

U.S. Department of the Interior  
Office of Surface Mining  
Reclamation and Enforcement



# North Cumberland Wildlife Management Area

Tennessee Lands Unsuitable for Mining  
Final Petition Evaluation Document /  
Environmental Impact Statement  
OSM-EIS-37

**Volume II**

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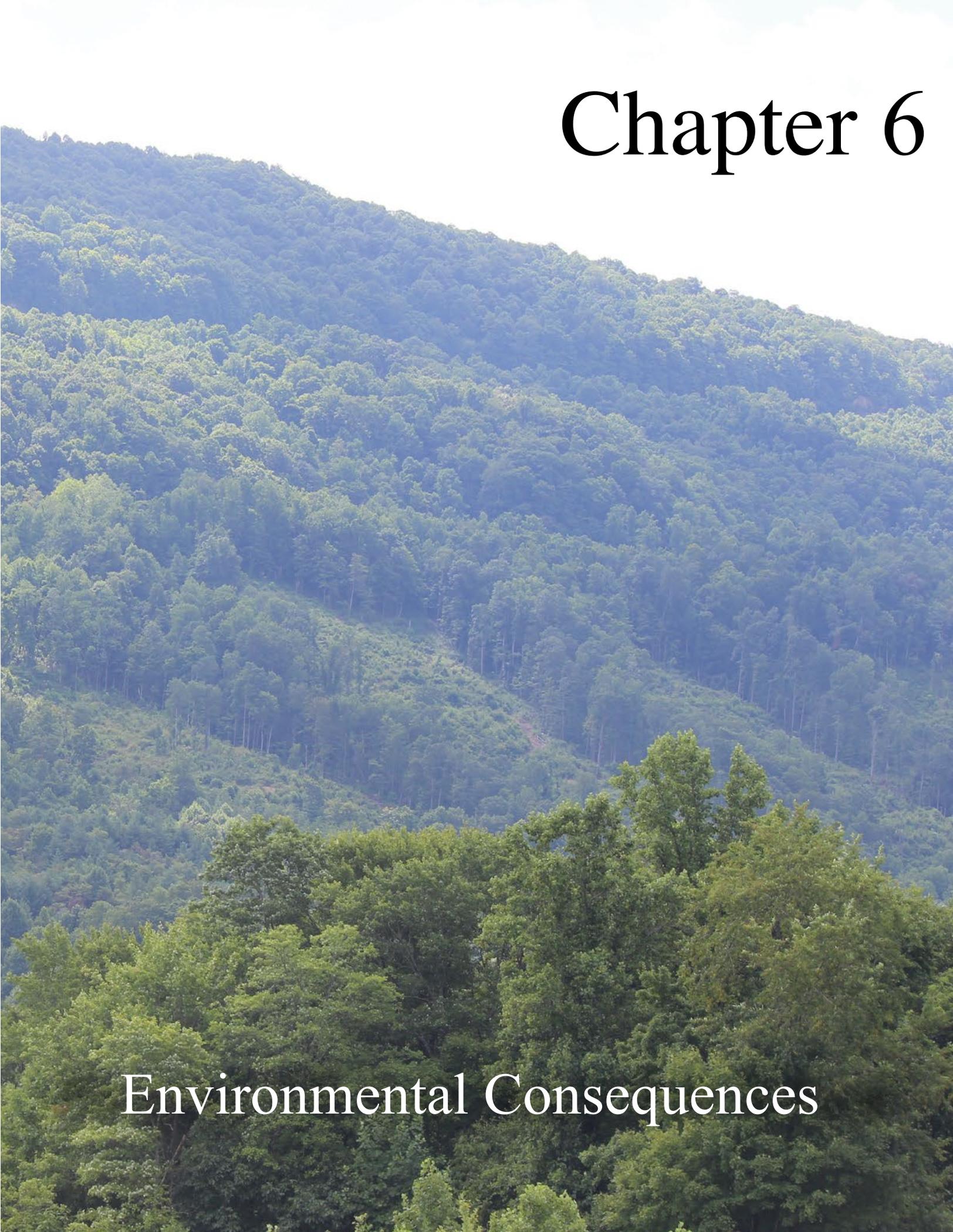
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# Chapter 6

A photograph of a vast, dense forest covering a mountain slope. The trees are lush green, and the sky is a clear, bright blue. The forest extends from the foreground into the distance, creating a sense of depth and scale.

## Environmental Consequences

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# CHAPTER 6: ENVIRONMENTAL CONSEQUENCES

## INTRODUCTION

This chapter analyzes beneficial and adverse impacts that would result from implementing any of the alternative petition decisions, including the no-action alternative, available to the Office of Surface Mining Reclamation and Enforcement (OSMRE) described in this petition evaluation document / environmental impact statement (PED/EIS). In addition, this chapter includes a summary of laws and policies relevant to each impact topic and methods used to analyze the direct, indirect, and cumulative impacts. As required by the Council on Environmental Quality regulations implementing the National Environmental Policy Act (NEPA), a summary of the environmental consequences for each alternative is provided in table 6-2, which can be found in later in this chapter. The resource topics presented in this chapter, and the organization of these topics, correspond to the resource discussions contained in “Chapter 4: Affected Environment,” except for the topic of soils, which is evaluated with the vegetation topic in this chapter.

## TYPICAL COAL MINING IN TENNESSEE

Typical coal mining in Tennessee includes surface mining, underground mining, auger and highwall mining, and combinations of each on a site-specific basis. In 2013 Tennessee produced approximately 1.1 million tons of coal with 67% being produced from underground mines and 33% produced from surface and auger mining operations.

### Surface Coal Mining in Tennessee

A typical surface mine in Tennessee is a surface contour mine, which is defined as a mining method that removes coal along a topographic contour by removing the overburden to a specified highwall height defined by the economics of the operation. Currently in Tennessee, the majority of surface contour mines use existing, open highwalls that were abandoned prior to enactment of Surface Mining Control and Reclamation Act (SMCRA) in 1977. Initially the pre-existing highwall is scaled to eliminate overhanging rock and potential rock falls to keep miners safe and meet existing regulatory guidelines. A second cut (approximately 60 to 100 feet wide) is then excavated above the existing highwall and the subsequent coal that is uncovered is extracted. The overburden produced by the second cut is placed on the existing bench to eliminate a portion of the existing highwall. Typically in Tennessee, auger mining is employed in conjunction with surface coal mining to enhance job profitability. An auger (or highwall miner) machine is set perpendicular to the highwall and laterally bores circular (or rectangular for a highwall mining machine) holes into the exposed coal seam to recover a percentage (20 to 40%) of the remaining coal in



*Photo 1 Typical Tennessee Surface Coal Mining Operation*

the hillside. The depths of the auger holes vary according to the method (circular or highwall miner), coal seam height, and the height of overburden above the coal seam.

This typical mine, using both surface mining and augering methods, progresses from a strategic point with respect to access and the coal reserves, and follows the contour around the sides of the mountain following the coal seams. Reclamation follows behind the contour/auger mining; this includes backfilling the highwall, reclaiming the ground back to approximate original contour, and implementing the postmining land use, and revegetation requirements.

In a typical Tennessee contour mine on an area not previously mined, the overburden from the initial mining cut is temporarily placed on the ground above the planned highwall or on a designated adjacent permitted area. The overburden generated by this initial mining cut is incorporated into the contour backfill when an area becomes available. If this new area is adjacent to a previously mined area, the initial mining cut can be placed on the bench of the previously mined area to augment the reclaiming of the highwall. The overburden from each succeeding mining cut is placed directly behind in the previous mining cut until all of the permitted coal reserve has been mined. Upon completion of all coal extraction (by surface mining and augering) the backfilled mining bench is reclaimed. Construction of permanent excess spoil fills in jurisdictional waters is forbidden in Tennessee due to the Tennessee Responsible Mining Act of 2009 (2009 Tenn. Pub. Acts 289). Contemporaneous reclamation rules in Tennessee dictate that no more than 50% of the permitted area can be disturbed and/or unreclaimed on a multi-seam contour mine at any one time.

To achieve a coal production level of 100,000 tons per year, the typical mine excavation equipment would include a front-end loader (12 to 15 cubic yard capacity) and two haul trucks (100-ton capacity) to excavate all overburden. One 10-hour shift per day, 5 days per week would constitute an average weekly schedule. This would account for an overall strip ratio of 10 to 12 cubic yards of overburden per ton of coal (including auger coal).

Typical additional support equipment would include a bulldozer, small front-end loader for coal loading, coal haulage trucks, blasthole drill, water truck, mechanics truck, explosives truck, and motor grader.

### **Underground Coal Mining in Tennessee**

A typical underground mining scenario in Tennessee would start on an abandoned mine lands bench or by drilling and blasting a bench in order to create a highwall or “face-up” area to conduct coal removal activities. According to Mine Safety and Health Administration regulations, the face-up area must have safety benches constructed depending on total highwall height. Several mine entries are then driven into the coal from the face-up area to access the coal and provide room for underground machinery, conveyor belts, and ventilation fans.

In Tennessee, coal is typically removed using continuous miner machines in what is referred to as the “room and pillar” mining technique. Room and pillar mining, when view from a map view, appears as a checkerboard pattern and the tunnels intersect at 90 degrees. Pillars of coal are left in place to support the roof along the tunnels and to prevent subsidence. On occasion, some of these pillars are removed during retreat mining when the underground coal reserve has reached its maximum lateral extent and the mine begins to move back toward the face-up area. Coal recovery is maximized by retreat mining and is usually in the range of 50 to 80% coal recovery.

Vastly different from a surface mine, the underground mine would only use surface earth-moving machinery at the beginning and end of the mining operation. Topsoil and spoil are removed by dozer after fragmentation due to blasting. Front-end loaders deposit the material into haul trucks for temporary

disposal within designated storage areas. Depending on the amount of coal reserves, the underground mine might remain active for 20 years or more. After mining operations are complete, the spoil and topsoil are hauled back to the face-up area to be used for backfilling and reclamation.

Most underground mine entries are sealed with concrete blocks prior to backfilling to prevent access and seal water and gasses in the mine. For mines with large quantities of water of acceptable quality, a small diameter pipe may be placed in the concrete block and routed to an underdrain that carries the water out beyond the toe of the backfilled slope.

Revegetation and the postmining land use of underground mines are similar to most surface mines. In fact, sometimes a face-up highwall is left after surface contour mining in order to develop a future underground mine. This category of mining is called “combined” surface and underground mining in the permit application.

## REGULATORY IMPLICATIONS

In addition to the SMCRA statutory and regulatory requirements that apply to coal mining anywhere within the United States, in 30 CFR part 942, a number of regulations were developed that are applicable only in Tennessee. A summary of the most significant portions of the part 942 regulations follows.

**Diversions:** Section 942 includes a number of specific requirements intended to ensure the construction of stable diversion channels that cause or are subject to minimal erosion. Per 30 CFR § 942.816(c), diversion channel linings must be designed using standard engineering practices to safely pass the design velocities. Unless OSMRE determines greater levels are necessary, diversion channel freeboard must be no less than 0.3 feet with protection being provided for areas of flow transition and for critical areas such as swales and curves. Energy dissipaters must be installed at discharge points and in diversion channels where those diversions intersect with natural streams and the exit velocity of the diversion ditch flow is greater than that of the receiving stream. When diversion channels are constructed, any excess excavated material not used in diversion channel construction must be disposed of in accordance with regulations for disposal of excess spoil (30 CFR §§ 816.71 through 816.74).

The impact of this regulation is that a minimum of 3.6 inches of freeboard must be maintained when carrying the design flow which in most cases is equivalent to the regulation at 30 CFR part 816. Also, any spoil left over from diversion construction must be disposed of in a controlled manner just like spoil from the mined out area. The impact of this regulation on a typical mine in Tennessee is a slight increase in reclamation cost to adhere to the design flow requirements and excess spoil disposal.

**Hydrologic Balance: Siltation Structures:** Section 942 includes specific requirements intended to provide protections for nearby streams by ensuring sedimentation ponds meet minimum sediment storage requirements. As indicated in 30 CFR § 942.816(d), in the absence of an approved plan for sediment cleanout, sediment pond storage volume must be no less than 0.2 acre feet per disturbed acre draining into a basin. If a pond maintenance and cleanout plan is approved by OSMRE, lesser sediment storage volumes may be approved but in no case can sediment storage volume be less than 0.1 acre-feet per disturbed acre.

**Backfilling and Grading:** Section 942 includes specific requirements intended to protect the environment by limiting the amount of mining-related disturbance that can occur in advance of reclamation. The regulation at 30 CFR § 942.816(e) limits contour mining by requiring that rough backfilling and grading follows coal removal by not more than 60 days or 1,500 linear feet. For area mining, rough backfilling and grading must be completed within 180 days following coal removal and cannot be more than four spoil ridges behind the pit being worked with the spoil from the active pit being

considered the first ridge. OSMRE may grant additional time for rough backfilling and grading if the permittee can demonstrate, through the detailed written analysis under 30 CFR § 780.18(b)(3) that additional time is necessary and the permittee can post the necessary bond amounts to ensure reclamation can be completed in the event the permittee fails to do so. The impact of this regulation for surface mining (also applicable to surface facilities for underground mines) is that time and distance constraints are required to ensure contemporaneous reclamation.

**Revegetation:** To minimize impacts to the environment and facilitate the establishment of the approved postmining land use, 30 CFR § 942.816(f) establishes minimum standards for revegetation success and requires that sampling techniques for measuring woody plant stocking and ground cover must be in accordance with techniques approved by the OSMRE. Revegetation success standards vary based on approved postmining land use. This section only discusses standards established for the land uses similar to those identified for the North Cumberland Wildlife Management Area (NCWMA) and Emory River Tracts Conservation Easement (ERTCE).

For areas developed for wildlife habitat, undeveloped land, recreation, or forestry, the stocking of woody plants must be at least equal to the rates specified in the approved reclamation plan. To minimize competition with woody plants, herbaceous ground cover should be limited to that necessary to control erosion and support the postmining land use. Seed mixes and seeding rates will be specified in the permit.

Minimum tree and shrub stocking levels and planting arrangements must be specified by the OSMRE after consultation with the appropriate state agencies. All trees and shrubs that will be used in determining the success of stocking and the adequacy of plant arrangement must have utility for the approved postmining land use. At the time of bond release, such trees and shrubs must be healthy, and at least 80% must have been in place for at least three growing seasons. No trees and shrubs in place for less than two growing seasons must be counted in determining stocking adequacy. Distribution of woody plants within the permit area must be consistent with the postmining land use. Vegetative ground cover must not be less than that required to achieve the approved postmining land use.

The impact of this regulation is that it establishes a Tennessee specific performance standard for revegetation rates and linked to the approved postmining land use.

**Roads:** Section 942 includes specific requirements intended to minimize the impacts of roads on the environment. Under 30 CFR § 942.816(g), roads must be designed and constructed or reconstructed in compliance with the following standards in order to control subsequent erosion and disturbance of the hydrologic balance.

Except for existing primary roads and where lesser grades are necessary to control site-specific conditions, these regulations minimize impacts by establishing maximum road gradients and by defining maximum spacing between culverts based on road gradient. Based on the erosive properties of the soil or to accommodate flow from small intersecting drainages, the OSMRE can require the installation of culverts at closer intervals than the maximum. Culverts may be installed at greater intervals than the maximum if approved by the OSMRE based upon a finding that greater spacing will not increase erosion. To maintain the integrity and function of culverts installed on primary roads, a minimum of one foot of compacted fill is required to cover culverts.

Ancillary road regulations allow field design methods to be used but still include requirements that establish maximum road gradients. Ancillary roads may meander as necessary to avoid natural obstructions. Compaction on ancillary road embankments need only occur to the extent necessary to control erosion and maintain the road. Temporary culverts and bridges must be sized to safely pass the one-year, six-hour precipitation event.

The impact of this regulation is that maximum grade requirements and culvert spacing specifications exist and must be complied with depending on whether the road is primary or ancillary. Also, culverts located along primary roads must have at least one foot of compacted fill as cover. Temporary culverts and bridges located along ancillary roads must be designed to pass the one-year, six-hour precipitation event.

**Use of Explosives:** Section 942 includes specific requirements intended to minimize the impacts of blasting. Under 30 CFR § 942.816(h), all blasting must be conducted between sunrise and sunset. Blasting may not be conducted at times different from those announced in the blasting schedule except in emergency situations where rain, lightning, or other atmospheric conditions, or operator or public safety requires unscheduled blasts. As deemed necessary, the OSMRE may specify more restrictive time periods for blasting.

The impact of this regulation is to protect the best interests of the public. Blasting can only be conducted during daylight hours. If a company has the ability to blast 24 hours per day, restricting blasting to daylight hours may add a logistical cost to the overall operation.

### **Tennessee Responsible Mining Act of 2009**

The State of Tennessee has regulatory primacy under the Clean Water Act. The State has adopted statutes and regulations designed to implement State programs to protect water quality. Tennessee Code Annotated, section 69-3-108, was amended in 2009 to require the following. In regard to permits for activities related to the surface mining of coal or the surface effects of underground mining, with limited exceptions, no coal mining or disposal of spoil or coal waste materials may occur within 100 feet of the ordinary high water mark of a stream. The limited exceptions allow disturbance within 100 feet of a stream for stream crossings. In addition, there are exceptions for operations to improve the quality of stream segments previously disturbed by mining; and for activities related to, and incidental to, the removal of coal from its original location. These exceptions include operations such as transportation, storage, coal preparation and processing, loading, and shipping operations within 100 feet of the ordinary high water mark of a stream, if necessary due to site-specific conditions, that do not cause the loss of stream function and that do not cause a discharge of pollutants in violation of water quality criteria.

Under the Tennessee Responsible Mining Act, if the State determines that surface coal mining at a particular site will violate water quality standards, the state permit (a Clean Water Act permit) must be denied. Violation of water quality standards during mining operations would be rare because water would be treatable to standards identified in the National Pollutant Discharge Elimination System permit.

### **ANNUAL MINING RATE IN THE EVALUATION AREA**

In determining significance, NEPA requires agencies to consider the context and intensity of their actions (40 CFR § 1508.27). Context refers to the setting of the action such as the affected region, interests, or locality (40 CFR § 1508.27(a)). Intensity “refers to the severity of the impact” (40 CFR § 1508.27(b)). In order to understand the degree of the potential impacts associated with alternatives being evaluated, it is important to understand the average area of disturbance from surface coal mining that occurs annually in the evaluation area. This area, or rate, of disturbance provides both the context in terms of whether impacts are widespread or local and provides some indication of the severity of the impact in terms of amount of area affected.

OSMRE calculated an average annual surface coal mining rate based on approximately 30 years (1984–2014) for the greater NCWMA and ERTCE area. During this period, a total of 74 individual permits were issued. Calculations used for each of these 74 permits were based on estimated disturbed acreage as submitted in the permit application. These calculations are subject to the following qualifications:

- for those older permits in which estimated disturbed acreage numbers were not available, permit acreage was used,
- for those permits that were located on the NCWMA and ERTCE boundaries, the permit acreage number for only that portion of the permit area which fell within the actual NCWMA and ERTCE area was used,
- for those six permits identified which as of the close of 2014 had not expired and still had portions of the proposed disturbance that had not yet been disturbed, a LiDAR slope grid and 2012 and 2014 National Agriculture Imagery Program aerial imagery were used. Available imagery and disturbed acres as reported by the OSMRE Inspectors and recorded in the OSMRE FOCIS database were used to determine that 213.1 acres of proposed permitted disturbance had not been disturbed as of the end of the 2014 calendar year and as such, should be removed from the disturbed area calculations.

When the above calculations were completed, OSMRE found the average annual rate of surface coal mining in the evaluation area to be approximately 112 acres per year, including re-mining where applicable. It should be noted that this is an average rate based on a 30-year historic trend and could fluctuate over time depending on engineering and economic factors such as the feasibility of coal resource extraction, the selling price, or other known and unknown open market factors. However, it helps provide the reader with conceptual idea of the projected magnitude of impact on the different resource areas analyzed. For purposes of the analysis, it is also assumed that the average annual rate of mining would be the same across alternatives. This means that across all alternatives, an average of 112 acres of coal mining disturbance per year is projected to occur within the evaluation area. For alternatives 2, 5, and 6, the mining disturbance would occur in the evaluation area outside the designation areas. For alternatives 3 and 4, which do not prohibit re-mining, the mining disturbance could occur in or outside of the designation areas because re-mining could occur within the designation area if permitted. This assumption is supported by the coal resource evaluation conducted in chapter 5. For example under alternative 2, which would preclude all surface coal mining (including re-mining) from the largest potential designation area, approximately 38% of the total of the coal resources within the evaluation area would still be available to be mined over 40% of the evaluation area (roughly 68,800 acres). Given the rather small-scale average rate of disturbance (i.e., 112 acres), and the availability of coal resources, it is reasonable to assume that mining could still occur at the historical rate outside the petition area of alternative 2. Similarly, alternative 5, which would designate the smallest area of all of the alternatives, would leave approximately 86% of the coal resource available over 87% of the

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**Evaluation Area:** *The area of land that extends beyond the petition or designation area where indirect effects from the alternatives could occur. This area may vary by resource topic but is generally described as the NCWMA and ERTCE boundaries. The evaluation area is defined more broadly than the petition area to also encompass non-public access lands.*

**Petition Area:** *The area described as alternative 2 and included as the petition from the State of Tennessee. Specifically, the petition area includes 505 miles of ridgelines with a 1,200-foot corridor (600 feet on both sides of the ridgetop). The petition area covers approximately 67,326 acres.*

**Designation Area:** *The areas described by alternatives 3–6 as alternative designation areas to the petition area of alternative 2.*

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evaluation area. Alternative 6 would leave approximately 64% of the coal resource available over 63% of the evaluation area.

Alternatives 3 and 4 do not prohibit remining in the designation areas. Alternative 3 would provide the same access for new mining to the coal resource as alternative 2, above. Alternative 4 could potentially leave approximately 45% of the coal resource available for new mining over 45% of the evaluation area. Under these alternatives, potential remining could account for the entire projected yearly 112-acre disturbance, or a portion thereof, within the designation area, resulting in the eventual long-term reclamation of existing mining disturbances. In terms of potential remining in the evaluation area, there are 390.7 miles of pre-SMCRA highwalls present within the NCWMA and ERTCE. There are 201.6 miles of highwalls within the petition area under alternatives 2 and 3; whereas alternative 4 contains approximately 219.5 miles of highwalls. However, not all of these miles would be subject to remining because they do not possess a suitable coal resource and/or may not be determined appropriate for remining under current regulations or the purposes for which the area was designated unsuitable for mining. Based on the coal resources data and calculations performed by OSMRE, approximately 183.7 miles of the pre-SMCRA highwalls have been identified as potentially surface mineable highwalls of the 390.7 miles of highwall present in the evaluation area. Under alternative 3, there could be approximately 102 miles of potentially mineable highwall; whereas under alternative 4 there could be approximately 112 miles of potentially mineable highwall. The net effect of alternatives 3 and 4 would be to reclaim 102 and 112 miles, respectively, of highwall within each respective petition area. There would be no such reclamation in alternatives that would not allow for remining within the designation area.

As described above, all of the alternatives being evaluated are examined in context with the 172,000-acre area that makes up the NCWMA and ERTCE. Even with a designation, some surface coal mining and remining could occur outside the final lands unsuitable for mining (LUM) designated area in adjacent areas within the evaluation area. Table 6-1 describes the area within the evaluation area under each alternative that could still be subject to surface coal mining or remining. For example, under alternative 1, a maximum of approximately 65,830 acres of unmined areas and 16,925 acres of previously surface mined areas would be available for surface mining and remining, respectively.

**TABLE 6-1: MAXIMUM POTENTIAL ACREAGE AVAILABLE FOR SURFACE MINING AND REMINING WITHIN THE EVALUATION AREA BY ALTERNATIVE**

<b>Alternative</b>	<b>Potential Surface Mineable Acreage</b>	<b>Previously Surface Mined (Potential Remining) Acreage</b>
Alternative 1 (No Action)	65,830.3	16,924.9
Alternative 2	31,736.5	8,146.6
Alternative 3	31,736.5	16,924.9
Alternative 4 (Preferred Alternative)	28,463.4	16,924.9
Alternative 5	56,954.5	15,399.9
Alternative 6	46,664.2	12,075.2

## REGULATORY FRAMEWORK

SMCRA section 506 (30 USC § 1256) and implementing regulations at 30 CFR §§ 740.13 and 773.4 require all people desiring to mine coal to obtain a permit. A new permit application, and the associated process, is slightly different for new applications to remove more than 250 tons of coal and exploration permits to remove less than 250 tons of coal. For exploration permits removing less than 250 tons of coal, the applicant must provide notification to the regulatory authority prior to commencing exploration (30

USC § 1262; 30 CFR § 772.11). If an operator wishes to perform exploration but remove more than 250 tons of coal or conduct exploration within the boundaries of a LUM designation, the applicant must file an application with the regulatory authority (30 CFR § 772.12).

All surface coal mining permit applications must contain all relevant technical, engineering, and administrative information as described in the statute and implementing regulations at (30 USC § 1257; 30 CFR part 780). Once an application has been filed with the regulatory authority, the regulatory authority is required to review the information and issue a written decision (30 CFR § 773.7). The regulatory authority must review the applicant violator system (30 CFR § 773.8), ownership and control (30 CFR § 773.9), permit history (30 CFR § 773.10), compliance history (30 CFR § 773.11), and permit eligibility (30 CFR § 773.12).

Once the application is administratively complete and the technical review is done, the regulatory authority must make a decision to issue or deny the application according to 30 CFR § 773.7. As part of the decision making process and before a coal mining permit can be issued, the regulatory authority must make the following findings related to its technical review of the mining application:

- The application is accurate and complete and the applicant has complied with all requirements of SMCRA and the regulatory program.
- The applicant has demonstrated that reclamation as required by SMCRA and the regulatory program can be accomplished under the reclamation plan contained in the permit application.
- The proposed permit area is—(1) not within an area under study or administrative proceedings under a petition, filed pursuant to 30 CFR parts 764 and 769 (under review for unsuitable for surface coal mining operations), unless the applicant demonstrates that before January 4, 1977, he has made substantial legal and financial commitments in relation to the operation covered by the permit application; or (2) not within an area designated as unsuitable for surface coal mining operations under 30 CFR parts 762 and 764 or 769 or within an area subject to the prohibitions of 30 CFR § 761.11.
- For mining operations where the private mineral estate to be mined has been severed from the private surface estate, the applicant has submitted to the regulatory authority the documentation required under 30 CFR § 778.15(b) to demonstrate the right to mine the coal.
- The regulatory authority has assessed the probable cumulative impacts of all anticipated coal mining on the hydrologic balance in the cumulative impact area and has determined that the proposed operation has been designed to prevent material damage to the hydrologic balance outside the permit area.
- The applicant has demonstrated that any existing structure will comply with 30 CFR § 701.5, and the applicable performance standards.
- The applicant has paid all reclamation fees from previous and existing operations.
- The applicant has satisfied the applicable requirements of 30 CFR part 785.
- The applicant has, if applicable, satisfied the requirements for approval of a long-term, intensive agricultural postmining land use, in accordance with the requirements of 30 CFR §§ 816.111(d) or 817.111(d).
- The operation would not affect the continued existence of endangered or threatened species or result in destruction or adverse modification of their critical habitats, as determined under the Endangered Species Act of 1973 (16 USC § 1531 et seq.).

- The regulatory authority has taken into account the effect of the proposed permitting action on properties listed on or eligible for listing on the National Register of Historic Places. This finding may be supported in part by inclusion of appropriate permit conditions or changes in the operation plan protecting historic resources, or a documented decision that the regulatory authority has determined that no additional protection measures are necessary.
- For a proposed remining operation where the applicant intends to reclaim in accordance with the requirements of 30 CFR §§ 816.106 or 817.106, the site of the operation is a previously mined area as defined in 30 CFR § 701.5.
- For permits to be issued under SMCRA, the permit application must contain the following:
  1. an identification of the potential environmental and safety problems related to prior mining activity that could reasonably be anticipated to occur at the site; and
  2. mitigation plans to sufficiently address these potential environmental and safety problems so that reclamation as required by the applicable requirements of the regulatory program can be accomplished.
- The applicant is eligible to receive a permit, based on the reviews under 30 CFR §§ 773.7 through 773.14.

Because Tennessee is a federal program state, the regulatory authority (OSMRE) in addition to making the written finding required by SMCRA, must also comply with the NEPA and produce a document addressing the following:

- The environmental impact of the proposed action,
- Any adverse environmental effects that cannot be avoided should the proposal be implemented,
- Alternatives to the proposed action,
- The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
- Any irreversible and irretrievable commitments of resources that would be involved in the proposed action should it be implemented.

SMCRA and its implementing regulations at 30 CFR parts 700 to 955 also include provisions for public participation (30 USC § 1263; 30 CFR § 773.6). The applicant must place public notice of the proposed operation in a newspaper of local circulation in the community the activity will occur (30 CFR § 773.6) and place a copy of the proposed application in a location for public review (30 CFR § 773.6). The regulatory authority must also retain a copy for public review (30 CFR § 773.6). The regulatory authority is required to notify all local, state, and federal governmental agencies potentially affected or with jurisdiction of the proposed action (30 CFR § 773.6). After an application is advertised and placed for review, the public may offer comments and objections on the application within a reasonable time period as established by the regulatory authority (30 CFR § 773.6). Any person with an affected interest from the proposed operation may also request an informal conference (30 CFR § 773.6).

Provisions of SMCRA (30 USC § 1259) and its implementing regulations (30 CFR § 800.11), require the applicant to submit a performance bond for the operation. The governing principle for calculating the amount of the performance bond is that the regulatory authority must have adequate bond on hand at all times to ensure the regulatory authority can perform all reclamation work on the site in the event of a forfeiture (30 CFR § 800.14). Performance bonds are regularly reviewed for adequacy (30 CFR § 800.15), can be adjusted as areas are reclaimed or increased (30 CFR § 800.15), and are releasable when

various phases of reclamation are successfully completed (30 CFR § 800.40). If an operator is unwilling or unable to perform the reclamation required on the site, the bonds can be forfeited and the money used for site reclamation (30 CFR § 800.50).

Once a permit to mine coal has been issued to the applicant, the regulatory authority must inspect each site and enforce the regulations (30 USC § 1267). The regulatory authority has right-of-entry jurisdiction on any coal mine operation (30 CFR § 840.12) and must inspect each site at least once per month for active sites or once per quarter for inactive sites (30 CFR § 840.11). The inspections must be carried out on an irregular basis, occur without prior notice, and include prompt filing of inspection reports (30 CFR § 840.11e).

## **ENVIRONMENTAL CONSEQUENCES OVERVIEW AND GENERAL ANALYSIS METHODS**

NEPA requires federal agencies to evaluate the environmental impacts of proposed actions and alternatives (40 CFR § 1502.16). The environmental consequences analysis must include a discussion of the environmental impacts, any adverse environmental effects that cannot be avoided, the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources (40 CFR § 1502.16). Specifically this chapter includes the assessment of the direct, indirect and cumulative impacts and their significance (40 CFR § 1502.16).

This chapter assesses the impacts to the following resources:

- Earth resources (geology, topography and physiographic setting)
- Air quality
- Water resources (surface water, groundwater, and wetlands)
- Soils and vegetation
- Fish and wildlife
- Special-status species
- Land use and recreation
- Aesthetics (visual resources and soundscapes)
- Socioeconomics
- Cultural resources
- Public health and safety

For the purposes of this PED/EIS, it should be noted that none of the alternatives authorize surface mining operations in the evaluation area. Potential future mining would require a permit application and a site-specific NEPA analysis to evaluate the potential impacts from surface coal mining. Also, none of the action alternatives would result in new or additional adverse impacts beyond those currently experienced under the no-action alternative.

As described in “Chapter 1: Purpose and Need,” unless otherwise specified the evaluation area for most impact topics includes the NCWMA and ERTCE. Although the ERTCE is evaluated for the purpose of analysis in this PED/EIS, OSMRE has determined that it is not eligible for inclusion in a LUM

designation. Based on a review of existing property rights and the terms of the conservation easement for the Emory River Tract, OSMRE believes that surface coal mining operations are not authorized in the ERTCE. In addition, there are no commercial mineable coal resources in the ERTCE. Therefore the ERTCE cannot be designated as lands unsuitable for surface coal mining operations. Therefore, overall impacts would likely be somewhat less than described in this chapter. In order to determine whether an action has the potential to result in significant impacts, the context and intensity of the action must be considered. Context refers to area of impacts and whether they are near or long term. Intensity refers to the severity of the impact.

The following definitions are used for impact topics unless otherwise noted:

- **Beneficial:** For the no-action alternative, an impact that would result in a positive change to the resource compared to the existing conditions. For the action alternatives, an impact that would result in a positive change to the resource compared to the no-action alternative.
- **Adverse:** An impact that causes an unfavorable result to the resource compared to the existing conditions.
- **Direct:** Impacts that are caused by the action and occur at the same time and place (40 CFR § 1508.8).
- **Indirect:** Impacts that are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable (40 CFR § 1508.8).
- **Cumulative:** The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR § 1508.7).
- **Long-term:** Impacts that will change the existing conditions beyond the cessation of mining activities or indefinitely.
- **Short-term:** Impacts that will likely only exist during mining operations prior to reclamation of sites.

The following should be considered in evaluating the significance of an impact (40 CFR § 1508.27):

- Impacts that may be both beneficial and adverse. A significant effect may exist even if the federal agency believes that on balance the effect will be beneficial.
- The degree to which the proposed action affects public health or safety.
- Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.
- The degree to which the effects on the quality of the human environment are likely to be highly controversial.
- The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.
- The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.

- Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.
- The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.
- The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.
- Whether the action threatens a violation of federal, state, or local law or requirements imposed for the protection of the environment.

The general approach for measuring the effects of the alternatives on each impact topic includes the following elements:

- Discussion of general analysis methods as described in applicable laws and regulations
- Discussion of the basic assumptions used in this analysis
- Description of the context of the actions
- Definition of the type and duration of impact resulting from each alternative
- Description of the methods used to evaluate the cumulative impacts of each alternative
- Conclusion of significance of impacts for each affected resource

## CUMULATIVE EFFECTS METHOD

Council on Environmental Quality regulations for implementing NEPA require the assessment of cumulative impacts in the decision-making process for proposed federal projects. Cumulative impacts are defined as the “impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions” (40 CFR § 1508.7). As stated in the Council on Environmental Quality handbook, “Considering Cumulative Effects under the National Environmental Policy Act” (CEQ 1997), cumulative impacts should be analyzed in terms of the specific resource, ecosystem, and human community being affected and focus on effects that are truly meaningful.

This chapter provides an analysis of potential cumulative impacts related to the petition evaluation and alternatives. The analysis was accomplished using the four steps summarized below.

- **Step 1 - Identify Potentially Affected Resources:** Resources are identified that potentially could be cumulatively affected by the State’s petition or alternatives being evaluated in combination with other actions.
- **Step 2 - Establish Boundaries:** Spatial (i.e., location) and temporal (i.e., time) boundaries are established for the consideration of other potentially cumulative actions.
- **Step 3 - Identify Potentially Cumulative Actions:** Other past, present, and reasonably foreseeable future actions are identified that have contributed, or could contribute, to cumulative impacts on the resources identified in step 1. These actions fall within the spatial and temporal boundaries established in step 2.

- **Step 4 - Analyze Cumulative Impacts:** For each resource, the actions identified in step 3 are analyzed in combination with the impacts of the State’s petition or alternatives being evaluated. This analysis describes the overall cumulative impact related to each resource and the contribution to this cumulative impact of State’s petition or alternatives being evaluated.

## **AFFECTED RESOURCES AND RESOURCE BOUNDARIES**

In identifying potentially affected resources (step 1), OSMRE considered the likelihood that a variety of other actions with a wide variety of potential effects on numerous resources have taken place or could take place within the evaluation area. Accordingly, OSMRE determined that all of the same resources described in “Chapter 4: Affected Environment” should be considered in the cumulative impacts analysis.

OSMRE then established reasonable boundaries for the consideration of other past, present, and reasonably foreseeable future actions (step 2). These boundaries were established in terms of where the other actions are located (i.e., spatial boundaries), and when in time these actions took place or will take place (i.e., temporal boundaries). For each resource, the spatial boundary is the area where other past, present, and reasonably foreseeable future actions have taken place, are taking place, or could take place and result in cumulative impacts on the affected resource when combined with the impacts of the State’s petition or alternatives being evaluated. Appropriate spatial boundaries can vary for each resource.

The temporal boundary describes how far into the past, and forward into the future, other actions should be considered in the cumulative impact analysis. For the purposes of this analysis, past and present actions that have shaped the landscape since approximately the first European settlement in the general vicinity are considered, to the extent that they have had lasting effects contributing to cumulative impacts. The reasonably foreseeable nature of potential future actions helps define the forward-looking temporal boundary. While it is acknowledged that the State’s petition or alternatives being evaluated could continue for 30 years or more and could contribute to cumulative impacts during that timeframe, it would be speculative to consider actions beyond what is reasonably foreseeable. Given this limitation, the forward-looking temporal boundary has been established generally at the period when mining could occur over the near term and when reclamation could occur over the long term.

## **CUMULATIVE ACTIONS**

After establishing appropriate spatial and temporal boundaries, OSMRE identified other past, present, and reasonably foreseeable future actions potentially contributing to cumulative effects along with the State’s petition or alternatives being evaluated (step 3). To identify these other actions, OSMRE used information gathered in the course of developing the analysis of direct and indirect impacts. OSMRE also considered guidance on determining what actions to consider in a cumulative analysis from a variety of sources, including the Council on Environmental Quality handbook, “Considering Cumulative Effects under the National Environmental Policy Act” (CEQ 1997).

The following discussion provides more information on how potentially cumulative past, present, and reasonably foreseeable future actions were identified; the discussion describes the cumulative actions that have been identified for the cumulative impacts analysis in this PED/EIS.

Past actions relevant to the cumulative impacts analysis in this PED/EIS are those that have previously taken place and are largely complete, but that have lasting effects on one or more resources that also would be affected by the State’s petition or alternatives being evaluated. For these past actions, The Council on Environmental Quality has issued a guidance memo entitled “Guidance on Consideration of Past Actions in Cumulative Effects Analysis.” This guidance states that consideration of past actions is only necessary in so far as it informs agency decision-making. Typically the only types of past actions

considered are those that continue to have present effects on the affected resources. In addition, the guidance states that “[a]gencies are not required to list or analyze the effects of individual past actions unless such information is necessary to describe the cumulative effect of all past actions.” Agencies are allowed to aggregate the effects of past actions without “delving into the historical details of individual past actions.” Impacts associated with past actions are largely captured in “Chapter 4: Affected Environment” for each resource.

Present actions are those that are currently occurring and result in impacts on the same resources that the State’s petition or alternatives being evaluated could affect. Present actions generally include ongoing land management and utilization activities (such as recreation and timber harvest), as well as recently completed residential and industrial development.

Reasonably foreseeable future actions are those actions that are likely to occur and affect the same resources as the State’s petition or alternatives being evaluated. For a future action to be considered reasonably foreseeable there must be a level of certainty that it will occur. This level of certainty is typically met by the submission of a formal project proposal or application to the appropriate jurisdiction, approval of such a proposal or application, inclusion of the future action in a formal planning document, or other similar evidence. For future actions in the proposal stage, the action must be sufficiently defined in terms of location, size, design, and other relevant features to permit meaningful consideration in the cumulative impacts analysis.

The following summarizes past, present, and reasonably foreseeable future actions considered in this cumulative impacts analysis. Additional actions and associated impacts are described and analyzed in each affected resource topic.

## **PAST, PRESENT, AND FUTURE ACTIVITIES COMMON TO ALL ALTERNATIVES AND THAT MIGHT CONTRIBUTE TO CUMULATIVE IMPACTS**

**Coal Mining Operations:** Past, present and reasonably foreseeable future coal mining operations would have impacts on a number of resources. Coal mining activities have occurred within the evaluation area at varying levels of intensity for more than 100 years (TWRA n.d.). Mining operations, especially surface mining operations, remove larger areas of vegetation, soil, subsurface geologic material, and alter the natural topography and hydrology. Although current and future mining operations must follow regulations concerning best management practices, impacts still occur. Many historic mining sites were never appropriately reclaimed, resulting in long-term impacts to a number of resources such as earth resources, water, vegetation and wildlife, among others. Underground mining can result in subsidence at the surface, resulting in long-term adverse impacts to surface drainage and underground aquifers.

**Timber Harvest:** Past, present and reasonably foreseeable future timber harvesting would have adverse impacts on resources such as vegetation, wildlife, soils, water resources, and aesthetics, among others. The removal of trees from land removes vegetation, degrades wildlife habitat, exposes soil to erosive factors, and changes site hydrology—indirectly contributing sediment to surface waters. OSMRE has estimated that the lease areas managed by private companies are harvested at a rate of 1,600 acres per year whereas the Tennessee Wildlife Resources Agency (TWRA) harvests 120 acres per year. In 2010, forestry best management practices in Tennessee were implemented at a rate of 88.9% (Sherrill et al. 2013).

**Oil and Gas Production:** Past, present and reasonably foreseeable future oil and gas production would have adverse impacts on a number of resources. Oil and gas pipelines that support the wells are common in the NCWMA and ERTCE and require roads and construction activities and stream crossings or drilling beneath streams. Much of this oil and gas production is located in steep slope areas. There are 289 oil and

gas wells within the boundaries of the evaluation area. The majority of these wells are located in the northeastern portion of the evaluation area. Well development and oil and gas production activities could result in spills or releases of brines and condensates into the surrounding environment.

**Recreational Activities:** Past, present and reasonably foreseeable future recreational activities, such as off-highway vehicle usage, hunting and fishing and camping impact a variety of resources. For example, use of off-highway vehicles disturbs wildlife and vegetation—eventually resulting in exposed soil and higher rates of erosion. Hunting, fishing and camping can result in additional disturbance to target and non-target fish and wildlife species. Recreational use also includes the development of future trails and other attractions, and improvements in recreational amenities.

**Construction and Development:** Construction and other civil works projects currently occurring in the evaluation area counties include highway and road construction and residential and non-residential land development. These actions have the potential to affect water resources, fish and wildlife, air quality, aesthetics, and socioeconomic resources, among other resources.

## **SUMMARY OF ENVIRONMENTAL CONSEQUENCES**

Table 6-2 provides a summary of the environmental impacts from each of the alternatives being analyzed. The remaining sections of chapter 6 provide an in-depth programmatic analysis for each potentially affected resource topic considered.

## **IMPACTS OF THE ALTERNATIVES ON EARTH RESOURCES (GEOLOGY, TOPOGRAPHY, AND PHYSIOGRAPHIC SETTING)**

### **METHODS FOR ANALYSIS**

#### **Applicable Statutes, Regulations, and Policies**

##### **Geology**

Coal mining permanently alters the geological structure of the mined area because of the removal of coal and, for surface mines, overburden. Factors that determine the level of geological disturbance are the elevation of the lowest coal seam mined, the depth of overburden above this seam, and the area mined. Surface mining completely alters the geologic structure above the lowest coal seam mined such that previously discrete strata of rock and soil, each stratum with its own distinctive characteristics, are converted to a more or less uniform fragmented mixture of rubble. Typically referred to as spoil, this rubble consists of mixtures of the parent rocks, with percentages of rock types varying at different locations across the site.

Underground mining can have a lesser impact on geology because the strata overlying the coal seam remains intact and in discrete units. However, subsidence may affect the intactness of the strata. Subsidence may cause pervasive changes in the elevation, continuity, and capability of individual strata but the strata moves as discrete units except in the immediate roof. This movement and subsequent disruption of the intact units may adversely affect the hydrologic properties and function of overlying water bearing strata.

## **Topography**

Coal mining alters the landscape by removing coal resources and changing the configuration and physical properties of rock and other earthen materials overlying the coal seam. Depending on the original topography, thickness of the coal seam, relative thickness of overburden, and mining method, significant changes in topography can result. Under SMCRA, mined land must be backfilled and graded to restore its approximate original contour, with limited exceptions.

### **Current Approximate Original Contour Requirements**

Section 515(b)(3) of SMCRA (30 USC § 1265(b)(3)) requires that mined lands be backfilled and graded to restore the approximate original contour, with certain exceptions. The implementing regulations at 30 CFR §§ 816.102 and 817.102 require that areas disturbed by mining operations be backfilled and graded to achieve approximate original contour. These regulations provide exceptions for sites with thin or thick overburden, mountaintop removal mining operations, those portions of steep-slope operations for which the regulatory authority has granted a variance from approximate original contour restoration requirements, previously mined areas for which complete highwall elimination is not required, and, for underground mines, settled and revegetated fills. The regulations at 30 CFR § 701.5 define approximate original contour as follows:

Approximate original contour means that surface configuration achieved by backfilling and grading of the mined areas so that the reclaimed area, including any terracing or access roads, closely resembles the general surface configuration of the land prior to mining and blends into and complements the drainage pattern of the surrounding terrain, with all highwalls, spoil piles and coal refuse piles eliminated. Permanent water impoundments may be permitted where the regulatory authority has determined that they comply with 30 CFR 816.49, 816.56, and 816.133 or 817.49, 817.56, and 817.133.

Figure 6-1 is a reconstruction of an illustration in the legislative history of SMCRA that demonstrates how the authors of SMCRA envisioned implementation of the backfilling and grading requirements of section 515(b)(3), both for operations required to restore the approximate original contour and for certain operations that are exempt from the requirement.

**TABLE 6-2: SUMMARY OF ENVIRONMENTAL CONSEQUENCES**

Resource	Alternative 1: No-Action Alternative	Alternative 2: State Petition Designation (67,326 acres)	Alternative 3: State Petition Designation with Potential Remining and Road Access (67,326 acres)	Alternative 4: Expanded Corridor Designation with Potential Remining and Road Access (Preferred Alternative) (74,968 acres)	Alternative 5: Targeted Resource Protection Designation (12,331 acres)	Alternative 6: Reduced Corridor Designation (39,106 acres)
Earth Resources (including) <ul style="list-style-type: none"> <li>• Geology</li> <li>• Topography</li> </ul>	Impacts from surface, underground, and auger mining would be permanent, localized, yet comparatively minor because any area subject to surface mining would be reclaimed to the approximate original contour. There would be benefits from remining and restoration of highwalls, and there is a limited amount of surface mining expected (assumed at an average of 112 acres per year). Alternative 1 would not have significant impacts on topography or geology.	Impacts to geology from underground and auger mining underneath the petition area would be permanent, localized, yet comparatively minor, and there would be a benefit since surface geology would remain undisturbed in the petition area. Impacts on topography would be mainly long-term beneficial from the protection of ridgelines in the petition area, but with the ongoing adverse impacts from the inability to remine and reclaim existing highwalls. Impacts would not be significant.	Impacts to geology would be permanent and localized, yet comparatively minor. The overall impacts to geology would be minor and there would be a benefit since surface geology would remain undisturbed in the designation area and reclamation would occur in remined areas if permitted in the future. Alternative 3 would have mostly beneficial impacts on topography from the protection of ridgelines within the designation area and the overall beneficial effect on potentially remined areas that are reclaimed. Impacts would not be significant.	Impacts to geology would be permanent and localized, yet comparatively minor, with a benefit since surface geology would remain undisturbed in the designation area and reclamation would occur in remined areas if permitted in the future. Impacts on topography under alternative 4 would be mainly beneficial from the protection of ridgelines within the designation area and the overall beneficial effect on potentially remined areas that are reclaimed. Impacts would not be significant.	Impacts to topography and geology from underground and auger mining underneath the petition area would be permanent, localized, yet comparatively minor, and there would be a benefit since surface geology would remain undisturbed in the designation area. Past adverse effects would remain where highwalls exist and cannot be reclaimed since no remining would be permitted. Overall, impacts on topography under alternative 5 would not be significant.	Impacts to geology from underground and auger mining underneath the petition area would be permanent, localized, yet comparatively minor. There would be beneficial impacts because topography and subsurface geology would remain undisturbed in the designation area. Past adverse effects would remain where highwalls exist and cannot be reclaimed since no remining would be permitted. Impacts would not be considered significant.
Air Quality and Greenhouse Gases	Alternative 1 would have near-term adverse impacts to air quality relative to existing ambient conditions for areas in the immediate vicinity of surface mining. Best management practices and compliance with applicable regulations and permit conditions would minimize impacts to this resource, but impacts related to particulate emissions would likely remain unchanged as a result of continued mining in the NCWMA. Greenhouse gas emissions would be less than significant.	Areas within the petition area would potentially experience fewer air quality impacts, but overall emissions in the evaluation area would remain the same as alternative 1. Best management practices and compliance with applicable regulations and permit conditions would minimize impacts to this resource, but impacts related to particulate matter emissions would likely remain unchanged as a result of continued mining in the NCWMA; however, based on the low level of annual production it is unlikely that impacts would be significant. Greenhouse gas emissions from coal extraction would be less than significant.	Areas within the designation area would be less likely to experience localized air quality impacts, because impacts in the designation area would result mainly from remining operations and associated haul roads if permitted in the future, which would be a small portion of overall production and would result in periodic and overall minor emissions. Overall emissions in the evaluation area would remain the same as alternative 1. Best management practices and compliance with applicable regulations and permit conditions would minimize impacts to this resource, but impacts related to particulate matter emissions would likely remain unchanged as a result of continued mining in the NCWMA. Greenhouse gas emissions from coal extraction would be less than significant.	Areas within the designation area would be less likely to experience localized air quality impacts, because impacts in the designation area would result mainly from remining operations and associated haul roads if permitted in the future, which would be a small portion of overall production and would result in periodic and overall minor emissions. Overall emissions in the evaluation area would remain the same as alternative 1. Best management practices and compliance with applicable regulations and permit conditions would minimize impacts to this resource, but impacts related to particulate matter emissions would likely remain unchanged as a result of continued mining in the NCWMA. Greenhouse gas emissions from coal extraction would be less than significant.	Areas within the designation area would experience few or minor localized air quality impacts from auger or underground mining only, because no surface mining would occur in the designation area. Overall emissions in the evaluation area would remain the same as alternative 1. Best management practices and compliance with applicable regulations and permit conditions would minimize impacts to this resource, but impacts related to particulate matter emissions would likely remain unchanged as a result of continued mining in the NCWMA. Greenhouse gas emissions from coal extraction would be less than significant.	Areas within the designation area would experience few or minor localized air quality impacts from auger or underground mining only, because no surface mining would occur in the designation area. Overall emissions in the evaluation area would remain the same as alternative 1. Best management practices and compliance with applicable regulations and permit conditions would minimize impacts to this resource, but impacts related to particulate matter emissions would likely remain unchanged as a result of continued mining in the NCWMA. Greenhouse gas emissions from coal extraction would be less than significant.

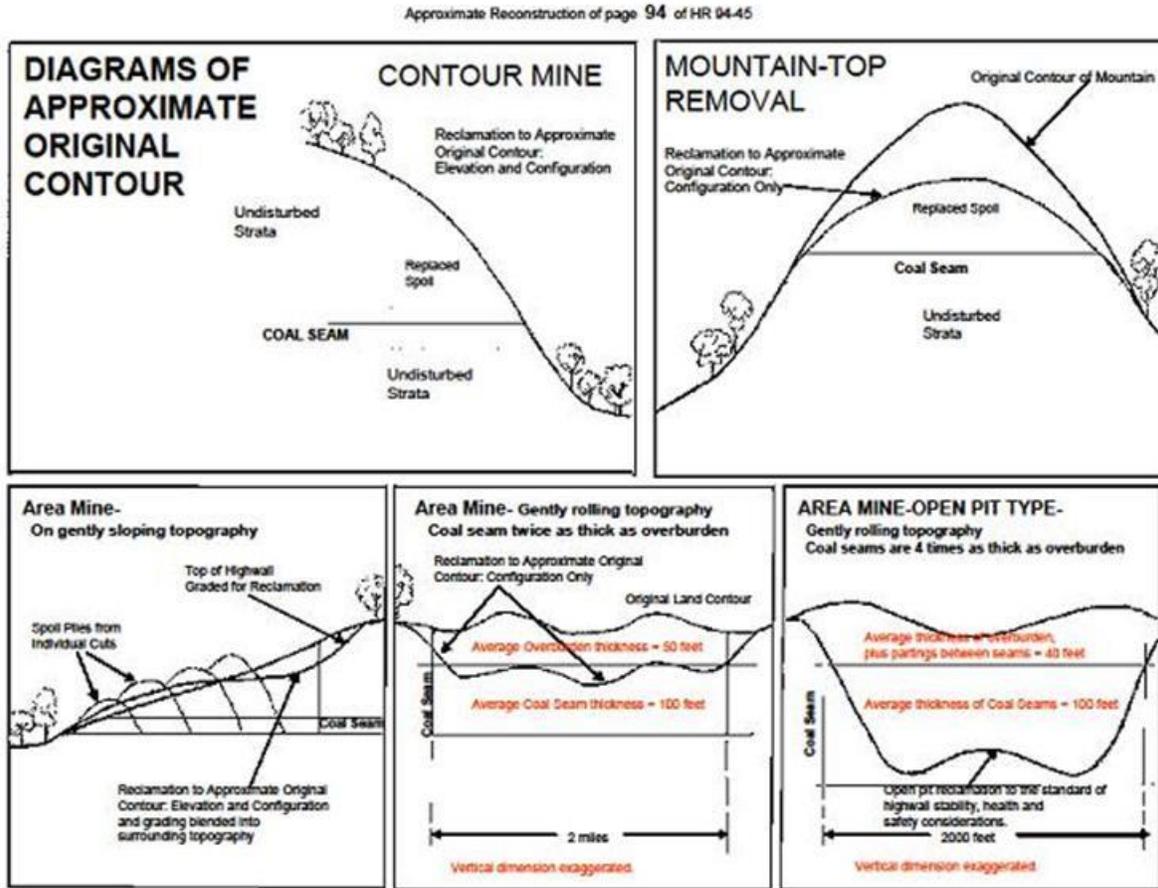
Resource	Alternative 1: No-Action Alternative	Alternative 2: State Petition Designation (67,326 acres)	Alternative 3: State Petition Designation with Potential Remining and Road Access (67,326 acres)	Alternative 4: Expanded Corridor Designation with Potential Remining and Road Access (Preferred Alternative) (74,968 acres)	Alternative 5: Targeted Resource Protection Designation (12,331 acres)	Alternative 6: Reduced Corridor Designation (39,106 acres)
<p>Water Resources (including)</p> <ul style="list-style-type: none"> <li>• Groundwater</li> <li>• Surface water</li> <li>• Wetlands</li> </ul>	<p>Alternative 1 would have short-term and long-term potentially widespread adverse impacts on surface water resources, but this is limited because the expected mining rate is assumed at an average of 112 acres per year. Remining would result in localized short-term adverse impacts to surface water and groundwater, but reclamation would result in localized long-term beneficial impacts to surface water and groundwater. Surface mining could result in widespread short-term and long-term adverse impacts on groundwater resources. Alternative 1 would not result in significant adverse impacts to surface water or groundwater.</p> <p>Both near- and long-term adverse impacts to wetlands could result from mining activities. Best management practices and compliance with applicable regulations and permit conditions would minimize impacts to wetlands and only a small percentage of the evaluation area would be mined based on the expected level of future surface coal mining operations.</p> <p>However, alternative 1 could result in site-specific localized significant impacts to a wetland depending on proximity to a mining operation.</p>	<p>Alternative 2 would reduce the potential for future adverse impacts from surface coal mining operations to surface water and groundwater resources, resulting in widespread long-term beneficial impacts, especially to source water protection and management zones, headwater streams and wells, and wellhead protection zones in the petition area. The continued existence of unreclaimed previously mined land would result in localized long-term adverse impacts to surface water and groundwater. Alternative 2 would not result in significant adverse impacts on surface water or groundwater resources.</p> <p>The designation of the petition area under alternative 2 would have long-term, widespread beneficial impacts on wetland resources in the petition area, but could also have some adverse effects because of underground mining activity and issues related to unreclaimed mines. Alternative 2 would not result in significant impacts to wetlands.</p>	<p>Alternative 3 would reduce the potential for future adverse impacts from surface coal mining operations to surface water and groundwater resources, resulting in widespread long-term beneficial impacts, especially to source water protection and management zones, headwater streams and wells, wellhead protection zones in the designation area. It would contribute localized short-term adverse impacts to surface water and groundwater during remining if permitted in the future, but would provide long-term beneficial impacts in the designation area due to reclamation activities. It would not result in significant adverse impacts on surface water and surface water.</p> <p>Alternative 3 would have long-term beneficial impacts to wetlands protected in the designation area. Potential remining and reclamation activities and haul roads could have near-term adverse impacts and long-term benefits from improved water quality. Alternative 3 would not have significant impacts on wetlands.</p>	<p>Alternative 4 would reduce the potential for future adverse impacts from surface coal mining operations to surface water and groundwater resources, especially to source water protection and management zones, headwater streams and wells, and wellhead protection zones in the designation area. It would contribute localized short-term adverse impacts to surface water and groundwater during remining operations if permitted in the future, but would provide long-term beneficial impacts in the designation area due to reclamation activities. Alternative 4 would not result in significant adverse impacts on surface water and groundwater resources.</p> <p>Impacts to wetlands would be similar to alternative 3, with no significant impacts expected.</p>	<p>Alternative 5 would reduce the overall adverse impacts from potential future mining. It would result in localized and relatively limited long-term beneficial impacts to surface water and groundwater resources, especially to source water protection and management zones, headwater streams and wells, and wellhead protection zones in the designation area. The continued existence of unreclaimed previously mined land would result in long-term, localized adverse impacts to surface water and groundwater resources. Alternative 5 would not result in significant adverse impacts on surface water and groundwater resources.</p> <p>Similar to alternative 2, alternative 5 would have mainly long-term, widespread beneficial impacts on wetland resources in the designation area, with some adverse effects because of issues related to unreclaimed mines. Impacts would not be significant.</p>	<p>Alternative 6 would reduce the potential for future adverse impacts from surface coal mining operations to surface water and groundwater resources, resulting in widespread long-term beneficial impacts, especially to source water protection and management zones, headwater streams and wells, and wellhead protection zones in the designation area. The continued existence of unreclaimed previously mined land would result in long-term, localized adverse impacts to surface water and groundwater resources. Alternative 6 would not result in significant adverse impacts on surface water and groundwater resources.</p> <p>Similar to alternative 2, alternative 6 would have long-term, widespread beneficial impacts on wetland resources in the designation area, with some adverse effects. Impacts would not be significant.</p>
<p>Soils and Vegetation</p>	<p>Alternative 1 would have both near- and long-term adverse impacts, which would be limited because only a small percentage of the evaluation area would be mined based on the expected level of future surface coal mining operations. Long-term beneficial impacts would be realized once a remined site is reclaimed. Impacts would not be significant.</p>	<p>Alternative 2 would have both near- and long-term beneficial impacts from protection of vegetation and soils in the petition area. Minor adverse impacts would occur because remining and associated reclamation would not be permitted. Impacts would not be at a large or landscape scale, and it is unlikely that impacts would be significant.</p>	<p>Alternative 3 would have long-term beneficial impacts from protection of the designation area and reclamation of remined area if permitted in the future, with near-term adverse effects during early stages of remining. It is unlikely that the impacts would be significant.</p>	<p>Alternative 4 would have greater long-term beneficial impacts from protection of the designation area and reclamation of remined area if permitted in the future, with near-term adverse effects during early stages of remining. It would result in direct or indirect adverse impacts, but could result in substantial benefits. It is unlikely that the impacts would be significant.</p>	<p>Alternative 5 would have both near- and long-term direct and indirect beneficial impacts from protection of vegetation and soils in the designation area, but the beneficial impacts of reclamation on the potential vegetation acres protected from remining would not occur. It is unlikely that the impacts would be significant.</p>	<p>Alternative 6 would result in both near- and long-term direct and indirect beneficial impacts in the designated area, with adverse effects continuing on lands that have not been reclaimed. It is unlikely that the impacts would be significant.</p>

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Fish and Wildlife	Alternative 1 would have near- and long-term adverse impacts to aquatic and terrestrial species. Alternative 1 would potentially impact up to approximately 945 miles of aquatic habitat. Remining may contribute to short-term impacts, but associated reclamation could improve water quality and aquatic habitat conditions in the long term. Based on an assumed average mining rate of 112 acres per year throughout the evaluation area, it is unlikely that widely distributed common species would be significantly impacted. In the event that small, isolated populations are adversely impacted, significant impacts to those populations could occur.	Alternative 2 would result in near- and long-term beneficial impacts to aquatic and terrestrial species. It would result in the protection of approximately 356 miles of aquatic habitat and 18,436 acres of terrestrial tier 1 priority habitat, although any areas that have water quality issues from pre-SMCRA mining would not be remined or reclaimed, resulting in continued adverse effects on aquatic species. Alternative 2 would not result in significant adverse impacts.	Alternative 3 would result in near- and long-term adverse and beneficial impacts to aquatic and terrestrial species. It would result in the protection of approximately 356 miles of aquatic habitat and approximately 18,436 acres of terrestrial tier 1 priority habitat. If permitted in the future, remining and reclamation activities along with haul road construction and maintenance within the designation area and adjacent to protected ridgelines could result in near- and long-term adverse impacts to aquatic and terrestrial species. However, protection of lands within the designation area from future surface coal mining operations would result in long-term beneficial impacts by limiting further injury and potentially facilitating ecosystem recovery. Alternative 3 would not likely result in significant adverse impacts.	Alternative 4 would result in near- and long-term adverse and beneficial impacts to aquatic and terrestrial species. Protection of lands within the designation area from future mining activities would also result in long-term beneficial impacts. Alternative 4 would result in the protection of approximately 360 miles of aquatic habitat and approximately 19,728 acres of terrestrial tier 1 priority habitat. If permitted in the future, remining and reclamation activities along with haul road construction and maintenance within the designation area and adjacent to protected ridgelines could result in near- and long-term adverse impacts to aquatic and terrestrial species. Protection of lands within the designation area from future mining activities would also result in long-term beneficial impacts by limiting further injury and potentially facilitating ecosystem recovery. Alternative 4 would not result in significant adverse impacts.	Alternative 5 would result in near- and long-term beneficial impacts to aquatic species. Alternative 5 would result in the protection of approximately 381 miles of aquatic habitat and approximately 4,409 acres of tier 1 priority habitat. Any areas that have water quality issues from pre-SMCRA mining would not be remined or reclaimed, resulting in continued adverse effects on aquatic species. Alternative 5 would not result in significant adverse impacts.	Alternative 6 would result in near- and long-term beneficial impacts to aquatic and terrestrial species. Alternative 6 would result in the protection of approximately 356 miles of aquatic habitat and approximately 10,065 acres of terrestrial tier 1 priority habitat. Any areas that have water quality issues from pre-SMCRA mining would not be remined or reclaimed, resulting in continued adverse effects on aquatic species. Alternative 6 would not result in significant adverse impacts.
Special-Status Species (for species-specific analyses, see chapter 6)	Alternative 1 would have near- and long-term adverse impacts to aquatic and terrestrial special-status species. Some species may benefit from active reclamation of mine sites. Depending on where surface coal mining operations occur, some species could experience significant adverse impact to important habitat areas. Alternative 1 would have a potential to adversely affect undetected plant special-status species and their habitat and would have long-term adverse impacts to plant special-status species due to habitat loss.	Alternative 2 would result in near- and long-term beneficial impacts to aquatic and terrestrial special-status species. The protection of lands within the petition area from future mining activities would result in long-term beneficial impacts to special-status species and habitats by limiting the potential for further injury and potentially facilitating ecosystem recovery. It would have long-term direct and indirect beneficial impacts to plant special-status species. Alternative 2 would not result in significant adverse impacts.	Alternative 3 would result in near- and long-term adverse and beneficial impacts to special-status species. Activities under alternative 3 would cause long-term direct adverse impacts due to the loss of individual undetected plant special-status species or their habitat. Protection of lands within the designation area from future mining activities would result in long-term beneficial impacts to special-status species and habitats. Alternative 3 would not result in significant adverse impacts.	Alternative 4 would result in near- and long-term adverse and beneficial impacts to special-status species. Activities under alternative 4 would cause long-term direct adverse impacts due to the loss of individual undetected plant special-status species or their habitat. Protection of lands within the designation area from future mining activities would result in long-term beneficial impacts to special-status species and habitats. Alternative 4 would not result in significant adverse impacts.	Alternative 5 would result in near- and long-term beneficial impacts to special-status species. It would result in the least amount of terrestrial habitat protection compared to the other action alternatives. Alternative 5 would not result in significant adverse impacts.	Alternative 6 would result in near- and long-term beneficial impacts to special-status species. Similar to alternative 2, but over a smaller area, the protection of lands within the designation area from future mining activities would result in long-term beneficial impacts to special-status species and habitats by limiting further loss, degradation, or injury. Alternative 6 would potentially facilitate ecosystem and species recovery by preventing the loss of undetected plant special-status species and their habitat. Alternative 6 would not result in significant adverse impacts.

Resource	Alternative 1: No-Action Alternative	Alternative 2: State Petition Designation (67,326 acres)	Alternative 3: State Petition Designation with Potential Remining and Road Access (67,326 acres)	Alternative 4: Expanded Corridor Designation with Potential Remining and Road Access (Preferred Alternative) (74,968 acres)	Alternative 5: Targeted Resource Protection Designation (12,331 acres)	Alternative 6: Reduced Corridor Designation (39,106 acres)
Land Use and Recreation	Alternative 1 would have near- and long-term adverse impacts to land use and recreation. Surface mining would result in potential conflicts with existing forestry and oil and gas production uses; potential impacts to dispersed recreation related to noise, traffic, fugitive dust, emissions, area closures, and access restrictions; and potential impacts to designated recreational resources that result primarily from noise impacts. Depending on the location of surface coal mining operations, these impacts would occur to greater or lesser degrees.	Under alternative 2, beneficial impacts would occur from increased potential for implementation of existing surface management plans, reduced impacts to dispersed recreation, and reduced impacts to designated recreational resources. Long-term adverse impacts would result from the continued presence of unreclaimed mine sites. Overall, greater beneficial impacts and fewer adverse impacts would be expected relative to alternative 1, with no significant impacts expected.	Under alternative 3, near-term adverse impacts would result from the remining of unreclaimed, previously mined areas and associated access and haul road construction. Long-term beneficial impacts would result from the reclamation of previously unreclaimed mine sites if permitted in the future. Beneficial impacts would occur from reduced potential for land use conflicts, increased potential for implementation of existing surface management plans, reduced impacts to dispersed recreation, and reduced impacts to designated recreational resources. Overall, greater beneficial impacts and fewer adverse impacts would be expected relative to alternative 1, with no significant impacts expected.	Under alternative 4 Impacts would be the same as described for alternative 3, with slightly more benefits related to the larger area designated. Overall, greater beneficial impacts and fewer adverse impacts would be expected relative to alternative 1, with no significant impacts expected.	Under alternative 5, limited beneficial impacts would occur from reduced potential for land use conflicts, increased potential for implementation of existing surface management plans, reduced impacts to dispersed recreation, and reduced impacts to designated recreational resources. Long-term adverse impacts would result from the continued presence of unreclaimed mine sites. Overall impacts would be slightly beneficial compared to alternative 1 and would not be significant.	Under alternative 6, beneficial impacts would occur from reduced potential for land use conflicts, reduced impacts to dispersed recreation, and reduced impacts to designated recreational resources. Long-term adverse impacts would result from the continued presence of unreclaimed mine sites. Impacts would not be significant.
Aesthetics (including) <ul style="list-style-type: none"> <li>• Visual Resources</li> <li>• Soundscapes</li> </ul>	Alternative 1 could have substantial near-term adverse impacts to visual resources. However, given the topography, dense vegetative cover, and the rural nature of the evaluation area, impacts are anticipated to be localized. Impacts from alternative 1 would not likely result in significant impacts to visual resources. Alternative 1 would have near-term localized significant adverse effects on soundscapes. Thresholds for human annoyance and disturbance of wildlife would be exceeded in the vicinity of coal mining areas and along roadways used by coal haul trucks. Following reclamation, these mining-related sources would cease. Therefore, there would be no long-term impact on soundscapes at any one mine site, although mining could continue at varying locations.	Alternative 2 would have long-term beneficial impacts as a result of prohibiting surface coal mining activities allowing lands to remain in their natural condition. Similarly, beneficial impacts would remain predominantly localized based on the topography and dense vegetation within the petition area. Individuals who directly view mining operations could experience adverse impacts; however, based on the relatively small scale of these operations, adverse impacts are anticipated to be infrequent. Alternative 2 would not have significant impacts to visual resources. Alternative 2 would have fewer impacts to soundscapes than alternative 1, but would still result in near-term significant adverse impacts in the vicinity of potential coal mine locations outside the petition area that could affect soundscapes in the petition area.	Alternative 3 would have near-term adverse impacts to visual resources as a result of remining operations if permitted in the future. Visual impacts under alternative 3 would offset past impacts and could provide beneficially significant impacts to visual resources. Impacts would not be significant. Alternative 3 would have fewer impacts to soundscapes and would be more beneficial than alternative 1, but would still result in near-term significant adverse impacts in the vicinity of new coal mine locations adjacent to the designation area and previously mined areas undergoing remining if permitted in the future.	Alternative 4 would have near-term adverse impacts to visual resources as a result of remining operations and associated road development if permitted in the future similar to alternative 2. It would not result in significant adverse impacts to visual resources. Alternative 4 would have fewer noise-related impacts than alternative 1, but would still result in near-term significant adverse impacts in the vicinity of surface coal mining operations and remining areas if permitted in the future.	Alternative 5 would have impacts similar to alternative 2, but those impacts would occur in areas with high recreational use providing localized benefits. Alternative 5 would not allow for remining and reclamation and therefore would not reduce existing negative visual impacts. Beneficial impacts from alternative 5 could potentially be significant as the areas identified under alternative 5 are sensitive and more frequently visited. Alternative 5 would have fewer impacts than alternative 1 and would avoid impacts to specific noise-sensitive areas, but would still result in near-term significant adverse impacts in the vicinity of allowable coal mine locations. Following reclamation outside the designation area, these mining-related sources would cease. Therefore, there would be no long-term impact on soundscapes at any one mine site.	Alternative 6 would have impacts similar to alternative 2, but those impacts would occur over a smaller area. Impacts from alternative 6 would not be significant. Alternative 6 would have fewer impacts to soundscapes than alternative 1, but would still result in near-term significant adverse impacts in the designation area from surface coal mining operations in the vicinity. Thresholds for human annoyance and disturbance of wildlife would be exceeded in the vicinity of coal mining areas and along roadways used by coal haul trucks. Following reclamation of mine sites outside the designation area, these mining-related sources would cease. Therefore, there would be no long-term impact on soundscapes at any one mine site.

Resource	Alternative 1: No-Action Alternative	Alternative 2: State Petition Designation (67,326 acres)	Alternative 3: State Petition Designation with Potential Remining and Road Access (67,326 acres)	Alternative 4: Expanded Corridor Designation with Potential Remining and Road Access (Preferred Alternative) (74,968 acres)	Alternative 5: Targeted Resource Protection Designation (12,331 acres)	Alternative 6: Reduced Corridor Designation (39,106 acres)
<p>Socioeconomics and Environmental Justice (including)</p> <ul style="list-style-type: none"> <li>• Mining</li> <li>• Recreation</li> <li>• Logging</li> <li>• Oil and Gas</li> </ul>	<p>Implementing the no-action alternative would have no new impact on the regional economy. Existing contributions to the local and regional economy would continue to benefit the region's economy because coal would continue to be mined from the petition and evaluation areas.</p> <p>There would be no significant disproportionate impact on environmental justice communities.</p>	<p>Alternative 2 is expected to continue to benefit the region's economy because coal mining would continue to be produced from the evaluation area. Under alternative 2, there would be long-term beneficial impacts to recreation and tourism spending because recreational experience in the petition area would be better than under alternative 1.</p> <p>Continued surface coal mining operations within the evaluation area would not likely change under the action alternatives, although the location of the operations would change. Therefore, alternative 2 (or any action alternative) would not result in significant disproportionate adverse impacts to environmental justice communities.</p>	<p>Alternative 3 is expected to continue to benefit the region's economy because coal would continue to be mined from the evaluation area, and remining, if permitted in the future, would be allowed in the designation area. Under alternative 3, there would be long-term beneficial impacts to recreation and tourism spending because recreational experience in the designation area would be better than under alternative 1.</p> <p>Impacts on environmental justice communities would be the same as alternative 2.</p>	<p>Alternative 4 is expected to continue to benefit the region's economy because coal would continue to be mined from the evaluation area and remining, if permitted in the future, would be allowed in the designation area. Under alternative 4, there would be long-term beneficial impacts to recreation and tourism spending because recreational experience in the designation area would be better than under alternative 1.</p> <p>Impacts on environmental justice communities would be the same as alternative 2.</p>	<p>Alternative 5 is expected to continue to benefit the region's economy because coal would continue to be mined from the evaluation area. Impacts to visitation and associated visitor spending, jobs, and income would be beneficial compared to alternative 1. However, out of all action alternatives, alternative 5 would have the least potential to minimize adverse noise-related impacts to visitors and wildlife, with potential adverse impacts to wildlife viewing opportunities, visitor spending, and associated jobs and income.</p> <p>Impacts on environmental justice communities would be the same as alternative 2.</p>	<p>Alternative 6 is expected to continue to benefit the region's economy because coal would continue to be mined from the evaluation area. Under alternative 6, there would be long-term beneficial impacts to recreation and tourism spending because recreational experience in the designation area would be better than under alternative 1.</p> <p>Impacts on environmental justice communities would be the same as alternative 2.</p>
<p>Cultural Resources</p>	<p>Alternative 1 would have the potential to adversely impact cultural resources, primarily through the continuation of mining, ground-disturbing activities, and inadvertent damage that could occur. Based on an assumed mining rate of on average 112 acres per year and regulatory requirements to avoid or mitigate impacts, no significant impacts under NEPA are expected.</p>	<p>Under alternative 2, land within the petition area would be protected from mining activities, which would be a benefit. No significant impacts under NEPA are expected.</p>	<p>Under alternative 3, land within the designation area would be protected from mining activities, but remining and road construction, if permitted in the future, would have the potential to adversely impact cultural resources, primarily through ground-disturbing activities. However, based on the expected mining rate and regulatory requirements, no significant impacts under NEPA are expected.</p>	<p>Under alternative 4, land within the designation area would be protected from mining activities, but remining and road construction, if permitted in the future, would have the potential to adversely impact cultural resources, primarily through ground-disturbing activities. However, based on the expected mining rate and regulatory requirements, no significant impacts under NEPA are expected.</p>	<p>Under alternative 5, only a small area within the designation area would be protected from mining and related activities, but there would be no remining. Similar to alternative 2, no significant impacts under NEPA are expected.</p>	<p>Under alternative 6, land within the designation area would be protected from mining activities, and there would be no remining. Similar to alternative 2, no significant impacts under NEPA are expected.</p>
<p>Public Health and Safety</p>	<p>There would be near-term adverse localized impacts to public health and safety due to surface mining, underground mining, auger mining, logging operations, oil and gas extraction, road building, and associated transportation. Overall, impacts would be minor and not significant.</p>	<p>Alternative 2 would reduce near-term localized hazards associated with surface mining operations in the petition area, a small benefit to recreational users in that area. However, barring remining from the petition area would allow continued adverse impacts from localized terrain hazards and water quality issues. Overall, impacts would be minor and not significant.</p>	<p>Alternative 3 would reduce near-term localized hazards associated with surface mining operations in the designation area. If permitted in the future, remining within the designation area would have near-term localized adverse impacts, but could have localized long-term beneficial impacts if the reclamation reduces the existing terrain hazards and improves water quality. Impacts would be minor and not significant.</p>	<p>Impacts would be the similar to alternative 3, with near-term localized adverse impacts but long-term beneficial impacts. Overall, impacts would be minor and not significant.</p>	<p>Alternative 5 would reduce near-term localized hazards associated with surface mining operations in the designation area. Barring remining from the designation area would allow terrain hazards and water quality issues from pre-SMCRA mines to persist. Impacts would be very minor and not significant.</p>	<p>Alternative 6 would reduce near-term localized hazards associated with surface mining operations in the designation area. Barring remining from the designation area would allow terrain hazards and water quality issues from pre-SMCRA mines to persist. Impacts would be minor and not significant.</p>

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Source: H.R. REP. NO. 94-45, at 94.

**FIGURE 6-1: LEGISLATIVE HISTORY SCHEMATIC OF BACKFILLING AND GRADING SCENARIOS**

### Exceptions to Approximate Original Contour Restoration Requirements

Both SMCRA and its implementing regulations allow exceptions to approximate original contour restoration requirements. For example, the surface mining regulations at 30 CFR § 816.102(a)(1) provide that the disturbed area must be backfilled and graded to achieve approximate original contour, except as provided in paragraph (k), which states that the postmining slope may vary from the approximate original contour when—

1. The standards for thin overburden in 30 CFR § 816.104 are met;
2. The standards for thick overburden in 30 CFR § 816.105 are met; or
3. Approval is obtained from the regulatory authority for
  - (i) Mountaintop removal operations in accordance with 30 CFR § 785.14;
  - (ii) A variance from approximate original contour requirements in accordance with 30 CFR § 785.16 [variances to approximate original contour requirements for steep-slope mining]; or
  - (iii) Incomplete elimination of highwalls in previously mined areas in accordance with 30 CFR § 816.106.

In addition, the underground mining regulations at 30 CFR § 817.102(1) contain an exception for settled and revegetated “fills” containing spoil from the face-up area of the underground mine and nontoxic-forming and non-acid-forming underground development waste, provided those fills meet specified conditions.

These variations and exceptions are discussed in detail below.

**Thin and Thick Overburden:** Thin overburden situations are not common in Tennessee given the nature and thickness of the coal seams. Thick overburden most commonly occurs in parts of the Appalachian Basin, including Tennessee.

The federal regulations at 30 CFR § 816.104(a) define thin overburden as follows:

Thin overburden means insufficient spoil and other waste materials available from the entire permit area to restore the disturbed area to its approximate original contour. Insufficient spoil and other waste materials occur where the overburden thickness times the swell factor, plus the thickness of other available waste materials, is less than the combined thickness of the overburden and coal bed prior to removing the coal, so that after backfilling and grading the surface configuration of the reclaimed area would not:

- (1) Closely resemble the surface configuration of the land prior to mining; or
- (2) Blend into and complement the drainage pattern of the surrounding terrain.

Paragraph (b) of 30 CFR § 816.104 provides that, where thin overburden occurs, the permittee must use all spoil and other waste materials available from the entire permit area to attain the lowest practicable grade, but not more than the angle of repose. In addition, the permittee must comply with the backfilling and grading requirements of 30 CFR §§ 816.102 (a)(2) through (j) (i.e., all requirements other than approximate original contour restoration).

The federal regulations at 30 CFR § 816.105 define thick overburden as follows:

Thick overburden means more than sufficient spoil and other waste materials available from the entire permit area to restore the disturbed area to its approximate original contour. More than sufficient spoil and other waste materials occur where the overburden thickness times the swell factor exceeds the combined thickness of the overburden and coal bed prior to removing the coal, so that after backfilling and grading the surface configuration of the reclaimed area would not:

- (1) Closely resemble the surface configuration of the land prior to mining; or
- (2) Blend into and complement the drainage pattern of the surrounding terrain.

Paragraph (b) of 30 CFR § 816.105 provides that, where thick overburden occurs, the permittee must restore approximate original contour and then use the remaining spoil and other waste materials to attain the lowest practicable grade, but not more than the angle of repose. In addition, the permittee must comply with the backfilling and grading requirements of 30 CFR §§ 816.102 (a)(2) through (j) (i.e., all requirements other than approximate original contour restoration, and must dispose of any excess spoil in accordance with 30 CFR §§ 816.71 through 816.74).

**Steep-Slope Mining Approximate Original Contour Variances:** Section 515(e) of SMCRA (30 USC § 1265(e)) allows the regulatory authority to approve a variance from approximate original contour

restoration requirements for non-mountaintop removal mines in steep-slope terrain if the variance will render the reclaimed land suitable for an industrial, commercial, residential, or public use (including recreational facilities). Unlike mountaintop removal mining operations, an agricultural postmining land use is not an acceptable basis for a steep-slope approximate original contour variance.

SMCRA and the implementing regulations at 30 CFR § 785.16 also impose other requirements and limitations on the approximate original contour variance. For example, the highwall must be completely eliminated in a stable fashion and the variance must improve watershed runoff control of the area relative to the premining condition or the condition that would exist if the approximate original contour were restored. Only that amount of spoil necessary to achieve the postmining land use, ensure stability of the spoil retained on the mine bench, and meet other applicable SMCRA requirements may be placed off the mine bench. All spoil not retained on the bench must be placed in accordance with the regulations governing excess spoil disposal (30 CFR §§ 816.71 through 816.74).

**Previously Mined Areas:** The current regulations at 30 CFR §§ 816.106 and 817.106 (the no-action alternative) apply where remining operations occur on previously mined areas that contain a pre-existing highwall. As defined in 30 CFR § 701.5, the term “remining” refers to surface coal mining and reclamation operations that affect previously mined areas. Under 30 CFR §§ 816.106 and 817.106, a remining operation must eliminate all highwalls that the operation re-affects unless the volume of all reasonably available spoil is demonstrated to be insufficient to completely backfill the re-affected highwall. In that case, the operator must eliminate the highwall to the maximum extent technically practicable. The operator must use all reasonably available spoil in the immediate vicinity of the remining operation, grading to a slope that provides adequate drainage and long-term stability, and ensuring that any highwall remnant is stable and does not pose a hazard to public health and safety or to the environment.

### **Excess Spoil**

Surface mining methods involve the fracturing of the rock strata overlying the coal to facilitate excavation of the overburden and extraction of the coal. Fracturing formerly solid rock into multiple fragments increases its overall volume because of the numerous void spaces between the rock fragments. This increase in volume is known as “swell” or “bulking.”

In areas with steep slopes, the swell factor commonly results in the generation of excess spoil because the volume of overburden removed, after swell, is greater than the volume that can be safely returned to the mined-out area or used to blend the mined-out area with the surrounding terrain. Re-establishment of the premining topography is limited by the physical properties of the spoil material, the associated angle of repose, and regulatory requirements related to angle of repose and stability. Typically, excess spoil is placed in fills constructed in valleys adjacent to the mined-out area.

In non-steep slope areas, mines seldom generate excess spoil. Instead, it is possible to return the spoil to the mined-out area and grade it to closely resemble the premining topography. Because of the increase in volume caused by the swell factor, the backfilled and graded area generally will have a higher elevation than it did before mining, but the edges can be graded to blend with the surrounding terrain, consistent with the definition of approximate original contour. In areas with abundant abandoned mine lands, excess spoil is seldom generated due to the existence of many orphan highwalls that can accommodate the excess spoil disposal.

## Types of Excess Spoil Fills

Prior to the passage of SMCRA, excess spoil fills generally were constructed with minimal engineering expertise and placed at locations that were most convenient and least costly to the mining operation. Sometimes spoil was simply pushed over the slope below the mine bench. Section 515(b)(22) of SMCRA (30 USC § 1265(b)(22)) established standards for excess spoil fill construction that focus on engineering and safety, with a goal of ensuring long-term fill stability. Among other things, SMCRA requires placing excess spoil within the permit area in a controlled manner to prevent mass movement and to ensure mass stability. In addition, the operation must comply with drainage requirements to prevent spoil erosion and movement. The design of the excess spoil fill must be certified by a registered professional engineer in conformance with professional standards.

A study published in 2005 found that excess spoil fills in Appalachia are quite stable, with fewer than 20 reported slope movements out of more than 6,800 fills constructed since 1985 (EPA et al. 2005). However, the fills studied were constructed prior to the implementation of fill minimization and optimization requirements; they also were generally constructed lower in the watershed and on flatter foundation slopes than fills being constructed today. Fill minimization policies adopted in Kentucky, West Virginia, and Tennessee since the completion of the study require fill placement higher in the watershed and on steeper slopes, thus creating the potential for greater instability. Fills placed on steeper foundations would inherently have a lower slope stability factor of safety.

The federal regulations at 30 CFR §§ 816.71 through 816.74 and §§ 817.71 through 817.74 expand upon the statutory requirements. General requirements for constructing excess spoil fills are contained in 30 CFR part 816 and § 817.71. The fill must be designed to achieve a minimum long-term static safety factor of 1.5 and a qualified registered professional engineer with appropriate experience must certify the design. The design must include underdrains constructed of durable rock or perforated pipe if the footprint of the fill contains springs, natural or manmade watercourses, or wet weather seeps. Excess spoil must be transported and placed in a controlled manner and concurrently compacted in horizontal lifts that do not exceed 4 feet unless the design engineer certifies that the design will ensure the stability of the fill and meet all other applicable requirements. A qualified registered professional engineer (or other qualified professional specialist under the direction of the engineer) must inspect the fill at least quarterly throughout construction. The engineer must provide a certified report to the regulatory authority after each inspection describing how the fill is being constructed and maintained in accordance with the approved design and regulatory requirements.

The federal regulations at 30 CFR part 816 and § 817.72 contain special requirements applicable to “valley fills” and “head-of-hollow fills,” which are two types of fills constructed in steep-slope areas (existing valleys with side slopes greater than 20 degrees) or where the average slope of the profile of the existing valley from the toe of the fill to the top of the fill is greater than 10 degrees. A head-of-hollow fill differs from a valley fill in that the top surface of the fill, when completed, is at approximately the same elevation as the adjacent ridgelines, which means that there is no significant area of natural drainage above the fill. By way of comparison, valley fills are constructed further down the valley and therefore have significant surface drainage from the watershed above the fill that must be diverted around the fill. The regulations allow both valley fills and head-of-hollow fills to use a specially constructed rock-core chimney drain in place of the underdrains and surface diversions that otherwise would be required under 30 CFR part 816 and § 817.71. However, a rock-core chimney drain may only be constructed where the fill is not located in an intermittent or perennial stream. In addition, if the fill is a valley fill, the volume of the fill may not exceed 250,000 cubic yards and upstream drainage must be diverted around the fill.

Durable rock fills are the most commonly constructed excess spoil fill in the Appalachian Basin, including Tennessee when they occur. The federal regulations at 30 CFR part 816 and § 817.73 require

that 80% of the spoil volume in a durable rock fill consist of durable, non-acid, and non-toxic-forming rock that does not slake in water and will not degrade to soil material. Durable rock fills are constructed by end-dumping excess spoil into valleys, generally in single lifts, but occasionally in multiple lifts. This construction technique relies upon gravity segregation of the end-dumped material to naturally form an underdrain concurrent with fill placement because the larger rocks roll to the base of the fill. Typically, this process results in a highly permeable zone of large-sized durable rock in the lower one-third of the fill. Existing durable rock fills generally contain single lifts ranging in size from 30 to over 400 feet in thickness. Following completion of spoil placement, the face of the fill typically is graded to a terraced configuration that may not exceed a 2h:1v slope ratio. Durable rock fills must be designed to attain a minimum long-term static safety factor of 1.5 and a seismic safety factor of 1.1.

Durable rock fills are susceptible to saturation and severe erosion of fill material, with consequent downslope flooding or mudflows, during significant rainfall events, particularly during the final stages of construction. Lack of contemporaneous reclamation of durable rock fills has been a contributing factor to severe erosion and flooding. One of the most notable significant flooding events associated with durable rock fill construction occurred in Lyburn, West Virginia, in 2002. While researching other failures following the event, the West Virginia Department of Environmental Protection concluded that 49 excess spoil fill washouts had occurred in the 5 years before the Lyburn event (Pierce 2004). To prevent or minimize offsite impacts, the West Virginia Department of Environmental Protection began requiring durable rock fills to be constructed in lifts of no more than 100 feet in thickness. Alternatively, fills may be constructed with an erosion protection zone, which is a free-draining durable rock bench extending downstream from the toe of the fill. It is intended to trap any fill material eroding, sliding, or flowing from an end-dumped fill during construction or final reclamation. Leaving fills with unreclaimed exposed surfaces increases the likelihood for mass soil movement and flooding.

The thick lifts and lack of mechanical compaction of spoil placed in durable rock fills results in greater void spaces and increased infiltration of both surface water and groundwater. These factors result in discharges containing elevated levels of total dissolved solids. The “Impacts of the Alternatives on Surface Water” section of this PED/EIS discusses the effects of mining activities on water quality.

The final type of excess spoil fill is the disposal of excess spoil on pre-existing mine benches. Placement of excess spoil on these benches both assists in the reclamation of abandoned mine lands and reduces the number and size of excess spoil fills in areas that have not been previously impacted by mining. The federal regulations in 30 CFR part 816 and § 817.74 that govern the placement of excess spoil on pre-existing benches contain requirements that more closely track the backfilling and grading regulations than the requirements that apply to construction of excess spoil fills on previously undisturbed terrain.

### **Relationship between Approximate Original Contour and Excess Spoil**

Approximate original contour restoration requirements do not apply to excess spoil fills because section 701(2) of SMCRA (30 USC § 1291(2)) defines “approximate original contour” as “that surface configuration achieved by backfilling and grading of the mined area.” The construction of excess spoil fills does not involve backfilling of the mined area; instead, it involves disposal of spoil that is not needed to restore the approximate original contour of the mined area (OSMRE 2008).

The federal regulations at 30 CFR § 701.5 define “excess spoil” as “spoil material disposed of in a location other than the mined-out area; provided that spoil material used to achieve the approximate original contour or to blend the mined-out area with the surrounding terrain in accordance with 30 CFR §§ 816.102(d) and 817.102(d) of this chapter in non-steep slope areas shall not be considered excess spoil.” Thus, spoil used to achieve approximate original contour is not considered excess spoil. Moreover, under the excess spoil minimization policies adopted by central Appalachian states, spoil that can be

returned to the mined-out area without either creating slope instability or a non-approximate original contour surface topography does not qualify as excess spoil. The proviso in the definition means that spoil from box cuts or first cuts in non-steep slope areas would not be considered excess spoil when that spoil is used to blend the mined-out area into the surrounding terrain.

### **Coal Mine Waste**

The federal regulations at 30 CFR § 701.5 define “coal mine waste” as having two components: coal processing waste and underground development waste. Coal produced by either surface mining or underground mining methods may contain non-coal mineral matter (clay, shale, etc.). These impurities may make the coal unsuitable for immediate use by the consumer so the coal is processed to remove impurities or blended with higher quality coal before delivery to the shipping point. The impurities removed during processing are known as “coal processing waste.” Underground mining methods also generate underground development waste (i.e., waste rock) that must be removed from the underground workings to facilitate the mining process.

Coal mine waste may be permanently disposed in refuse piles. Coal processing waste also may be stored in impounding structures, which must be dewatered and modified as necessary to meet the standards for refuse piles after they are no longer needed for coal processing purposes. Refuse piles are subject to regulations similar to those for excess spoil fills in terms of design, location, and construction. They are not subject to approximate original contour restoration requirements because they are placed outside the mined area. Coal mine waste disposal regulations may be found at 30 CFR §§ 780.25, 784.16, 784.19; §§ 816.81 through 816.84; and §§ 817.81 through 817.84.

Coal mine waste storage and disposal facilities (slurry impoundments and refuse piles) traditionally have been constructed for individual underground mines and associated coal preparation plants. Many currently active storage and disposal facilities have evolved to accept coal mine waste from other mines and preparation plants. In central Appalachia, the slurry resulting from the coal preparation process typically is stored in a large impoundment formed by constructing an embankment across an existing hollow or valley. The embankment typically is constructed in stages using coarse refuse that is also a waste product of the coal preparation process. The fine coal refuse resulting from the coal preparation process is pumped as slurry into the impoundment, from which the water typically is decanted or pumped to be reused. When slurry pumping ceases, the embankment typically is breached so that the basin can no longer impound standing water. The structure then must be reclaimed as a refuse pile.

Another method of handling fine coal refuse involves partially dewatering the slurry at the preparation plant. The resulting semi-solid material is then disposed of separately or mixed and placed with the coarse refuse material as combined refuse. Transporting and placing the material has been problematic because of the relatively high moisture content of the partially dewatered fine refuse. Recent research suggests that one option may be to transport the fine refuse as a paste (thickened tailings) that can be pumped to a disposal location (MSHA 2009).

Most coal mined by underground methods is processed in preparation plants to control ash and, where applicable, to reduce pyritic sulfur. Increased market specifications for higher quality coal initially led to greater percentages of material being considered waste; approximately 20 to 50% of the mine production was rejected during processing according to some studies (Lucas et al. 1979; OSMRE 2008). More recently, preparation plants have improved, resulting in considerably higher British thermal unit yields (i.e., fewer British thermal units lost in the preparation process) and therefore less reject per ton of coal processed.

## **Underground and Auger Mining**

Face-up areas of underground mines typically have impacts analogous to those of a similarly situated surface mine of the same size. However, underground mining has one unique potential impact on topography: longwall mining will (and other methods of underground mining may, depending on the competence of the overlying rock and the extent of pillars left as support) result in the collapse of overlying strata after the coal is removed, a process known as subsidence. Subsidence may reach the surface, depending upon the depth of the mine and the competence of rock strata between the underground workings and the surface. Subsidence that reaches the surface will alter the surface configuration and topography. Subsidence also can dewater streams in whole or in part. Subsidence mechanisms are more fully discussed in the “Impacts of the Alternatives on Groundwater” section of this PED/EIS.

Underground mining also can dewater streams or diminish flows by fracturing strata that support perched aquifers or by draining aquifers to facilitate mining.

Face-up areas and disturbed areas associated with support facilities are subject to the backfilling and grading requirements of 30 CFR §§ 817.102 through 817.107, including the requirement to restore the land to its approximate original contour. However, 30 CFR § 817.102(l) provides an exception for settled and revegetated fills. The regulation does not require use of the material in spoil piles resulting from the creation of the face-up area for an underground mine and underground development waste for restoration of the approximate original contour if the spoil or waste piles meet certain environmental, safety, stability, and postmining land use criteria.

## **Assumptions and Methodology**

This section addresses impacts on earth resources (topography and geology); impacts on soils are addressed along with vegetation later in this chapter. Geology and topography tend to be of large scale, and the data sources to be consulted (as described below) typically cover countywide (or even larger) areas. Data documenting earth resources conditions throughout the project study area are available from a variety of sources. Examples of the data (and potential sources) that will be collected in order to document existing earth resources conditions and impacts from each proposed alternative include the following:

- Surficial geology maps of Tennessee (Tennessee Geological Survey, scientific literature)
- Bedrock formations (US Geological Survey, scientific literature)
- Coal Resources (chapter 5)
- Ecoregions (US Environmental Protection Agency (EPA), scientific literature)
- Topography (US Geological Survey)

The impact analysis for earth resources includes a description of potential impacts of each alternative to coal and geologic resources and topography occurring within the evaluation area. Impacts on earth resources were assessed in terms of the potential for increased or decreased disturbance based on the ability of natural earth processes to continue unimpeded. Primary steps for assessing impacts on earth resources include identifying the following:

- potential changes in geology from mining and construction activities, including drilling and excavation for surface and underground mines, access roads, haul roads, staging areas

- potential changes to the local topography that would occur beyond that which would result from natural erosion and deposition
- potential changes in topsoil as the result of mining and road construction

The context for resource-specific impact assessment of the alternatives to earth resources includes the following:

- the characteristics of earth resources such as the tendency of rock to fracture, which can have effects on other resources such as groundwater
- the tendency for certain areas to be more susceptible to soil loss and erosion

Direct, indirect, and cumulative impacts were assessed. Conclusions are based on overall impacts to earth resources occurring within the petition or designation area and level of impact duration and intensity was ascribed to each alternative.

### **Area of Analysis**

The area of analysis includes all earth resources within the evaluation area and under each alternative, including coal resources, surficial geology, and topography. Because the location of potential future individual mines within and outside the petition/designation areas cannot be determined at this time, the direct and indirect impacts on earth resources cannot be evaluated at a site-specific level. The potential impacts within and outside the designation areas are generally addressed; however, further surveys would be required prior to development of individual mining operations.

## **GENERAL IMPACT OF COAL MINING IN TENNESSEE ON EARTH RESOURCES**

Impacts to geology would occur within the mining areas as part of the mining process, and would be permanent. The geology from the base of the coal seam to the land surface would be subject to considerable permanent change. After removal of the coal, the replaced overburden would be a relatively homogeneous mixture compared to the premining layered overburden. The area of impacts to overburden geology is the same as the direct mining disturbance associated with the removal of soil, overburden, and coal. Coal and geologic resources would be directly affected by the removal of the coal and subsurface geology (overburden) (Brant 1964).

The impact on landforms and topography resulting from permitted mining activities would be localized and permanent. Surface coal mining would permanently alter the topography of the area being mined. SMCRA implementing regulations require that the mining operator sequentially return the spoil to the mined-out area for reclamation, grading it to resemble the premining topography; however, it is not possible to recreate the exact premining topography, so impacts would be considered permanent. Topsoil would be removed from the land and stockpiled or placed directly on re-contoured areas. Overburden (surficial geology) would be blasted, excavated, and stockpiled or directly placed into the already mined pit, and coal would be removed. The existing topography around the surface mining area would be substantially altered during mining. A highwall with a vertical height equal to overburden plus coal thickness would exist in the active pits.

### **Surface Coal Mining**

Surface coal mining operations involve the removal of surface overburden to access the coal reserve through a combination of explosives and heavy machinery. After the coal has been mined, the open pit area is backfilled with the removed overburden as part of the reclamation process. This process rebuilds

the topography of the landscape; however, the returned overburden is vastly different from the original geology (Bozeman 2014). Existing shallow sub-surface geology (0–200 feet) within the mined areas would be irreversibly and permanently altered. The geology from the coal seam to the land surface would be subject to permanent change in the areas of coal removal within the designation area. The resulting subsurface physical characteristics of these lands would be substantially altered by mining. The mining and backfilling would permanently and irreversibly alter the in-situ character of the subsurface geology (overburden) to a mixture of broken rock and backfilled spoil material. The replaced overburden and interburden (backfill) would be a relatively homogeneous (compared to the premining layers of shale, siltstone, and sandstone overburden and interburden) and partly recompacted mixture. To the extent practicable (per 30 CFR § 816.102), all of subsurface geologic (overburden) material would be returned to the mined out area during reclamation; however, the replaced overburden would be a relatively homogeneous mixture of rock compared to the premining geologically distinct layers. While the removal of coal and subsurface geology (overburden) would have a long-term impact, the existing stratification in this region is not unusual or rare; as a result the impact would be minor.

Surface coal mining may modify the topography and landform features, such as mountains, hills, slopes, and surface drainage patterns (EPA 2013d). The original topography of the study area is somewhat rugged. The expected postmining topography would be more homogenous and subdued, but would blend with the undisturbed surroundings. The impact on landforms and topography resulting from permitted mining activities would be localized and permanent. Existing topography would be affected by the removal of coal, relocation of overburden, and construction of staging areas.

Under 30 CFR § 816.100, mines are subject to contemporaneous reclamation, which would result in reduction of near-term impacts to topography. Also, when mining is complete, areas must be reestablished to their approximate original contour within 180 days following coal removal and cannot leave more than four spoiled ridges unreclaimed at a time. SMCRA requires the mine operation to “backfill, compact... and grade in order to restore the approximate original contour of the land with all highwalls, spoil piles, and depressions eliminated ....” SMCRA section 515; (30 USC §§ 1265(b) and (c)). As a result, there would be both substantial near-term and more minor long-term adverse impacts on topography. The existing topography within mined areas would be slightly to moderately changed. Topsoil would be removed and stockpiled or placed directly on re-contoured areas. Overburden would be excavated and stockpiled or placed directly behind into the mined cut to backfill to the approximate original contour as mining proceeds to the end of the operation, and coal would be removed. After the coal is removed, highwalls would be eliminated and the land surface would be restored to the approximate original contour or to a configuration approved during the mine permitting processes. The topographic configuration would be developed and approved as part of a SMCRA required comprehensive mine land restoration and reclamation plan (30 USC § 1258).

### **Underground and Auger Mining**

In areas where underground and auger mining occurs surrounding geology and the coal seam would be subject to permanent change on the areas of coal removal within the designation area. In the area of the underground workings, the strata overlying the mine workings could, in time, fracture as a result of settling and subsidence (OSMRE 1984). The area of topographic impact would be limited largely to the mine portal area.

Auger mining would directly affect both coal deposits and surficial geology, resulting in the permanent removal of the coal and a small amount of the subsurface geology directly adjacent to the coal deposits. Over time, some of the bedrock strata above the auger holes would subside and fracture (OSMRE 1984). In underground coal mines, coal is removed by cutting entryways into the coal deposit without significantly disturbing the soil, near surface geology, or topography. In those areas where underground

coal mining operations occur, the strata overlying the mine workings could, in time, fracture as a result of settling and subsidence. However, in general the area of topographic impact would be limited largely to the mine portal area (OSMRE 1984).

Reclamation of the surface disturbance access areas for underground mines is similar to surface mining reclamation. The underground mine opening may require a hydraulic seal to control gravity discharges from the mine opening reducing the risk of potential acid mine drainage. Once the seal is in place, support structures are removed and the disturbed surface area is regraded to approximate the original contour and replanted. In the absence of subsidence, underground mining would have the same impact on coal deposits, as described above. Impacts from underground mining on surficial geology would be less than surface mining because the geologic material would only be removed during room and pillar development. Assuming no subsidence, underground mining would impact less of a surface area than surface mining and therefore result in less of an impact.

## **Remining**

Potential remining operations would result in the mining of pre-SMCRA mined areas followed by reclamation of these sites. Remined areas are subject to reclamation to the extent possible based on using all reasonably available overburden materials (30 CFR § 816.106 (b)(1)). The act of remining could result in short-term adverse impacts; however, reclamation of these sites could result in overall beneficial impacts to geology, soils, and topography, by reducing highwalls and restoring topography closer to approximate original contour. Topographic impacts could be largely beneficial because the mining of previously mined areas could result in restoration or partial restoration of an abandoned, unreclaimed bench to premining conditions. An exception to this restoration could be where the postmining land use called for a land surface configuration different from the premining topography, although in either case the land surface would be stabilized and the overall impacts to geology and topography would be minor.

Remined areas are subject to reclamation to the extent possible based on using available overburden materials. Reclamation of these sites could result in overall beneficial impacts to topography, by reducing highwalls and restoring topography closer to approximate original contour. The operator must use all reasonably available spoil in the immediate vicinity of the remining operation to eliminate all highwalls to the maximum extent technically practicable (30 CFR § 816.106(b)(1)), grading to a slope that provides adequate drainage and long-term stability (30 CFR § 816.106(b)(2)), and ensuring that any highwall remnant is stable and does not pose a hazard to public health and safety or to the environment (30 CFR §§ 816.106(b)(3) and (b)(4)).

Underground and auger mining would cut into the side of a hill, clear an operational area, and bore into the earth surface, resulting in localized surface disturbance as well as earth and rock material being brought to the surface and stored on site, resulting in a localized disturbance of topographic conditions near the mine entrance, operation, and staging areas. Because the mining operations would occur underground, mine entrances and staging areas would impact the topography of the area by disturbance and removal of soils and surficial geology, albeit over a much smaller area than compared to larger surface coal mining operations. In the area of the undergrounding, the strata overlying the mine could, in time, fracture as a result of settling and subsidence. The area of topographic impact would be limited largely to the mine entrance area (OSMRE 1984).

The prohibition on remining would preserve current conditions, resulting in no disturbance. The continued existence of pre-SMCRA unreclaimed abandoned mined lands would result in ongoing long-term adverse impacts from unreclaimed overburden geology. In addition, there is the potential for extended exposure of unreclaimed overburden spoils to increased amounts of water and oxygen, resulting

in the generation of acid mine runoff (Skousen et al. 1998; also see the “Impacts of the Alternatives on Water Resources” section).

## **Roads**

The mining operations would use existing access and haul roads when available. The construction of any new haul roads and access roads would alter the existing surficial geology, ground surface, and slopes in certain areas. Road cuts into the surface geology would remove those areas and leave the remainder exposed. The majority of roads already exist; however, if new roads are required, the excavations for access and haul roads, and other support facilities would result in both permanent and temporary localized and comparatively small impacts on geologic resources.

## **ALTERNATIVE 1: NO-ACTION ALTERNATIVE**

Under alternative 1 (no action), OSMRE would deny the State’s petition to designate the subject lands as “unsuitable for surface coal mining operations” (30 CFR § 764.13). Therefore, the no-action alternative would have the same effect as deciding not to designate any of the petition area as unsuitable for surface coal mining operations.

## **Direct and Indirect Impacts**

Alternative 1 would result in direct impacts to topographic and geology. Under the no-action alternative, no acres inside the evaluation area would be designated as unsuitable for mining. Although limited to an average of 112 acres per year, all types of mining and supporting infrastructure activities would continue to be allowed, including surface, underground, augering, and remining. Development of both access and haul roads and mine reclamation would also be allowed under this alternative. Existing topography would be affected under alternative 1 by the removal of coal, relocation of overburden, and construction of staging areas, as described under the “General Impact of Coal Mining in Tennessee on Earth Resources” section. Impacts from surface mining, underground and auger mining to topography would be permanent, localized, yet comparatively minor and would be considered negligible as the area would be reclaimed to the approximate original contour per SMCRA requirements. There would be permanent removal of portions of the coal seam under this alternative. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions. Therefore, of the total 65,830 acres of potential surface mineable area and 16,343 acres available for remining within the evaluation area, there is a potential for on average 112 acres per year of disturbance associated with past, present, and future mining operations based on the historic mining rate. This is less than a 1% disturbance within the evaluation area. Therefore, impacts from mining would be permanent, localized, yet comparatively minor, and could occur on ridgelines anywhere within the evaluation area. Topographic impacts of remining would be adverse in the short-term, but beneficial over the long-term because remining would result in restoration or partial restoration of pre-SMCRA mined and abandoned, unreclaimed bench to premining topography. There are 390.7 miles of pre-SMCRA highwalls within the evaluation area. Based on the coal resources data and calculations performed by OSMRE, approximately 183.7 miles of these pre-SMCRA highwalls have been identified as probable surface mineable highwalls and could be reclaimed through remining, although not all 183.7 miles fall within the alternatives considered.

## **Cumulative Impacts**

Past, present, and reasonably foreseeable future actions that could impact topography and geology include existing permitted surface mining operations, re-mining of abandoned mines, underground mining operations, forest practice operations, oil and gas operations, and construction and maintenance of road infrastructure. Ground-disturbing work associated with mining, forest practices, oil and gas operations, and roads could have both near- and long-term adverse impacts to geology due to excavation and removal of material and drilling. While topography and geology may be disturbed by these cumulative actions, the majority of impacts would require reclamation or result in localized minor effects on topography and geology. The impacts of alternative 1, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on geologic resources. Alternative 1 would contribute minor adverse cumulative effects considering the expected rate of mining, and there would be benefits where re-mining results in restoration of pre-mining topography.

## **Conclusion**

The impact on geology and topography resulting from permitted mining activities would be localized and permanent. Existing topography and geology would be affected under alternative 1 by the removal of coal, relocation of overburden, and construction of staging areas. Impacts from surface mining, underground and auger mining to topography and geology would be permanent, localized, yet comparatively minor, as any area subject to surface mining would be reclaimed to the approximate original contour, and there would be benefits to topography from re-mining and restoring highwalls to their approximate original contour. Given this requirement, the reclamation done during re-mining, and the average annual expected rate of mining, alternative 1 would not have significant impacts on topography.

## **ALTERNATIVE 2: STATE PETITION DESIGNATION**

Under alternative 2, OSMRE would designate 67,326 acres as unsuitable for surface coal mining operations all public access lands proposed in the State's petition and petition area map. Under this alternative, 505 miles of ridgelines with a 1,200-foot corridor (600 feet on both sides of the ridgeline) would be designated as unsuitable for surface coal mining.

## **Direct and Indirect Impacts**

Under alternative 2, no new surface mining would be allowed in the 67,326-acre petition area; as a result, there would be no surface disturbance within the petition area. The majority of surficial geology would remain intact, and the designation would protect approximately 34,094 acres that are within potential surface mineable coal seams. This would preclude the mining of coal unless underground or augering mining originating outside of the petition area were possible. An additional 8,345 acres falls in areas that have been previously surfaced mined, but no re-mining would occur under this alternative, so there would be little if any impact on topography and geology in those areas. Unreclaimed and abandoned problem mines under certain physical and geologic conditions would continue to impact the environment through acid mine drainage. As ridgelines are protected under this alternative, changes to overall topography in the petition area are unlikely, resulting in long-term beneficial impacts compared to alternative 1. This would leave pre-SMCRA mines unreclaimed, resulting in the continued negative impact of exposed highwalls and mine drainage, as described in the "General Impact of Coal Mining in Tennessee on Earth Resources" section. This would result in adverse impacts at existing highwall sites. Approximately 201.6 miles of pre-SMCRA highwalls exist within the State's petition area and no beneficial impacts to topography would be realized for removal since no re-mining is allowed for this alternative. Underground and auger mining would be allowed if the entrance or auger borehole is located outside of the petition area. Impacts under alternative 2 on coal deposits and geology would occur from underground and auger

operations located outside of the petition area and removing coal underneath the petition area; these impacts would be permanent, localized, yet comparatively minor and these impacts would occur within the 112 acres per year mining rate expected in the evaluation area.

### **Cumulative Impacts**

Past, present, and reasonably foreseeable future actions that could impact topography and geology include the same actions, as described under alternative 1. These actions include existing permitted surface mining operations and issues related to unreclaimed abandoned mines in the petition area, underground mining, forest practice operations, oil and gas operations, and construction and maintenance of road infrastructure. The impacts of alternative 2, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on geologic resources. Alternative 2 would benefit topography and geology from the protection of the petition area but still contribute a small adverse cumulative impact from auger and underground mines and not allowing remining and the resulting reclamation.

### **Conclusion**

Under alternative 2, impacts from underground and auger mining underneath the petition area to geology would be permanent, localized, yet comparatively minor, and there would be a benefit since surface geology and topography would remain undisturbed in the petition area. For these reasons, impacts on geology under alternative 2 are not considered to be significant.

The overall impacts of alternative 2 on topography would be mainly long-term beneficial from the protection of 22,122 potential surface mineable acres, but with the ongoing adverse impacts from the inability to remine and reclaim existing highwalls. However, these adverse impacts would not be new and would be the same as under the no-action alternative. Adverse impacts would not be significant.

### **ALTERNATIVE 3: STATE PETITION DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS**

Alternative 3 includes the same area as alternative 2 and would designate all public access lands proposed in the State's petition with a 1,200-foot ridgeline corridor area as unsuitable for all surface mining that is not remining. Alternative 3 could also potentially allow underground and auger mining along with construction and maintenance of haul roads inside the petition area. Unlike alternative 2, alternative 3 would not designate the area unsuitable for remining (pursuant to 30 CFR chapter VII).

### **Direct and Indirect Impacts**

Under alternative 3, except for remining, all mining that is not remining would be prohibited in the 67,326 acre designation area; as a result, there would be no surface disturbance associated with new mining within the designated area. The majority of surficial geology and topography would remain intact, and the designation would protect 34,094 acres that are within potential surface mineable coal seams, although this would preclude the mining of coal unless underground or augering mining originating outside of the petition area were possible. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions. Therefore, approximately 8,345 acres of previously mined areas within the designation area would be available for remining, which could include a portion of the 112 acres of surface mining and associated disturbance based on the historic mining rate. There are approximately 201.6 miles of pre-SMCRA highwalls within the State's petition area. The allowance of remining in the

designated area would result in short-term adverse impacts similar to those described for Alternative 1, although they would be limited to previously disturbed areas. However, re-mining could have a long-term beneficial impact to topography due to potential removal of some highwalls and pits, which would occur through reclamation. Based on the coal resources data and calculations performed by OSMRE, approximately 102.2 miles of these pre-SMCRA highwalls have been identified as potential surface mineable highwalls.

Underground and auger mining could occur outside of the designation area and remove coal from under the designation area. Development of both access and haul roads and mine reclamation would also be allowed under this alternative. Impacts to geologic resources from road construction include removal of surficial geology through excavation. Haul roads would alter the existing surficial geology, ground surface, and slopes in certain areas adversely affecting topography. Underground and auger mining originating outside of the petition area could occur and remove coal from under the designation area and would have little if any effect on topography. Development of both access and haul roads would also be allowed under this alternative. Existing haul roads would be used when available, but alternative 3 would allow for the construction of new roads to be used for re-mining. Haul roads would alter the existing ground surface and slopes in certain areas, a very limited and localized adverse effect. Impacts to topography and geology would be permanent and, localized, yet comparatively the overall impacts to topography and geology would be minor.

### **Cumulative Impacts**

Past, present, and reasonably foreseeable future actions that could impact topography and geology include the same actions that were described under alternative 1 and would result in minor adverse impacts on topography and geology. These actions include existing permitted surface mining operations, potential re-mining of abandoned mines, underground mining operations, forest practice operations, oil and gas operations, and construction and maintenance of road infrastructure. The impacts of alternative 3, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on geologic resources. Alternative 3 would benefit topography and geology but still contribute a small adverse impact through underground and auger mines and re-mining to the overall cumulative impact. However, these impacts would be minor and mitigated, and re-mining would add a small beneficial increment to cumulative impacts.

### **Conclusion**

As described with alternative 2, alternative 3 would not result in any new adverse impacts compared to the no-action alternative. Potential re-mining operations could result in the mining of pre-SMCRA mined areas followed by reclamation of these sites. Re-mining could result in impacts similar to the no-action alternative, but would be largely limited to previously disturbed areas. Reclamation of these sites would result in potential overall beneficial impacts to topography and geology. Impacts to geology would be permanent and, localized, yet comparatively the overall impacts to geology would be minor and there would be a benefit since surface geology would remain undisturbed in the designation area. Alternative 3 would have mostly beneficial impacts on topography from the protection of ridgelines within the designation area and the overall beneficial effect on re-mined areas that are reclaimed. There would be permanent removal of portions of the coal seam during re-mining, but the area affected would be relatively small and impacts would therefore not be significant.

## **ALTERNATIVE 4: EXPANDED CORRIDOR DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS (PREFERRED ALTERNATIVE)**

Under alternative 4, OSMRE would designate 76,133 acres as unsuitable for surface coal mining operations all public access lands proposed in the State's petition and petition area map, as described under alternative 2, plus additional ridgelines. Similar to alternative 3, this alternative could potentially allow remining and construction and maintenance of haul roads within the petition area.

### **Direct and Indirect Impacts**

Impacts to topography and geology under alternative 4 would be the similar to those under alternative 3, but with slightly greater benefits due to the larger area protected and available for remining. All mining that is not remining would be prohibited in the 76,133 acre designation area. The majority of surficial geology and topography would remain intact, and the designation would protect 37,367 acres that are located in potential surface mineable coal seams, although this would preclude the mining of coal unless underground or auger mining were possible. Within the petition area there is approximately 9,094 acres of previously mined areas available for remining, 748 more than alternative 3. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions. Therefore, approximately 9,094 acres of previously mined areas within the designation area would be available for remining, which could include a portion of the 112 acres of surface mining and associated disturbance based on the historic mining rate. Based on the coal resources data and calculations performed by OSMRE, approximately 111.9 miles of the pre-SMCRA highwalls have been identified as potential surface mineable highwalls. Remining operations would result in short-term adverse impacts similar to the no-action alternative but would be limited to the mining of pre-SMCRA mined areas followed by reclamation of these sites. Remined areas are subject to reclamation to the extent possible based on using available overburden materials. Reclamation of these sites would result in overall beneficial impacts to topography and geology. Impacts to topography and geology would be permanent and, localized, yet comparatively the overall impacts to topography and geology would be minor. Underground and auger mining could occur outside of the designation area and remove coal from under the designation area. Potential development of both access and haul roads and mine reclamation could also be allowed under this alternative. If allowed, existing haul roads would be used when available, but alternative 4 could potentially allow for the construction of new roads to be used for remining. Impacts to geologic resources from road construction include removal of surficial geology through excavation. Haul roads would alter the existing surficial geology, ground surface, and slopes in certain areas adversely affecting topography.

### **Cumulative Impacts**

Past, present, and reasonably foreseeable future actions that could impact topography and geology include the same actions that were described under alternative 1 and would result in minor adverse impacts on topography and geology. These actions include existing permitted surface mining operations, potential remining of abandoned mines, underground mining operations originating outside of the petition area, forest practice operations, oil and gas operations, and construction and maintenance of road infrastructure. The impacts of alternative 4, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on geologic resources. Alternative 4 would benefit geology but still contribute a small adverse impact through underground and auger mines and potential remining to the overall cumulative impact. However, these impacts would be minor and mitigated, and potential remining would add a small beneficial increment to cumulative impacts.

## **Conclusion**

Under alternative 4 impacts to topography and geology would be permanent and localized, yet comparatively minor. There would be permanent removal of portions of the coal seam during remining, but the area affected would be relatively small. Potential remining operations could result in the mining of pre-SMCRA mined areas followed by reclamation of these sites potentially benefitting topography. No new or additional adverse impacts are expected compared to the no-action alternative. Impacts on topography under alternative 4 would be mainly beneficial from the protection of ridgelines within the designation area and the potential overall beneficial effect on potentially remined areas that are reclaimed. Impacts would not be significant.

## **ALTERNATIVE 5: TARGETED RESOURCE PROTECTION DESIGNATION**

Under alternative 5, OSMRE would designate lands as unsuitable for surface coal mining operations based on the presence of certain sensitive resources. This designation differs from alternatives 2, 3, 4, and 6, which designate protected areas based on ridgelines. Alternative 5 would protect environmentally sensitive habitat areas, including portions of Stinking Creek and Thompson Creek within the Upper Cumberland watershed.

## **Direct and Indirect Impacts**

Under alternative 5, no new surface mining or remining would be allowed in the 12,331 acre designation area; as a result, there would be no surface disturbance within this area. The majority of topography and surficial geology would remain intact and the designation would protect 8,876 acres that are located in potential surface mineable coal seams, although this would preclude the mining of coal unless underground or augering mining originating outside of the petition area are possible. However, underground and auger mining would be allowed only if the entrance or auger borehole is located outside of the designation area and operations occur underneath the petition area. Impacts under alternative 5 on coal deposits and geology would occur from underground and auger operations located outside of the designation area and removing coal underneath the designation area. There will be little impact on topography. Remining would not be allowed, therefore existing highwalls would remain exposed, a long-term adverse impact. There are approximately 30 miles of highwalls within the designation area.

## **Cumulative Impacts**

Past, present, and reasonably foreseeable future actions that could impact geology include the same actions described under alternative 1 and would result in minor adverse impacts on topography and geology. These actions include existing permitted surface mining operations, underground mining operations originating outside of the petition area, forest practice operations, oil and gas operations, and construction and maintenance of road infrastructure. The impacts of alternative 5, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on geologic resources. Alternative 5 would benefit geology but still contribute a small adverse impact through auger and underground mines originating outside of the petition area and to the overall cumulative impact. Alternative 5 would provide long-term cumulative benefits on topography based on the protection afforded in the designation area, but would contribute long-term adverse cumulative impacts because existing highwalls from pre-SMCRA mining could not be reclaimed to the approximate original contour.

## **Conclusion**

Under alternative 5, impacts from underground and auger mining underneath the petition area to topography and geology would be permanent, localized, yet comparatively minor, and there would be a

benefit since surface geology would remain undisturbed in the designation area. Under alternative 5, there would be beneficial impacts since topography and geology would remain undisturbed in the designation area. There would be permanent removal of portions of the coal seam during underground and auger mining, but the area affected would be relatively small and impacts would therefore not be significant. Past adverse effects would remain where highwalls exist and cannot be reclaimed since no remining would be permitted. However, no new or additional adverse impacts are expected compared to the no-action alternative. Overall, impacts on topography under alternative 5 are not considered to be significant because a large area containing sensitive resources would be protected, although there are some areas that would not be returned to their original contour through reclamation.

## **ALTERNATIVE 6: REDUCED CORRIDOR DESIGNATION**

Under alternative 6, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State's petition and petition area. Lands protected under alternative 6 would be the same as those protected under alternatives 2 and 3, except that the corridor width would be reduced by half (600-foot corridor instead of 1,200-foot corridor).

### **Direct and Indirect Impacts**

Under alternative 6, no new surface mining or remining would be allowed in the 39,106 acre designation area; as a result, there would be no surface disturbance within this area. The majority of topography and surficial geology would remain intact, and the designation would protect 19,166 acres that are located in potential surface mineable coal seams, although this would preclude the mining of coal unless underground or augering mining originating outside of the petition area were possible. Impacts to topography and geology under alternative 6 would be similar to those described under alternative 2; however, the protected area would be about half the area protected under alternative 2. Underground and auger mining would be allowed if the entrance or auger borehole is located outside of the designation area and operations occur underneath the petition area. Also, remining would not be permitted, and pre-SMCRA mines would remain unreclaimed, resulting in the continued negative impact of exposed highwalls and a long-term adverse impact on topography. There are approximately 108 miles of highwalls within the reduced State's petition area. Impacts under alternative 6 on coal deposits and geology would occur from underground and auger operations located outside of the designation area and removing coal underneath the designation area.

### **Cumulative Impacts**

Past, present, and reasonably foreseeable future actions that could impact topography and geology include the same actions that were described under alternative 1 and would result in minor adverse impacts on topography and geology. These actions include existing permitted surface mining operations, underground mining operations originating outside of the petition area, forest practice operations, oil and gas operations, and construction and maintenance of road infrastructure. The impacts of alternative 6, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on geologic resources. Alternative 6 would benefit topography and geology but would still contribute a small amount to the overall cumulative impact.

### **Conclusion**

Under alternative 6, impacts from underground and auger mining underneath the petition area to geology would be permanent, localized, yet comparatively minor. Under alternative 6, there would be beneficial impacts because topography would remain undisturbed in the designation area. There would be a benefit since topography and surface geology would remain undisturbed in the designation area. There would be

permanent removal of portions of the coal seam during underground and auger mining, but the area affected would be relatively small and impacts would therefore not be significant. No new or additional adverse impacts are expected compared to the no-action alternative. The prohibition on remining would have long-term adverse impacts on topography. Overall, impacts on topography under alternative 6 are not considered to be significant because a relatively large area of ridgeline would be protected, and although there are some areas that would not be returned to their original contour.

## **IMPACTS OF THE ALTERNATIVES ON AIR QUALITY**

### **METHODS FOR ANALYSIS**

#### **Applicable Statutes, Regulations, and Policies**

##### **Air Quality Standards**

Air quality in a given location is determined by the concentration of various pollutants in the atmosphere. The EPA has established National Ambient Air Quality Standards (NAAQS) under the Clean Air Act of 1970 (amended 1977 and 1990, 42 USC § 7401 et seq.).

The NAAQS represent maximum levels of background pollution that are considered safe, with an adequate margin of safety, to protect public health (primary standards) and welfare (secondary standards such as diminished production and quality of agricultural crops, reduced visibility, degraded soils, materials and infrastructure damage, damaged vegetation, and ecosystem resources). Recently, the EPA has proposed developing new secondary standards for sulfur dioxide and nitrogen oxide aimed at reducing the impacts of atmospheric deposition on surface waters (GAO 2013). Individual states have the option to adopt more stringent standards and to include other pollution sources.

Federal law defines criteria pollutants to include ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide, particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), and lead. Elimination of tetraethyl lead in motor gasoline has eliminated emissions of lead from vehicles and portable equipment. Ozone is not directly emitted, rather, its precursors (nitrogen oxide and volatile organic compounds) are the pollutants that react with sunlight to form ground-level photochemical ozone and contribute to regional haze, along with sulfur dioxide and particulate matter. Criteria emissions – also referred to as regulated pollutants – caused by an action include reactive organic compounds or volatile organic compounds, nitrogen oxide as NO and nitrogen dioxide, carbon monoxide, sulfur dioxide, PM<sub>10</sub>, and PM<sub>2.5</sub>.

In the 1977 Clean Air Act amendments, Congress classified those areas that meet or exceed the NAAQS as Class I, Class II, or Class III (42 USC § 7472). Congress decided that national parks and wilderness areas already in existence at the time of the 1977 amendments and meeting a set acreage threshold would be designated as Class I areas. The act designated the rest of the clean air areas as Class II. In addition, Congress allowed states to designate some areas as Class III, none have done so to date. In the coal-producing regions, areas that have attained the NAAQS for criteria pollutants are designated as attainment areas or “unclassifiable” and are regulated under the prevention of significant deterioration program.

As discussed below, within and adjacent to the evaluation area, there are NAAQS nonattainment areas for the following criteria air pollutants: PM<sub>2.5</sub>, PM<sub>10</sub>, ozone, and sulfur dioxide. Mining activities near these nonattainment areas may contribute to further degradation of the air quality and may be subject to more stringent requirements to minimize emissions.

## Hazardous Air Pollutants

Hazardous air pollutants, also known as toxic air pollutants or air toxics, are those pollutants that cause or may cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental and ecological effects. Title III of the Clean Air Act Amendments of 1990 currently identifies 187 pollutants as hazardous air pollutants, the federal term for air toxics. In 2001, the EPA identified 21 hazardous air pollutants as mobile source air toxics, 6 of which are designated priority pollutants (66 FR 17235): acetaldehyde, acrolein, benzene-1, 3-butadiene, diesel exhaust (particulate matter and organic gases), and formaldehyde. Diesel particulate matter (DPM, as PM<sub>10</sub>) is considered a carcinogenic air toxic. An EPA assessment “examined information regarding the possible health hazards associated with exposure to diesel engine exhaust, which is a mixture of gases and particles. The assessment concludes that long-term (i.e., chronic) inhalation exposure is likely to pose a lung cancer hazard to humans, as well as damage the lung in other ways depending on exposure. Short-term (i.e., acute) exposures can cause irritation and inflammatory symptoms of a transient nature, these being highly variable across the population” (EPA 2002). However, no EPA standard exists for diesel particulate matter.

In addition to diesel particulate matter from mining equipment and heavy trucks, coal combustion in power plant boilers emits a wide range of inorganic and organic hazardous air pollutants from stacks, according to the EPA (EPA 2011; 40 CFR part 63 subpart UUUUU). Inorganic metals include antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, and selenium. Organic and nonmetallic inorganic materials include acetaldehyde, acetophenone, acrolein, benzene, benzyl chloride, bis(2-ethylhexyl)phthalate, carbon disulfide, chlorobenzene, chloroform, cyanide, 2,4-dinitrotoluene, ethyl benzene, ethyl chloride, formaldehyde, hexane, hydrogen chloride, hydrogen fluoride, isophorone, methyl bromide, methyl chloride, methyl ethyl ketone, methylene chloride, polycyclic aromatic hydrocarbons, phenol, propionaldehyde, tetrachloroethylene, toluene, styrene, and xylenes (ortho-, meta-, para- isomers).

Coal-fired power plants are the largest source of mercury and acid gas emissions in the United States and are responsible for about 50% of mercury emissions and about 77% of acid gas emissions.

On March 28, 2013, the EPA finalized updates to certain emission limits for new power plants under the Mercury and Air Toxics Standards rule, including mercury, particulate matter, sulfur dioxide, acid gases, and certain individual metals. Additionally, certain testing and monitoring requirements that apply to new sources were adjusted. The new standards affect only new coal- and oil-fired units that will be built in the future (78 FR 24073). The update does not change the final emission limits or other requirements for existing power plants.

## Federal Visibility Protection and Atmospheric Deposition Control Programs

Section 169A (42 USC part 7491) of the Clean Air Act sets forth a national goal for visibility which is the “prevention of any future, and the remedying of any existing, impairment of visibility in Class I areas which impairment results from manmade air pollution” (64 FR 35714). Visibility and regional haze are regulated under the Regional Haze Rule of the Clean Air Act (40 CFR part 51 subpart P). Under the Clean Air Act, Class I areas receive the highest visibility protection. As stated previously, Class I areas are those national parks and wilderness areas in existence as of the date of the enactment of the 1977 amendments to the statute and contained the required threshold acreage at that time.

There are 156 Class I areas in the United States where visibility is an important value. The NPS, USFWS, and the US Forest Service manage the following number of such areas respectively: 49, 21, and 86. The Regional Haze Rule, promulgated in 1999, requires states to establish goals and emission reduction

strategies for improving visibility in all Class I areas as part of state implementation plans as geographically applicable. In addition, the EPA encourages states to work together in regional partnerships to develop and implement multistate strategies to reduce emissions of visibility-impairing fine particle ( $PM_{2.5}$ ) pollution (64 FR 35714). Due to long range transport of visibility-impairing fine particles, all 50 states are required to participate in planning, analysis, and in many cases, emission control programs.

### **Federal Stationary Source Regulations**

Title V Operating Permits Parts 70 and 71 implement Title V of the Clean Air Act, 42 USC § 7661, et seq. Title V operating permits are legally enforceable documents that permitting authorities issue to major stationary sources of air pollution regulating their emissions. Title V major source thresholds are defined by the NAAQS attainment status of the jurisdiction, with progressively lower (more stringent) thresholds in moderate, serious, severe, and extreme nonattainment areas. Part 70 permits are issued by state and local (county or district) permitting authorities. Part 71 permits are issued either directly by the EPA or through tribal environmental protection agencies on sovereign tribal lands. Many other parts within Title V provide additional requirements for monitoring and limits on emissions at stationary sources such as coal burning power plants.

### **Mobile Source Regulations**

A vehicle may have an engine that both propels the vehicle and powers equipment mounted on the vehicle, typically via hydraulics. As such, single-engine vehicles are generally exempt from direct regulation by states, air districts, or sovereign tribes. However, not included in most exemption provisions is any non-driveline engine-powered equipment mounted on a vehicle that would otherwise require a permit under state, air district, or tribal regulations. An example of this dual-engine configuration would be a vacuum street sweeper where an auxiliary engine drives the vacuum blower. Another example would be a mobile crane or drilling rig with an independent hoist or draw-works engine, respectively.

Federal Tier 1 standards for off-road diesel engines were adopted in 1995. Federal Tier 2 and Tier 3 standards were adopted in 2000 and selectively apply to the full range of diesel off-road engine power categories. Both Tier 2 and Tier 3 standards include durability requirements to ensure compliance with the standards throughout the useful life of the engine (40 CFR § 89.112). On May 11, 2004, the EPA signed the final rule implementing Tier 4 emission standards that are to be phased-in over the period of 2008–2015 (69 FR 38957–39273, June 29, 2004). The Tier 4 standards require that emissions of particulate matter and nitrogen oxide be further reduced by about 90%. Such emission reductions can be achieved through the use of advanced control technologies – including advanced exhaust gas after treatment similar to those required by the 2007–2010 standards for highway diesel engines. It should be noted that diesel engines used in underground mining equipment are exempt from these requirements because diesel emissions and air quality from such engines are regulated by the Mine Safety and Health Administration.

### **Greenhouse Gas Emissions**

Greenhouse gases trap solar energy in the atmosphere and cause it to warm. This phenomenon is called the greenhouse effect and is necessary to support life on earth; however, excessive buildup of greenhouse gases can change the earth's climate and result in undesirable effects on ecosystems, which affect human health and welfare (EPA 2012e). Greenhouse gas emissions from the combustion of fossil fuels for energy include carbon dioxide, methane, and nitrous oxide, and represent the largest share of total US greenhouse gas emissions (EPA 2013c, 2013e).

The EPA tracks greenhouse gas emissions in the United States and publishes an annual update to its Inventory of United States Greenhouse Gas Emissions and Sinks (EPA 2012a, 2015a). From the current report, the main source of greenhouse gas emissions in the United States is electric power generation, which accounts for 32% of greenhouse gas emissions nationwide. Over 70% of electric power is generated by burning fossil fuels, mainly coal and natural gas. Greenhouse gas emissions from electric power generation in the United States have increased by about 24% since 1990 as demand for electric power has grown, and fossil fuels have remained the dominant energy source for generation due to their low cost and high reliability. Coal combustion is much more carbon-intensive than burning natural gas or petroleum to generate electricity. In 2012, consumption of energy generated by coal decreased by 12.3%; thus coal generated about 33% of electric power in the United States and in 2012 accounted for about 40% of carbon dioxide emissions from the power sector (EPA 2015a).

The amount of methane released during coal mining depends on a number of factors, the most important of which are coal rank, coal seam depth, and method of mining. Coal rank represents the differences in the stages of coal formation and depends on the temperature history of the coal seam. As coal rank increases, the amount of methane produced also increases. Because pressure increases with the depth of the coal seam and the adsorption capacity of coal increases with pressure, deeper coal seams generally contain more methane than shallow seams of the same rank. In addition, over time methane can be released to the atmosphere from near surface coal seams through natural fractures in overburden strata. Coal extraction tends to lead to the release of more methane than was originally trapped within the mined coal seam itself because the drop in pressure draws in additional gas from surrounding strata. Also, the mining process tends to fracture the surrounding strata including neighboring seams, particularly where longwall extraction is used. Underground coal mining typically releases more methane than surface mining because of the higher gas content of deeper seams (Irving and Tailakov 1999).

The 2011 EPA Greenhouse Gas Inventory Report (EPA 2013c) provides a detailed description of methane emissions from coal mining and how they are estimated. According to the EPA report, three types of coal mining and related activities release methane to the atmosphere: underground mining, surface mining, and postmining (i.e., coal-handling) activities. Underground coal mines contribute the largest share of methane emissions. Underground coal mines employ ventilation systems to maintain safe methane levels for workers. These systems can exhaust significant amounts of methane to the atmosphere in low concentrations. Additionally, some US coal mines supplement ventilation systems with degasification systems. Degasification systems are wells drilled from the surface or boreholes drilled inside the mine that remove large volumes of methane before, during, or after mining. In 2011, 14 coal mines collected methane from degasification systems and used this gas, thus reducing emissions to the atmosphere; all of these mines sold methane to the natural gas pipeline, including one that also used methane to fuel a thermal coal dryer. Surface coal mines also release methane as the overburden is removed and the coal is exposed, but the level of emissions is much lower than from underground mines. Finally, some of the methane retained in the coal after mining is released during processing, storage, and transport of the coal. Total methane emissions from coal mining in 2011 have declined by 25% since 1990 (EPA 2013c).

### **Greenhouse Gas Permitting for Stationary Sources**

On May 13, 2010, EPA issued the Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule (75 FR 31514), which addressed greenhouse gas emissions from stationary sources under the Clean Air Act permitting programs. This final rule set thresholds for greenhouse gas emissions, defining when Clean Air Act major source permits are required for new and existing industrial facilities that emit greenhouse gases. This rule had the potential to affect methane and carbon dioxide emissions from coal mining activities. However, EPA determined in response to a June 2010 petition filed by Earthjustice et al., that such facilities would not be listed under Clean Air Act Section 111 at this time.

Therefore, EPA would not pursue federal standards of performance for existing, new, and modified sources in the coal-mines category (EPA 2013e).

### **Greenhouse Gas Reporting Program**

Federal greenhouse gas regulations and reporting requirements do not apply to surface coal mining operations. On October 30, 2009, the EPA issued the Mandatory Reporting of Greenhouse Gases rule (74 FR 56260; 40 CFR part 98, effective December 29, 2009), which requires reporting of greenhouse gas data and other relevant information from large sources and suppliers in the United States pursuant to the Fiscal Year 2008 Consolidated Appropriations Act (HR 2764; Public Law 110-161).

The rule facilitates collection of accurate and comprehensive emissions data to provide a basis for future EPA policy decisions and regulatory initiatives. The rule requires specified industrial source categories and facilities with an aggregated heat input capacity of 30 mm British thermal unit or more per hour or that emit 25,000 metric tonnes or more per year of carbon dioxide equivalent greenhouse gases to submit annual reports to the EPA. The gases covered by the rule are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and other fluorinated gases including nitrogen trifluoride, and hydrofluorinated ethers.

On July 12, 2010, EPA published a final rule, Mandatory Reporting of Greenhouse Gases from Magnesium Production, Underground Coal Mines, Industrial Wastewater Treatment, and Industrial Waste Landfills (75 FR 39736). Under this rule underground coal mines that were subject to quarterly (or more frequent) sampling of ventilation systems by the Mine Safety and Health Administration were subject to 40 CFR part 98 regardless of the actual facility emissions. On November 29, 2011 (FR 76 73886), EPA amended specific provisions in the Mandatory Reporting of Greenhouse Gases Rule to correct certain technical and editorial errors. EPA revised the threshold for underground coal mines subject to subpart FF to include only those that have ventilation emissions of 36,500,000 actual cubic feet of methane or more per year. This revision excluded approximately 500 mines from mandatory reporting. Underground mines that meet this threshold are required to report the following:

- Quarterly methane liberation from ventilation and degasification systems; and
- Quarterly methane destruction for ventilation and degasification systems and resultant carbon dioxide emissions, if destruction takes place on-site.

In addition, each facility must report greenhouse gas emissions of other source categories for which calculation methods are provided in the rule. For example, facilities must report carbon dioxide, nitrous oxide, and methane emissions from each stationary combustion unit on site by following the requirements of 40 CFR part 98, subpart C (General Stationary Fuel Combustion Sources). Reporting year 2011 was the first year emissions data were collected for this industry sector.

EPA chose not to include abandoned underground mines and active surface mines since EPA determined that measuring or monitoring emissions from these sources would be difficult since there are currently no robust facility-level monitoring methods available to measure fugitive emissions.

### **Effects of the Current Regulatory Environment**

As discussed above, air emissions emanate from vehicle engines associated with mining activities, from emissions released during explosives detonation, from the erosion and wind transport of dust and particulate matter, and from the release of greenhouse gases as coal is exposed. Under the no-action alternative, the effects of coal mining on air quality, with the exception of erosion-related pollution, are regulated primarily under the Clean Air Act. Implementation of performance standards for blasting,

however, falls under the purview of SMCRA. Compliance with these standards reduces human exposure to toxic air pollutants that may otherwise result from blasting.

Pollutants released from combustion engines include five of the six EPA defined criteria pollutants: carbon monoxide, sulfur dioxide, nitrogen oxides, volatile organic compounds, and particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>). EPA regulates toxic emissions from motor vehicles through standards on motor vehicle fuels and engine efficiency; however, mobile sources do not require permitting under the Clean Air Act and methane emissions from mobile sources are not subject to performance standards.

The detonation of explosives under ideal field conditions releases nitrogen gas, carbon dioxide, and water vapor. In the case that field conditions are not ideal, or the explosives product formulation is incorrect, the blast may yield nitric oxide, nitrogen dioxide, or carbon monoxide in addition to the gases listed above. Section 515 of SMCRA (30 USC § 1265(b)(15)) includes a general performance standard that requires limitation of the type and size of explosives and detonating equipment, and timing of the detonation, to prevent injury to people and damage to property (e.g., livestock) outside the permit area.

The regulations implementing this section of SMCRA are included in the performance standards at 30 CFR part 816 and § 817.67. Specifically, 30 CFR part 816 and § 817.67 (a) provide general regulatory requirements for control of adverse effects from conducting blasting operations, including the requirement to prevent injury to people and damage to property. Subsequent sections address specific adverse effects of blasting, which include airblast, flyrock, and ground vibrations; however, fumes are not addressed. In addition, 30 CFR § 780.13 requires blast plans to describe how blasting will be conducted to meet the performance standards. In the case that concern exists regarding potential danger from fumes to people or property, the regulatory authority may require blasting to be conducted in a manner to minimize fume generation, or expanding the blast area security to ensure exposure is avoided.

While ground vibrations, airblast, and flyrock are commonly identified in the blast plan, blasting fumes are only addressed under certain circumstances, by a few state regulatory authorities. If not addressed in the blast plan, any visible fumes observed during an inspection or reported by a citizen that approach people or living property are considered “imminent harm” (30 CFR § 843.11). Industry practice is to never enter a reddish-orange cloud, which is considered toxic and thus poses an imminent danger. Historically, though infrequent, regulatory authorities have issued notices of violation and imminent harm cessation orders through the state counterpart regulations to 30 CFR part 843.

On April 18, 2014, OSMRE received a petition for rulemaking from WildEarth Guardians requesting that OSMRE “promulgate a rule prohibiting the production of visible nitrogen oxide emissions during blasting at surface coal mining operations in order to protect public and mine worker health, welfare, and safety, and prevent injury to persons, as required by the Surface Mining Control and Reclamation Act of 1977 (SMCRA).” On July 25, 2014, OSMRE published the petition in the Federal Register (79 FR 43326). On February 20, 2015, the Director of OSMRE’s decision to grant the petition in principle was published in the Federal Register (80 FR 9256). OSMRE staff are currently developing a proposed rule that would require the regulatory authority to consider protections for people and private property with regard to fume generation from blasting operations.

Coal mining may also affect particulate matter concentrations in air, specifically fugitive dust. Dust may be released or spread through operations by wind during mining activities such as blasting; operation of drag lines; hauling overburden and mined coal, and road grading as well as in general from earthmoving activities (Lashof et al. 2007). As noted previously, if related to erosion and wind transport, fugitive dust is regulated under SMCRA, otherwise it is regulated under the Clean Air Act. The dust is generally coarse (PM<sub>10</sub> classification). Surface mining produces more PM<sub>10</sub> emissions in comparison to underground mining as a result of the increased percentage of disturbance occurring aboveground (Lashof et al. 2007).

Section 515 of SMCRA (30 USC § 1265(b)) contains provisions related to prevention of windborne erosion from stockpiled and transported materials, as well as provisions related to handling vegetative debris. Moreover, SMCRA implementing regulations at 30 CFR §§ 816.95(a) and 817.95(a) require all exposed surface areas to be protected and stabilized to control erosion. Likewise, 30 CFR §§ 816.150(b)(1) and 817.150(b)(1) contain provisions to control or prevent erosion (including road dust) through measures such as vegetating, watering, using chemical or other dust suppressants, or otherwise stabilizing all exposed surfaces.

However, neither SMCRA nor the implementing regulations specifically require reincorporation of plant debris accumulated from site clearing (for example non-merchantable trees, tree limbs, stumps and branches). As a result these materials are often burned on site, which impacts local air quality by adding particulate matter into the air. Additionally, neither SMCRA nor the implementing regulations require reforestation of previously forested mine sites. Therefore, coal regions are currently experiencing a net loss of forested area due to coal mining. This reduction in forested acreage impacts the environment in many ways; specific to air quality it results in the loss of oxygen production potential from the vegetation, and the net loss of sequestered carbon stocks. That is, forest-based carbon is reintroduced to the atmosphere as greenhouse gases from burning of the wood, rather than being reincorporated into other stable uses (such as building materials), returned to the soil, or disposed of in ways that prevent carbon decay (e.g., landfilling).

In addition to the air quality impacts from operations at coal mines (from vehicles, blasting, and dust), the greenhouse gas methane may be released as the overburden is removed and coal and rock layers are broken as part of the mining process. Underground coal mining releases more fugitive methane than surface mining because of the higher gas content of deeper seams (Irving and Tailakov 1999). Methane released from underground mines may be captured and used as an energy source. The objective of the EPA Coalbed Methane Outreach Program is to promote the recovery and use of coal mine methane by working with industry. Future voluntary involvement in this activity on the part of coal operations is uncertain. However, to the extent that participation grows over time, methane emissions associated with coal mining may decrease in the future under the no-action alternative.

Finally, coal mining activity under the no-action alternative would reduce the carbon sequestration potential of the landscape by reducing vegetative biomass, at least in the short term. The no-action alternative requires the establishment of vegetative cover, but not reforestation. As a result, mined areas experience a net loss of forestland. In comparison to other vegetation, forested areas contain more biomass both above and below ground. This increased biomass represents additional carbon storage, additional carbon dioxide consumption during photosynthesis, and increased production of oxygen. The reduction in forested landscapes under the no-action alternative reduces the level of carbon that is removed from the atmosphere, thus contributing to climate change.

### **Methodology for Estimating Total Coal Mining Emissions in the Evaluation Area**

Surface coal mining results in emissions of several criteria pollutants, but particulate matter is a key pollutant of concern because Anderson County is designated a nonattainment area under the Clean Air Act for PM<sub>2.5</sub> (see chapter 4). Particulate matter is a broad class of air pollutants that exist as liquid droplets or solids, with a wide range of size and chemical composition. Smaller particulates that are smaller than or equal to 10 and 2.5 microns in size (PM<sub>10</sub> and PM<sub>2.5</sub>) are of particular health concern because they can get deep into the lungs and affect respiratory and heart function. Particulates can also impact visibility; damage soil, plants, and water quality; and stain stone materials. Heavy duty diesel equipment and trucks used in surface coal mining emit both PM<sub>2.5</sub> and PM<sub>10</sub> directly, with additional emissions (primarily of PM<sub>10</sub>) resulting from fugitive dust generated by activities such as overburden removal/loading/unloading, truck travel on unpaved roads and coal processing.

Surface coal mining-related emissions of PM<sub>2.5</sub> and PM<sub>10</sub> in the evaluation area were quantified based on the assumption that mining emissions would be proportional to the quantity of coal produced. The range of production expected under any of the alternatives is 54,000 to 240,000 tons per year (based on data from actual production from 2006 through 2013). This range in coal production was used to estimate the range of total annual mining-related emissions in the mining area. This is considered an order-of-magnitude estimate due to the broad assumptions implicit in this methodology. For example, the mining ratio (e.g., overburden removed per ton of coal produced) coal haul truck travel distances would vary for each coal mine and equipment mixes would vary based on site-specific conditions. The methodology also does not account for the generally lower criteria pollutant emissions associated with underground mining; 100% surface contour mining is assumed, thus providing a conservative estimate of the emissions impact.

Detailed technical information regarding the specific equations and models used to quantify emissions is provided in appendix I. Fugitive dust was quantified based on emission factors from the EPA 2011 National Emissions Inventory, which in turn are based on the procedures for quantifying fugitive dust emissions from western surface coal mines presented in AP-42: Compilation of Air Pollutant Emission Factors. Emissions from off-road equipment such as excavators, dozers, drill rigs, graders, and off-highway trucks were estimated using the EPA MOVES2014 emissions model (which incorporates the NONROAD model). Emissions from on-road trucks used for hauling coal and employee commutes were also quantified using MOVES2014. A key assumption in the on-road emissions quantification was a one-way travel distance of 50 miles for each truck trip.

### **Methodology for Comparing Alternatives**

As discussed in “Chapter 5: Evaluation of Coal Resources,” the alternatives would not change the total amount of coal production in the evaluation area from past trends. There may be shifts in the type and location of mining as a result of the alternatives, but such shifts are not known in sufficient detail to present a quantitative comparison of the emissions differences between alternatives. Therefore, all of the alternatives are assumed to have the roughly the same total potential emissions.

The alternatives would differ in the specific areas that would be potentially mineable, which could in turn influence air quality impacts at the local level. However, it is not known specifically where in the area mines would be located under alternative 1 and how that placement would change under the action alternatives. Given these unknown factors, predicting changes in local air quality impacts is not possible. Since none of the action alternatives authorize or permit mining, the only definitive conclusion that can be reached is that mining would not occur within the petition area/designation area, although potential re-mining could occur under alternatives 3 and 4. Therefore, for the purposes of the PED/EIS, none of the action alternatives would result in direct emissions. Indirect impacts could result from mining operations relocating to other areas outside the designation area and would be potentially permitted under a separate process.

### **Significance Criteria**

The significance threshold for particulate matter emissions is 100 tons per year of PM<sub>2.5</sub> or PM<sub>10</sub>. As discussed in chapter 4, Anderson County is a nonattainment area for PM<sub>2.5</sub>, which requires preparation of a State Implementation Plan detailing how the area will attain air quality standards. As discussed in the “Air Quality Standards” section of this chapter, general conformity applies to federal actions in nonattainment or maintenance areas. The 100 tons per year threshold selected for NEPA purposes corresponds to the de minimis threshold under the general conformity regulations (e.g., the level below which a general conformity determination is not required because the emissions are low enough in magnitude to not cause new violations of air quality standards or worsen existing violations).

The context for greenhouse gas emissions is that global contributions from numerous individual sources are causing climate changes, which in turn have impacts on the environment (US Global Change Research Program 2014). For greenhouse gas emissions, the Council on Environmental Quality issued final greenhouse gas guidance (CEQ 2016) that no longer provides a reference point for determining whether emissions are significant under NEPA. Instead, the guidance suggests a rule of reason be used in considering the environmental effects of greenhouse gas contributions to climate change (CEQ 2016).

### Area of Analysis

The analysis area is the evaluation area that consists of NCWMA and ERTCE and adjacent land where changes in air quality could result from surface coal mining operations.

## GENERAL IMPACT OF COAL MINING IN TENNESSEE ON AIR QUALITY

### Coal Mining-Related Particulate Matter Emissions in the Evaluation Area

Table 6-3 summarizes the results of the analysis of the range of PM<sub>2.5</sub> and PM<sub>10</sub> emissions due to surface coal mining in the evaluation area. In a year with a low level of production (as has been common since 2008), emissions of PM<sub>10</sub> and PM<sub>2.5</sub> would be below the general conformity de minimis threshold of 100 tons per year. In the peak year, the 100 tons per year threshold would be exceeded for PM<sub>10</sub> and PM<sub>2.5</sub>.

**TABLE 6-3: EVALUATION AREA PARTICULATE POLLUTANT EMISSIONS (TONS PER YEAR), BASED ON 2006–2013 COAL PRODUCTION RANGE**

Particulate Pollutant	PM <sub>10</sub> Maximum	PM <sub>10</sub> Minimum	PM <sub>2.5</sub> Maximum	PM <sub>2.5</sub> Minimum
Fugitive Dust	61.6	13.9	7.7	1.7
Off-Road Equipment	198.4	66.1*	192.4	64.1*
Coal Haul Trucks	0.072	0.016	0.032	0.007
Employee Commutes	0.038	0.015	0.015	0.006
<b>Total</b>	<b>260.1</b>	<b>80.0</b>	<b>200.2</b>	<b>65.9</b>
Four-County Region Total (Anderson, Scott, Morgan, Campbell) (EPA 2015d)	5,119		2,799	

\*A separate calculation of minimum production equipment requirements was not performed; instead it was assumed the minimum equipment requirement would be 1/3 of the modeled maximum.

To provide context for these emissions, the table also shows the total emissions from all sectors for the four counties intersecting the evaluation area (EPA 2015b). PM<sub>2.5</sub> and PM<sub>10</sub> emissions from surface coal mining could be up to 5% and 7%, respectively, above the regional total emissions at the highest production level. At the lower level of production, the percentages would be 1.6% and 2.3% of the total for PM<sub>10</sub> and PM<sub>2.5</sub>, respectively.

### Greenhouse Gas Analysis Common to All Alternatives

Surface coal mining operations in the evaluation area would generate greenhouse gas emissions from the use of heavy-duty diesel equipment, coal haul trucks, and worker transportation. The quantity of emissions from heavy equipment and worker transportation would be dependent on the specific mining practices used and the number and location of future mines (which in turn would be influenced by factors such as coal prices and environmental regulations). However, an order-of-magnitude estimate of the potential range of annual greenhouse gas emissions is provided in table 6-4 based on the same assumptions discussed for the PM<sub>2.5</sub> and PM<sub>10</sub> emissions analysis above. The total quantity of emissions

from surface coal mining in the evaluation area would be well under EPA reporting requirement of 25,000 metric tons CO<sub>2</sub> equivalent per year.

**TABLE 6-4: CARBON DIOXIDE EQUIVALENT EMISSIONS (METRIC TONS PER YEAR) IN THE EVALUATION AREA, BASED ON 2006–2013 COAL PRODUCTION RANGE**

	Carbon Dioxide Equivalent Maximum	Carbon Dioxide Equivalent Minimum
Off-Road Equipment	6,945	2,315*
Coal Haul Trucks	512	115
Employee Commutes	253	101
<b>Total</b>	<b>7,710</b>	<b>2,531</b>

\*A separate calculation of minimum production equipment requirements was not performed; instead it was assumed the minimum equipment requirement would be 1/3 of the modeled maximum.

Carbon dioxide equivalent is a metric used to reflect total greenhouse gas emissions taking into account the varying global warming potential of different greenhouse gases. For example, methane has a global warming potential of 21, which means that methane will cause 21 times as much warming as an equivalent mass of carbon dioxide over a 100-year time period. Expressing greenhouse gas emissions on a carbon dioxide equivalent basis provides a common unit for comparing the total emissions of various greenhouse gases (EPA n.d.b). In addition to the emissions associated with equipment and vehicle activity related to coal extraction discussed above, coal mining releases the greenhouse gas methane (IPCC 2014). Deeper coal seams tend to have higher methane emissions than shallower seams, and underground mines tend to have higher methane emissions than surface mines because of the higher gas content of deeper seams (IPCC 2014). Measurements of surface mine methane emissions in northern Appalachia found emission factors ranging from 0.000333 to 0.000241 tons per square foot of exposed mine area (EPA 2014c). Methane emissions can continue from coal mines even after the mining activity is completed (EPA 2014c).

The range of methane emissions from surface coal mining in the evaluation area currently was quantified using the EPA State Inventory and Projection Tool (EPA n.d.a). This spreadsheet tool incorporates central Appalachian-basin specific data. All default input data was used given the purpose of the analysis to provide a general level of magnitude emission estimate. Assuming the maximum production of 240,000 tons per year, approximately 6,573 metric tons of carbon dioxide equivalent greenhouse gas emissions per year of methane could be emitted by surface coal mines. At the lower end of production (54,000 tons per year), the methane emissions would be 1,479 tons per year carbon dioxide equivalent. This simple estimate is based on surface coal mining only. Substantially higher emissions could result from underground mining (the post-activity methane emission factor for underground mining is more than double the comparable emission factor for surface mining). It also does not include emissions from abandoned mines. EPA default data suggests underground mines were responsible for nearly 78,000 metric tons of carbon dioxide-equivalent methane emissions in 2012 for Tennessee as a whole (EPA n.d.b).

### Greenhouse Gas Emissions from Coal Combustion

Combustion of coal mined under any of the alternatives would indirectly contribute to greenhouse gas emissions, specifically carbon dioxide, methane, and nitrous oxide. The EPA provides the following national average emission factors for bituminous coal:

- 2,325 kg carbon dioxide per short ton

- 274 g methane per short ton
- 40 g nitrous oxide per short ton

Taking into account the global warming potential of each of these greenhouse gases, the combustion of one ton of bituminous coal results in 2.58 short tons of carbon dioxide-equivalent greenhouse gas emissions. The potential greenhouse gas emissions would be roughly proportional to the amount of coal that could be produced in the evaluation area under each alternative, which in turn is expected to remain constant (see “Chapter 5: Evaluation of Coal Resources”). Therefore, the greenhouse gas emissions resulting from combustion of coal produced in the evaluation area would be the same under each alternative, including the no-action alternative. Under a low production scenario (54,000 tons per year), the combustion of coal from the evaluation area could contribute 139,320 metric tons carbon dioxide equivalent. Under a high production scenario (240,000 tons per year), the combustion of coal from the evaluation area could contribute 619,200 metric tons carbon dioxide equivalent. While the various action alternatives would designate certain areas as unsuitable for mining, sufficient minable land exists outside these designated areas that overall production would not change as a result of the alternatives.

The alternatives are not expected to result in net increase in greenhouse gas emissions associated with coal combustion since any change in the mining rate is anticipated to be nominal. This is because the influence of factors other than the supply of coal in the evaluation area are the driving factors of coal consumption (e.g., economics of various energy sources, environmental regulation of coal-fired power plants etc.).

### **ALTERNATIVE 1: NO-ACTION ALTERNATIVE**

Under alternative 1, OSMRE would deny the State’s petition to designate the subject lands as “unsuitable for surface coal mining operations” (30 CFR § 764.13). Therefore, the no-action alternative would have the same effect as deciding not to designate any of the petition area as unsuitable for surface coal mining operations.

### **Direct and indirect impacts**

Coal production is expected to continue within the range of 54,000 to 240,000 tons per year under the no-action alternative, resulting in the particulate matter emissions shown in table 6-3, plus additional criteria pollutants. Greenhouse gas emissions would also be generated, but would not exceed 25,000 metric tons per year as shown in table 6-4. Best management practices and compliance with applicable regulations and permit conditions would minimize impacts to this resource, but impacts with respect to particulate matter could still be significant for particulate matter during peak operations (e.g., exceed the general conformity de minimis threshold of 100 tons per year). However, based on the low level of annual production, it is unlikely that impacts would be significant.

### **Cumulative Impacts**

Past emissions control programs under the Clean Air Act have had substantial beneficial effects on ambient air quality in terms of the criteria pollutants. Present criteria pollutant emissions from existing roadway traffic and other activities (residential heating, off-road equipment, oil and gas development, permitted mines, etc.) would contribute to localized elevated (but below standards) concentrations and contribute to regional ozone formation. In the future, the sources of present emissions are expected to continue, along with phase-in of more stringent emissions limits for mobile and stationary sources. The impacts of alternative 1, when added to the impacts of actions by others, would result in temporary adverse cumulative impacts in the vicinity of mine sites. Alternative 1 would be the primary contributor

to impacts in the vicinity of mine sites from heavy equipment exhaust and fugitive dust. Dust control measures would be required in accordance with state regulations.

### **Conclusion**

Overall, alternative 1 (no action) would have near-term adverse impacts to air quality, relative to existing ambient conditions for areas in the immediate vicinity of surface mining. Best management practices and compliance with applicable regulations and permit conditions would minimize impacts to this resource, but impacts related to particulate matter emissions could still be significant. Greenhouse gas emissions from coal extraction would be well under 25,000 metric tons of carbon dioxide equivalent per year.

## **ALTERNATIVE 2: STATE PETITION DESIGNATION**

Under alternative 2, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State's petition. Under this alternative, 505 miles of ridgelines with a 1,200-foot corridor (600 feet on both sides of the ridgeline) would be designated as unsuitable for surface coal mining.

### **Direct and indirect impacts**

Coal production is expected to continue within the range of 54,000 to 240,000 tons per year under alternative 2 in areas outside the petition area, resulting in the particulate matter emissions shown in table 6-3, plus additional criteria pollutants. Greenhouse gas emissions would also be generated from mining outside the petition area, but would not exceed 25,000 metric tons per year as shown in table 6-4. No mining would occur within the petition area, consequently it can be qualitatively concluded that areas within the petition area would be less likely to experience localized air quality impacts compared to alternative 1. However, this benefit could be offset by changes in the location of mining within the evaluation area (e.g., shift in the location of mining, impacting air quality locally in the different location).

### **Cumulative Impacts**

Past, present, and future actions would contribute to cumulative impacts as discussed under alternative 1. Given the uncertainty in the locations that would potentially be mined and the locations of non-coal mining sources, the potential for cumulative impacts cannot be predicted in detail. In general, locations within the petition area would experience lower cumulative impacts due to the absence of coal mining in these areas. The impacts of alternative 2, when added to the impacts of actions by others, would result in temporary adverse cumulative impacts in the vicinity of mine sites.

### **Conclusion**

In conclusion, under alternative 2 areas within the petition area would potentially experience fewer air quality impacts, but overall emissions in the evaluation area would remain the same as alternative 1. Best management practices and compliance with applicable regulations and permit conditions would minimize impacts to this resource, but impacts with respect to particulate matter could still be significant for particulate matter during peak operations (e.g., exceed the general conformity de minimis threshold of 100 tons per year). However, based on the low level of annual production, it is unlikely that impacts would be significant. Greenhouse gas emissions from coal extraction would be well under 25,000 metric tons of carbon dioxide equivalent per year.

### **ALTERNATIVE 3: STATE PETITION DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS**

Under alternative 3, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State's petition with a 1,200-foot ridgeline corridor, as described under alternative 2. Unlike alternative 2, alternative 3 would not prohibit re-mining (pursuant to 30 CFR chapter VII). Alternative 3 could also potentially allow construction and maintenance of haul roads inside the designation area.

#### **Direct and indirect impacts**

Coal production is expected to continue within the range of 54,000 to 240,000 tons per year under alternative 3, resulting in the particulate matter emissions as shown in table 6-3, plus additional criteria pollutants. Greenhouse gas emissions would also be generated, but would not exceed 25,000 metric tons per year, as shown in table 6-4. No mining would occur within the designation area (except for the previously mined areas that could be re-mined); consequently it can be qualitatively concluded that areas within the designation area would be less likely to experience localized air quality impacts than under alternative 1. However, this benefit could be offset by changes in the location of mining within the evaluation area (e.g., shift in the location of mining, impacting air quality locally in the different location).

#### **Cumulative Impacts**

Past, present and future actions would contribute to cumulative impacts as discussed under alternative 1. Given the uncertainty in the locations that would potentially be mined and the locations of non-coal mining sources, the potential for cumulative impacts cannot be predicted in detail. In general, locations within the designation area would experience lower cumulative impacts due to the absence of coal mining in these areas (except where re-mining occurs). The impacts of alternative 3, when added to the impacts of actions by others, would result in temporary adverse cumulative impacts in the vicinity of mine sites.

#### **Conclusion**

In conclusion, alternative 3 would have near-term adverse impacts to air quality relative to existing ambient conditions for areas in the immediate vicinity of surface mining. Areas within the designation area would be less likely to experience localized air quality impacts, because impacts in the designation area would result mainly from re-mining operations and associated haul roads, which would be a small portion of overall production and would result in periodic and overall minor emissions. Overall emissions in the evaluation area would remain the same as alternative 1. Best management practices and compliance with applicable regulations and permit conditions would minimize impacts to this resource, but impacts with respect to particulate matter could still be significant for particulate matter during peak operations (e.g., exceed the general conformity de minimis threshold of 100 tons per year). However, based on the low level of annual production it is unlikely that impacts would be significant. Greenhouse gas emissions from coal extraction would be well under 25,000 metric tons of carbon dioxide equivalent per year.

### **ALTERNATIVE 4: EXPANDED CORRIDOR DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS (PREFERRED ALTERNATIVE)**

Under alternative 4, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State's petition, as described under alternative 2, and on additional ridgelines. Like alternative 3, alternative 4 would not prohibit re-mining, reclamation activities, and

construction and maintenance of haul roads within the designation area and protected ridgeline boundaries.

### **Direct and Indirect Impacts**

Coal production is expected to continue within the range of 54,000 to 240,000 tons per year under alternative 4, resulting in the particulate matter emissions shown in table 6-3, plus additional criteria pollutants. Greenhouse gas emissions would also be generated, but would not exceed 25,000 metric tons per year, as shown in table 6-4. No mining would occur within the designation area (except for the previously mined areas that could be remined); consequently it can be qualitatively concluded that areas within the designation area would be less likely to experience localized air quality impacts than under alternative 1. However, this benefit could be offset by changes in the location of mining within the evaluation area (e.g., shift in the location of mining, impacting air quality locally in the different location).

### **Cumulative Impacts**

Past, present and future actions would contribute to cumulative impacts as discussed under alternative 1. Given the uncertainty in the locations that would potentially be mined and the locations of non-coal mining sources, the potential for cumulative impacts cannot be predicted in detail. In general, locations within the designation area would experience lower cumulative impacts due to the absence of coal mining in these areas (except where remining occurs). The impacts of alternative 4, when added to the impacts of actions by others, would result in temporary adverse cumulative impacts in the vicinity of mine sites.

### **Conclusion**

In conclusion, areas within the designation area would be less likely to experience localized air quality impacts, because impacts in the designation area would result mainly from remining operations and associated haul roads, which would be a small portion of overall production and would result in periodic and overall minor emissions. Overall emissions in the evaluation area would remain the same as alternative 1. Best management practices and compliance with applicable regulations and permit conditions would minimize impacts to this resource, but impacts with respect to particulate matter could still be significant for particulate matter during peak operations (e.g., exceed the general conformity de minimis threshold of 100 tons per year). However, based on the low level of annual production it is unlikely that impacts would be significant. Greenhouse gas emissions from coal extraction would be well under 25,000 metric tons of carbon dioxide equivalent per year.

## **ALTERNATIVE 5: TARGETED RESOURCE PROTECTION DESIGNATION**

Under alternative 5, OSMRE would designate lands as unsuitable for surface coal mining operations based on the presence of sensitive resources. Alternative 5 would protect environmentally sensitive habitat areas including portions of Stinking Creek and Thompson Creek within the Upper Cumberland watershed.

### **Direct and Indirect Impacts**

Coal production is expected to continue within the range of 54,000 to 240,000 tons per year under alternative 5, resulting in the particulate matter emissions shown in table 6-3, plus additional criteria pollutants. Greenhouse gas emissions would also be generated, but would not exceed 25,000 metric tons per year, as shown in table 6-4. No mining would occur within the designation area, consequently it can be qualitatively concluded that areas within the designation area would be less likely to experience

localized air quality impacts than under alternative 1. However, this benefit could be offset by changes in the location of mining within the evaluation area (e.g., shift in the location of mining, impacting air quality locally in the different location).

### **Cumulative Impacts**

Past, present and future actions would contribute to cumulative impacts as discussed under alternative 1. Given the uncertainty in the locations that would potentially be mined and the locations of non-coal mining sources, the potential for cumulative impacts cannot be predicted in detail. In general, locations within the designation area would experience lower cumulative impacts due to the absence of coal mining in these areas. The impacts of alternative 5, when added to the impacts of actions by others, would result in temporary adverse cumulative impacts in the vicinity of mine sites.

### **Conclusion**

In conclusion, under alternative 5, areas within the designation area would experience few or minor localized air quality impacts from auger or underground mining only, because no surface mining would occur in the designation area. Overall emissions in the evaluation area would remain the same as alternative 1. Best management practices and compliance with applicable regulations and permit conditions would minimize impacts to this resource, but impacts with respect to particulate matter could still be significant for particulate matter during peak operations (e.g., exceed the general conformity de minimis threshold of 100 tons per year). However, based on the low level of annual production, it is unlikely that impacts would be significant. Greenhouse gas emissions from coal extraction would be well under 25,000 metric tons of carbon dioxide equivalent per year.

## **ALTERNATIVE 6: REDUCED CORRIDOR DESIGNATION**

Under alternative 6, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State's petition. Lands protected under alternative 6 would be the same as those protected under alternatives 2 and 3, except that the corridor width would be reduced by half (600-foot corridor instead of 1,200-foot corridor).

### **Direct and Indirect Impacts**

Coal production is expected to continue within the range of 54,000 to 240,000 tons per year under alternative 6, resulting in the particulate matter emissions shown in table 6-3, plus additional criteria pollutants. Greenhouse gas emissions would also be generated, but would not exceed 25,000 metric tons per year as shown in table 6-4. No mining would occur within the designation area; consequently it can be qualitatively concluded that areas within the designation area would be less likely to experience localized air quality impacts than under alternative 1. However, this benefit could be offset by changes in the location of mining within the evaluation area (e.g., shift in the location of mining, impacting air quality locally in the different location).

### **Cumulative Impacts**

Past, present and future actions would contribute to cumulative impacts as discussed under alternative 1. Given the uncertainty in the locations that would potentially be mined and the locations of non-coal mining sources, the potential for cumulative impacts cannot be predicted in detail. In general, locations within the designation area would experience lower cumulative impacts due to the absence of coal mining in these areas. The impacts of alternative 6, when added to the impacts of actions by others, would result in temporary adverse cumulative impacts in the vicinity of mine sites.

## Conclusion

In conclusion, under alternative 6, areas within the designation area would experience few or minor localized air quality impacts from auger or underground mining only, because no surface mining would occur in the designation area. Overall emissions in the evaluation area would remain the same as alternative 1, because the amount of mining to occur outside of designated areas would likely have occurred without a designation. Best management practices and compliance with applicable regulations and permit conditions would minimize impacts to this resource, but impacts with respect to particulate matter could still be significant for particulate matter during peak operations (e.g., exceed the general conformity de minimis threshold of 100 tons per year). However, based on the low level of annual production it is unlikely that impacts would be significant. Greenhouse gas emissions from coal extraction would be well under 25,000 metric tons of carbon dioxide equivalent per year.

## IMPACTS OF THE ALTERNATIVES ON SURFACE WATER

### METHODS FOR ANALYSIS

#### Applicable Statutes, Regulations, and Policies

This section provides an overview of the existing regulatory environment governing water resources relating to coal mining. The section begins with a discussion of important sections of the Clean Water Act since there is a high degree of interaction between the requirements of SMCRA and the requirements of the Clean Water Act. While a SMCRA permit addresses all parts of the mining activity, those activities affecting waters of the United States also require a Clean Water Act permit. For example, a proposed surface coal mining operation requires a SMCRA permit to authorize the mining activity itself, and a permit under section 404 of the Clean Water Act, and a state water quality certification under section 401 if the mining activity requires the discharge of fill material into the waters of the United States.

Each relevant Clean Water Act section is discussed below, followed by a discussion of existing water quality requirements under SMCRA.

#### Clean Water Act

Congress established the Clean Water Act with the goal of “restor[ing] and maintain[ing] the chemical, physical, and biological integrity of the Nation’s waters” (33 USC § 1251(a)). To achieve that objective, the Clean Water Act prohibits the discharge of pollutants from point sources into waters of the United States unless consistent with the requirements of the act (33 USC § 1311(a)). The Clean Water Act allows for the discharge of pollutants into waters of the United States under two permitting programs. Section 402 governs the discharge of pollutants other than dredged or fill material; section 404 governs the discharge of dredged or fill material. Congress charged EPA with oversight authority of state-authorized permit programs (33 USC §§ 1342(b)-(e); §§ 1344(g)(l), (n)) and provided EPA with other authorities in connection with section 404 permits issued by the US Army Corps of Engineers (33 USC §§ 1344(b)-(c), (q), (n)).

**Clean Water Act Section 303 Water Quality Standards:** Section 303 of the Clean Water Act requires states and tribes to adopt water quality standards applicable to their intrastate and interstate waters (33 USC § 1313(a)(c)). Water quality standards assist in maintaining the physical, chemical, and biological integrity of a waterbody by designating uses, setting criteria to protect those uses, and establishing provisions to protect water quality from degradation. Water quality standards established by states are subject to EPA review (40 CFR § 131.5; 33 USC § 1313(c)). The EPA may object to state-adopted water quality standards and may require changes to the state-adopted water quality standards and, if the state

does not respond to EPA's objections, EPA may promulgate federal standards (33 USC §§ 1313(c)(3)-(4); 40 CFR §§ 131.5 and 131.21).

Water quality criteria may be expressed numerically and implemented in permits through specific numeric limitations on the concentration of a specific pollutant in the water (e.g., 0.1 milligrams of chromium per liter) or by more general narrative standards applicable to a wide set of pollutants. To assist states in adopting water quality standards that will meet with EPA approval, Congress authorized EPA to develop and publish recommended criteria for water quality that accurately reflect "the latest scientific knowledge" (33 USC § 1314(a)). Water quality standards are not self-implementing; they are implemented through permits, such as the section 402 permit or the section 404 permit (33 USC § 1311(b)(1)(C); 40 CFR §§ 122.44(d) and 230.10(b)).

**Clean Water Act Section 401 Water Quality Certification:** State water quality standards are incorporated into all federal Clean Water Act permits through section 401, which requires each applicant to submit a certification from the affected state that the discharge will be consistent with state water quality requirements (33 USC § 1341(a)(1)). Thus, section 401 provides states and tribes with veto authority over federal Clean Water Act permits that may allow exceedances of state water quality standards, and empowers states to impose and enforce water quality standards that are more stringent than those required by federal law (33 USC § 1370).

**Clean Water Act Section 402 Permits:** Section 402 of the Clean Water Act, 33 USC § 1342, governs discharges of pollutants other than dredged or fill material. Permits issued under the authority of section 402 are known as National Pollutant Discharge Elimination System permits, and typically contain numerical limits called "effluent limitations" that restrict the amounts of specified pollutants that may be discharged. National Pollutant Discharge Elimination System permits must contain technology-based effluent limits, and any more stringent water quality-based effluent limits necessary to meet applicable state water quality standards (33 USC §§ 1311(b)(1)(A),(C) and 1342(a); 40 CFR §§ 122.44(a)(1) and (d)(1)). Water quality-based effluent limitations are required for all pollutants that the permitting authority determines "are or may be discharged at a level [that] will cause, have the reasonable potential to cause, or contribute an excursion above any [applicable] water quality standard, including State narrative criteria for water quality" (40 CFR § 122.44(d)(1)(i)). The procedure for determining the need for water quality-based effluent limits is called a reasonable potential analysis.

Section 402 permits are issued by EPA, unless the state has an approved program whereby the state issues the permits, subject to EPA oversight (33 USC § 1342(b)(e); 551 USC §§ 644, 650–651 (2007)). The state must submit draft permits to EPA for review, and EPA may object to a proposed permit that is not consistent with the Clean Water Act and federal regulations (33 USC § 1342(d); 40 CFR §§ 123.43 and 123.44). If the state does not adequately address EPA objections, the EPA may assume the authority to issue the permit (33 USC § 1342(d)(4)). EPA procedures for the review of state-issued permits are set forth in regulations at 40 CFR § 123.44 and in memoranda of agreement with the states.

Sediment control ponds and other sediment control structures, connected by various diversion channels and other conveyances, often form an integral part of the wastewater effluent treatment systems on coal mine sites. Section 402 authorizations (National Pollutant Discharge Elimination System permits) consider the effectiveness of these systems on the mine site in ensuring that discharges leaving coal mining permit areas meet applicable water quality standards.

**Clean Water Act Section 404 Permits:** Section 404(a) of the Clean Water Act, 33 USC § 1344(a) authorizes the Secretary of the Army, acting through the US Army Corps of Engineers, to "issue permits ... for the discharge of dredged or fill material into the navigable waters at specified disposal sites" (33 USC § 1344(a)). By this authority, the US Army Corps of Engineers regulates discharges of dredged and

fill material into waters of the United States in connection with surface coal mining activities. The US Army Corps of Engineers regulations governing section 404 permit procedures are set forth at 33 CFR part 325.

Although the US Army Corps of Engineers is the permitting authority under section 404, EPA has an important role in the permitting process. Section 404(b) of the Clean Water Act requires that US Army Corps of Engineers permit decisions comply with guidelines developed by EPA in conjunction with the US Army Corps of Engineers, referred to as the “404(b)(1) guidelines” (33 USC § 1344(b)(1)). Among other things, the 404(b)(1) guidelines prohibit the discharge of fill if it would cause or contribute to a violation of a water quality standard or cause or contribute to significant degradation of the waters of the United States (40 CFR §§ 230.10(b) and (c)(1)-(3)). The 404(b)(1) guidelines require the US Army Corps of Engineers to analyze more than 15 different factors that could be impacted by the proposed action, including substrate, suspended particulates, turbidity, water quality, water circulation, water level fluctuations, salinity gradients, threatened and endangered species, aquatic organisms in the food web, other wildlife special aquatic sites, water supplies, fisheries, recreation, aesthetics, and parks (40 CFR §§ 230 (c)-(f)). The section 404(b)(1) guidelines provide that the US Army Corps of Engineers must ensure that the proposed discharges would not cause or contribute to significant adverse effects on human health or welfare, aquatic life, or aquatic ecosystems (40 CFR §§ 230.10(c)(1)-(3)).

Before the US Army Corps of Engineers may issue a section 404 permit, it must provide notice to the public, EPA, and other resource agencies that may all provide comments to the US Army Corps of Engineers for consideration (33 CFR § 325.3(d)). In addition, the US Army Corps of Engineers and EPA have entered into a memorandum of agreement as directed by section 404(q) of the Clean Water Act, 33 USC § 1344(q), that expressly recognizes that “the EPA has an important role in the Department of the Army Regulatory Program under the Clean Water Act[.]” The memorandum of agreement provides that “[p]ursuant to its authority under section 404(b)(1) of the Clean Water Act, the EPA may provide comments to the Corps identifying its views regarding compliance with the section 404(b)(1) Guidelines” and “[t]he Corps will fully consider EPA’s comments when determining [compliance] with the National Environmental Policy Act, and other relevant statutes, regulations, and policies.” Id.

In addition, and in recognition of “EPA’s expertise and concentrated concern with environmental matters” (12 F.3d 1330, 1336 (4th Cir. 1993)), Congress gave EPA the authority in section 404(c) to prohibit, withdraw, deny, or restrict the specification of disposal sites that would otherwise be authorized by a section 404 permit—often referred to as the “veto” authority of the EPA.

The US Army Corps of Engineers reviews “individual” permit applications on a case-by-case basis under section 404(a) (33 USC § 1344(a)). Individual permits may be issued or denied after a review involving, among other things, site-specific documentation and analysis, opportunity for public hearing, public interest review, and a formal determination that the permit is lawful and warranted (33 CFR parts 320, 323, 325).

Not every discharge is of such significance that an individual evaluation of the discharge’s environmental effects is necessary. Instead, section 404(3)(1) authorizes the Secretary of the Army to issue general permits for categories of activities involving discharges of dredged or fill material that, as a group, have only minimal impacts on the waters of the United States. The US Army Corps of Engineers can issue these general permits (as well as individual permits) on a state, regional, or nationwide basis. The US Army Corps of Engineers refers to general permits issued on a nationwide basis as nationwide permits. Current nationwide permits include nationwide permit NWP 21, which the US Army Corps of Engineers reissued on February 21, 2012 (77 FR 10184).

NWP 21 provides US Army Corps of Engineers authorization for the discharge of dredged or fill material into waters of the United States associated with surface coal mining activities. The US Army Corps of Engineers review under NWP 21 is focused on the individual and cumulative adverse effects to the aquatic environment, and on determining appropriate mitigation should mitigation become necessary. The US Army Corps of Engineers review does not extend to the mining operation as a whole, unlike the SMCRA permit.

To qualify for NWP 21 an activity must meet all of the following criteria:

- (1) The activities are already authorized or are currently being processed by a SMCRA-approved state program or an integrated permit processing procedure by the Department of the Interior;
- (2) The discharge will not cause the loss of more than 1/2 acre of non-tidal waters of the United States, including the loss of no more than 300 linear feet of stream bed, unless for intermittent and ephemeral stream beds the district engineer waives the 300 linear foot limit by making a written determination concluding that the discharge will result in minimal individual and cumulative adverse effects; and
- (3) The discharge is not associated with the construction of valley fills that are fill structures associated with surface coal mining activities that are typically constructed within valleys associated with steep, mountainous terrain.

Surface coal mining activities that impact waters of the United States, and that do not meet the requirements of NWP 21, would require an individual section 404 permit to proceed. Consideration of resources occurs under either an individual permit or nationwide permits, as required by the 404(b)(1) guidelines. The primary differences between the two processes are the extent of public review opportunities, the degree of administrative burden, and the amount of time involved in processing the permit.

### **Surface Mining Control and Reclamation Act**

Congress enacted SMCRA for the purpose of, among other things, striking a balance between protecting the environment from the adverse effects of surface coal mining operations and meeting the nation's energy requirements (30 USC §§ 1202(a), (d), (f)). SMCRA expressly provides that “[n]othing in this chapter shall be construed as superseding, amending, modifying, or repealing” the Clean Water Act or “any rule or regulation promulgated thereunder” (30 USC § 1292(a)(3)). In addition, SMCRA requires that “[t]o the greatest extent practicable each federal agency shall cooperate with the Secretary and the States in carrying out” its provisions, and it directs the coordination of regulatory activities among departments and agencies responsible for implementation of identified statutes, including the Clean Water Act (30 USC §§ 1292(c), 1303(a)).

Parts 780, 810, 815, 816, and 817 of SMCRA implementing regulations outline an extensive method for protecting water resources. For example, the regulations impose special requirements for mining activities in or adjacent to perennial or intermittent streams subject to several exceptions. Moreover, the regulatory authority may authorize these activities (through the SMCRA permit) only when the applicant has successfully demonstrated that the “activities will not cause or contribute to the violation of State or Federal water quality standards, and will not adversely affect the water quantity or other environmental resources of the stream” (30 CFR §§ 816.57(a)(1) and 817.57(a)(1)).

In addition to surface mining activities, SMCRA emphasizes the protection of water resources in connection with underground coal mining operations. In section 516 of SMCRA, the operator is required to minimize disturbances to the prevailing hydrologic balance at the mine site, in associated off-site areas,

and to the quantity of water in the surface water and groundwater systems. The operator must minimize these effects both during coal mining operations and during reclamation.

Each SMCRA permit application must include an assessment of the probable hydrologic consequences of the mining and reclamation operations proposed (30 CFR §§ 780.21(f) and 784.14(e)). The assessment must include a review of groundwater and surface water, quantity and quality, both on and off the mine site (30 USC § 507(b)(11)). The corresponding regulations require the operator to submit specific baseline data in each application, including specific, detailed information relative to the hydrologic and geologic components of the proposed cumulative impact area (30 CFR § 780.21)).

Current regulations also require each SMCRA permit application to provide a “detailed description of the measures to be taken during the mining and reclamation process to assure the protection of the quality and quantity of surface and ground water systems both on-and off-site, from adverse effects of the mining and reclamation process...” (30 USC § 1258; 30 CFR part 780). The regulatory authority uses this assessment of the probable hydrologic consequence to determine if the permittee has designed the proposed operation appropriately to prevent material damage to the hydrologic balance outside the permit boundary (30 CFR §§ 780.21 and 784.14). The regulatory authority cannot issue the SMCRA permit unless the applicant successfully shows that the proposed operation has been designed to prevent material damage to the hydrologic balance outside the permit area (30 USC § 1260(b)(3); 30 CFR § 773.15(e)). To ensure that sufficient financial resources are provided to complete the proposed reclamation plan, the applicant must submit a performance bond prior to mining. The regulatory authority calculates the performance bond based on, among other things, “the probable difficulty of reclamation, giving consideration to ... hydrology ...” (30 USC § 1259; 30 CFR § 800.14).

Parts 810, 815, 816, and 817 of SMCRA implementing regulations contain performance standards and design requirements to provide for minimizing disturbance to the prevailing hydrologic balance at the mine site and in associated off-site areas, and to the quality and quantity of water in surface and groundwater systems. These standards recognize that it is important to prevent erosion and sedimentation to protect water quality. For example, the operator is required to use the best technology currently available to prevent additional contributions of suspended solids (sediment) to streamflow outside the permit area (30 CFR § 816.46(c)(iii)).

In addition to SMCRA and the Clean Water Act, applicants must also comply with the Tennessee Responsible Miners Act as described above. However, re-mining operations in previously mined streams are exempt from the act when done to as part of stream restoration.

The existing regulations allow mining through intermittent and perennial streams when the regulatory authority makes a finding that diverting the stream will not adversely affect water quantity, water quality, and related environmental resources of the stream (see 30 CFR §§ 816.43(b) and 817.43(b)). Vegetated buffer zones can slow overland water flow and allow sediment particles to settle out before they reach surface waters. SMCRA implementing regulations at 30 CFR §§ 816.57 and 817.57, provide a requirement for a 100 foot stream buffer. However, the regulatory authority may grant an exception to this requirement for several reasons. The existing regulations at 30 CFR §§ 816.57 and 817.57 prohibit disturbance of the land surface by mining activities within 100 feet of an intermittent or perennial stream unless the regulatory authority specifically authorizes activities closer to or through the stream. That authorization requires a finding that the mining activities will not cause or contribute to the violation of applicable state or federal water quality standards and will not adversely affect the water quantity or quality or other environmental resources of the stream (30 CFR §§ 816.57(a)(1) and 817.57(a)(1)). Nationwide, some regulatory authorities have applied this regulation in a manner that allows construction of excess spoil fills and coal mine waste disposal facilities in streams within the permit area, as long as

the findings can be made with respect to the remaining portion of the stream below the toe of the fill or facility. Tennessee State law does not allow in-stream disposal of any fill material.

### **Assumptions and Methodology**

Surface water and groundwater resources are affected by land uses within the watershed including runoff, which contributes to the pollutant load and physical modifications that change water quantity and movement. Watershed characteristics define how water is transported through the basin, and understanding these characteristics is integral to assessing water quality and quantity impacts, including underlying groundwater resources such as aquifers.

Topics such as effects of surface coal and underground mining operations on water resources, water quality of area streams, surface water and groundwater protection programs, riparian buffers, downstream impacts of surface coal mining pollution, loss of biodiversity due to land impacts, hydrologic alterations, and the percent of mining in a watershed were investigated using relevant available literature and data. Information pertaining to these topics was found in multiple references, including but not limited to Bernhardt and Palmer 2011; Downstream Strategies 2010; Klapproth and Johnson 2009; Lindberg et al. 2011; Palmer et al. 2010; Paybins et al. 2000; Petty et al. 2010; and Rauch 1980. Other data was available from Tennessee Department of Environment & Conservation (TDEC) and the OSMRE.

Geographic Information System (GIS) data depicting the petition or designation of area of each alternative, the evaluation area, water resources, and potential coal resources within the evaluation and designation area was used to analyze impacts. Coal resource GIS data layers include unmined areas and previously mined areas and the commercially viable coal seam in which each is located. Water resource GIS data layers include National Hydrography Dataset streams, US Geological Survey Hydrologic Unit Code-8 watersheds, 303(d) impaired waters, surface water and groundwater intakes, and wellhead and source water protection areas.

The potential impacts inside and outside the evaluation area were addressed generally and at a site-specific scale. For each alternative, impacts on surface waters and groundwater were evaluated to the extent feasible using the available data. Impacts were discussed based on the five US Geological Survey Hydrologic Unit Code-8 cataloging units (or subwatersheds) present within the area of analysis. These subwatersheds are the Upper Cumberland River, South Fork Cumberland River, Upper Clinch River, Powell River, and Emory River.

Impacts on surface waters were qualitatively assessed in terms of the potential for increased or decreased disturbance in water quality, quantity, and use. The assessment focused on how the proposed alternatives would affect the physical and chemical characteristics of the water resource, water movement and flow, and the water uses.

A more site-specific analysis was completed using GIS tools and associated data, where feasible. GIS data provided the location for various water resources as well as areas within the evaluation area that were considered potential surface mineable or augerable coal resource areas; commercial viability of the coal resources was not considered in the analyses. For the analyses, these areas included potential surface mineable coal resources and potential augerable coal resources as described in chapter 5. Measurements were then made to determine the distance between water resources and potential surface mineable and/or augerable coal resources. For the purposes of this analysis and comparison of alternatives, OSMRE estimated that downstream effects would be diminished from any particular mine area within 6.2 miles (10 km) downstream from the operation based on conclusions presented in a 2010 study (Petty et al. 2010) regarding the distance for diminishment of downstream effects in similar areas of West Virginia. Hereafter the text of this EIS will refer to this distance as the “buffer area used to analyze alternatives.”

This average reach was used in the analysis to provide a rough estimate of where potential impacts on water quality and quantity would be likely to occur. The use of the buffer area is for the purpose of analyses of the alternatives only. It does not constitute a finding that downstream effects could not extend beyond the 6.2 miles. Sources of and rationale for selection of this buffer area are derived from Klapproth and Johnson 2009 and Petty et al. 2010, and described in detail below. For each alternative and subwatershed, these analyses looked at the proximity to sensitive surface water features for one or more of the following indicators:

- Miles of surface waters located less than 100 feet from potential surface mineable and/or augerable coal resources
- Acres of “critical source water protection zone” located less than 100 feet from potential surface mineable and/or augerable coal resources
- Acres of “source water management zone A” located less than 100 feet from potential surface mineable and/or augerable coal resources
- Miles of surface waters within the buffer area used to analyze alternatives from potential surface mineable and/or augerable coal resources
- Miles of 303(d) impaired surface waters within the buffer area used to analyze alternatives from potential surface mineable and/or augerable coal resources
- Miles of special-status surface waters within the buffer area used to analyze alternatives from potential surface mineable and/or augerable coal resources
- Number of surface water intakes within the buffer area used to analyze alternatives from potential surface mineable and/or augerable coal resources
- Acres of “critical source water protection zone within the buffer area used to analyze alternatives from potential surface mineable and/or augerable coal resources
- Acres of “source water management zone A” within the buffer area used to analyze alternatives from potential surface mineable and/or augerable coal resources

Figures 6-2, 6-3, 6-4, 6-5, and 6-6 show impacts of the alternatives to surface water resources within 100 feet of potential mineable area.

The purpose of these proximity values are only meant to allow for the completion of quantitative analyses to evaluate the potential impacts from surface coal mining within the evaluation area. The selection of these distances (i.e., 100 feet overland or 6.2 miles downstream) from potential surface mineable and/or augerable coal resources does not mean that there would definitely be impacts within that distance or that there would not be impacts outside of that distance. Additionally, it was not feasible to perform a detailed examination of every physical, chemical, and biological factor that determines the contamination removal/reduction efficiency of a riparian buffer or downstream distance. This analysis is meant to be programmatic in nature not prescriptive, therefore these proximity distances were selected to represent potential impacts using the best available data and literature. As stated above, each individual mine permittee must perform an assessment of the probable hydrologic consequences to ensure that their particular mining operation would not violate water quality standards and the Clean Water Act or SMCRA regulations and requirements.

It is assumed that the greater impacts to surface water resources would be likely to occur closer to active or unreclaimed mining areas. These impacts could occur due to overland flow or downstream flow of contaminated surface waters. Therefore to facilitate quantitative analyses, values describing the distance from mineable areas where impacts could potentially occur were selected. The distance required to

remove sediment and other pollutants from surface runoff flowing over land depends on many factors (e.g., vegetation, soil, slope, topography, concentration of pollutant). No literature sources were found discussing riparian buffer removal of acid mine drainage, however, many sources provided a range of buffer widths for sediment removal. Klapproth and Johnson 2009 indicate a minimum width of 30-300 feet. Therefore, using this range and the TDEC rule concerning stream buffers, the distance of 100 feet was selected.

The distance downstream from a known mine operation at which pollutants from surface coal mining are observed in the water depends on many factors (e.g., landscape; geology, mine location, concentration of the pollutant; and the existing physical, chemical, and biological attributes of the receiving waterbody). The Petty et al. 2010 report discusses the longitudinal characteristics of mining-related effects in streams. Petty and others (2010) estimate that the downstream effects of mining extend, on average, approximately 6.2 miles from the mine site. The Petty et al. (2010) research includes stream sampling from both underground and surface mining and includes both pre- and post-SMCRA mining activities in the Appalachian coal region. Inclusion of pre-SMCRA mining activity in the stream sampling conducted for the Petty et al. (2010) study means that this estimate may be overly conservative (i.e., an overestimate) of downstream reach of effects for potential future mining in the LUM area. Extent of downstream effects may be influenced, however, by a variety of site-specific factors and the exact placement of the future permit area within the evaluation area. The analysis presented in the following text assumes that the permit area would be on the edge of the evaluation area and measures the downstream effects from that point; this provides another measure of conservatism in estimation of impacts to resources adjacent to the evaluation area. It is likely that a greater number of permits would be located away from the edges and closer to the center of the evaluation area, which would ensure a greater distance to downstream aquatic resources than the 6.2-mile downstream estimate suggests. Lacking site-specific information on spatial relationships between any future mine in the LUM evaluation area and the specific distance to sensitive resources downstream, this analysis conservatively assumes, on average, that adverse effects of mining on water quality persist 6.2 miles downstream of mines for streams that cross the disturbed area of a mine site. In the following text, this is referred to as the “buffer area used to analyze alternatives” as mentioned above. OSMRE will use a multi-criteria approach to assessing hydrologic impacts when considering a site-specific application for surface mining because at that point, the amount and intensity of mining is known. However, OSMRE determined that it was reasonable and appropriate to use a single criterion to measure the general impacts of this designation. OSMRE examined the literature on downstream effects from coal mining and decided that the use of Petty et al. (2010) as a gross metric was reasonable.

Effects to individual species are unknown and will be assessed at the time a site-specific application is received during the permitting process. OSMRE will consult under the Endangered Species Act on any potential impacts to listed species as warranted. The Tennessee Source Water Protection Program under the 1996 Safe Drinking Water Act protects public water systems. Critical source water protection zones and source water management Zone A are protection areas for public water systems using surface water under this program. These areas are based on an area of watershed upstream of the surface water intake and are delineated using the time it would take for water to travel a given distance (TDEC 2003). A critical source water protection zone is defined as “five miles upstream of the intake and along any major tributaries with a 1,000-foot corridor.” The source water management zone A is defined as “5–15 miles upstream of the intake and major tributaries with a 1,000-foot corridor.”

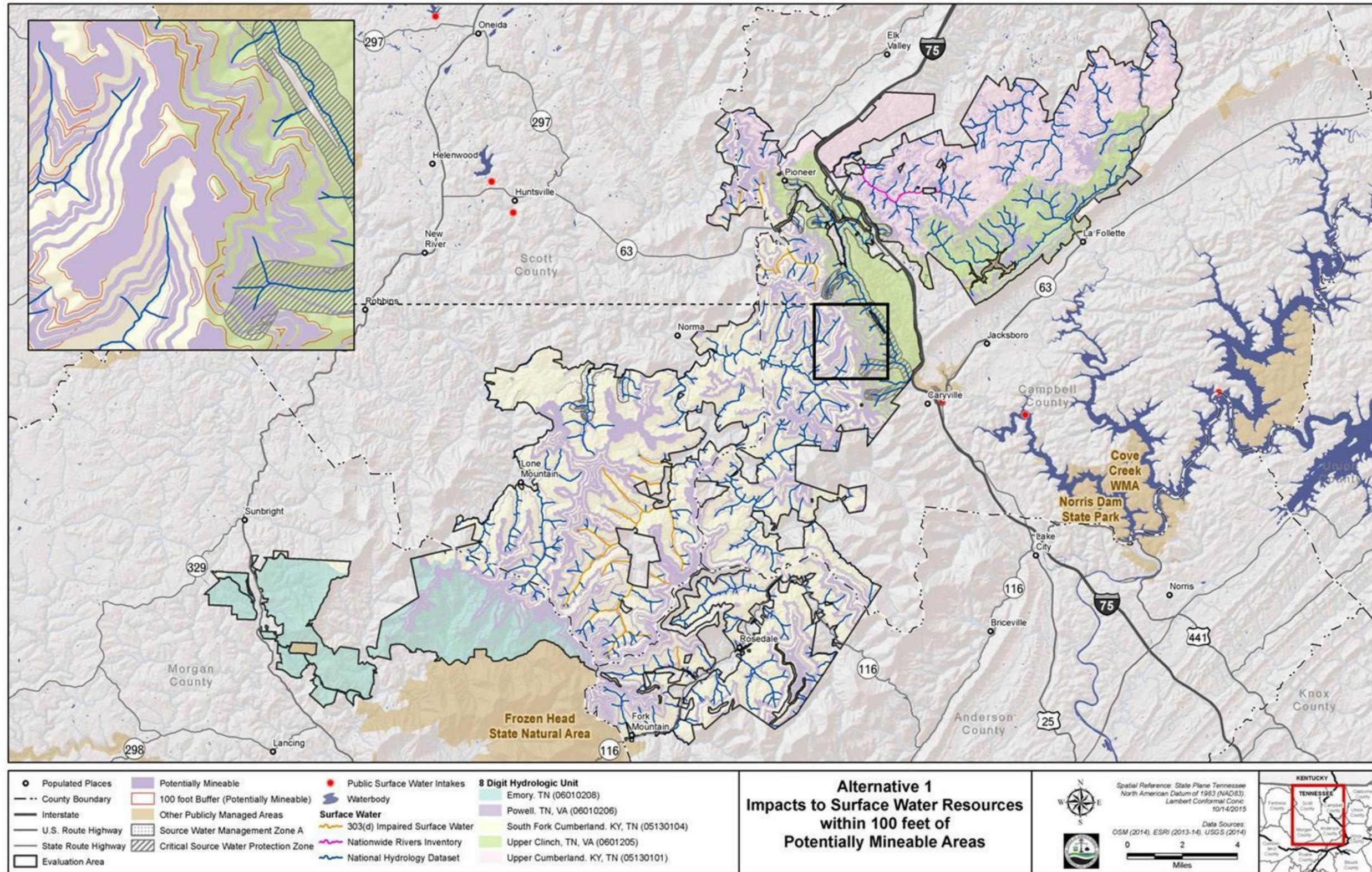


FIGURE 6-2: ALTERNATIVE 1 IMPACTS TO SURFACE WATER RESOURCES WITHIN 100 FEET OF POTENTIALLY MINEABLE AREA

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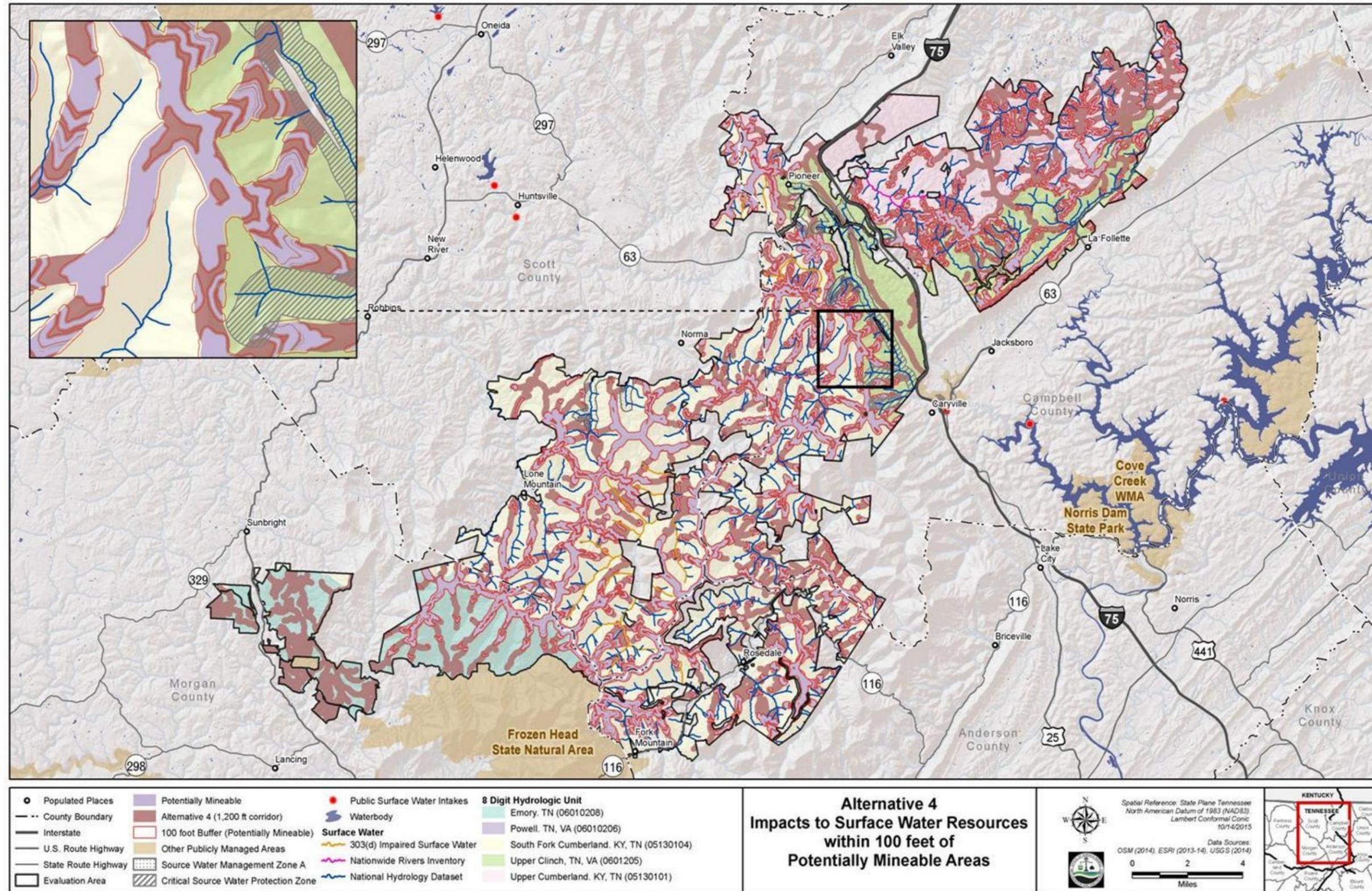


FIGURE 6-4: ALTERNATIVE 4 IMPACTS TO SURFACE WATER RESOURCES WITHIN 100 FEET OF POTENTIALLY MINEABLE AREA

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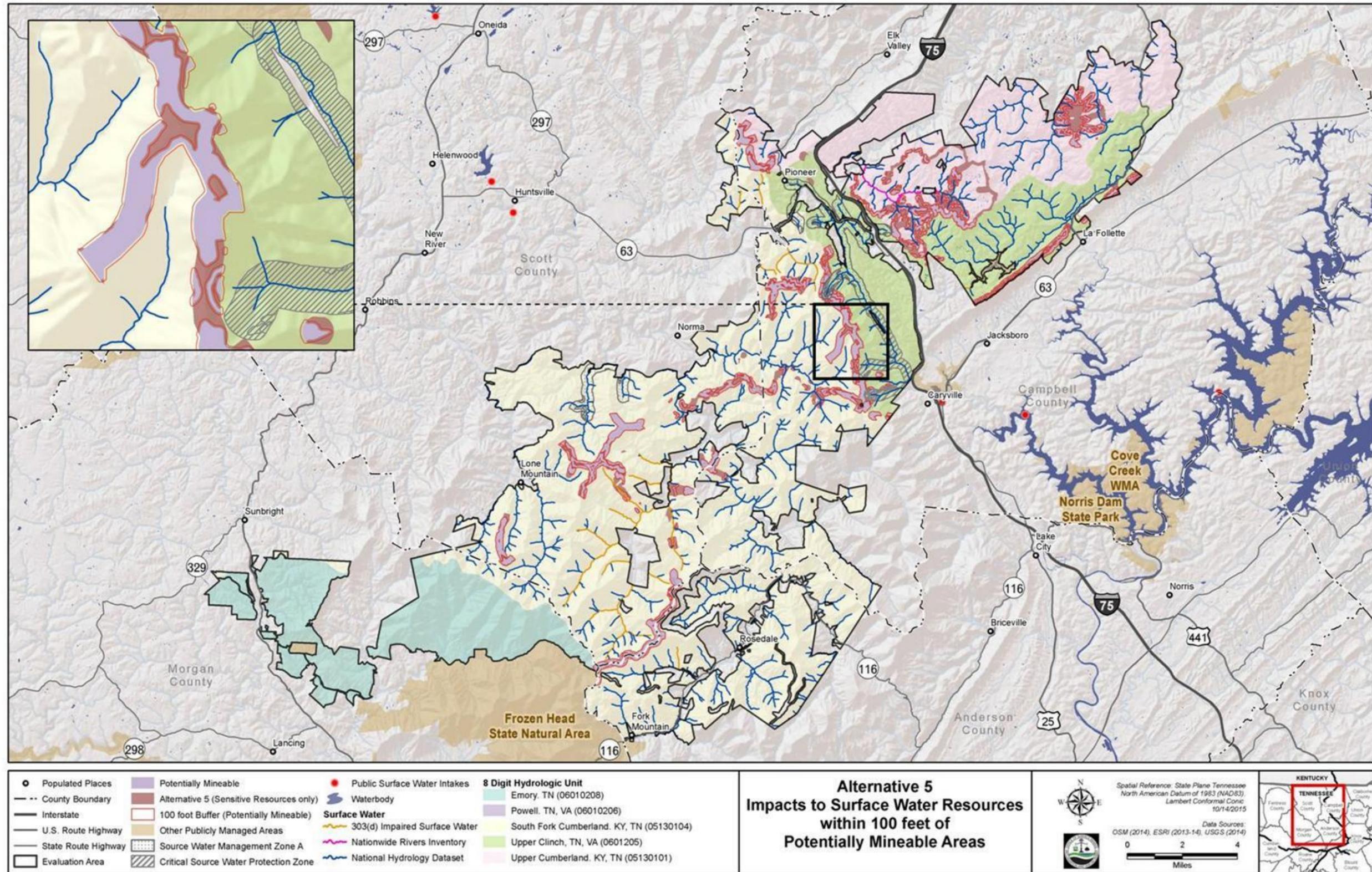


FIGURE 6-5: ALTERNATIVE 5 IMPACTS TO SURFACE WATER RESOURCES WITHIN 100 FEET OF POTENTIALLY MINEABLE AREA

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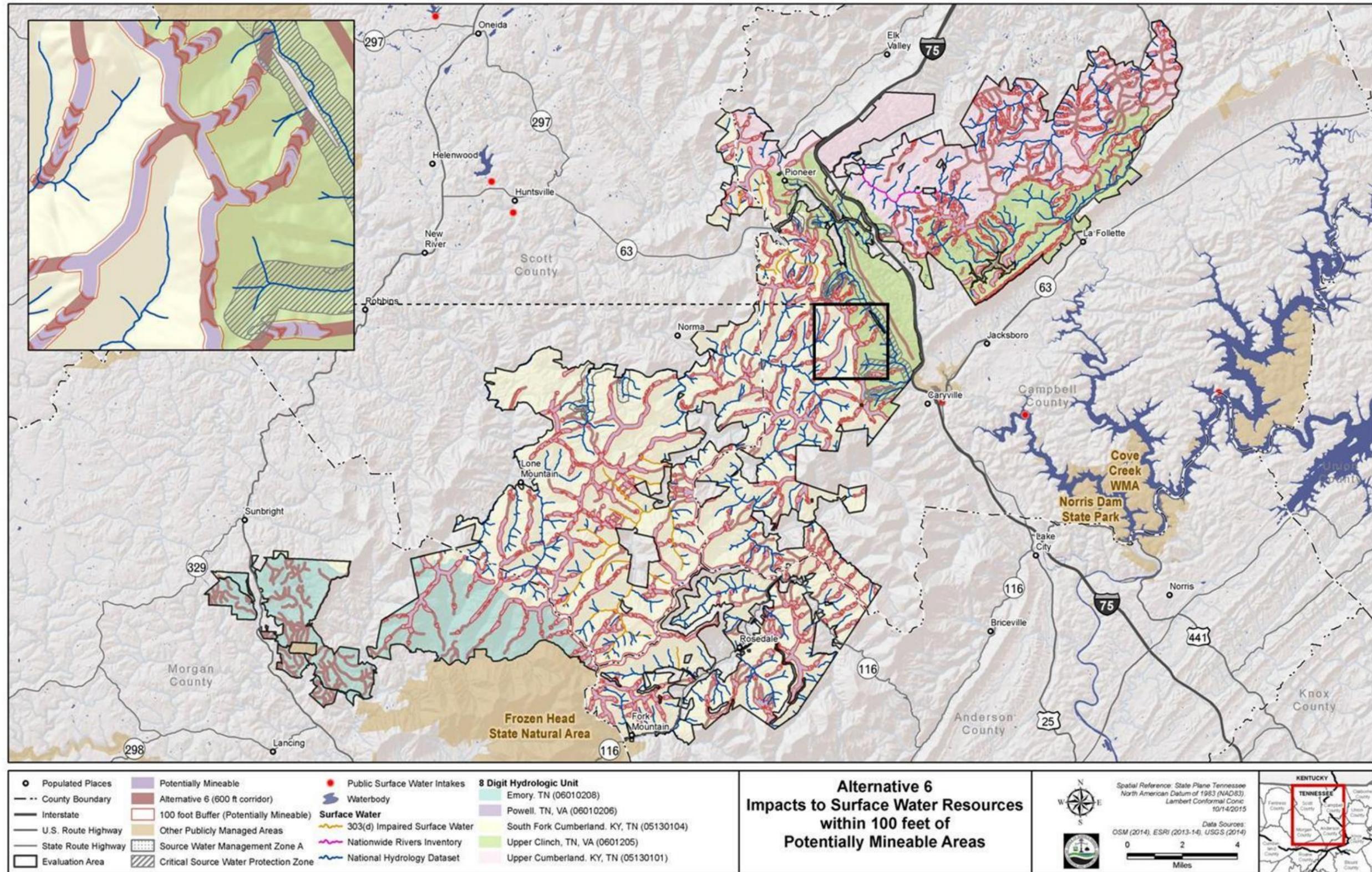


FIGURE 6-6: ALTERNATIVE 6 IMPACTS TO SURFACE WATER RESOURCES WITHIN 100 FEET OF POTENTIALLY MINEABLE AREA

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Using the data sources and analyses, the conditions of surface water and groundwater within the evaluation area watersheds were investigated. The resulting assessment served as a baseline against which the impacts of each alternative were compared. It was expected that, under the six alternatives, impacts from potential mining operations would vary with possible implications for water quality and quantity. Conclusions were based on overall impacts to water resources occurring within the project area and determination of impact type, potential area, duration, and intensity for each alternative.

Pollutants in surface waters can be transported a long distance downstream from their source thereby degrading waters outside the evaluation area. Resource specific context for assessing impacts to water resources include the following:

- Several surface waters within or immediately downstream of the evaluation have been wholly or in part designated as a special-status stream, such as Nationwide Rivers Inventory or Exceptional Tennessee Waters. Therefore, in the case of water resources, there are some ecologically critical areas both inside and outside the evaluation area that could be impacted.
- The water resources within the area of analysis have been previously disturbed and currently are not fully restored. Abandoned mines have led to pH and siltation levels in violation of water quality standards, resulting in some surface waters being listed as impaired. In spite of this, the general water quality of the evaluation area has improved over the years as evidenced by the New River watershed that is fed by tributaries within this area (TDEC 2013). A sampling site on Tackett Creek above the State Highway 90 Bridge showed an increase in the Tennessee Macroinvertebrate Index from 30 in June of 2000 to 36 in October of 2012; a score of 32 meets the biocriteria. Samples collected from Spruce Lick Branch from March 2007 to March 2013 showed a decrease in field conductivity from approximately 820 to 443 microsiemens per centimeter. During the same period the Tennessee Macroinvertebrate Index increased from 24 to 36 (EPA 2011).

Specific assumptions used in the analysis of impacts on surface water resources include the following:

- Site-specific details pertaining to the potential surface mineable and/or augerable coal resources and surrounding areas (e.g., pollutant concentration or level, slope, sediment characteristics, drainage pattern, chemical and physical characteristics of streams, tributary effects, vegetation type and density, hydraulic conductivity, and subsurface drainage patterns) were not available. Therefore, pollutants discharged from a mine site were assumed to behave (e.g., be transported across land and downstream, or infiltrated into groundwater, and eventually modified) in a similar manner and have similar consequences.
- Impacts from remining and surface, underground, and auger mining on surface water and groundwater resources were not evaluated according to mining type.
- The greater impacts to surface water resources would occur closer to active or unreclaimed mining areas.
- Many headwater streams are not mapped in the National Hydrography Dataset stream layer and therefore are not quantitatively assessed in the analysis (USGS 2014a).
- It is assumed that impacts to water resources would occur but that adherence to performance standards and implementation of mitigation measures would minimize or prevent exceedances of applicable water quality criteria. This based on several points including the fact that a SMCRA permit is not issued unless the applicant shows that the proposed operation “would not cause or contribute to the violation of State or Federal water quality standards pursuant to the Clean Water

Act” (30 CFR § 816.57(a)(2)) and has been designed to prevent material damage to the hydrologic balance outside the permit area (30 USC § 1260(b)(3); 30 CFR § 773.15(e)).

### **Area of Analysis**

The limits of the potential area affected for surface water resources includes the petition area or designation area of each alternative proposed, the evaluation area, and surface waters within a certain distance downstream of an active mine. Therefore, the area of analysis includes the entire evaluation area including the applicable petition or designation area as well as surface waters within the buffer area used to analyze alternatives from the evaluation area boundary.

## **GENERAL IMPACTS OF SURFACE COAL MINING IN TENNESSEE ON SURFACE WATER**

### **Surface Water Effects**

Both surface and underground mining operations have the potential to adversely affect surface water quality. These effects can be chemical (e.g., changes to the water column chemistry and characteristics), or they can be physical (e.g., changes to the size, location, and flow characteristics). The effects are generally more pronounced in areas of older mining, such as sites activated prior to the enactment of SMCRA in 1977, as compared to more current operations, because mining practices have improved over time.

However, as described in the studies presented below, mining under current regulations is continuing to result in physical and chemical effects on surface waters. Certain effects of mining are unavoidably associated with the activity. For example, during the duration of the mining activity vegetation is removed and surfaces remain exposed, topography is altered and surfaces are compacted, infiltration of rainwater and uptake of water into vegetation is reduced and consequently overland runoff of water is increased. The local geology has a profound influence on the quantity and quality of surface water and groundwater. Mining can increase the effect because mining activities break rock into smaller fragments, exposing previously unexposed minerals and increasing the amount of surface area available for weathering. As weathering commences, chemical constituents contained within the rock are released to the environment. In the mining environment these constituents would be released into waters on the site, which would then make their way to water treatment structures before being discharged from the permitted mine area. Constituents also make their way into groundwater and then are discharged as groundwater baseflow into receiving streams.

**Chemical Effects on Surface Waters:** Studies have shown that mining impacted waterways often contain elevated levels of iron, aluminum, manganese, and sulfate. These waters typically have lower alkalinity concentrations, and lower pH, while specific conductivity values and total suspended solids are typically higher, as compared to streams unimpacted by mining (Wangsness et al. 1981; Zuehls et al. 1984; Cravotta 2008; Paybins 2003; Howard et al. 2001; Stauffer and Ferreri 2002; Bryant et al. 2002; Hartman et al. 2005; Pond et al. 2008; Petty et al. 2010). Aluminum increases are typically associated with increases in suspended solids. In addition to acidic drainage associated with certain seams in the evaluation area, discharges from surface coal mining operations also include alkaline mine drainage. This alkaline drainage has higher pH, increased levels of alkalinity, and elevated concentrations of calcium, magnesium, bicarbonate, and sulfates than drainage from unmined watersheds (EPA 1997; Kleinmann 2000; OSMRE 2007).

Acid mine drainage has historically been a primary concern associated with coal mining due to the effects of low pH on the viability of the system for aquatic life, and impacts on human use and enjoyment of the water. Generally, aquatic life forms do best in pH range conditions of 6.5 to 9.0. Outside this range

certain analytes become more toxic for aquatic life (Lowry et al. 1983). This concern is relevant to mining nationwide, although not as prevalent in the western coal fields, where natural conditions of the geology, soils, and hydrology provide high buffering capacity (alkalinity). For example, in coal regions of the Colorado Plateau and Northern Rocky Mountains and Plains, if sulfuric acid forms through the oxidation of sulfide materials within mine spoil and waste, it is usually neutralized by the highly alkaline conditions of surface waters in this region (Lowry et al. 1983).

Valley fills constructed during large-scale mining impact aquatic ecosystems by increasing ion concentrations in receiving waters. These impacts are seen during the mining activity and continue after reclamation. Study results compiled in Palmer, Menninger, and Bernhardt (2009) showed local and regional impacts on aquatic ecosystems from mountaintop mining valley fills, showed that streams impacted by valley fills often have 30 to 40 fold increases in sulfate concentrations and sulfate concentrations in receiving waters continued to increase after mining activities ended. In addition, streams and rivers below valley fills receive elevated concentrations of calcium, magnesium, and bicarbonate ions and often trace metals, which means that electrical conductivity levels in receiving streams below mining operations can be extremely high and create toxic conditions for aquatic biology. Biological impairment of streams is highly correlated to elevated levels of these ions (Palmer, Menninger, and Bernard 2009).

Direct impacts to streams from mining and reclamation activities also occur in association with the practice of mining through ephemeral, intermittent, and perennial streams. The impacts of large-scale mining operations upon the water quality of ephemeral, intermittent, and perennial streams in central Appalachia are highlighted in Bernhardt and Palmer (2011). Research compiled by Bernhardt and Palmer (2011) demonstrates that multiple surface mines and valley fill activity within large watersheds resulted in the accumulation of impacts in small streams, such that concentrations of sulfate, bicarbonate, calcium, and magnesium ions, increased further downstream.

**Physical Effects on Surface Waters:** Physical effects on surface waters include all those effects that would change the size (width and or depth) and location of the water. These effects occur from mining activities that include mining through waters, placement of fill in waters to cross them with mining roads, and placement of spoil or refuse in waters. Each of these activities has different consequences as discussed below. Excess spoil placement into streams is unallowable under the current regulations in Tennessee.

## **Surface Coal Mining**

Water quantity impacts from surface mining operations include alterations to surface drainage and surface water flow and volume. Surface coal mining impacts surface flow and drainage by removing vegetation, altering topographic contours, and compacting the soil within a mining site (Bernhardt and Palmer 2011). Generally, impacts on surface water quantity and movement due to surface mining occur on a more localized scale compared to those from underground mining (Bernhardt and Palmer 2011). However, the presence of multiple surface mining operations can have large cumulative impacts over a watershed-wide scale through modification of surface water runoff, infiltration patterns, surface water-groundwater connections, or groundwater recharge areas (Bernhardt and Palmer 2011; Kleinmann 2000). Alterations to recharge areas can impact surface waters by increasing or decreasing runoff and/or stream baseflow (Kleinmann 2000). The creation of a mine bench or uncovering of a fracture could capture more surface runoff, resulting in increased aquifer recharge (OSMRE 2007; Wyrick and Borchers 1981). Soil compaction during mining operations from equipment and following mining from reclamation would reduce porosity and infiltration capabilities, resulting in increased surface water yields and peak flows within mined watersheds (Bernhardt and Palmer 2011). Surface mining operations must use mitigation measures and best management practices such as sediment ponds to prevent the discharge of sediment and pollutants to water resources including surface waters. Although mitigation measures are ultimately

beneficial, they also temporarily alter surface drainage patterns as they capture surface water runoff and discharges.

Water quality impacts from surface mining operations include release of acidic, alkaline, and toxic drainage and sediments to surrounding water resources. Surface mining operations remove vegetation and expose soils leading to erosion and sediment deposition into receiving waters. The movement of surface water through backfill can leach various chemicals and result in contaminated water resources. Specifically, elevated levels of total dissolved solids have been observed downstream from mined sites; these surface waters generally have high conductivity (Pond et al. 2014; Timpano et al. 2011). Spoil fills and waste derived from surface coal mining operations can increase the concentration of constituents such as sulfate, total dissolved solids, total selenium, total calcium, total magnesium, hardness, total and dissolved manganese, specific conductance, alkalinity, total potassium, acidity, and nitrate/nitrite (OSMRE 2007). Possible weathering and solution of exposed rock on a bench could alter the chemical characteristics of groundwater that infiltrates and recharges to the underlying aquifer (Kleinmann 2000; Wyrick and Borchers 1981). Downhill and downgradient water movement can transport sediment and dissolved pollutants to surface waters farther from a mine site. The effects of mining on water quality are observed in surface waters within the buffer area used to analyze alternatives from mining operations.

Water-bearing characteristics differ considerably among rock strata, owing primarily to differences in the size and number of pores and fractures in the rocks. Surface mining disrupts these rock strata changing them permanently. The overburden is removed to get to the coal seam and then the fractured and broken material is returned to the excavation area. This material is physically changed from the premining overburden. It is considerably more porous with more voids and cracks than the original strata. No significant or regional aquifers would be affected by surface mining activities due to the topography and high elevations associated with the evaluation area. However, small perched aquifers and associated stress-relief fracture zones that act to transmit groundwater moving from higher elevation recharge areas to valley bottom discharge zones would be removed and replaced by unconsolidated spoil materials (Kleinmann 2000). These alterations could lead to a localized decrease in groundwater recharge due to interception and diversion of surface runoff and precipitation. Spoil materials have different water storage and transmissivity capacities (OSMRE 2007). After completion of mining operations, groundwater recharge could increase due to the enhanced storage and infiltration capacity of backfill materials.

### **Underground and Auger Mining**

Some underground mines provide a continuing source of discharge to surrounding streams even during periods of low flow. If acid drainage is occurring at the mine site, then this discharge of water may pollute the receiving stream if discharged in sufficient quantity. Underground mines can also intercept surface water runoff through subsidence (Kleinmann 2000). Underground coal mining operations in Tennessee typically use room and pillar operations that, in general, do not result in subsidence and associated loss of surface water. However, changing groundwater flows can influence surface flows. Therefore, the impact on surface water flow from underground mines would be negligible.

Compared to surface mining, underground mining alters groundwater quantity and movement on a larger spatial scale. The impact of underground mining on groundwater resources depends on site-specific conditions as well as the location of the mine working in relation to the water table. Underground mining could disturb and impact perched aquifers but there would be no impact to deeper regional aquifers. There could be indirect water quality and quantity impacts to other groundwater resources outside the mine site due to mine discharge or movement of groundwater farther from mine operations. The presence of underground workings could act as aquifers with high hydraulic conductivities (Kleinmann 2000). Excavation of a mine working below the water table could dewater surrounding areas, especially perched aquifers above the site, by acting as a low-pressure sink, resulting in groundwater moving from current

higher pressure areas to the excavated area. This could impact groundwater resources in a wider area depending on the level of hydrologic connection. The excavation of a mine working above the water table could lead to formation of a mine void. This mine void could drain local surface waters resulting in the formation of a permeable aquifer. The area of impact associated with an underground mining operation is frequently greater than just the boundaries of the mine due to movement of overburden, rock fracturing, dilation of joints, and separation occurring along bedding planes. The movement of overburden typically occurs in an upward direction while rock fracturing can occur at an angle from the mine boundary leading to an “angle of dewatering” where there could be groundwater hydrologic impacts outside of the permitted area (Kleinmann 2000). The effects of underground mining on groundwater quality are similar to the effects on surface water quality. Underground mines expose minerals to air and water. Groundwater that comes into contact with these exposed acidic materials can produce acidic and toxic drainage. This contaminated groundwater can move from the mine working to surrounding aquifers thereby adversely impacting the water quality (Kleinmann 2000; Rauch 1980).

## **Remining**

Remining operations on previously pre-SMCRA mined areas that were left unreclaimed have the potential to pollute surface water and groundwater, disturb surface runoff, alter surface water and groundwater connections, and impair water uses, resulting in short-term adverse impacts on water resources. Following potential remining, reclamation would be required to restore these previously damaged areas and reduce or eliminate water impacts including sediment and pollutant loads from the previously mined areas (EPA 2000). Reclamation operations would restore the approximate original contours and eliminate associated exposed highwalls and pits as specified under 30 CFR §§ 816.102 and 817.102 and thereby restore surface drainage patterns (TNWF 2005). Reclamation operations should take into account that the water resources of some unreclaimed abandoned mine sites may have been naturally restored over time. Under 30 CFR § 816.106, if a remining operation has insufficient volume of reasonably available spoil, then the highwall would only be eliminated to the maximum extent practicable. Recontouring of surface mining benches, through backfilling with impermeable material, could cover fracture openings, resulting in a decrease in groundwater recharge in the area (Wyrick and Borchers 1981). The removal or stabilization of mine tailings, wastes, and refuse piles from previously mined sites would prevent surface runoff from coming into contact with these materials and leaching acidic and toxic materials into groundwater. Affected areas would be regraded and revegetated so that any surface runoff would follow a more natural course thereby minimizing impacts on groundwater levels. Reclamation would result in long-term beneficial impacts on surface water and groundwater resources (Kleinmann 2000).

The continued existence of pre-SMCRA unreclaimed abandoned mined lands could result in long-term adverse impacts especially to water quality. Even though regulations prohibit acid mine drainage and regulate the treatment of discharge to meet effluent limits in current mining operations, acid mine and other polluted drainage can still occur at pre-SMCRA unreclaimed mines (TNWF 2005; EPA 2000). In addition to pollution from unreclaimed mines, the presence of mine workings can disturb natural surface water and groundwater flow patterns and alter natural water levels, as described above.

## **Roads**

Potential construction of haul and access roads could impact surface water hydrology, alter drainage patterns, and degrade water quality (Tsunokawa and Hoban 1997). Haul and access road construction would remove vegetation, disturb and expose soils, and increase the potential for erosion and runoff to adjacent surface waterbodies. This could result in adverse impacts including increased sedimentation of surrounding water resources requiring the use of best management practices. Stream crossings by roads can alter surface runoff patterns and streamflow, including volume and velocity, resulting in increased

erosion, turbidity, and sediment deposition (Tsunokawa and Hoban 1997). Roads could cut off overland flow and alter the hydrologic regime of the watershed by decreasing retention of flood waters and stormwater runoff travel time. Road culverts should be designed with the capacity to carry the existing stream flow. However, if a culvert is sized inappropriately, flow concentration at a culvert can have downstream impacts such as channel incision and streambank erosion (Tsunokawa and Hoban 1997). Operation of roads could also result in some erosive action through stormwater runoff leading to sediment discharge to streams. Implementation of best management practices and compliance with applicable SMCRA and other regulations would minimize adverse impacts from construction and operation of roads, resulting in long-term minor impacts on water resources.

Tables 6-5 through 6-8 provide a summary comparison of alternatives and their associated impacts to water resources. Figures 6-7, 6-8, 6-9, 6-10, and 6-11 show impacts of the alternatives to water resources within the buffer area used to analyze alternatives from potential minable areas. The summary tables and figures are followed by alternative-specific analyses.

**TABLE 6-5: CHARACTERIZATION OF THE EVALUATION AREA AND DESIGNATED AREA UNDER EACH ALTERNATIVE**

<b>Watershed</b>	<b>Evaluation Area (acres) Alternative 1</b>	<b>Area Designated (acres) Alternatives 2 and 3</b>	<b>Area Designated (acres) Alternative 4</b>	<b>Area Designated (acres) Alternative 5</b>	<b>Area Designated (acres) Alternative 6</b>
Emory River	19,045	9,501	9,886	9	5,234
Powell River	48	0	35	35	0
South Fork Cumberland River	98,767	35,893	40,944	5,625	18,725
Upper Clinch River	26,130	10,104	11,820	2,168	5,336
Upper Cumberland River	28,146	11,829	13,449	4,494	6,297
<b>Total</b>	<b>172,135</b>	<b>67,326</b>	<b>76,134</b>	<b>12,332</b>	<b>35,592</b>

Note: Variations in totals are based on rounding.

**TABLE 6-6: EXISTING DISTURBANCE AND POTENTIAL MINING ACREAGES BY SUBWATERSHED**

Watershed	Alt 1 <sup>a</sup> Previous Mining Acreage	Alt 1 <sup>a</sup> Previous Mining % of Evaluation Area	Alt 1 <sup>a</sup> PSM and/or ACR* Acreage	Alt 1 <sup>a</sup> PSM and/or ACR* % of Evaluation Area	Alt 2/3 <sup>b</sup> Previous Mining Acreage	Alt 2/3 <sup>b</sup> Previous Mining % of Evaluation Area	Alt 2/3 <sup>b</sup> PSM and/or ACR* Acreage	Alt 2/3 <sup>b</sup> PSM and/or ACR* % of Evaluation Area	Alt 4 <sup>b</sup> Previous Mining Acreage	Alt 4 <sup>b</sup> Previous Mining % of Evaluation Area	Alt 4 <sup>b</sup> PSM and/or ACR* Acreage	Alt 4 <sup>b</sup> PSM and/or ACR* % of Evaluation Area	Alt 5 <sup>b</sup> Previous Mining Acreage	Alt 5 <sup>b</sup> Previous Mining % of Evaluation Area	Alt 5 <sup>b</sup> PSM and/or ACR* Acreage	Alt 5 <sup>b</sup> PSM and/or ACR* % of Evaluation Area	Alt 6 <sup>b</sup> Previous Mining Acreage	Alt 6 <sup>b</sup> Previous Mining % of Evaluation Area	Alt 6 <sup>b</sup> PSM and/or ACR* Acreage	Alt 6 <sup>b</sup> PSM and/or ACR* % of Evaluation Area
Emory River	1,038	0.6	2,491	1.4	657	0.4	1,448	0.8	702	0.4	1,547	0.9	0	0	9	0.01	354	0.2	790	0.5
Powell River	0	0	19	0.01	0	0	0	0	0	0	16	0.01	0	0	16	0.01	0	0	0	0
South Fork Cumberland River	15,009	8.7	31,354	18.2	7,554	4.4	15,248	8.9	8,291	4.8	16,715	9.7	1,189	0.7	3,117	1.8	4,061	2.4	8,427	4.9
Upper Clinch River	3,043	1.8	5,521	3.2	1,847	1.1	2,964	1.7	2,018	1.2	3,285	1.9	438	0.3	996	0.6	1,096	0.6	1,730	1.0
Upper Cumberland River	4,402	2.6	5,471	3.2	2,315	1.3	2,462	1.4	2,433	1.4	2,731	1.6	455	0.3	1,305	0.8	1,278	0.7	1,271	0.7
<b>Total</b>	<b>23,492</b>	<b>13.6</b>	<b>44,856</b>	<b>26.1</b>	<b>12,374</b>	<b>7.2</b>	<b>22,122</b>	<b>12.9</b>	<b>13,444</b>	<b>7.8</b>	<b>24,294</b>	<b>14.1</b>	<b>2,082</b>	<b>1.2</b>	<b>5,442</b>	<b>3.2</b>	<b>6,789</b>	<b>3.9</b>	<b>12,217</b>	<b>7.1</b>

\* PSM and/or ACR = Potential Surface Mineable and/or Augerable Coal Resources.

<sup>a</sup> Within the Evaluation Area.

<sup>b</sup> Within the Designated Area.

**TABLE 6-7: SENSITIVE SURFACE WATER RESOURCES LOCATED WITHIN THE BUFFER AREA USED TO ANALYZE ALTERNATIVES FROM POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES (POTENTIALLY AFFECTED BY SURFACE COAL MINING)**

Watershed	Alt 1 <sup>a</sup> Surface Waters (miles)*	Alt 1 <sup>a</sup> CSWPZ (acres)	Alt 1 <sup>a</sup> SWMZ (acres)	Alt 2/3 <sup>b</sup> Surface Waters (miles)* Inside Designation Area	Alt 2/3 <sup>b</sup> Surface Waters (miles)* Outside Designation Area	Alt 2/3 <sup>b</sup> CSWPZ (acres)	Alt 2/3 <sup>b</sup> SWMZ (acres)	Alt 4 <sup>b</sup> Surface Waters (miles)* Inside Designation Area	Alt 4 <sup>b</sup> Surface Waters (miles)* Outside Designation Area	Alt 4 <sup>b</sup> CSWPZ (acres)	Alt 4 <sup>b</sup> SWMZ (acres)	Alt 5 <sup>b</sup> Surface Waters (miles)* Inside Designation Area	Alt 5 <sup>b</sup> Surface Waters (miles)* Outside Designation Area	Alt 5 <sup>b</sup> CSWPZ (acres)	Alt 5 <sup>b</sup> SWMZ (acres)	Alt 6 <sup>b</sup> Surface Waters (miles)* Inside Designation Area	Alt 6 <sup>b</sup> Surface Waters (miles)* Outside Designation Area	Alt 6 <sup>b</sup> CSWPZ (acres)	Alt 6 <sup>b</sup> SWMZ (acres)
Emory River	75.7	0	0	0.8	0.04	0	0	0.9	0.04	0	0	0	0	0	0	0.2	0	0	0
Powell River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
South Fork Cumberland River	358.2	0	2,041	16.5	0.4	0	156	19	0.5	0	173	1.6	0	0	5	5.5	0.1	0	101
Upper Clinch River	98.6	1,467	4,157	4.9	0.2	129	301	5.5	0.3	133	307	0.5	0.02	103	115	1.6	0.1	70	180
Upper Cumberland River	110.5	0	85	11.2	0.1	0	19	13.6	0.1	0	37	4.3	0	0	19	3.9	0.02	0	12
<b>Total</b>	<b>643</b>	<b>1,467</b>	<b>6,283</b>	<b>33.2</b>	<b>0.7</b>	<b>129</b>	<b>476</b>	<b>38.1</b>	<b>0.9</b>	<b>133</b>	<b>517</b>	<b>6.4</b>	<b>0.02</b>	<b>103</b>	<b>139</b>	<b>11.2</b>	<b>0.2</b>	<b>70</b>	<b>293</b>

CSWPZ – Critical Source Water Protection Zone; SWMZ – Source Water Management Zone.

\* These values do not include any potentially unmapped headwater streams.

<sup>a</sup> Within the Evaluation Area.

<sup>b</sup> Within the Designated Area.

**TABLE 6-8: SENSITIVE SURFACE WATER RESOURCES LOCATED WITHIN THE BUFFER AREA USED TO ANALYZE ALTERNATIVES FROM POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES (POTENTIALLY AFFECTED BY SURFACE COAL MINING)**

Watershed	Surface Waters <sup>a,c</sup> Alt 1	Surface Waters <sup>a,c</sup> Alt 2/3	Surface Waters <sup>a,c</sup> Alt 4	Surface Waters <sup>a,c</sup> Alt 5	Surface Waters <sup>a,c</sup> Alt 6	303(d) Impaired Surface Waters <sup>c</sup> Alt 1	303(d) Impaired Surface Waters <sup>c</sup> Alt 2/3	303(d) Impaired Surface Waters <sup>c</sup> Alt 4	303(d) Impaired Surface Waters <sup>c</sup> Alt 5	303(d) Impaired Surface Waters <sup>c</sup> Alt 6	Special-Status Surface Waters <sup>b,c</sup> Alt 1	Special-Status Surface Waters <sup>b,c</sup> Alt 2/3	Special-Status Surface Waters <sup>b,c</sup> Alt 4	Special-Status Surface Waters <sup>b,c</sup> Alt 5	Special-Status Surface Waters <sup>b,c</sup> Alt 6	Surface Water Intakes (#)Alt 1	Surface Water Intakes (#)Alt 2/3	Surface Water Intakes (#)Alt 4	Surface Water Intakes (#)Alt 5	Surface Water Intakes (#)Alt 6	CSWPZ <sup>d</sup> Alt 1	CSWPZ <sup>d</sup> Alt 2/3	CSWPZ <sup>d</sup> Alt 4	CSWPZ <sup>d</sup> Alt 5	CSWPZ <sup>d</sup> Alt 6	SWMZ <sup>d</sup> Alt 1	SWMZ <sup>d</sup> Alt 2/3	SWMZ <sup>d</sup> Alt 4	SWMZ <sup>d</sup> Alt 5	SWMZ <sup>d</sup> Alt 6	
Emory River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Powell River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
South Fork Cumberland River	496	308	310	295	308	78	51	51	51	51	3	2	2	0	2	1	1	1	0	1	1,558	1,426	1,558	43	1,426	6,612	6,612	6,612	6,463	6,612	
Upper Clinch River	125	75	75	75	75	32	25	25	25	25	0	0	0	0	0	1	1	1	1	1	3,613	3,613	3,613	3,613	3,613	3,136	3,136	3,136	3,136	3,136	
Upper Cumberland River	166	96	96	90	96	0	0	0	0	0	29	20	20	20	20	0	0	0	0	0	0	0	0	0	0	9	9	9	9	9	
<b>Total</b>	<b>787</b>	<b>479</b>	<b>481</b>	<b>460</b>	<b>479</b>	<b>110</b>	<b>76</b>	<b>76</b>	<b>76</b>	<b>76</b>	<b>32</b>	<b>22</b>	<b>22</b>	<b>20</b>	<b>22</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>5,170</b>	<b>5,038</b>	<b>5,170</b>	<b>3,656</b>	<b>5,038</b>	<b>9,758</b>	<b>9,758</b>	<b>9,758</b>	<b>9,608</b>	<b>9,758</b>	

CSWPZ – Critical Source Water Protection Zone; SWMZ – Source Water Management Zone.

<sup>a</sup> These values do not include any potentially unmapped headwater streams.

<sup>b</sup> Nationwide Rivers Inventory.

<sup>c</sup> Miles.

<sup>d</sup> Acres.

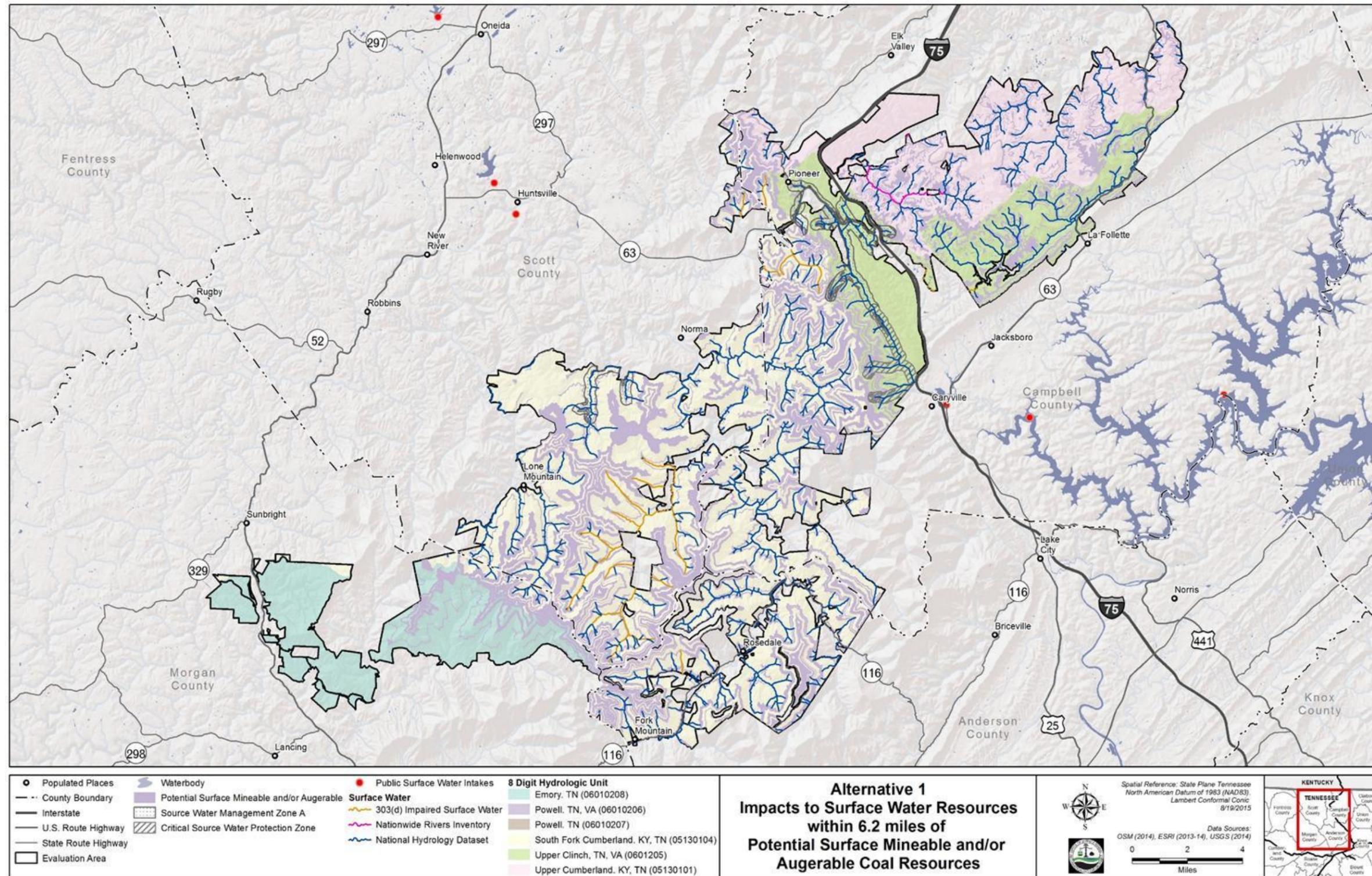


FIGURE 6-7: ALTERNATIVE 1 IMPACTS TO SURFACE WATER RESOURCES WITHIN THE BUFFER AREA USED TO ANALYZE ALTERNATIVES OF POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES

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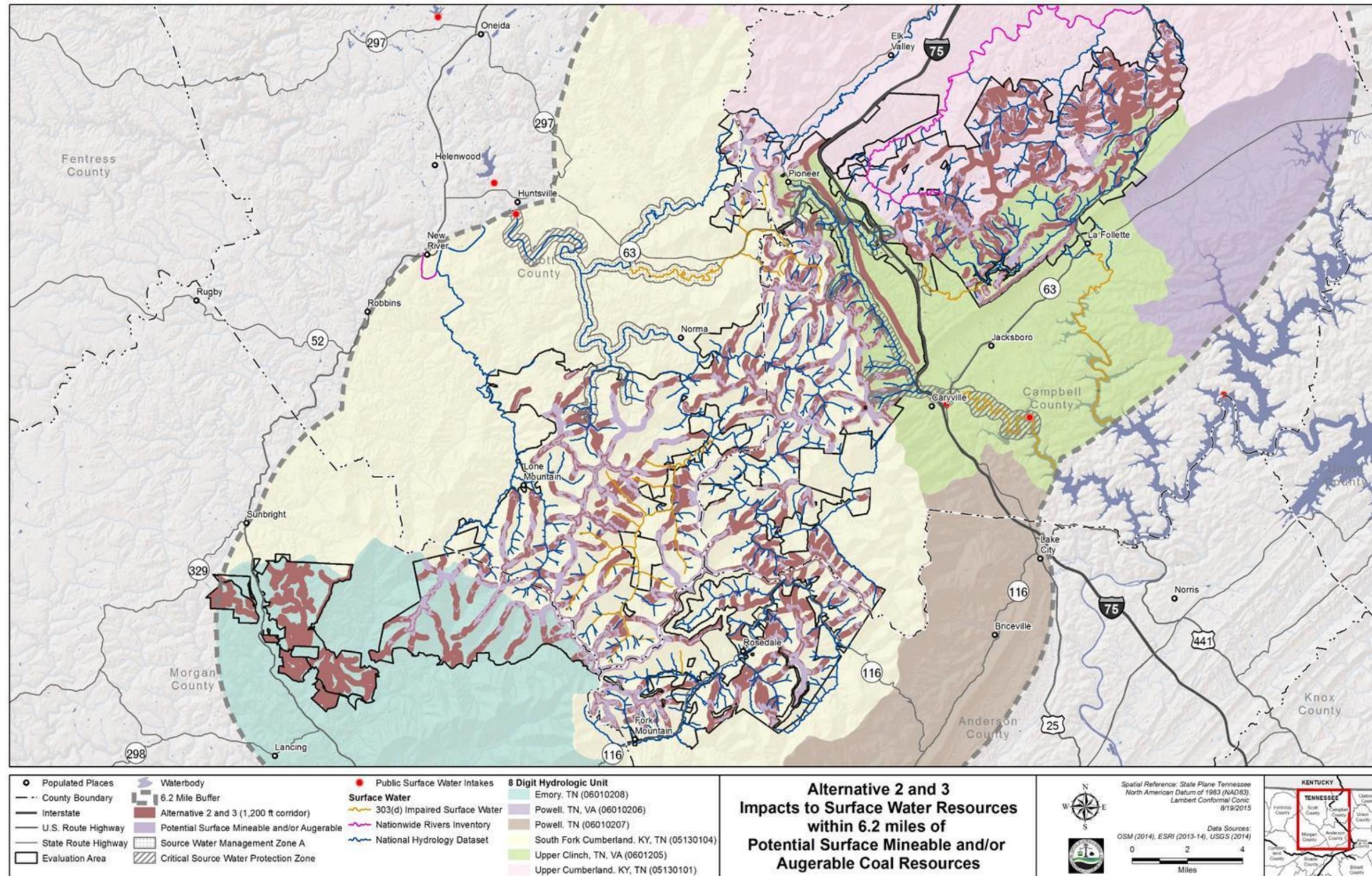


FIGURE 6-8: ALTERNATIVES 2 AND 3 IMPACTS TO SURFACE WATER RESOURCES WITHIN THE BUFFER AREA USED TO ANALYZE ALTERNATIVES OF POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES

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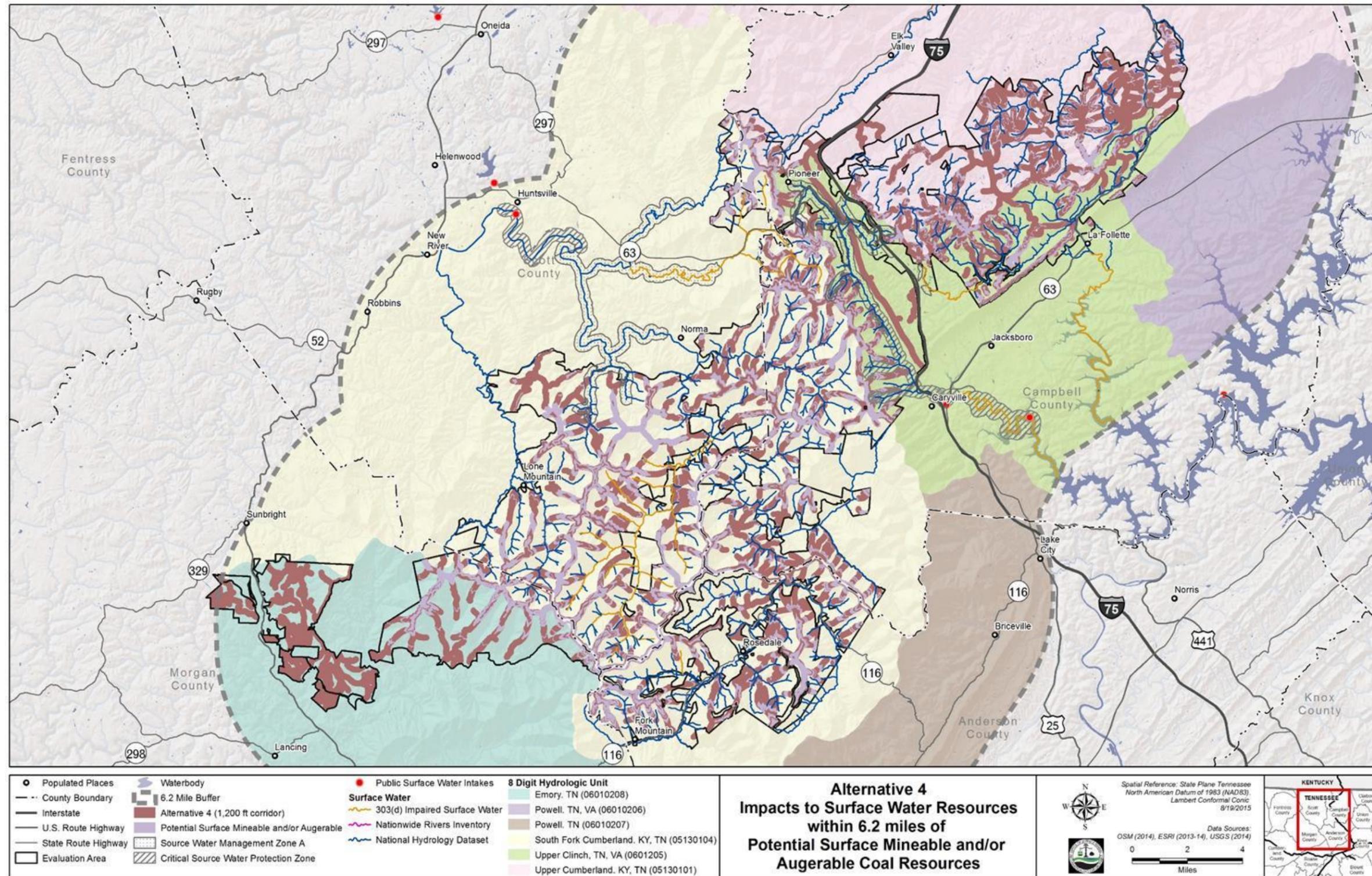


FIGURE 6-9: ALTERNATIVE 4 IMPACTS TO SURFACE WATER RESOURCES WITHIN THE BUFFER AREA USED TO ANALYZE ALTERNATIVES OF POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES

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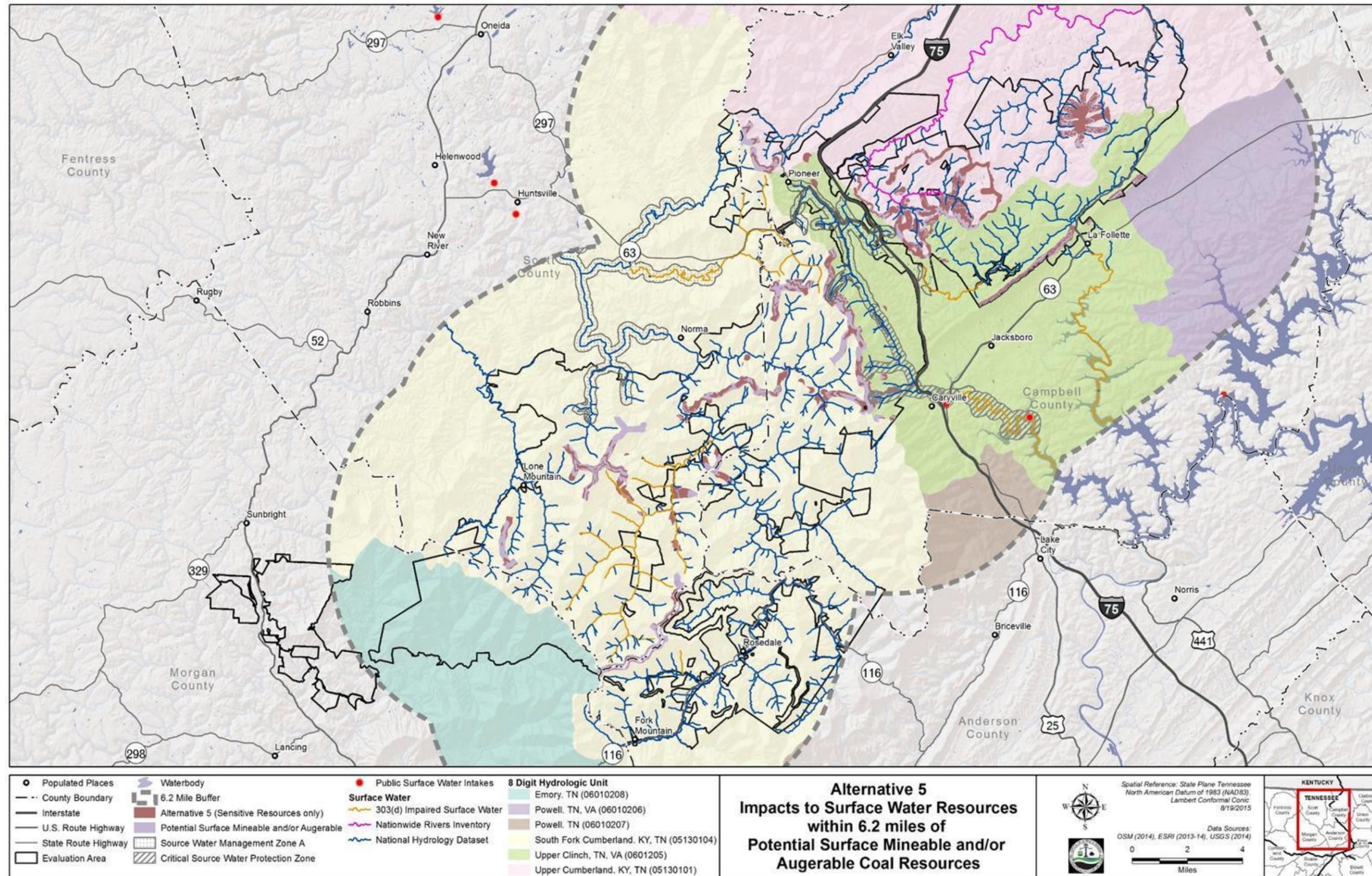


FIGURE 6-10: ALTERNATIVE 5 IMPACTS TO SURFACE WATER RESOURCES WITHIN THE BUFFER AREA USED TO ANALYZE ALTERNATIVES OF POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES

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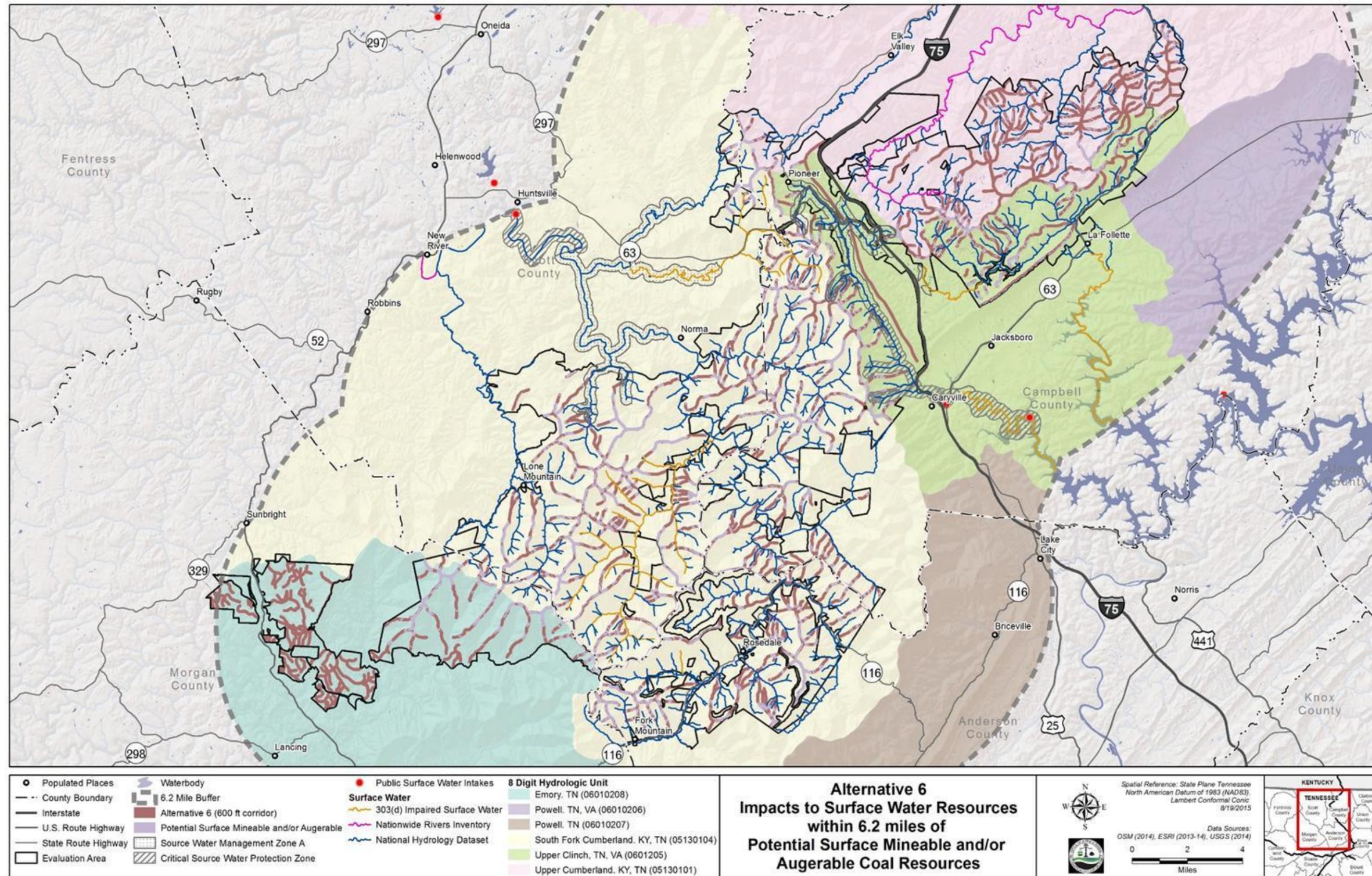


FIGURE 6-11: ALTERNATIVE 6 IMPACTS TO SURFACE WATER RESOURCES WITHIN THE BUFFER AREA USED TO ANALYZE ALTERNATIVES OF POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES

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## **ALTERNATIVE 1: NO-ACTION ALTERNATIVE**

Under the no-action alternative, no areas would be designated as unsuitable for surface coal mining, and surface coal mining operations would continue to be authorized within the approximately 172,000-acre evaluation area. It is expected that surface coal mining operations under the no-action alternative would continue to be permitted over time. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions. Surface, underground, and auger mining and re-mining operations would be permitted on all land including ridgelines except within 100 feet of streams (except in certain circumstances to restore impaired streams) and other areas, as described under “Applicable Statutes, Regulations, and Policies.” Although no new mining could occur within 100 feet of streams per these requirements (in most circumstances, as there are exceptions for re-mining operations when the intent is stream restoration), calculations of acres of sensitive areas or mileage of streams within close proximity of mineable coal is an indication of potential risk from surface runoff from mining operations and roads. Adverse impacts to surface water resources including headwater streams are expected, as described in “General Impacts of Surface Coal Mining in Tennessee on Surface Water.” These include contamination of surface water from mine discharge and polluted surface runoff and alterations to stream levels and flow during the period of mining until the area is reclaimed. Regulatory requirements and permit conditions would reduce but not eliminate adverse effects.

Headwater streams are an important source of organic matter and nutrients for downstream reaches, support a unique assemblage of aquatic species, and perform aquatic ecosystem functions food web dynamics (Bernhardt and Palmer 2011; OSMRE 2007). These streams provide connection between groundwater and surface water. Surface coal mining can impact headwater streams through sedimentation, increased dissolved chemical constituents, decreased organic nutrients, and alterations to the thermal character, flow regime, and drainage pattern, and response to runoff and flooding (OSMRE 2007). Major alterations to headwater streams can also affect the hydrologic processes, water quality, channel morphology, biogeochemistry, and aquatic communities of downstream waters (Bernhardt and Palmer 2011). Many headwater streams are not monitored or mapped in datasets and therefore impacts could be undetected. In addition to impairment to water quality and quantity, disturbance to headwater streams can adversely impact biological communities. Impacts to these communities are discussed in the sections on the following resources: Aquatic and Terrestrial Species, Special-Status Species, and Vegetation.

Under the no-action alternative, the evaluation area including approximately 44,856 acres (26% of the evaluation area) of potential surface mineable and/or augerable coal resources would potentially be affected by future surface coal mining operations (table 6-9). This could result in adverse impacts to surface water resources inside the evaluation area as well as the hydrologically connected surface waters outside the evaluation area within the buffer area used to analyze alternatives from potential surface mineable and/or augerable coal resources (tables 6-10 and 6-11). For the purposes of the GIS-based quantitative analyses, sensitive surface water resources are defined as critical source water protection and source water management zones, currently impaired streams, special-status surface waters, and surface water intakes. According to the analyses, there are approximately 643 miles of surface waters; 1,467 acres of critical source water protection; and 6,283 acres of source water management zone located within 100 feet of potential surface mineable and/or augerable coal resources in the Emory, South Fork Cumberland, Upper Clinch, and Upper Cumberland River watersheds of the evaluation area (table 6-10). Additionally, there are 787 miles of surface waters, 110 miles of 303(d) impaired streams, 32 miles of special-status surface waters, and 2 surface water intakes within the buffer area used to analyze alternatives from

potential surface mineable and/or augerable coal resources (table 6-11). It should be noted that there are likely many headwater streams that are not included in the GIS-based calculations because they are not mapped. Therefore, the quantitative analysis most likely does not assess all headwater streams that are present within the area of analysis. Mining operations could result in adverse impacts to these resources that are in close proximity to the potential surface mineable and/or augerable coal resources, especially if these locations include high sulfur content seams (i.e., Big Mary, Jellico, Murray, and Kent), which are more likely to result in acid water conditions. These seams comprise approximately 18,382 acres (11% of the evaluation area) of potential surface mineable and/or augerable coal resources within the evaluation area. The South Fork Cumberland and Upper Clinch River watersheds have the most potential for adverse effects from mining operations due to the large number of miles and acreages of sensitive surface water resources in close proximity to potential surface mineable and/or augerable coal resources. There would also be adverse impacts to surface water resources, within the Upper Cumberland River watershed, although on a smaller scale. No sensitive surface water resources that are close to potential surface mineable and/or augerable coal resources have been identified within the Powell River watershed; therefore the adverse impacts from the mining operations would likely be smaller than those in the other watersheds. As discussed in chapter 2, the ERTCE prohibits the owner of the mineral interest from engaging in mining. In addition, there are no commercial mineable coal resources in the ERTCE. Therefore no surface, underground, or auger mining or remining would take place within the Emory River watershed and there would be no impacts to surface water resources compared to the existing conditions.

Assuming an average annual rate of mining per year (112 acres per year) direct mining disturbance would be limited to approximately 2% of the total evaluation area over the 30-year period. However, alternative 1 could adversely impact surface water resources throughout the evaluation area as well as the hydrologically connected surface waters outside the evaluation area within the buffer area used to analyze alternatives. Surface coal mining and other mining operations at higher elevations and along ridgelines would indirectly disturb ecologically important headwaters, as described in “General Impacts of Surface Coal Mining in Tennessee on Surface Water.” The degradation of headwater streams would translate into an increase in adverse impacts to downstream waters thereby extending the impacts over a wider area. The no-action alternative would result in long-term adverse impacts compared to existing conditions.

Remining and associated reclamation operations would be permitted within a portion of the approximately 23,492 acres (14% of the evaluation area) of previously mined land located within the evaluation area (table 6-9). Potential adverse and beneficial impacts to surface water resources from these operations would be greater in the South Fork Cumberland and Upper Clinch River watersheds because these watersheds have the most sensitive resources located in close proximity to potential surface mineable and/or augerable coal resources (tables 6-10 and 6-11). Remining operations have the potential to temporarily impact surface water resources, resulting in localized short-term adverse impacts. If remining occurs within one of the coal seams characterized by higher sulfur content seams (i.e., Big Mary, Jellico, Murray, and Kent), there is a greater potential for adverse impacts resulting from acidic or toxic water conditions. These seams comprise approximately 11,298 acres (6.6% of the evaluation area) of previously mined land within the evaluation area. The adverse impacts from remining would be avoided or minimized through the implementation of mitigation and best management practices. As part of the remining operation, reclamation would restore previously abandoned mined sites, thereby minimizing or potentially eliminating, if possible, existing environmental issues such as erosion, acid mine drainage, discharges of sediment and metals, and surface water flow alterations. Remining operations would result in localized short-term adverse surface water impacts that would persist until reclamation operations are completed. However, reclamation would restore previously disturbed land and minimize or potentially eliminate ongoing water quality and quantity issues, resulting in long-term beneficial impacts. Because there are no areas protected by a designation of unsuitable for surface coal mining under alternative 1, the short-term adverse impacts from remining operations and the long-term beneficial impacts from associated reclamation would be the same as under existing conditions.

The construction and operation of access and haul roads would have localized adverse impacts on surface water quality over the long term, mainly from sedimentation. In accordance with federal and state regulations, the only possibility of direct impacts to streams as a result of roads and surface coal mining in Tennessee would occur at the points where roads cross streams.

Alternative 1 would have short-term and long-term potentially widespread adverse impacts on surface water resources compared to existing conditions resulting from degradation of surface water quality and quantity from surface, underground, and auger mining and re-mining operations and road development, as well as long-term beneficial impacts from reclamation operations associated with re-mining.

**TABLE 6-9: EXISTING DISTURBANCE AND POTENTIAL MINING ACREAGES UNDER ALTERNATIVE 1**

Watershed	Evaluation Area (acres)	Previous Mining within the Evaluation Area Acreage	Previous Mining within the Evaluation Area % of Evaluation Area	Potential Surface Mineable and/or Augerable Coal Resources within the Evaluation Area Acreage	Potential Surface Mineable and/or Augerable Coal Resources within the Evaluation Area % of Evaluation Area
Emory River	19,045	1,038	0.6	2,491	1.4
Powell River	48	0	0	19	0.01
South Fork Cumberland River	98,767	15,009	8.7	31,354	18.2
Upper Clinch River	26,130	3,043	1.8	5,521	3.2
Upper Cumberland River	28,146	4,402	2.6	5,471	3.2
<b>Total</b>	<b>172,135</b>	<b>23,492</b>	<b>13.6</b>	<b>44,856</b>	<b>26.1</b>

Source: Geospatial Information Data.

**TABLE 6-10: PROXIMITY OF POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES TO SENSITIVE SURFACE WATER RESOURCES UNDER ALTERNATIVE 1**

Watershed	Surface Waters* (miles)*	Critical Source Water* Protection Zone (acres)	Source Water* Management Zone (acres)
Emory River	75.7	0	0
Powell River	0	0	0
South Fork Cumberland River	358.2	0	2,041
Upper Clinch River	98.6	1,467	4,157
Upper Cumberland River	110.5	0	85
<b>Total</b>	<b>643</b>	<b>1,467</b>	<b>6,283</b>

Source: Geospatial Information Data.

\* Located less than 100 feet from potential surface mineable or augerable coal resources (potentially affected by surface coal mining).

\*These values do not include any potentially unmapped headwater streams.

**TABLE 6-11: SENSITIVE SURFACE WATER RESOURCES IN CLOSE PROXIMITY TO POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES UNDER ALTERNATIVE 1**

Watershed	Surface Waters* (miles) <sup>a</sup>	303(d) Impaired Surface Waters* (miles)	Special-Status Surface Waters <sup>*,b</sup> (miles)	Surface Water* Intakes (#)	Critical Source Water* Protection Zone (acres)	Source Water* Management Zone (acres)
Emory River	0	0	0	0	0	0
Powell River	0	0	0	0	0	0
South Fork Cumberland River	496	78	3	1	1,558	6,612
Upper Clinch River	125	32	0	1	3,613	3,136
Upper Cumberland River	166	0	29	0	0	9
<b>Total</b>	<b>787</b>	<b>110</b>	<b>32</b>	<b>2</b>	<b>5,170</b>	<b>9,758</b>

Source: Geospatial Information Data.

\* Located within the buffer area used to analyze alternatives from potential surface mineable or augerable coal resources (potentially affected by surface coal mining).

<sup>a</sup> These values do not include any potentially unmapped headwater streams.

<sup>b</sup> Nationwide Rivers Inventory.

## Cumulative Impacts

Past, present, and reasonably foreseeable future mining, road construction, timber harvest, oil and gas production, recreation, and development would have the potential to adversely affect surface water resources due to removal of vegetation, exposure of land surface and soil, alterations to topography and geology, and soil compaction. These activities would continue to result in water quality and quantity degradation over time due to soil disturbance, associated sedimentation and discharges of pollutants and contaminated water, alterations in drainage and flow patterns, changes in water storage capacity, and increases or decreases in natural water levels. However, mitigation measures and adherence to water quality and quantity standards would minimize the adverse effects. Remining and associated reclamation efforts would ultimately help to improve water quality and other surface water properties. The adverse and beneficial impacts of alternative 1, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on surface water resources. Alternative 1 would contribute a noticeable amount to this adverse effect, based on the expected rate of mining and the lack of protection for headwater streams.

## Conclusion

Under alternative 1, existing coal mining operations and management would continue with no designation of lands as unsuitable for surface coal mining. Pollutant and sediment loading from surface and underground mine discharges could affect surface water quality; surface and underground mine workings could alter surface water drainage and flow regimes, especially in areas with acid-producing coal seams. Compared to existing conditions this alternative would result in widespread short-term and long-term adverse impacts to surface water resources especially to source water protection and management zones, 303(d) impaired streams, special-status waters, surface water intakes, headwater streams, and streams that are near high sulfur content coal seams throughout the evaluation area including ridgeline corridors, other sensitive areas, and downstream and downslope areas. Remining would result in localized short-term adverse impacts and associated reclamation of unreclaimed previously mined land would result in

localized long-term beneficial impacts compared to existing conditions. The adverse impacts to surface water resources from remining would be avoided or minimized through the implementation of best management practices and mitigation measures and compliance with state and federal water quality criteria and mining operation performance standards, as described in “Applicable Statutes, Regulations, and Policies.” Alternative 1 would not result in significant adverse impacts because violations of applicable water quality regulations are not anticipated due to the implementation of mitigation measures and compliance with water quality standards and regulations. The reclamation associated with remining would add beneficial impacts. Additionally, the amount of area disturbed under the expected average annual mining rate would disturb only approximately 2% of the entire evaluation area over the 30-year period.

## **ALTERNATIVE 2: STATE PETITION DESIGNATION**

The designation of a 1,200-foot corridor centered on 505 miles of ridgelines as unsuitable for surface coal mining would prevent surface coal mining operations, as well as any surface activities or surface impacts incident to underground coal mines on 67,326 acres. Surface waters, especially headwater streams, would obtain some protection from the designation of the ridgeline corridors. This protection from potential future adverse impacts would result in widespread beneficial impacts on surface water resources by preventing impacts to surface water quality and quantity in the headwaters and minimizing the impacts to downstream reaches. However, remining is not part of this alternative, therefore unreclaimed abandoned mines inside the petition area would continue to adversely impact surface water quality and quantity. Underground and auger mining could occur outside the petition area; however actual mining could take place underneath the petition area with potential adverse surface water quality impacts. Under this alternative, adverse impacts from mining operations located outside the petition area and from the continued presence of unreclaimed abandoned mines inside the petition area would occur, as described in “General Impacts of Surface Coal Mining in Tennessee on Surface Water.” Regulatory requirements and permit conditions would reduce but not eliminate adverse effects. Although no mining could occur within 100 feet of streams (except in certain circumstances to restore impaired streams) per requirements discussed in “Applicable Statutes, Regulations, and Policies,” calculations of acres of sensitive areas or mileage of streams within close proximity of mineable coal is an indication of potential risk from surface runoff from mining operations and roads.

Under alternative 2, the petition area including approximately 22,122 acres of potential surface mineable and/or augerable coal resources (13% of the evaluation area) would be protected from future surface coal mining operations (table 6-12). This would benefit surface water resources inside the petition area as well as the hydrologically connected surface waters outside both the petition area and the evaluation area within the buffer area used to analyze alternatives from potential surface mineable and/or augerable coal resources (tables 6-13 and 6-14). For the purposes of the GIS-based quantitative analyses, sensitive surface water resources are defined as critical source water protection and source water management zones, currently impaired streams, special-status surface waters, and surface water intakes. According to the analyses, there are approximately 33 miles of surface waters, 129 acres of critical source water protection and 476 acres of source water management zone located within 100 feet of potential surface mineable and/or augerable coal resources within the petition area (table 6-13). Outside the evaluation area, there are 0.7 miles of streams within 100 feet of potential surface mineable and/or augerable coal resources. Additionally, there are 479 miles of surface waters, 76 miles of 330(d) impaired streams, 22 miles of special-status surface waters, and two surface water intakes within the buffer area used to analyze alternatives from potential surface mineable and/or augerable coal resourced (table 6-14). It should be noted that there are likely many headwater streams that are not included in the GIS-based calculations because they are not mapped. Therefore, the quantitative analysis most likely does not assess all headwater streams that are present within the area of analysis. The protection provided to these resources would result in beneficial impacts. The South Fork Cumberland and Upper Clinch River

watersheds have the most potential for adverse effects from mining operations due to the large number of miles and acreages of sensitive surface water resources in close proximity to potential surface mineable and/or augerable coal resources and therefore, the protection provided to surface water resources under this alternative would likely have the largest benefit in these watersheds. There would also be beneficial impacts to surface water resources within the Upper Cumberland River watershed, although on a smaller scale than within the other watersheds. The Powell River watershed has no sensitive surface water resources that are close to potential surface mineable and/or augerable coal resources; therefore the beneficial impacts from the designation of land as unsuitable for surface coal mining would likely be smaller than those in the other watersheds.

**TABLE 6-12: EXISTING DISTURBANCE AND POTENTIAL MINING ACREAGES BY SUBWATERSHED UNDER ALTERNATIVE 2**

Watershed	Area Designated (acres)	Previous Mining within the Designated Area Acreage	Previous Mining within the Designated Area % of Evaluation Area	Potential Surface Mineable and/or Augerable Coal Resources within the Designated Area Acreage	Potential Surface Mineable and/or Augerable Coal Resources within the Designated Area % of Evaluation Area
Emory River	9,501	657	0.4	1,448	0.8
Powell River	0	0	0	0	0
South Fork Cumberland River	35,893	7,554	4.4	15,248	8.9
Upper Clinch River	10,104	1,847	1.1	2,964	1.7
Upper Cumberland River	11,829	2,315	1.3	2,462	1.4
<b>Total</b>	<b>67,326</b>	<b>12,374</b>	<b>7.2</b>	<b>22,122</b>	<b>12.9</b>

Source: Geospatial Information Data.

**TABLE 6-13: SENSITIVE SURFACE WATER RESOURCES IN CLOSE PROXIMITY TO POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES UNDER ALTERNATIVE 2 (PROTECTED FROM SURFACE MINING)**

Watershed	Surface Waters* Inside Petition Area (miles)*	Surface Waters* Outside Evaluation Area (miles)*	Critical Source Water* Protection Zone (acres)	Source Water* Management Zone (acres)
Emory River	0.8	0.04	0	0
Powell River	0	0	0	0
South Fork Cumberland River	16.5	0.4	0	156
Upper Clinch River	4.9	0.2	129	301
Upper Cumberland River	11.2	0.1	0	19
<b>Total</b>	<b>33.2</b>	<b>0.7</b>	<b>129</b>	<b>476</b>

Source: Geospatial Information Data.

\* Located less than 100 feet from potential surface mineable or augerable coal resources (protected from surface mining).

\*These values do not include any potentially unmapped headwater streams.

**TABLE 6-14: SENSITIVE SURFACE WATER RESOURCES IN CLOSE PROXIMITY TO POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES UNDER ALTERNATIVE 2 (POTENTIALLY AFFECTED BY SURFACE COAL MINING)**

Watershed	Surface Waters* (miles) <sup>a</sup>	303(d) Impaired Surface Waters* (miles)	Special-Status Surface Waters* <sup>b</sup> (miles)	Surface Water* Intakes (#)	Critical Source Water* Protection Zone (acres)	Source Water* Management Zone (acres)
Emory River	0	0	0	0	0	0
Powell River	0	0	0	0	0	0
South Fork Cumberland River	308	51	2	1	1,426	6,612
Upper Clinch River	75	25	0	1	3,613	3,136
Upper Cumberland River	96	0	20	0	0	9
<b>Total</b>	<b>479</b>	<b>76</b>	<b>22</b>	<b>2</b>	<b>5,038</b>	<b>9,758</b>

Source: Geospatial Information Data.

\* Located within the buffer area used to analyze alternatives from potential surface mineable and/or augerable coal resources (potentially affected by surface coal mining).

<sup>a</sup> These values do not include any potentially unmapped headwater streams.

<sup>b</sup> Nationwide Rivers Inventory.

The potential for future pollution of surface water from mine drainage or alteration of water levels and flow resulting from surface mining operations or surface disturbance would be eliminated from the petition area. The designation of areas at higher elevations and along ridgelines would help to protect ecologically important headwaters, as described in “General Impacts of Surface Coal Mining in Tennessee on Surface Water.” The protection of headwater streams would translate into a decrease in adverse impacts to hydrologically connected downstream waters thereby extending the benefits over a wider area. Alternative 2 provides greater protection to all surface waters than the no-action alternative, resulting in overall long-term beneficial impacts compared to the no-action alternative.

Approximately 12,374 acres of previously mined land (7% of the evaluation area) is located within the petition area. Under this alternative remining and associated reclamation operations would not be permitted within this area (table 6-12). Long-term adverse impacts to the quality and quantity of surface water resources would continue on a portion of this previously mined land within the petition area, especially if the previously mined coal seams are the higher sulfur content seams (i.e., Big Mary, Jellico, Murray, and Kent), which are more likely to result in acid water conditions. These seams comprise approximately 4,618 acres of previously mined land within the petition area and 2.7% of the evaluation area. Potential adverse impacts to surface water resources from the unreclaimed land, such as pollution of surface water, disturbance to surface runoff, alteration of surface water and groundwater connections, and impairment of water uses, would be greater in the South Fork Cumberland and Upper Clinch River watersheds because these watersheds have the most sensitive resources located in close proximity to potential surface mineable and/or augerable coal resources (tables 6-13 and 6-14). The effects from unreclaimed mines would likely be fairly localized within each watershed although within the South Fork Cumberland watershed these impacts would occur over a larger area compared to the other watersheds. The Emory and Powell River watersheds have little to no previous mining disturbance within the petition area and few surface water resources that are close to potential surface mineable and/or augerable coal resources (tables 6-12 to 6-14). Therefore, the adverse impacts from unreclaimed mines would likely be minimal in these watersheds. Impacts to surface water resources from unreclaimed mines would be long term and adverse compared to the no-action alternative, under which remining is permitted.

Underground and auger mining could occur within the portion of the evaluation area that is outside the petition area (104,809 acres); however adverse impacts could affect surface water quality inside the petition area resulting in potential localized long-term adverse impacts. The construction and operation of access and haul roads would be prohibited within the petition area, therefore adverse impacts to surface water resources from roads would not occur.

### **Cumulative Impacts**

Overall cumulative impacts on surface water resources within the evaluation area would be adverse, as described above for alternative 1. The cumulative actions that have the potential to affect surface water include mining, road construction, timber harvest, oil and gas production, recreation, and development. These activities would continue to result in water quality and quantity degradation over time although implementation of mitigation measures would minimize potential adverse impacts and help to improve water quality and other surface water properties. The impacts of alternative 2, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on surface water resources. Overall, alternative 2 would contribute minimally to adverse cumulative impacts, but could help offset these adverse impacts by providing a measurable benefit.

### **Conclusion**

Alternative 2 would reduce the potential for future adverse impacts from surface coal mining operations to surface water resources especially source water protection and management zones, section 303(d) impaired streams, special-status waters, surface water intakes, and headwater streams in the petition area and the evaluation area, resulting in widespread long-term beneficial impacts compared to the no-action alternative. The continued existence of unreclaimed previously mined land would result in localized long-term adverse impacts compared to the no-action alternative. However, no new or additional adverse impacts would be expected compared to the no-action alternative. Alternative 2 would not result in significant adverse impacts because violations of applicable water quality regulations are not anticipated due to the very localized scale of adverse impacts from unreclaimed mines within the petition area, compliance with Clean Water Act regulations and SMCRA performance requirements, and from the use of mitigation measures, and because headwaters in the petition area would be protected.

### **ALTERNATIVE 3: STATE PETITION DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS**

Under alternative 3, areas designated as unsuitable for surface coal mining would be the same as those described for alternative 2, resulting in the prevention of surface coal mining operations, as well as any surface activities or surface impacts incident to underground coal mines on 67,326 acres. Surface waters, especially headwater streams, located within the designation area would be protected as a result of the designation of the ridgeline corridors as unsuitable for surface coal mining. This protection would result in widespread beneficial impacts on surface water resources by preventing impacts to surface water quality and quantity in the headwaters and minimizing the impacts to downstream reaches. Alternative 3 would not prohibit remining and the development and use of access and haul roads for use in remining would be allowed inside the designation area. Underground and auger mining could occur outside the designation area; however actual mining and impacts could take place underneath the designation area. Under this alternative, short-term adverse impacts would occur from potential remining and road development inside the designation area and underground and auger mining outside the designation area, as described in “General Impacts of Surface Coal Mining in Tennessee on Surface Water” but ridgelines and some headwater streams would be protected. Regulatory requirements and permit conditions would reduce but not eliminate adverse effects. Although remining would not occur within 100 feet of streams

(except in certain circumstances to restore impaired streams) per requirements discussed in “Applicable Statutes, Regulations, and Policies,” calculations of acres of sensitive areas or mileage of streams within close proximity of mineable coal is an indication of potential risk from surface runoff from remining operations and roads.

The acreage protected within the designation area and the acreage that could still be potentially impacted from future surface coal mining operations is the same as that under alternative 2 (table 6-12). This alternative would benefit surface water resources inside the designation area as well as the hydrologically connected surface waters outside both the designation area and the evaluation area within the buffer area used to analyze alternatives from potential surface mineable and/or augerable coal resources (tables 6-13 and 6-14). The largest beneficial impacts to surface water resources would be within the South Fork Cumberland and Upper Clinch River watersheds due to the large the number of miles and acreages of sensitive surface water resources protected. Beneficial impacts within the other watersheds would occur on a smaller scale. As described under alternative 2, the potential for adverse impacts resulting from future surface mining operations would be eliminated from the designation area thereby protecting land and headwaters at higher elevations and along ridgelines, resulting in decreases in downstream adverse impacts and an extension of the benefits over a wider area. Alternative 3 provides greater protection to surface waters than the no-action alternative, resulting in overall beneficial impacts compared to the no-action alternative where surface coal mining operations are permitted.

Potential remining and associated reclamation operations could be permitted within a portion of the approximately 12,374 acres of previously mined land (7% of the evaluation area) within the designation area (table 6-12). Potential adverse and beneficial impacts to surface water resources from these operations would be greater in the South Fork Cumberland and Upper Clinch River watersheds because these watersheds have the most sensitive resources located in close proximity to potential surface mineable and/or augerable coal resources (tables 6-13 and 6-14). Remining operations have the potential to temporarily impact surface water resources, resulting in localized short-term adverse impacts. If potential remining occurs within one of the coal seams characterized by higher sulfur content seams (i.e., Big Mary, Jellico, Murray, and Kent), there is a greater potential for adverse impacts resulting from acidic or toxic water conditions. These seams comprise approximately 4,618 acres of previously mined land within the designation area and 2.7% of the evaluation area. However, remining would likely occur on a portion of the average annual acres mined. The adverse impacts from remining would also be avoided or minimized through the implementation of mitigation and best management practices, as described in “General Impacts of Surface Coal Mining in Tennessee on Surface Water.” The result of these measures would be that alterations to water quality and quantity from remining operations would be further localized and on average would be within water quality and quantity narrative and numeric thresholds set by the state or federal government and referred to in the “Applicable, Statues, Regulations, and Policies” section. As part of the remining operation, reclamation would restore previously abandoned mined sites, thereby minimizing or potentially eliminating existing environmental issues such as erosion, acid mine drainage, discharges of sediment and metals, and surface water flow alterations. Therefore, reclamation would result in localized long-term beneficial impacts to surface water resources. Under alternative 3, the short-term adverse impacts from remining operations and the long-term beneficial impacts from associated reclamation would be the same as under the no-action alternative.

Underground and auger mining could occur within the portion of the evaluation area that is outside the designation area (104,809 acres); however adverse impacts could affect surface water quality inside the designation area resulting in potential localized long-term adverse impacts. The potential construction and operation of access and haul roads could be permitted within the designation area, potentially resulting in localized long-term adverse impacts to surface water resources.

## **Cumulative Impacts**

Overall cumulative impacts on surface water resources within the evaluation area would be adverse, as described above for alternative 1. The cumulative actions that have the potential to affect surface water include mining, road construction, timber harvest, oil and gas production, recreation, and development. These activities would continue to result in water quality and quantity degradation over time. Potential remining and associated reclamation efforts accompanying future mining operations would ultimately minimize adverse impacts through implementation of mitigation measures and help to improve water quality and other surface water properties. The impacts of alternative 3, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on surface water resources. However, alternative 3 would not contribute substantially to overall cumulative adverse impacts. Reclamation of lands previously mined prior to the implementation of SMCRA could help offset adverse impacts of cumulative actions and result in long-term benefits.

## **Conclusion**

Alternative 3 would reduce the potential for future adverse impacts from surface coal mining operations to surface water resources especially source water protection and management zones, 303(d) impaired streams, special-status waters, surface water intakes, and headwater streams in the designation area and the larger evaluation area, resulting in widespread long-term beneficial impacts compared to the no-action alternative. Alternative 3 would contribute localized short-term adverse impacts during potential remining operations but would provide long-term beneficial impacts to the designation area due to reclamation activities. However, no new or additional adverse impacts would be expected compared to the no-action alternative. Alternative 3 would not result in significant adverse impacts because violations of applicable water quality regulations are not anticipated due to the very localized scale of adverse impacts from remining operations within the analysis area, compliance with Clean Water Act regulations and SMCRA performance requirements, and from the use of mitigation measures. Implementation of the alternative would contribute water quality benefits and protection to headwater streams.

## **ALTERNATIVE 4: EXPANDED CORRIDOR DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS (PREFERRED ALTERNATIVE)**

The designation of a 1,200-foot corridor centered on 569 miles of ridgelines as unsuitable for surface coal mining would prevent surface coal mining operations, as well as any surface activities or surface impacts incident to underground coal mines on 76,133 acres. Under this alternative, adverse impacts would occur from potential remining and road development inside the designation area and underground and auger mining outside the designation area, as described in “General Impacts of Surface Coal Mining in Tennessee on Surface Water” but more ridgelines and headwater streams would be protected than under any of the other alternatives. Regulatory requirements and permit conditions would reduce but not eliminate adverse effects. Although remining would not occur within 100 feet of streams (except in certain circumstances to restore impaired streams) per requirements discussed in “Applicable Statutes, Regulations, and Policies,” calculations of acres of sensitive areas or mileage of streams within close proximity of mineable coal is an indication of potential risk from surface runoff from remining operations and roads.

Under alternative 4, the designation area, including approximately 24,294 acres of potential surface mineable and/or augerable coal resources (14% of the evaluation area), would be protected from future surface coal mining operations (table 6-15). This would benefit surface water resources inside the designation area as well as the hydrologically connected surface waters outside both the designation area and the evaluation area within the buffer area used to analyze alternatives from potential surface mineable

and/or augerable coal resources (tables 6-16 and 6-17). For the purposes of the GIS-based quantitative analyses, sensitive surface water resources are defined as critical source water protection and source water management zones, currently impaired streams, special-status surface waters, and surface water intakes. According to the analyses, there are approximately 38 miles of surface waters, 133 acres of critical source water protection and 517 acres of source water management zone located within 100 feet of potential surface mineable and/or augerable coal resources the designation area (table 6-16). Outside the evaluation area, there are 0.9 miles of streams within 100 feet of potential surface mineable and/or augerable coal resources. Additionally, there are 481 miles of surface waters, 76 miles of 330(d) impaired streams, 22 miles of special-status surface waters, and two surface water intakes located within the buffer area used to analyze alternatives from potential surface mineable and/or augerable coal resources (table 6-17). It should be noted that there are likely many headwater streams that are not included in the GIS-based calculations because they are not mapped. Therefore, the quantitative analysis most likely does not assess all headwater streams that are present within the area of analysis. The protection provided to these resources would result in beneficial impacts. As with alternatives 2, 3, and 6, the South Fork Cumberland and Upper Clinch River watersheds have the greatest amount of sensitive surface water resources near potential surface mineable and/or augerable coal resources, and therefore would likely have the largest benefits. Beneficial impacts to surface water resources within the other watersheds would occur on a smaller scale.

**TABLE 6-15: EXISTING DISTURBANCE AND POTENTIAL MINING ACREAGES BY SUBWATERSHED UNDER ALTERNATIVE 4**

<b>Watershed</b>	<b>Area Designated (acres)</b>	<b>Previous Mining within the Designated Area Acreage</b>	<b>Previous Mining within the Designated Area % of Evaluation Area</b>	<b>Potential Surface Mineable and/or Augerable Coal Resources within the Designated Area Acreage</b>	<b>Potential Surface Mineable and/or Augerable Coal Resources within the Designated Area % of Evaluation Area</b>
Emory River	9,886	702	0.4	1,547	0.9
Powell River	35	0	0	16	0.01
South Fork Cumberland River	40,944	8,291	4.8	16,715	9.7
Upper Clinch River	11,820	2,018	1.2	3,285	1.9
Upper Cumberland River	13,449	2,433	1.4	2,731	1.6
<b>Total</b>	<b>76,134</b>	<b>13,444</b>	<b>7.8</b>	<b>24,294</b>	<b>14.1</b>

Source: Geospatial Information Data.

The potential for pollution of surface water from mine drainage or alteration of water levels and flow resulting from future surface mining operations or surface disturbance would be eliminated from the designation area. This alternative would protect the largest amount of land and ridgelines and associated headwaters from water quality and quantity degradation. This alternative would prevent associated impacts to larger areas of downslope and downstream surface water. The protection of headwater streams would translate into a decrease in adverse impacts to downstream waters thereby extending the benefits over a wider area. Alternative 4 would have widespread long-term beneficial impacts on surface water resources compared to the no-action alternative where surface coal mining operations are permitted.

**TABLE 6-16: SENSITIVE SURFACE WATER RESOURCES IN CLOSE PROXIMITY TO POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES UNDER ALTERNATIVE 4 (PROTECTED FROM SURFACE MINING)**

Watershed	Surface Waters <sup>a</sup> Inside Designation Area (miles)*	Surface Waters <sup>a</sup> Outside Evaluation Area (miles) <sup>a</sup>	Critical Source Water <sup>a</sup> Protection Zone (acres)	Source Water <sup>a</sup> Management Zone (acres)
Emory River	0.9	0.04	0	0
Powell River	0	0	0	0
South Fork Cumberland River	19	0.5	0	173
Upper Clinch River	5.5	0.3	133	307
Upper Cumberland River	13.6	0.1	0	37
<b>Total</b>	<b>38.1</b>	<b>0.9</b>	<b>133</b>	<b>517</b>

Source: Geospatial Information Data.

\* These values do not include any potentially unmapped headwater streams.

<sup>a</sup> Located less than 100 feet from potential surface mineable or augerable coal resources (protected from surface mining).

**TABLE 6-17: SENSITIVE SURFACE WATER RESOURCES IN CLOSE PROXIMITY TO POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES UNDER ALTERNATIVE 4 (POTENTIALLY AFFECTED BY SURFACE COAL MINING)**

Watershed	Surface Waters* (miles) <sup>a</sup>	303(d) Impaired Surface Waters* (miles)	Special-Status Surface Waters <sup>b</sup> (miles) *	Surface Water* Intakes (#)	Critical Source Water* Protection Zone (acres)	Source Water* Management Zone (acres)
Emory River	0	0	0	0	0	0
Powell River	0	0	0	0	0	0
South Fork Cumberland River	310	51	2	1	1,558	6,612
Upper Clinch River	75	25	0	1	3,613	3,136
Upper Cumberland River	96	0	20	0	0	9
<b>Total</b>	<b>481</b>	<b>76</b>	<b>22</b>	<b>2</b>	<b>5,170</b>	<b>9,758</b>

Source: Geospatial Information Data.

\* Located within the buffer area used to analyze alternatives from potential surface mineable or augerable coal resources (potentially affected by surface coal mining).

<sup>a</sup> These values do not include any potentially unmapped headwater streams.

<sup>b</sup> Nationwide Rivers Inventory.

Potential remining and associated reclamation operations could be permitted within a portion of the approximately 13,444 acres of previously mined land (8% of the evaluation area) within the designation area (table 6-15). Potential adverse and beneficial impacts to surface water resources from these operations would be greater in the South Fork Cumberland and Upper Clinch River watersheds because these watersheds have the most sensitive resources located in close proximity to potential surface mineable and/or augerable coal resources (tables 6-16 and 6-17). The South Fork Cumberland watershed has the largest percentage of previously mined land on which remining operations and adverse impacts could potentially occur. Potential remining operations have the potential to temporarily impact surface

water resources, resulting in localized short-term adverse impacts. If remining occurs within one of the coals seams characterized by higher sulfur content seams (i.e., Big Mary, Jellico, Murray, and Kent), there is a greater potential for adverse impacts resulting from acidic or toxic water conditions. These seams comprise approximately 5,351 acres of previously mined land within the designation area and 3.1% of the evaluation area. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions. Therefore, remining would likely occur on a small portion of the area mined annually. The adverse impacts from remining would also be avoided or minimized through the implementation of mitigation and best management practices. The result of these measures would be that alterations to water quality and quantity from remining operations would be further localized and on average would be within water quality and quantity narrative and numeric thresholds set by the state or federal government and referred to in the “Applicable, Statutes, Regulations, and Policies” section. As part of remining operations, reclamation would restore previously abandoned mined sites, thereby minimizing or potentially eliminating, if possible, existing environmental issues, as described under alternative 3 and the “General Impacts of Surface Coal Mining in Tennessee on Surface Water” section. Therefore, reclamation would result in localized long-term beneficial impacts to surface water resources within a portion of the previously mined area and potential surface mineable and/or augerable coal resources, the largest of which is located within the South Fork Cumberland River watershed. Under alternative 4, the short-term adverse impacts from remining operations and the long-term beneficial impacts from associated reclamation would be the same as under the no-action alternative. However, alternative 4 would designate and protect a larger area than under the other alternatives and would provide greater benefits over the long term.

Underground and auger mining could occur within the portion of the evaluation area that is outside the designation area (96,001 acres); however adverse impacts could affect surface water quality inside the designation area, resulting in potential localized long-term adverse impacts. The construction and operation of access and haul roads would be permitted within the designation area, resulting in localized long-term adverse impacts to surface water resources.

### **Cumulative Impacts**

Overall cumulative impacts on surface water resources within the evaluation area would be adverse, as described above for alternative 1. The cumulative actions that have the potential to affect surface water include mining, road construction, timber harvest, oil and gas production, recreation, and development. These activities would continue to result in water quality and quantity degradation over time. Potential remining and associated reclamation efforts accompanying future mining operations would ultimately minimize adverse impacts through implementation of mitigation measures and help to improve water quality and other surface water properties. The impacts of alternative 4, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on surface water resources. Alternative 4 would not contribute substantially to overall cumulative adverse impacts. Although there may be short-term adverse contributions to cumulative impacts from potential remining, alternative 4 would provide greater benefits over the long term.

### **Conclusion**

Alternative 4 would protect the largest acreage of the action alternatives and would reduce the potential for future adverse impacts from surface coal mining operations to surface water resources, especially source water protection and management zones, 303(d) impaired streams, special-status waters, surface water intakes, and headwater streams in the designation area and the larger evaluation area, resulting in

widespread long-term beneficial impacts compared to the no-action alternative. Alternative 4 would contribute localized short-term adverse impacts during potential remining operations but could provide long-term beneficial impacts to the designation area due to these reclamation activities. However, no new or additional adverse impacts would be expected compared to the no-action alternative. Alternative 4 would not result in significant adverse impacts because violations of applicable water quality regulations are not anticipated due to the very localized scale of adverse impacts from remining operations within the analysis area, compliance with Clean Water Act regulations and SMCRA performance requirements, and the use of mitigation measures. In addition, it could contribute beneficial impacts from reclamation associated with potential remining through the removal of acid mine drainage and sedimentation sources.

### **ALTERNATIVE 5: TARGETED RESOURCE PROTECTION DESIGNATION**

Alternative 5 would designate as unsuitable for surface coal mining 12,331 acres of the NCWMA and ERTCE due to the presence of important public access avenues and sensitive natural resources. This designation would prevent surface coal mining operations, as well as any surface activities or surface impacts incident to underground coal mines on the acreage, resulting in beneficial impacts to surface water resources including headwater streams. There would be no remining permitted under alternative 5, therefore unreclaimed abandoned mines inside the designation area would continue to adversely impact surface water quality and quantity. Underground and auger mining could occur outside the designation area; however actual mining and potential impacts could take place underneath the designation area. Under this alternative, adverse impacts from mining operations located outside the designation area and the continued presence of unreclaimed abandoned mines inside the designation area would occur, as described in “General Impacts of Surface Coal Mining in Tennessee on Surface Water.” Regulatory requirements and permit conditions would reduce but not eliminate adverse effects. Although no mining could occur within 100 feet of streams (except in certain circumstances to restore impaired streams) per requirements discussed in “Applicable Statutes, Regulations, and Policies,” calculations of acres of sensitive surface water areas or mileage of streams within close proximity of mineable coal is an indication of potential risk from surface runoff from mining operations and roads.

Through prevention of surface coal mining, alternative 5 would protect important public access avenues and sensitive natural resources, including reaches of Stinking Creek, Meadow Creek, and Thompson Creek associated with environmentally sensitive wetlands, but the alternative would not protect as many ridgelines as are protected under the other action alternatives. Mining operations would be permitted close to ridgelines and in higher elevation areas. Mining within these areas would result in adverse impacts to surface waters. Under this alternative, the designation area including approximately 5,442 acres of potential surface mineable and/or augerable coal resources (3% of the evaluation area) would be protected from future surface coal mining operations (table 6-18). This would benefit surface water resources inside the designation area as well as the hydrologically connected surface waters outside both the designation area and the evaluation area within the buffer area used to analyze alternatives from potential surface mineable and/or augerable coal resources (tables 6-19 and 6-20). For the purposes of the GIS-based quantitative analyses, sensitive surface water resources are defined as critical source water protection and source water management zones, currently impaired streams, special-status surface waters, and surface water intakes. According to the analyses, there are approximately 6 miles of surface waters, 103 acres of critical source water protection and 139 acres of source water management zone located within 100 feet of potential surface mineable and/or augerable coal resources in the South Fork Cumberland, Upper Clinch, and Upper Cumberland River watersheds within the designation area (table 6-19). Outside the evaluation area, there are 0.02 miles of streams within 100 feet of potential surface mineable and/or augerable coal resources. Additionally, there are 460 miles of surface waters, 76 miles of 330(d) impaired streams, 20 miles of special-status surface waters, and one surface water intake located within the buffer area used to analyze alternatives from potential surface mineable and/or augerable coal resources (table 6-20). It should be noted that there are likely many headwater streams that are not included in the GIS-

based calculations because they are not mapped. Therefore, the quantitative analysis most likely does not assess all headwater streams that are present within the area of analysis. The protection provided to these resources would result in beneficial impacts. The Upper Clinch River watershed has the most potential for adverse effects from mining operations due to the large number of miles and acreages of sensitive surface water resources in close proximity to potential surface mineable and/or augerable coal resources and therefore, the protection provided to surface water resources under this alternative would likely have the largest benefit in this watershed.

The potential for future pollution of surface water resources would be eliminated from the designation area. The direct protection of headwater streams and other surface waters is limited under this alternative. The beneficial impact of this small amount of protection would translate into a slight decrease in adverse impacts to downstream waters thereby extending the benefits over a correspondingly wider area. Although alternative 5 would protect the smallest number of acres, it would nonetheless have limited long-term beneficial impacts on surface water resources compared to the no-action alternative.

Under alternative 5, mining close to ridgelines and the continued presence of unreclaimed mines would result in adverse impacts to surface water resources including headwater streams and the sensitive resources described above. Approximately 2,082 acres of previously mined land (1% of the evaluation area) is located within the designation area. Under this alternative remining and associated reclamation operations would not be permitted within this area (table 6-18). Long-term adverse impacts to the quality and quantity of surface water resources would continue on a portion of this previously mined land within the designation area, especially if the previously mined coal seams are the higher sulfur content seams (i.e., Big Mary, Jellico, Murray, and Kent), which are more likely to result in acid water conditions. These seams comprise approximately 393 acres of previously mined land within the designation area and 0.2% of the evaluation area. The largest potential adverse impacts from unreclaimed mine lands would be in the South Fork Cumberland and Upper Clinch River watersheds because these have the most sensitive surface water resources located in close proximity to potential surface mineable and/or augerable coal resources (tables 6-19 and 6-20). The effects from unreclaimed mines would likely be fairly localized due to the relatively small acreage of previously mined area and potential surface mineable and/or augerable coal resources. Impacts to surface water resources from unreclaimed mines would be long term and adverse compared to the no-action alternative where remining is not prohibited.

**TABLE 6-18: EXISTING DISTURBANCE AND POTENTIAL MINING ACREAGES BY SUBWATERSHED UNDER ALTERNATIVE 5**

Watershed	Area Designated (acres)	Acreage <sup>a</sup>	% of Evaluation Area <sup>a</sup>	Acreage <sup>b</sup>	% of Evaluation Area <sup>b</sup>
Emory River	9	0	0	9	0.01
Powell River	35	0	0	16	0.01
South Fork Cumberland River	5,625	1,189	0.7	3,117	1.8
Upper Clinch River	2,168	438	0.3	996	0.6
Upper Cumberland River	4,494	455	0.3	1,305	0.8
<b>Total</b>	<b>12,332</b>	<b>2,082</b>	<b>1.2</b>	<b>5,442</b>	<b>3.2</b>

Source: Geospatial Information Data.

<sup>a</sup> Previous mining within the designated area.

<sup>b</sup> Potential surface mineable or augerable coal resources within the designated area.

**TABLE 6-19: SENSITIVE SURFACE WATER RESOURCES IN CLOSE PROXIMITY TO POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES UNDER ALTERNATIVE 5 (PROTECTED FROM SURFACE MINING)**

Watershed	Surface Waters <sup>a</sup> Inside Designation Area (miles)*	Surface Waters <sup>a</sup> Outside Evaluation Area (miles)*	Critical Source <sup>a</sup> Water Protection Zone (acres)	Source Water <sup>a</sup> Management Zone (acres)
Emory River	0	0	0	0
Powell River	0	0	0	0
South Fork Cumberland River	1.6	0	0	5
Upper Clinch River	0.5	0.02	103	115
Upper Cumberland River	4.3	0	0	19
<b>Total</b>	<b>6.4</b>	<b>0.02</b>	<b>103</b>	<b>139</b>

Source: Geospatial Information Data.

\* These values do not include any potentially unmapped headwater streams.

<sup>a</sup> Located less than 100 feet from potential surface mineable or augerable coal resources (protected from surface mining).

**TABLE 6-20: SENSITIVE SURFACE WATER RESOURCES IN CLOSE PROXIMITY TO POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES UNDER ALTERNATIVE 5 (POTENTIALLY AFFECTED BY SURFACE COAL MINING)**

Watershed	Surface Waters* (miles) <sup>a</sup>	303(d) Impaired Surface Waters* (miles)	Special-Status Surface Waters <sup>b</sup> (miles)	Surface Water* Intakes (#)	Critical Source Water* Protection Zone (acres)	Source Water* Management Zone (acres)
Emory River	0	0	0	0	0	0
Powell River	0	0	0	0	0	0
South Fork Cumberland River	295	51	0	0	43	6,463
Upper Clinch River	75	25	0	1	3,613	3,136
Upper Cumberland River	90	0	20	0	0	9
<b>Total</b>	<b>460</b>	<b>76</b>	<b>20</b>	<b>1</b>	<b>3,656</b>	<b>9,608</b>

Source: Geospatial Information Data.

\* Located within the buffer area used to analyze alternatives from potential surface mineable or augerable coal resources (potentially affected by surface coal mining).

<sup>a</sup> These values do not include any potentially unmapped headwater streams.

<sup>b</sup> Nationwide Rivers Inventory.

Underground and auger mining could occur within the portion of the evaluation area that is outside the designation area (159,804 acres); however adverse impacts could affect surface water quality inside the designation area resulting in potential localized long-term adverse impacts. The construction and operation of access and haul roads would be prohibited within the designation area, therefore direct adverse impacts to surface water resources from roads would not occur within the designation area. However, access and haul roads would be permitted within the larger evaluation area including areas that are at higher elevations than the designation area. Therefore, impacts to water quality and quantity could travel downgradient into surface waters within the designation area, resulting in localized long-term adverse impacts to surface water resources.

## Cumulative Impacts

Overall cumulative impacts on surface water resources within the evaluation area would be adverse, as described above for alternative 1. The cumulative actions that have the potential to affect surface water include mining, road construction, timber harvest, oil and gas production, recreation, and development. These activities would continue to result in water quality and quantity degradation over time although implementation of mitigation measures would minimize potential adverse impacts and help to improve water quality and other surface water properties. The impacts of alternative 5, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on geologic resources. Alternative 5 would provide the least benefit to overall cumulative impacts compared to the no-action alternative and the other action alternatives because it results in the least area designated, even though alternative 5 would specifically designate areas associated with aquatic species.

## Conclusion

Alternative 5 and the protection it provides would preclude surface coal mining and reduce the overall adverse impacts from potential future mining on both the designation area and the surrounding evaluation area. Although this alternative protects sensitive public resources including reaches of Stinking Creek and Thompson Creek, the small scope of the designation area and the protection of fewer sensitive surface water resources especially source water protection and management zones, 303(d) impaired streams, special-status waters, surface water intakes, and headwater streams would result in localized and relatively limited long-term beneficial impacts compared to the no-action alternative. The continued existence of unreclaimed previously mined land would result in continued localized long-term adverse impacts similar to the no-action alternative. No new or additional adverse impacts would be expected compared to the no-action alternative. Because alternative 5 would preclude surface coal mining and reduce the overall adverse impacts from potential future mining on both the designation area and the larger evaluation area, alternative 5 would result in localized long-term beneficial impacts compared to the no-action alternative. Alternative 5 would not result in significant adverse impacts because violations of applicable water quality regulations are not anticipated due to the very localized scale of adverse impacts from unreclaimed mines within the designation area, compliance with Clean Water Act regulations and SMCRA performance requirements, and from the use of mitigation measures.

## ALTERNATIVE 6: REDUCED CORRIDOR DESIGNATION

The designation of a 600-foot corridor centered on 505 miles of ridgelines as unsuitable for surface coal mining would prevent surface coal mining operations, as well as any surface activities or surface impacts incident to underground coal mines on 35,592 acres. This area would be protected from potential adverse impacts from surface coal mining or re-mining operations, resulting in beneficial impacts on surface water resources including headwater streams. However, alternative 6 would prohibit re-mining, and therefore unreclaimed abandoned mines inside the designation area would continue to adversely impact surface water quality and quantity. Underground and auger mining could occur outside the designation area; however actual mining could take place underneath the designation area with potential surface water quality impacts. Under this alternative, adverse impacts from mining operations located outside the designation area and the continued presence of unreclaimed mines inside the designation area would occur, as described in “General Impacts of Surface Coal Mining in Tennessee on Surface Water.” Regulatory requirements and permit conditions would reduce but not eliminate adverse effects. Although no mining could occur within 100 feet of streams (except in certain circumstances to restore impaired streams) per requirements discussed in “Applicable Statutes, Regulations, and Policies,” calculations of acres of sensitive areas or mileage of streams within close proximity of mineable coal is an indication of potential risk from surface runoff from mining operations and roads.

Under alternative 6, the designation area including approximately 12,217 acres of potential surface mineable and/or augerable coal resources (7% of the evaluation area) would be protected from future surface coal mining operations (table 6-21). This would benefit surface water resources inside the designation area as well as the hydrologically connected surface waters outside both the designation area and the evaluation area within the buffer area used to analyze alternatives from potential surface mineable and/or augerable coal resources (tables 6-22 and 6-23). For the purposes of the GIS-based quantitative analyses, sensitive surface water resources are defined as critical source water protection and source water management zones, currently impaired streams, special-status surface waters, and surface water intakes. According to the analyses, there are approximately 11 miles of surface waters, 70 acres of critical source water protection and 293 acres of source water management zone located within 100 feet of potential surface mineable and/or augerable coal resources within the designation area (table 6-22). Outside the evaluation area, there are 0.2 miles of streams within 100 feet of potential surface mineable and/or augerable coal resources. Additionally, there are 479 miles of surface waters, 76 miles of 330(d) impaired streams, 22 miles of special-status surface waters, and two surface water intakes located within the buffer area used to analyze alternatives from potential surface mineable and/or augerable coal resources (table 6-23). It should be noted that there are likely many headwater streams that are not included in the GIS-based calculations because they are not mapped. Therefore, the quantitative analysis most likely does not assess all headwater streams that are present within the area of analysis. The protection provided to these resources would result in beneficial impacts. Similar to alternative 2, this alternative would likely have the largest benefit in the South Fork Cumberland and Upper Clinch River watersheds due to the large number of miles and acreages of sensitive surface water resources in close proximity to potential surface mineable and/or augerable coal resources. The beneficial impacts within the Upper Cumberland River watershed would occur on a smaller scale.

The potential for pollution of surface water from mine drainage or alteration of water levels and flow resulting from surface mining operations or surface disturbance would be eliminated from the designation area. The designation of areas at higher elevations and along ridgelines would help to protect ecologically important headwaters, as described in “General Impacts of Surface Coal Mining in Tennessee on Surface Water.” The protection of headwater streams would translate into a decrease in adverse impacts to downstream waters thereby extending the benefits over a wider area. Alternative 6 would have long-term beneficial impacts on surface water resources compared to the no-action alternative where mining operations and road development are permitted.

**TABLE 6-21: EXISTING DISTURBANCE AND POTENTIAL MINING ACREAGES BY SUBWATERSHED UNDER ALTERNATIVE 6**

Watershed	Area Designated (acres)	Acreage <sup>a</sup>	% of Evaluation Area <sup>a</sup>	Acreage <sup>b</sup>	% of Evaluation Area <sup>b</sup>
Emory River	5,234	354	0.2	790	0.5
Powell River	0	0	0	0	0
South Fork Cumberland River	18,725	4,061	2.4	8,427	4.9
Upper Clinch River	5,336	1,096	0.6	1,730	1.0
Upper Cumberland River	6,297	1,278	0.7	1,271	0.7
<b>Total</b>	<b>35,592</b>	<b>6,789</b>	<b>3.9</b>	<b>12,217</b>	<b>7.1</b>

Source: Geospatial Information Data.

<sup>a</sup> Previous mining within the designated area.

<sup>b</sup> Potential surface mineable or augerable coal resources within the designated area.

**TABLE 6-22: SENSITIVE SURFACE WATER RESOURCES IN CLOSE PROXIMITY TO POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES UNDER ALTERNATIVE 6 (PROTECTED FROM SURFACE MINING)**

Watershed	Surface Waters <sup>a</sup> Inside Designation Area (miles)*	Surface Waters <sup>a</sup> Outside Evaluation Area (miles)*	Critical Source Water <sup>a</sup> Protection Zone (acres)	Source Water <sup>a</sup> Management Zone (acres)
Emory River	0.2	0	0	0
Powell River	0	0	0	0
South Fork Cumberland River	5.5	0.1	0	101
Upper Clinch River	1.6	0.1	70	180
Upper Cumberland River	3.9	0.02	0	12
<b>Total</b>	<b>11.2</b>	<b>0.2</b>	<b>70</b>	<b>293</b>

Source: Geospatial Information Data.

\* These values do not include any potentially unmapped headwater streams.

<sup>a</sup> Located less than 100 feet from potential surface mineable or augerable coal resources (protected from surface mining).

**TABLE 6-23: SENSITIVE SURFACE WATER RESOURCES IN CLOSE PROXIMITY TO POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES UNDER ALTERNATIVE 6 (POTENTIALLY AFFECTED BY SURFACE COAL MINING)**

Watershed	Surface Waters* (miles) <sup>a</sup>	303(d) Impaired Surface Waters* (miles)	Special-Status Surface Waters <sup>b</sup> (miles) *	Surface Water* Intakes (#)	Critical Source Water* Protection Zone (acres)	Source Water* Management Zone (acres)
Emory River	0	0	0	0	0	0
Powell River	0	0	0	0	0	0
South Fork Cumberland River	308	51	2	1	1,426	6,612
Upper Clinch River	75	25	0	1	3,613	3,136
Upper Cumberland River	96	0	20	0	0	9
<b>Total</b>	<b>479</b>	<b>76</b>	<b>22</b>	<b>2</b>	<b>5,038</b>	<b>9,758</b>

Source: Geospatial Information Data.

\* Located within the buffer area used to analyze alternatives from potential surface mineable or augerable coal resources (potentially affected by surface coal mining).

<sup>a</sup> These values do not include any potentially unmapped headwater streams.

<sup>b</sup> Nationwide Rivers Inventory.

Approximately 6,789 acres of previously mined land (4% of the evaluation area) is located within the designation area. Under this alternative remining and associated reclamation operations would not be permitted (table 6-21). Long-term adverse impacts to the quality and quantity of surface water resources would continue on a portion of this previously mined land within the designation area, especially if the previously mined coal seams are the higher sulfur content seams (i.e., Big Mary, Jellico, Murray, and Kent), which are more likely to result in acid water conditions. These seams comprise approximately 2,315 acres of previously mined land within the designation area and 1.3% of the evaluation area. Potential adverse impacts to surface water resources from the unreclaimed land would be greater in the South Fork Cumberland and Upper Clinch River watersheds because these watersheds have the most

sensitive resources located in close proximity to potential surface mineable and/or augerable coal resources (tables 6-22 and 6-23). Adverse impacts from unreclaimed mines would likely be minimal in the other watersheds. The effects from unreclaimed mines would be likely be fairly localized within each watershed although within the South Fork Cumberland watershed these impacts would occur over a larger area compared to the other watersheds. Impacts to surface water resources from the continued presence of unreclaimed mines would be localized, long term, and adverse compared to the no-action alternative where remining is not prohibited.

Underground and auger mining could occur within the portion of the evaluation area that is outside the designation area (136,543 acres); however adverse impacts could affect surface water quality inside the designation area resulting in potential localized long-term adverse impacts. The construction and operation of access and haul roads would be prohibited within the designation area, therefore adverse impacts to surface water resources from roads would not occur.

### **Cumulative Impacts**

Overall cumulative impacts on surface water resources within the evaluation area would be adverse, as described above for alternative 1. The cumulative actions that have the potential to affect surface water include mining, road construction, timber harvest, oil and gas production, recreation, and development. These activities would continue to result in water quality and quantity degradation over time although implementation of mitigation measures would minimize potential adverse impacts and help to improve water quality and other surface water properties. The impacts of alternative 6, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on surface water resources. Alternative 6 would have similar impacts as alternative 2 and would not contribute substantially to overall cumulative impacts, although it would provide long-term benefits that could help offset some adverse impacts.

### **Conclusion**

Alternative 6 would reduce the potential for future adverse impacts from surface coal mining operations to surface water resources, especially source water protection and management zones, 303(d) impaired streams, special-status waters, surface water intakes, and headwater streams, in the designation area and surrounding the evaluation area, resulting in widespread long-term beneficial impacts compared to the no-action alternative. The continued existence of unreclaimed previously mined land would result in localized long-term adverse impacts similar to the no-action alternative. However, no new or additional adverse impacts would be expected compared to the no-action alternative. Violations of applicable water quality regulations are not anticipated due to the very localized scale of adverse impacts from unreclaimed mines within the designation area, compliance with Clean Water Act regulations and SMCRA performance requirements, and from the use of mitigation measures. Additionally, the protection of headwaters would provide benefits. Therefore, alternative 6 would not result in significant adverse impacts.

## **IMPACTS OF THE ALTERNATIVES ON GROUNDWATER**

### **METHODS FOR ANALYSIS**

#### **Applicable Statutes, Regulations, and Policies**

The SMCRA, Clean Water Act, and Tennessee Water Quality Control Act of 1977 described within “Impacts of the Alternatives on Surface Water” also pertain to groundwater resources. The main

provisions include performance requirements set forth on 30 CFR part 816 and include establishing baseline conditions and monitoring. The applicant is required to develop the probable hydrologic consequences and the hydrologic reclamation plan to estimate and address hydrologic impacts from the operation. The regulatory authority will develop a cumulative hydrologic impact analysis to include the entire hydrologic system – both surface water and groundwater (30 CFR § 780.21). Additionally, TDEC Rule 1200-04-03 provides water quality standards and use classifications to protect the groundwater resources. Specifically, TDEC Rules 0400-40-03-.07 through 0400-40-03-.10 apply to groundwater including specifying characteristics of impaired or unusable groundwater and associated remediation.

### **Assumptions and Methodology**

Data sources used in the analysis of impacts on groundwater resources are the same as those described within “Impacts of the Alternatives on Surface Water.”

The methodology used to analyze impacts on groundwater resources is the same as that described within “Impacts of the Alternatives on Surface Water.” However, the focus of the GIS-based quantitative analyses was slightly different so as to capture groundwater impacts. As with the surface water analyses, the groundwater analyses included both potential surface mineable coal resources and potential augerable coal resources as described in chapter 5. The analyses did not consider the commercial viability of the coal resources. Therefore, for each alternative and subwatershed, these analyses looked at one or more of the following indicators:

- Number of private drinking supply wells and springs located less than 750 feet from potential surface mineable and/or augerable coal resources
- Acreage of wellhead protection zones located within potential surface mineable and/or augerable coal resources.

It is assumed that the greater groundwater impacts would occur closer to active or unreclaimed mining areas. The source of the 750 foot buffer distance applied to private wells within the analyses was Paybins and others (2000) and the description of the TDEC wellhead protection Zone 1. Paybins and others (2000) reported that pollutants were observed as far as 2,000 feet away from mined sites. However, the pollutant concentrations in Paybins et al. (2000) that were above the water quality guidelines, and therefore prohibited under state and federal regulations, typically occurred closer to the mined sites, not at a 2,000-foot distance. The Tennessee Source Water Protection Program under the 1996 Safe Drinking Water Act protects public water systems. Under this program, a wellhead protection zone is a protection area for public water systems using groundwater. This zone is based on hydrogeologic considerations, modeling, or a fixed radius around a well (TDEC 2003). Typically, the delineation of a wellhead management zone (Zone 2) requires field measurement and knowledge of specific hydrogeologic conditions such as groundwater flow direction and recharge as well as production data for each well. The wellhead protection zone acreage was provided through GIS data. The wellhead protection zone (Zone 1) is designated in TDEC Rule 0400-45-01-.34 as a fixed radius ranging from 250 feet for smaller public water systems with fewer connections and limited average daily production to 750 feet for larger public water systems with more connections and average daily production. The assumption was made that protection zones for public water systems would also be applicable to private wells. Therefore, because the available well and hydrogeologic data was limited, the 750 foot radius was used in the quantitative analyses to assess the potential mineable area around private wells.

## **Area of Analysis**

The limits of the potential area affected for groundwater resources includes the petition area or designation area of each alternative proposed, the evaluation area, and land within a certain distance of an active mine. Sources have observed that mining impacts on groundwaters can be some distance from mined sites however the pollutant concentrations are typically above drinking water guidelines closer to the site (McAuley and Kozar 2006; Paybins et al. 2000; Rauch 1980). The most conservative of these is a 750 foot buffer around wells and springs. Therefore, for groundwater impacts, the area of analysis includes the entire evaluation area, as well as areas within 750 feet of the evaluation area boundary.

## **GENERAL IMPACT OF COAL MINING IN TENNESSEE ON GROUNDWATER**

### **Groundwater Effects**

#### **Chemical Effects on Groundwater**

Mining can have similar chemical effects on groundwater as those discussed previously for surface water. A US Geological Survey study (Paybins et al. 2000) investigating groundwater water quality downgradient of reclaimed surface coal mine showed lowered pH and increased sulfate concentrations at sampling locations affected by mining. The same study showed higher sulfate concentrations in groundwater in shallow wells within 1,000 feet of reclaimed surface mines. This study also documented iron, manganese, and aluminum concentrations that were elevated above background concentrations within about 2,000 feet of reclaimed surface mines (Paybins et al. 2000). Another US Geological Survey study focusing on groundwater resources in the Allegheny and Monongahela River Basins found groundwater in shallow private domestic wells near reclaimed surface coal mines had higher concentrations, compared to unmined areas, of sulfate, iron, and manganese, even after all mining and reclamation had been completed (Anderson et al. 2000).

#### **Physical Effects on Groundwater**

Mining activities can affect both the quantity and direction of groundwater flow. Water infiltration contributes to groundwater, and coal mining and reclamation activities can change overland flow and the amount of water that infiltrates the surface to ultimately recharge the groundwater system. Subsidence due to underground mining impacts the direction of groundwater flow as well, because it changes the contour and infiltration capacity of the overlying surface (discussed in greater detail in the next section). According to the US Geological Survey Groundwater Atlas of the United States, HA 730-L (Trapp and Horn 1997):

“Underground mining of coal disturbs the natural groundwater flow system when the mines are active because artificial drains are constructed to dispose of unwanted water and mining activities can create new fractures and thus increase permeability. The regional water table can be lowered when the drains are effective and groundwater flow directions can be changed in some cases until flow moves across former groundwater divides into adjoining basins. Groundwater tends to flow toward mines, which are usually dewatered by pumping. Adverse effects of mine drainage on well yields are greatest where the mines are not much deeper than the bottoms of the wells and where vertical fractures connect the aquifers and the mines.”

Overburden removal and coal excavation to a depth below the groundwater table is commonly done during mining and results in a new hydraulic gradient (resulting in changes to direction of the groundwater flow). Although intact portions of the aquifer(s) may still exist beyond the extent of the coal removal area, water availability from within these aquifers will generally be reduced as the water flows

towards the active pit in response to a lowering of hydraulic head values. As a result, water levels in existing wells installed in these aquifers are lowered, reducing the amount of water available for use (e.g., as drinking water) and the amount of water discharged downstream as baseflow.

Mines and preparation facilities may also need to use groundwater resources for their operations. Some mines must continuously pump water from the mine to facilitate mining operations. The interception of groundwater and continuous mine pumping lowers the surrounding groundwater table. The lowered groundwater table may affect springs, streams, or users of groundwater resources. In doing so, water levels in affected aquifers may be significantly lowered over long periods of time (OSMRE 2007). These levels may recover over time once mining and reclamation activities are complete and the mine pits fill, saturating the backfilled spoil material.

Wells can also be affected when streams find a new course underground via fractures. Streams that disappear into underground mine voids form mine pools, which are an underground accumulation of water where the water fills a void left after coal has been removed. Flooded mines can then induce artesian conditions where water from the flooded mine is higher (but still subsurface) than the surrounding materials that wells are drawing water from, creating a pressure situation where the water will be forced vertically upward in the well. This effect was seen at Spruce Laurel Fork, a perennial stream in Boone County, West Virginia, which was adversely affected by both pre- and post-SMCRA underground mining operations, resulting in the formation of a mine pool. Downstream artesian effects on residential wells then occurred when pumping did not control the mine pool level (Galya 2008).

It is assumed that the Tennessee Valley Divide, which separates the Emory River from other watersheds, would also act as a groundwater divide.

### **Subsidence and Effects on Surface Water and Groundwater**

Underground mining can have significant impacts upon surface waters and groundwater due to subsidence (downward vertical movement of the overlying land surface from the removal of underlying strata). Operators and the regulatory authority assess the potential for the mining to cause material damage to the hydrologic balance outside the permit boundary via the probable hydrologic consequences report and the cumulative hydraulic impact assessment report, respectively. The regulatory authority must determine that the planned subsidence within the permit boundary would not cause material damage to the hydrologic balance outside the permit boundary before issuing the permit. However, it is common for subsidence within the permit area to adversely affect the surface water and groundwater outside the permit boundary. Although, the probable hydrologic consequences and cumulative hydraulic impact assessment reports often do not indicate that material damage of the hydrologic balance outside the permit boundary would occur, it frequently happens. OSMRE believes this likely is due to a lack of comprehensive baseline information on the geology and hydrology of the area used in the probable hydrologic consequences and cumulative hydraulic impact assessment to predict the consequences of underground mining within and outside the permit boundary and sometimes unforeseen consequences.

With respect to surface hydrology, the major concern associated with subsidence is that it changes the shape of the overlying surface with commensurate impacts on surface water flow and drainage. With respect to groundwater, the most common problem is dewatering aquifers above the mined out coal seam, which most often affects the hydrologic balance outside the permit boundary by adversely impacting baseflow to intermittent and perennial streams. In addition, subsidence within the permit boundary can impact water-quality of the groundwater providing baseflow to the streams outside the permit boundary.

Several studies have documented subsidence-related impacts to hydrologic systems that continue to occur under existing regulations. These studies are summarized below.

Subsidence from longwall mining continues to affect base flow in affected streams, despite the requirements contained in the current regulations. Carver and Rauch (1994) reported the following findings from a study looking at West Virginia streams affected by subsidence associated with longwall mining:

Subsidence from longwall mining typically reduced stream discharge for two to three years. Panels positioned beneath upland catchment areas and not under streams caused no apparent stream dewatering... Monitored stream reaches within the angle of draw zone of an adjacent panel did not normally become dewatered for panels older than 2.3 years. However, stream reaches in basins less than 200 acres in size often experienced dewatering for up to 3.1 years after undermining... After two to three years since mine subsidence occurred recovered streams displayed lower high base flow and higher low base flow discharge, or more uniform base-flow discharge, compared to unsubsided streams...

Subsidence impacts to hydrology are continuing to occur in other regions as well. The US Geological Survey conducted several studies describing the effects of longwall mining in Carbon and Emery Counties, Utah. The initial study reported that subsidence had impacted the hydrologic system by loss of flow in reaches of perennial streams, and had increased dissolved solids content in streams and dewatering of the aquifer above the mine workings (Slaughter et al. 1995). The initial study also reported that there was not a clear relationship between mining subsidence and spring discharge. The follow-up study reported on hydrologic and water quality conditions thirteen years after longwall mining (Wilkowske et al. 2007). This study concluded that some of the previously reported impacts still remain, while others appear to have lessened. The persistent effects include increases in the dissolved solids and sulfate content in water samples, increased base flow, and a significant increase in spring discharge.

Figures 6-12, 6-13, 6-14, 6-15, and 6-16 show impacts of the alternatives to groundwater resources close to potential surface minable and/or augerable coal resources. The summary tables and figures are followed by alternative-specific analyses.

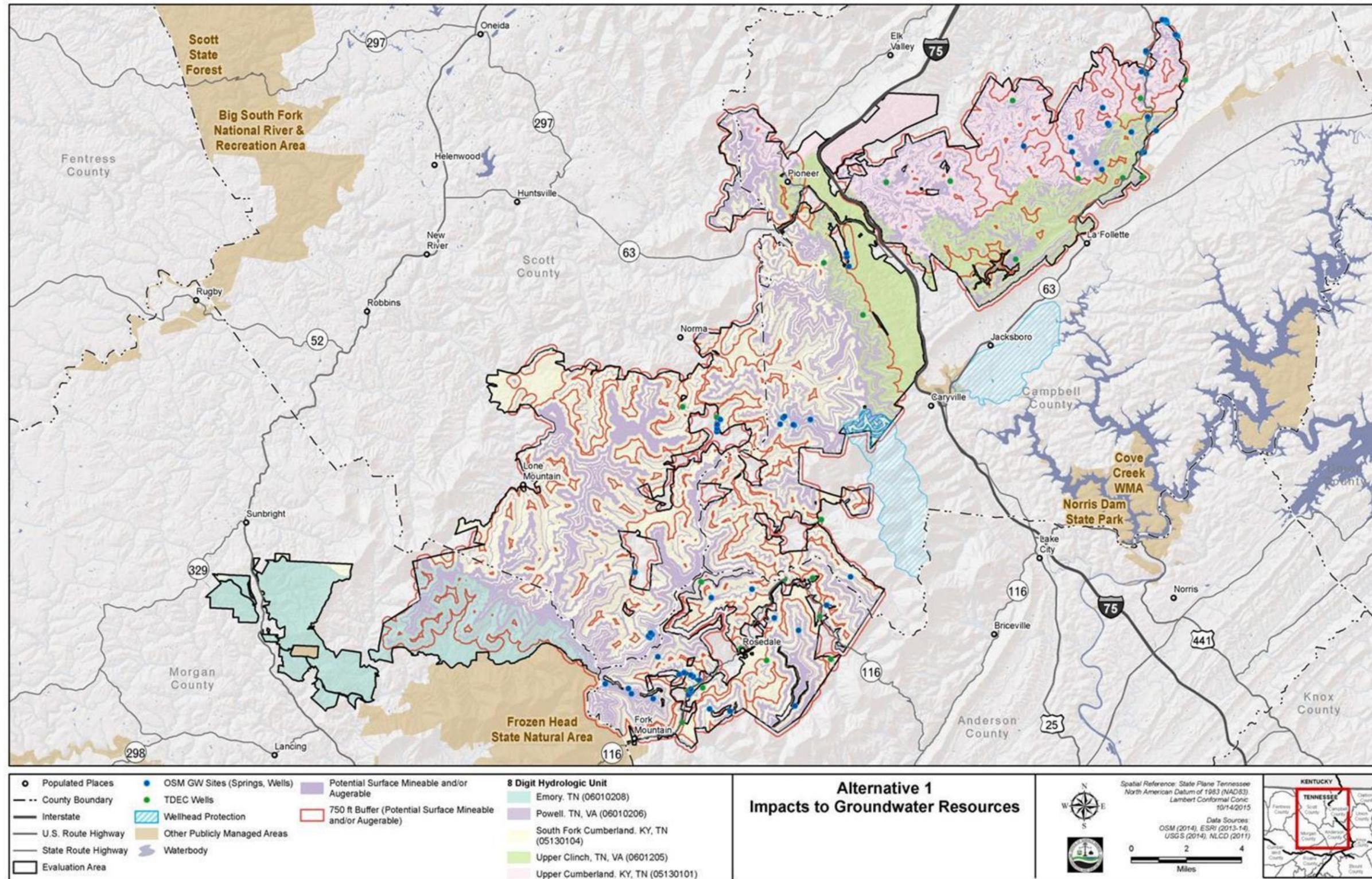


FIGURE 6-12: ALTERNATIVE 1 IMPACTS TO GROUNDWATER RESOURCES

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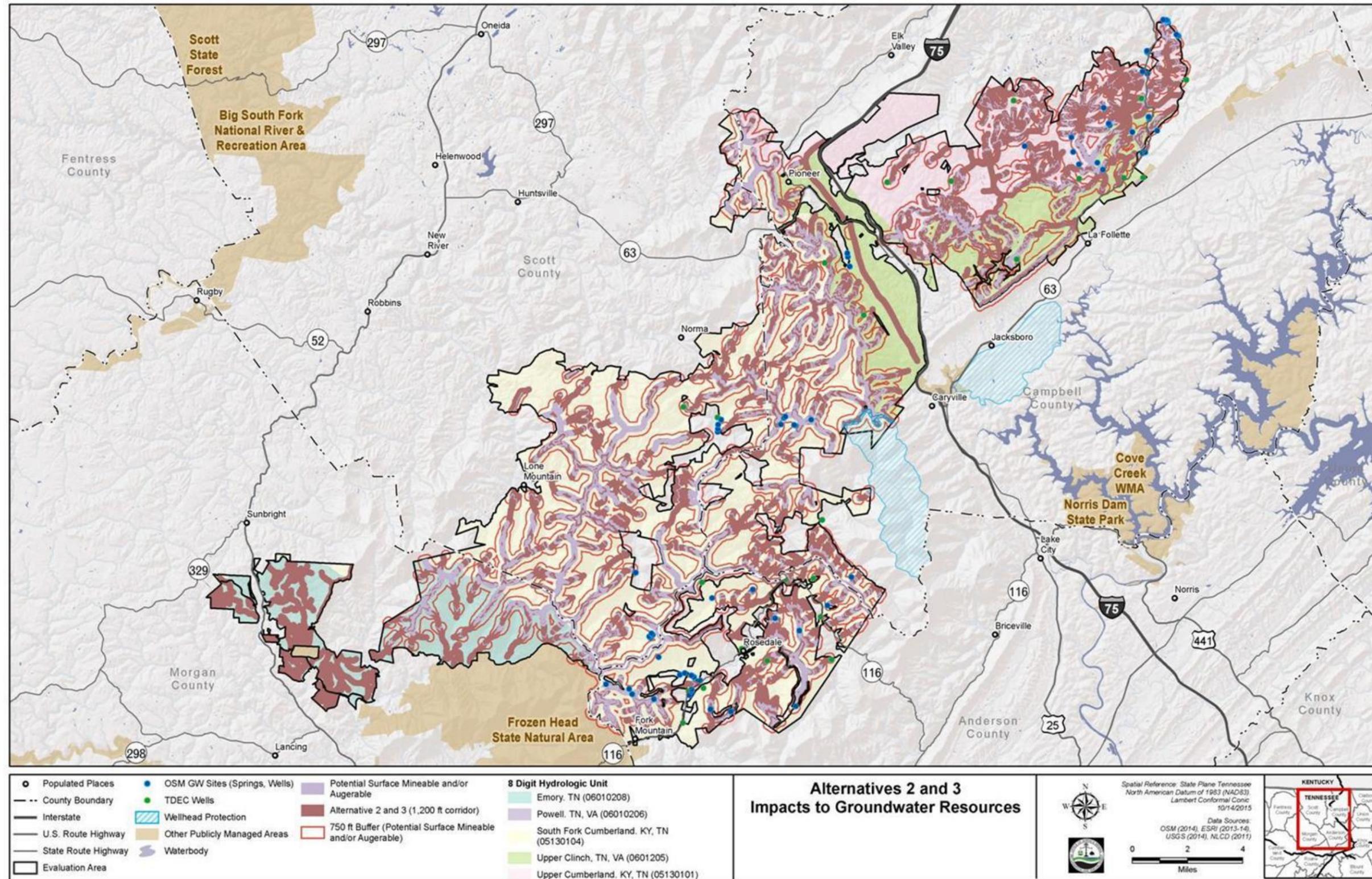


FIGURE 6-13: ALTERNATIVES 2 AND 3 IMPACTS TO GROUNDWATER RESOURCES

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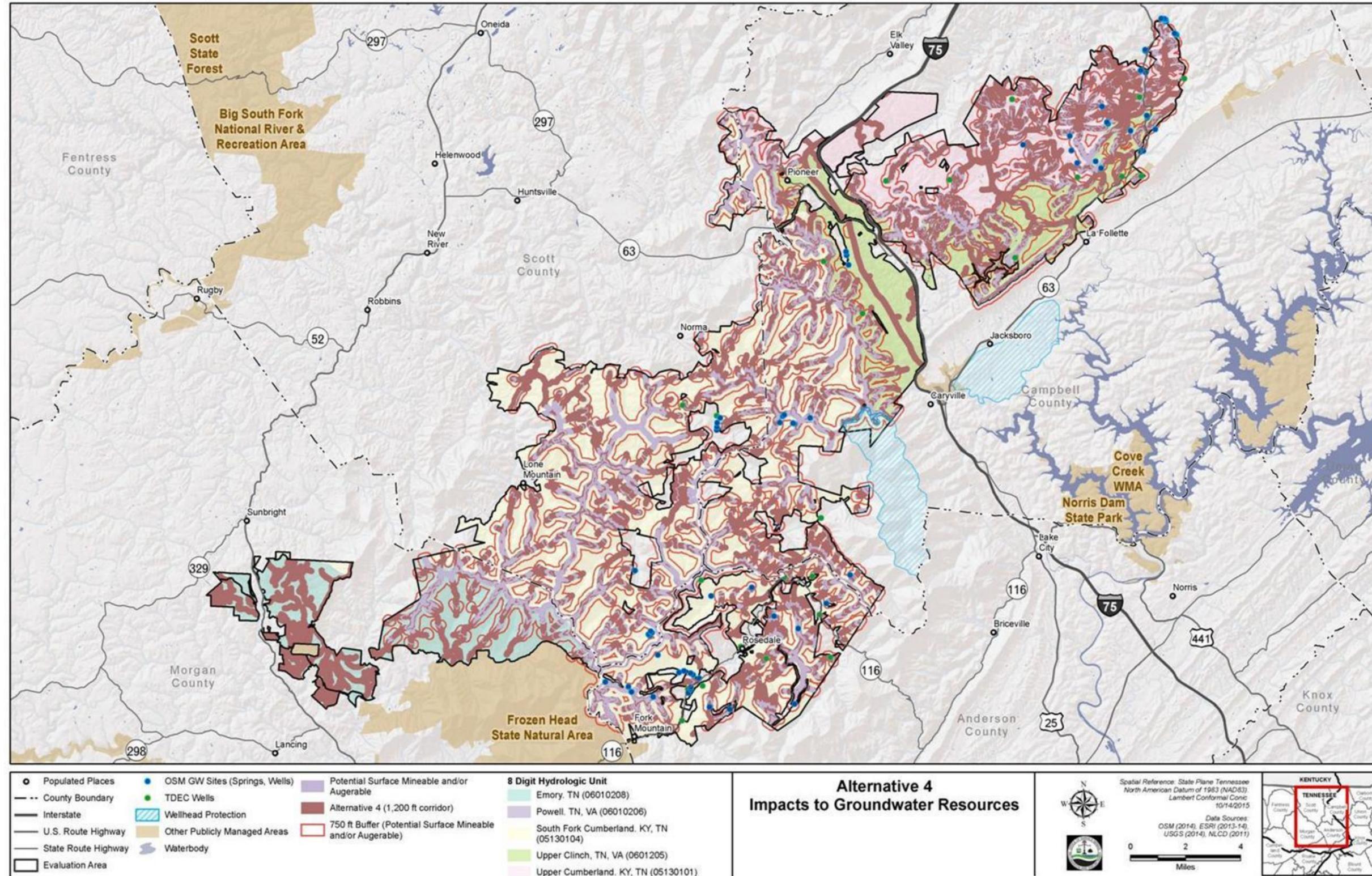


FIGURE 6-14: ALTERNATIVE 4 IMPACTS TO GROUNDWATER RESOURCES

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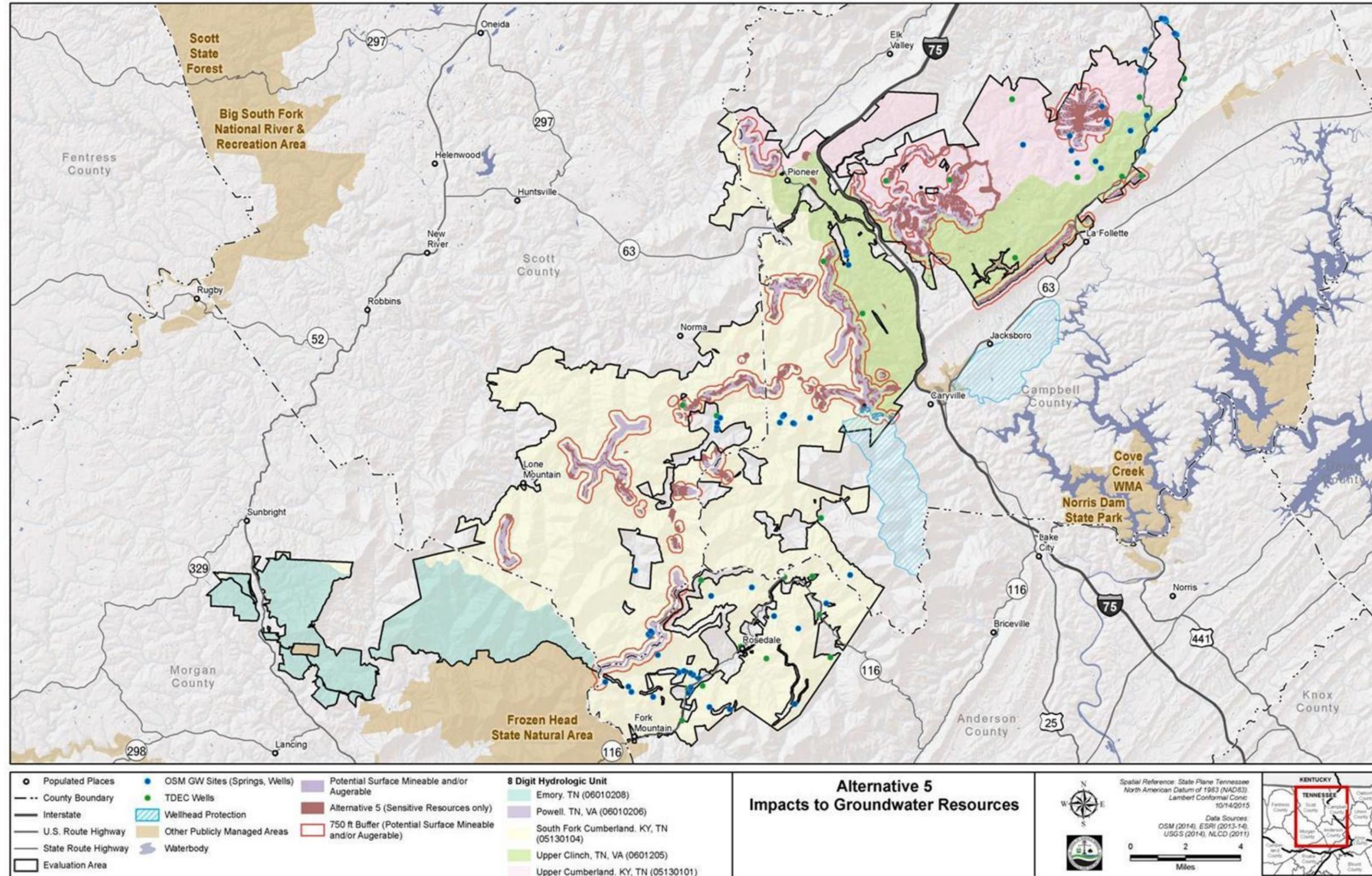


FIGURE 6-15: ALTERNATIVE 5 IMPACTS TO GROUNDWATER RESOURCES

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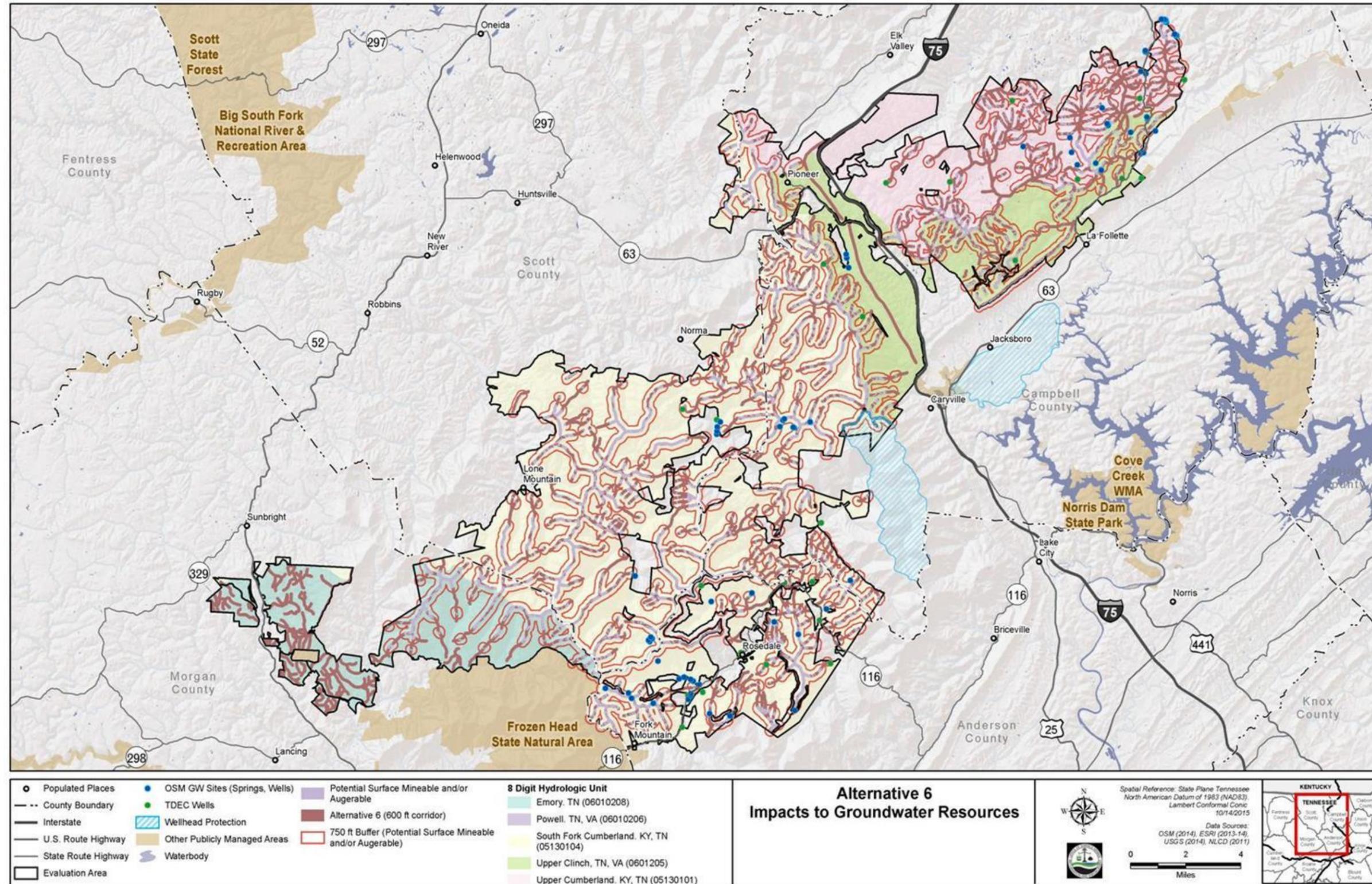


FIGURE 6-16: ALTERNATIVE 6 IMPACTS TO GROUNDWATER RESOURCES

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## **ALTERNATIVE 1: NO-ACTION ALTERNATIVE**

Under the no-action alternative, no areas would be designated as unsuitable for surface coal mining, and surface coal mining operations would continue to be authorized within the approximately 172,000-acre evaluation area. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions. Surface, underground, and auger mining and re-mining operations would be permitted on all land including ridgelines except within 100 feet of streams (except in certain circumstances to restore impaired streams) and other areas, as described under “Applicable Statutes, Regulations, and Policies.” Calculations of numbers or acreage of sensitive groundwater resources within or in close proximity of mineable coal, as described in the “Assumptions and Methodology” section, is an indication of potential risk from mining operations. Adverse impacts to groundwater resources including wells and wellhead protection areas are expected, as described in “General Impacts of Surface Coal Mining in Tennessee on Groundwater.” These include contamination of groundwater from mine discharge and polluted surface runoff and alterations to groundwater levels and flow during the period of mining until the area is reclaimed. Regulatory requirements and permit conditions would reduce but not eliminate adverse effects.

Under the no-action alternative, the evaluation area including approximately 44,856 acres (26% of the evaluation area) of potential surface mineable and/or augerable coal resources would potentially be affected by future surface coal mining operations (table 6-9). For the purposes of the GIS-based quantitative analyses, sensitive groundwater resources are defined as wells and wellhead protection areas. According to the analyses, there are 48 private wells and 377 acres of wellhead protection zone located within or in close proximity to potential surface mineable and/or augerable coal resources within the evaluation area (table 6-24). Mining operations could result in adverse impacts on these groundwater resources that are in close proximity to the potential surface mineable and/or augerable coal resources, especially if these locations include high sulfur content seams (i.e., Big Mary, Jellico, Murray, and Kent), which are more likely to result in acid water conditions. These seams comprise approximately 18,382 acres (11% of the evaluation area) of potential surface mineable and/or augerable coal resources within the evaluation area. The South Fork Cumberland watershed has the most potential for adverse effects from mining operations due to the large numbers and acres of sensitive groundwater resources (table 6-25) in close proximity to potential surface mineable and/or augerable coal resources. There would also be adverse impacts to groundwater resources within the Upper Clinch and Upper Cumberland River watersheds, although on a smaller scale than within the South Fork Cumberland watershed. The Powell River watershed has no sensitive groundwater resources that are close to potential surface mineable and/or augerable coal resources, therefore the adverse impacts from the mining operations would likely be smaller than those in the other watersheds. No surface, underground, or auger mining or re-mining would take place within the Emory River watershed. Therefore, there would be little to no impacts to groundwater resources compared to existing conditions. Adverse impacts to groundwater within the Emory River watershed could result from mining operations located within another watershed, although the chance of this occurring would be unlikely given the geography of the area—the Tennessee Valley Divide separates the Emory River watershed from other watersheds in the evaluation area.

**TABLE 6-24: SENSITIVE GROUNDWATER RESOURCES IN CLOSE PROXIMITY TO POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES UNDER ALTERNATIVE 1**

<b>Watershed</b>	<b>Number of Wells* (within 750 Feet of Potential Surface Mineable and/or Augerable Coal Resources)</b>	<b>Wellhead Protection Zone Acres (within Potential Surface Mineable and/or Augerable Coal Resources)</b>
Emory River	0	0
Powell River	2	0
South Fork Cumberland River	27	341
Upper Clinch River	5	36
Upper Cumberland River	14	0
<b>Total</b>	<b>48</b>	<b>377</b>

Source: Geospatial Information Data.

\* Privately owned wells used for drinking water and other uses.

**TABLE 6-25: SENSITIVE GROUNDWATER RESOURCES IN CLOSE PROXIMITY TO POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES UNDER ALL ALTERNATIVES**

<b>Watershed</b>	<b>Alternative 1<sup>a,*</sup></b>	<b>Alternative 2/3<sup>b,*</sup></b>	<b>Alternative 4<sup>b,*</sup></b>	<b>Alternative 5<sup>b,*</sup></b>	<b>Alternative 6<sup>b,*</sup></b>
Emory River	0	0	0	0	0
Powell River	2	0	2	2	0
South Fork Cumberland River	27	11	11	2	11
Upper Clinch River	5	3	3	0	2
Upper Cumberland River	14	6	6	3	3
<b>Total</b>	<b>48</b>	<b>20</b>	<b>22</b>	<b>7</b>	<b>16</b>
<b>Watershed</b>	<b>Alternative 1<sup>a,**</sup></b>	<b>Alternative 2/3<sup>b,**</sup></b>	<b>Alternative 4<sup>b,**</sup></b>	<b>Alternative 5<sup>b,**</sup></b>	<b>Alternative 6<sup>b,**</sup></b>
Emory River	0	0	0	0	0
Powell River	0	0	0	0	0
South Fork Cumberland River	341	110	110	31	36
Upper Clinch River	36	36	36	28	28
Upper Cumberland River	0	0	0	0	0
<b>Total</b>	<b>377</b>	<b>146</b>	<b>146</b>	<b>59</b>	<b>64</b>

\* Number of privately owned wells used for drinking water and other uses within 750 feet of potential surface mineable or augerable coal resources.

\*\* Wellhead protection zone acreage (within potential surface mineable and/or augerable coal resources).

<sup>a</sup> Within the evaluation area.

<sup>b</sup> Within the petition/designation area.

Assuming an average annual mining rate (112 acres per year) direct mining disturbance would be limited to approximately 2% of the total evaluation area over the 30-year period. This alternative could adversely impact groundwater resources throughout the evaluation area as well as the hydrologically connected

groundwaters outside the evaluation area. Surface coal mining and other mining operations at higher elevations and along ridgelines could adversely impact shallow perched aquifers located on ridges. The degradation of these aquifers could translate into an increase in adverse impacts to downslope and downgradient groundwater resources thereby extending the impacts over a wider area. The no-action alternative would result in long-term adverse impacts compared to existing conditions.

Remining and associated reclamation operations would be permitted within a portion of the approximately 23,492 acres (14% of the evaluation area) of previously mined land located within the evaluation area (table 6-9). Potential adverse and beneficial impacts to groundwater resources from these operations would be greater in the South Fork Cumberland watershed because this watershed has the most sensitive resources located in close proximity to potential surface mineable and/or augerable coal resources (table 6-25). Remining operations have the potential to temporarily impact groundwater resources, resulting in localized short-term adverse impacts. If remining occurs within one of the coal seams characterized by higher sulfur content seams (i.e., Big Mary, Jellico, Murray, and Kent), there is a greater potential for adverse impacts resulting from acidic or toxic water conditions. These seams comprise approximately 11,298 acres (6.6% of the evaluation area) of previously mined land within the evaluation area. The adverse impacts from remining would be minimized or avoided through the implementation of mitigation and best management practices, as described in “General Impacts of Surface Coal Mining in Tennessee on Groundwater.” As part of the remining operation, reclamation would restore previously abandoned mined sites, thereby minimizing or potentially eliminating, if possible, existing environmental issues such as erosion, acid mine drainage, discharges of sediment and metals, and flow alterations. Remining operations would result in localized short-term adverse groundwater impacts that would persist until reclamation operations are completed. Reclamation would restore previously disturbed land and minimize or potentially eliminate, if possible, ongoing water quality and quantity issues, resulting in long-term beneficial impacts. Because there are no areas protected by a designation of unsuitable for surface coal mining under alternative 1, the short-term adverse impacts from remining operations and the long-term beneficial impacts from associated reclamation would be the same as under existing conditions.

Underground and auger mining operations could result in long-term adverse impacts on groundwater quality and quantity. The construction and operation of access and haul roads would have no impacts on groundwater quality.

Compared to existing conditions, alternative 1 would have short-term and long-term potentially widespread adverse impacts on groundwater resources resulting from degradation of groundwater quality and quantity from surface, underground, and auger mining and remining operations, as well as long-term beneficial impacts from reclamation operations associated with remining.

## **Cumulative Impacts**

Past, present, and reasonably foreseeable future mining, timber harvest, oil and gas production, recreation, and development would have the potential to adversely affect groundwater resources due to removal of vegetation, exposure of land surface and soil, alterations to topography and geology, and soil compaction. These activities would continue to result in water quality and quantity degradation over time due to discharges of pollutants and contaminated water, alterations in drainage and flow patterns, water storage capacity, and increases or decreases in natural water levels. However, mitigation measures and adherence to water quality and quantity standards would minimize the adverse effects. Remining and associated reclamation efforts accompanying future mining operations would ultimately help to improve water quality and other groundwater properties. The impacts of alternative 1, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on groundwater resources. Alternative 1 would contribute adverse and beneficial effects to the overall adverse cumulative impacts.

## **Conclusion**

Under alternative 1, existing coal mining operations and management would continue with no designation of lands as unsuitable for surface coal mining. Pollutant and sediment loading from surface and underground mine discharges could affect groundwater quality; underground mine workings could alter groundwater recharge, aquifer levels, and groundwater flow regimes, especially in areas with acid-producing coal seams. Compared to existing conditions, this alternative could result in widespread short-term and long-term adverse impacts on groundwater resources throughout the evaluation area including ridgeline corridors, other sensitive areas, and downstream and downslope areas. Remining would result in localized short-term adverse impacts and associated reclamation operations would result in long-term beneficial impacts compared to existing conditions. The adverse impacts to groundwater resources from remining would be minimized or avoided through the implementation of best management practices and mitigation measures and compliance with state and federal water quality criteria and mining operation performance standards, as described in “General Impacts of Surface Coal Mining in Tennessee on Groundwater.” Alternative 1 would not result in significant adverse impacts because violations of applicable water quality regulations are not anticipated due to implementation of mitigation measures and compliance with water quality standards and regulations. Furthermore, implementation of the alternative would provide beneficial impacts to groundwater resources from reclamation associated with remining. Lastly, the amount of area disturbed under the expected mining rate would be only 2% of the entire evaluation area over the 30-year period.

## **ALTERNATIVE 2: STATE PETITION DESIGNATION**

The designation of a 1,200-foot corridor centered on 505 miles of ridgelines as unsuitable for surface coal mining would prevent surface coal mining operations, as well as any surface activities or surface impacts incident to underground coal mines on 67,326 acres. Groundwater would obtain some protection from the designation of the ridgeline corridors. This protection from potential future adverse impacts at higher elevations and gradients would result in wider beneficial impacts by minimizing the impacts to downgradient locations. However, remining would be prohibited, and therefore unreclaimed abandoned mines inside the petition area would continue to adversely impact groundwater quality and quantity. Underground and auger mining could occur outside the petition area; however actual mining could take place underneath the petition area with potential adverse groundwater quality and quantity impacts. Under this alternative, adverse impacts from mining operations located outside the petition area and unreclaimed mines inside the petition area would occur, as described in “General Impacts of Surface Coal Mining in Tennessee on Groundwater.” Regulatory requirements and permit conditions would reduce but not eliminate adverse effects. Calculations of numbers or acreage of sensitive areas within close proximity of mineable coal is an indication of potential risk from mining operations.

Under alternative 2, the petition area including approximately 22,122 acres of potential surface mineable and/or augerable coal resources (13% of the evaluation area) would be protected from future surface coal mining operations (table 6-12). This alternative would benefit groundwater resources inside the petition area as well as hydrologically connected groundwater outside both the petition area and the evaluation area. For the purposes of the GIS-based quantitative analyses, sensitive groundwater resources are defined as wells and wellhead protection areas. According to the analyses, there are 20 private wells and 146 acres of wellhead protection zone located within or in close proximity to potential surface mineable and/or augerable coal resources in the South Fork Cumberland, Upper Clinch, and Upper Cumberland River watersheds (table 6-26). The protection provided to these resources would result in beneficial impacts. There are 97 wells within the evaluation area but outside the protection of the petition area. The South Fork Cumberland watershed has the largest number and acreage of sensitive groundwater resources in close proximity to potential surface mineable and/or augerable coal resources and therefore, the protection provided to groundwater resources under this alternative would likely have the largest benefit

in this watershed. There would also be beneficial impacts to groundwater resources within the Upper Clinch and Upper Cumberland River watersheds, although on a smaller scale than within the South Fork Cumberland watershed. The Emory and Powell River watersheds have no sensitive groundwater resources that are close to potential surface mineable and/or augerable coal resources, therefore the beneficial impacts from the designation of land as unsuitable for surface coal mining would likely be smaller than those in the other watersheds.

**TABLE 6-26: SENSITIVE GROUNDWATER RESOURCES IN CLOSE PROXIMITY TO POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES PROTECTED FROM SURFACE MINING UNDER ALTERNATIVE 2**

<b>Watershed</b>	<b>Number of Wells* (within 750 feet of Potential Surface Mineable and/or Augerable Coal Resources)</b>	<b>Wellhead Protection Zone Acres (within Potential Surface Mineable and/or Augerable Coal Resources)</b>
Emory River	0	0
Powell River	0	0
South Fork Cumberland River	11	110
Upper Clinch River	3	36
Upper Cumberland River	6	0
<b>Total</b>	<b>20</b>	<b>146</b>

Source: Geospatial Information Data.

\* Privately owned wells used for drinking water and other uses.

The potential for pollution of groundwater from acid mine drainage or other toxic discharges and alterations of water levels and flow resulting from surface mining operations or surface disturbance would be eliminated from the petition area. The designation of areas at higher elevations and along ridgelines would help protect shallow perched aquifers located on ridges from degradation to water quality and quantity as well as downslope groundwater resources extending benefits to a wider area. Alternative 2 provides greater protection to groundwater than the no-action alternative, resulting in overall long-term beneficial impacts compared to the no-action alternative where mining operations and road development are permitted inside the petition area.

Approximately 12,374 acres of previously mined land (7% of the evaluation area) is located within the petition area. Under this alternative, remining and associated reclamation operations would not be permitted within this area (table 6-12). Long-term adverse impacts to the quality and quantity of groundwater resources would continue on a portion of this previously mined land within the petition area, especially if the previously mined coal seams are the higher sulfur content seams (i.e., Big Mary, Jellico, Murray, and Kent), which are more likely to result in acid water conditions. These seams comprise approximately 4,618 acres of previously mined land within the petition area and 2.7% of the evaluation area. Potential adverse impacts to groundwater resources from the unreclaimed land would be greater in the South Fork Cumberland watershed because this watershed has the most sensitive resources located in close proximity to potential surface mineable and/or augerable coal resources (table 6-26). The effects from unreclaimed mines would likely be fairly localized within each watershed although within the South Fork Cumberland watershed these impacts would occur over a larger area compared to the other watersheds. The Emory and Powell River watersheds have little to no previous mining disturbance within the petition area and no groundwater resources that are close to potential surface mineable and/or augerable coal resources (tables 6-9 and 6-23). Therefore the adverse impacts from the continued presence of unreclaimed mines would likely be minimal in these watersheds. Impacts to groundwater

resources from unreclaimed mines would be long term and adverse compared to the no-action alternative where remining is permitted.

Underground and auger mining could occur within the portion of the evaluation area that is outside the petition area (104,809 acres); however adverse impacts could affect groundwater quality inside the petition area, resulting in potential localized long-term adverse impacts. The construction and operation of access and haul roads would be prohibited within the petition area, therefore adverse impacts to groundwater resources from roads would not occur.

### **Cumulative Impacts**

Overall cumulative impacts on groundwater resources within the evaluation area would be adverse, as described above for alternative 1. The cumulative actions that have the potential to affect groundwater resources include mining, timber harvest, oil and gas production, recreation, and development. These activities would continue to result in water quality and quantity degradation over time although implementation of mitigation measures would minimize potential adverse impacts and help to improve water quality and other groundwater properties. The impacts of alternative 2, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on groundwater resources. Overall, alternative 2 would contribute minimally to adverse cumulative impacts, but could help offset these adverse impacts by providing a noticeable benefit.

### **Conclusion**

Alternative 2 would reduce the potential for future adverse impacts from surface coal mining operations to groundwater resources especially wells and wellhead protection zones in the petition area and the evaluation area, resulting in widespread long-term beneficial impacts compared to the no-action alternative. The continued existence of unreclaimed previously mined land would result in localized long-term adverse impacts compared to the no-action alternative. However, no new or additional adverse impacts would be expected compared to the no-action alternative. Violations of applicable water quality regulations are not anticipated due to the very localized scale of impacts from unreclaimed mines within the petition area, compliance with Clean Water Act regulations and SMCRA performance requirements. Therefore, alternative 2 would not result in significant adverse impacts.

### **ALTERNATIVE 3: STATE PETITION DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS**

Under alternative 3, areas designated as unsuitable for surface coal mining would be the same as those described for alternative 2, resulting in the prevention of surface coal mining operations, as well as any surface activities or surface impacts incident to underground coal mines on 67,326 acres. Groundwater, especially shallow perched aquifers, would be protected by the designation of the ridgeline corridors as unsuitable for surface coal mining. This protection would result in widespread beneficial impacts on groundwater resources by preventing impacts to groundwater quality and quantity at higher elevations and minimizing the impacts to downgradient aquifers. Alternative 3 would not prohibit remining and the development and use of access and haul roads for use in remining would be allowed inside the designation area. Underground and auger mining could occur outside the designation area; however actual mining and impacts could take place underneath the designation area. Under this alternative, adverse impacts could occur from potential remining inside the designation area and underground and auger mining outside the designation area, as described in “General Impacts of Surface Coal Mining in Tennessee on Groundwater.” Regulatory requirements and permit conditions would reduce but not eliminate adverse effects.

The acreage protected within the designation area and the acreage that could potentially still be impacted from future surface coal mining operations is the same as that under alternative 2 (table 6-12). This alternative would benefit groundwater resources inside the designation area as well as hydrologically connected groundwater outside both the designation area and the evaluation area (table 6-26). The largest beneficial impacts to groundwater resources would be within the South Fork Cumberland watershed due to the large the number and acreages of sensitive groundwater resources protected. Beneficial impacts within the other watersheds would occur on a smaller scale. The potential for adverse impacts resulting from future surface mining operations would be eliminated from the designation area thereby protecting land and shallow perched aquifers at higher elevations and along ridgelines, resulting in decreases in downgradient adverse impacts and an extension of the benefits over a wider area. Alternative 3 still provides greater protection to groundwater than the no-action alternative, resulting in overall beneficial impacts compared to the no-action alternative where surface coal mining operations are permitted.

Remining and associated reclamation operations could be potentially permitted within a portion of the approximately 12,374 acres of previously mined land (7% of the evaluation area) within the designation area (table 6-12). Potential adverse and beneficial impacts to groundwater resources from these operations would be greater in the South Fork Cumberland watershed because this watershed has the most sensitive resources located within or in close proximity to potential surface mineable and/or augerable coal resources. Potential remining operations could have the potential to impact groundwater resources, resulting in localized short-term adverse impacts. If remining occurs within one of the coals seams characterized by higher sulfur content seams (i.e., Big Mary, Jellico, Murray, and Kent), there is a greater potential for adverse impacts resulting from acidic or toxic water conditions. These seams comprise approximately 4,618 acres of previously mined land within the designation area and 2.7% of the evaluation area. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions. Therefore, remining could potentially occur on a portion of the 112 acres mined annually. Also, the adverse impacts from remining would be minimized or avoided through the implementation of mitigation and best management practices, as described in “General Impacts of Surface Coal Mining in Tennessee on Groundwater.” The result of these measures would be that alterations to water quality and quantity from remining operations would be further localized and on average would be within water quality and quantity narrative and numeric thresholds set by the state or federal government and referred to in the “Applicable Statues, Regulations, and Policies” section. As part of the potential remining operation, reclamation would restore previously abandoned mined sites, thereby minimizing or potentially eliminating, if possible, existing environmental issues such as erosion, acid mine drainage, discharges of sediment and metals, and groundwater flow alterations. Therefore, reclamation could result in localized long-term beneficial impacts to groundwater resources. Under alternative 3, the short-term adverse impacts from remining operations and the long-term beneficial impacts from associated reclamation would be the same as under the no-action alternative.

Underground and auger mining could occur outside the designation area within 104,809 acres; however adverse impacts could affect groundwater quality inside the designation area resulting in potential localized long-term adverse impacts. The potential construction and operation of access and haul roads could be permitted within the designation area but would result in no impacts to groundwater resources.

## **Cumulative Impacts**

Overall cumulative impacts on groundwater resources within the evaluation area would be adverse, as described above for alternative 1. The cumulative actions that have the potential to affect groundwater resources include mining, timber harvest, oil and gas production, recreation, and development. These

activities would continue to result in water quality and quantity degradation over time. Potential remining and associated reclamation efforts accompanying future mining operations could minimize adverse impacts through implementation of mitigation measures and help to improve water quality and other groundwater properties. The impacts of alternative 3, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on groundwater resources. Alternative 3 would not contribute substantially to overall cumulative adverse impacts. Reclamation of lands previously mined prior to the implementation of SMCRA could potentially help offset adverse impacts from cumulative actions and result in long-term benefits.

## **Conclusion**

Alternative 3 would reduce the potential for future adverse impacts from surface coal mining operations to groundwater resources especially wells and wellhead protection zones in the designation area and the larger evaluation area, resulting in widespread long-term beneficial impacts compared to the no-action alternative. Alternative 3 would contribute localized short-term adverse impacts during potential remining operations but would provide long-term beneficial impacts to the designation area due to reclamation activities. However, no new or additional adverse impacts would be expected compared to the no-action alternative. Violations of applicable water quality regulations are not anticipated due to the very localized scale of adverse impacts from potential remining operations within the analysis area, compliance with Clean Water Act regulations and SMCRA performance requirements. Additionally, implementation of the alternative would contribute water quality benefits from reclamation associated with remining. Therefore, alternative 3 would not result in significant adverse impacts.

## **ALTERNATIVE 4: EXPANDED CORRIDOR DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS (PREFERRED ALTERNATIVE)**

The designation of a 1,200-foot corridor centered on 569 miles of ridgelines as unsuitable for surface coal mining would prevent surface coal mining operations, as well as any surface activities or surface impacts incident to underground coal mines on 76,133 acres. Groundwater, especially shallow perched aquifers, would be protected when ridgeline corridors are designated as unsuitable for surface coal mining. This protection would result in widespread beneficial impacts on groundwater resources by preventing impacts to groundwater quality and quantity at higher elevations and minimizing the impacts to downgradient aquifers. Alternative 4 would not prohibit remining and the development and use of access and haul roads for use in remining would be allowed inside the designation area. Underground and auger mining could occur outside the designation area; however actual mining and impacts could take place underneath the designation area. Under this alternative, adverse impacts could occur from potential remining inside the designation area and underground and auger mining outside the designation area, as described in “General Impacts of Surface Coal Mining in Tennessee on Groundwater.” Regulatory requirements and permit conditions would reduce but not eliminate adverse effects.

Under alternative 4, the designation area including approximately 24,294 acres of potential surface mineable and/or augerable coal resources (14% of the evaluation area) would be protected from future surface coal mining operations (table 6-15). This would benefit groundwater resources inside the designation area as well as hydrologically connected groundwater outside both the designation area and the evaluation area. For the purposes of the GIS-based quantitative analyses, sensitive groundwater resources are defined as wells and wellhead protection areas. According to the analyses, there are 22 private wells and 146 acres of wellhead protection zone located within or in close proximity to potential surface mineable and/or augerable coal resources in the designation area (table 6-27). The South Fork Cumberland watershed has the greatest amount of sensitive groundwater resources near potential surface mineable and/or augerable coal resources, and therefore the protection provided to groundwater resources would likely have the largest benefit in this watershed. Beneficial impacts to groundwater resources

within the other watersheds would occur on a smaller scale. The potential for adverse impacts resulting from future surface mining operations would be eliminated from the designation area. There are 89 wells within the evaluation area but outside the protection of the designation area. This alternative would protect the largest amount of land and ridgelines and associated shallow perched aquifers from water quality and quantity degradation, which would in turn prevent associated impacts to larger areas of hydrologically connected downslope groundwater resources. Alternative 4 would have widespread long-term beneficial impacts on groundwater resources compared to the no-action alternative where surface coal mining operations are permitted.

Potential remining and associated reclamation operations could be potentially permitted within a portion of the approximately 13,444 acres of previously mined land (8% of the evaluation area) within the designation area (table 6-15). Potential adverse and beneficial impacts to groundwater resources from these operations would be greater in the South Fork Cumberland watershed because this watershed has the most sensitive resources located close to or within potential surface mineable and/or augerable coal resources (table 6-27). Furthermore, this watershed has the largest percentage of previously mined land on which potential remining operations and adverse impacts could potentially occur. Potential remining operations have the potential to impact groundwater, resulting in localized short-term adverse impacts. If potential remining occurs within one of the coals seams characterized by higher sulfur content seams (i.e., Big Mary, Jellico, Murray, and Kent), there is a greater potential for adverse impacts resulting from acidic or toxic water conditions. These seams comprise approximately 5,351 acres of previously mined land within the designation area and 3.1% of the evaluation area. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions. Therefore, potential remining could likely occur on a portion of the 112 acres mined annually. Also, adverse impacts from potential remining would be minimized or avoided through the implementation of mitigation and best management practices. The result of these measures would be that alterations to water quality and quantity from remining operations would be further localized and on average would be within water quality and quantity narrative and numeric thresholds set by the state or federal government and referred to in the “Applicable Statutes, Regulations, and Policies” section. As part of the potential remining operations, reclamation could restore previously abandoned mined sites, thereby minimizing or potentially eliminating, if possible, existing environmental issues, as described under alternative 3 and “General Impacts of Surface Coal Mining in Tennessee on Groundwater.” Therefore, reclamation would result in long-term localized beneficial impacts to groundwater resources within a portion of the previously mined area and potential surface mineable and/or augerable coal resources. Under alternative 4, the short-term adverse impacts from potential remining operations and the long-term adverse impacts from associated reclamation could be the same as under the no-action alternative.

Underground and auger mining could occur within the portion of the evaluation area that is outside the designation area (96,001 acres); however these activities could affect groundwater quality inside the designation area, resulting in potential localized long-term adverse impacts. The potential construction and operation of access and haul roads would be permitted within the designation area but would not result in impacts to groundwater resources.

**TABLE 6-27: SENSITIVE GROUNDWATER RESOURCES IN CLOSE PROXIMITY TO POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES PROTECTED FROM SURFACE MINING UNDER ALTERNATIVE 4**

<b>Watershed</b>	<b>Number of Wells* (within 750 feet of Potential Surface Mineable and/or Augerable Coal Resources)</b>	<b>Wellhead Protection Zone Acres (within Potential Surface Mineable and/or Augerable Coal Resources)</b>
Emory River	0	0
Powell River	2	0
South Fork Cumberland River	11	110
Upper Clinch River	3	36
Upper Cumberland River	6	0
<b>Total</b>	<b>22</b>	<b>146</b>

Source: Geospatial Information Data.

\* Privately owned wells used for drinking water and other uses.

### Cumulative Impacts

Overall cumulative impacts on groundwater resources within the evaluation area would be adverse, as described above for alternative 1. The cumulative actions that have the potential to affect groundwater resources include mining, timber harvest, oil and gas production, recreation, and development. These activities would continue to result in water quality and quantity degradation over time. Remining and associated reclamation efforts accompanying future mining operations would minimize adverse impacts through implementation of mitigation measures and help to improve water quality and other groundwater properties. The impacts of alternative 4, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on groundwater resources. Alternative 4 would not contribute substantially to overall cumulative adverse impacts. Although there may be short-term contributions to cumulative impacts from remining, alternative 4 would designate and protect a larger area compared to the no-action alternative and the other action alternatives and would provide greater benefits over the long term.

### Conclusion

Alternative 4 would protect the largest acreage of all of the action alternatives and thus would reduce the potential for future adverse impacts from surface coal mining operations to groundwater resources, especially wells and wellhead protection zones, in the designation area and the evaluation area, resulting in widespread long-term beneficial impacts compared to the no-action alternative. Alternative 4 would contribute localized short-term adverse impacts during remining operations but would provide long-term beneficial impacts due to reclamation activities. However, no new or additional adverse impacts would be expected compared to the no-action alternative. Alternative 4 would not result in significant adverse impacts because violations of applicable water quality regulations are not anticipated due to compliance with Clean Water Act regulations and SMCRA performance requirements. The scale of adverse impacts from remining operations within the analysis area would be localized. Additionally, the alternative would contribute beneficial impacts to groundwater resources from the reclamation associated with remining through the removal of acid mine drainage.

## ALTERNATIVE 5: TARGETED RESOURCE PROTECTION DESIGNATION

Alternative 5 would designate as unsuitable for surface coal mining 12,331 acres of the NCWMA and ERTCE due to the need for public access and the presence of sensitive natural resources. This designation would prevent surface coal mining operations, as well as any surface activities or surface impacts incident to underground coal mines on the acreage, resulting in beneficial impacts to groundwater resources. Remining would not be permitted under alternative 5, therefore unreclaimed abandoned mines inside the designation area would continue to adversely impact groundwater quality and quantity. Underground and auger mining could occur outside the designation area; however actual mining and potential impacts could take place underneath the designation area. Under this alternative, adverse impacts from mining operations located outside the designation area and the continued presence of unreclaimed mines inside the designation area would occur, as described in “General Impacts of Surface Coal Mining in Tennessee on Groundwater.” Regulatory requirements and permit conditions would reduce but not eliminate adverse effects.

Alternative 5 protects important public access avenues and sensitive natural resources, but does not protect as many ridgelines as are protected under the other action alternatives. Mining operations would be permitted close to ridgelines and in higher elevation areas. Mining within these areas would result in adverse impacts to groundwater resources, as described in “General Impacts of Surface Coal Mining in Tennessee on Groundwater.” Under this alternative, the designation area including approximately 5,442 acres of potential surface mineable and/or augerable coal resources (3% of the evaluation area) would be protected from future surface coal mining operations (table 6-18). For the purposes of the GIS-based quantitative analyses, sensitive groundwater resources are defined as wells and wellhead protection areas. According to the analyses, there are a total of seven private wells and 59 acres of wellhead protection zone located within or in close proximity to potential surface mineable and/or augerable coal resources in the designation area. There are 239 wells within the evaluation area but outside the protection of the designation area (table 6-28). Both the South Fork Cumberland and Upper Clinch River watersheds have the largest number and acreage of sensitive groundwater resources in close proximity to potential surface mineable and/or augerable coal resources, and therefore, the protection provided to groundwater resources would likely have the largest benefit in these watersheds.

**TABLE 6-28: SENSITIVE GROUNDWATER RESOURCES IN CLOSE PROXIMITY TO POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES PROTECTED FROM SURFACE MINING UNDER ALTERNATIVE 5**

<b>Watershed</b>	<b>Number of Wells* (within 750 feet of Potential Surface Mineable and/or Augerable Coal Resources)</b>	<b>Wellhead Protection Zone Acres (within Potential Surface Mineable and/or Augerable Coal Resources)</b>
Emory River	0	0
Powell River	2	0
South Fork Cumberland River	2	31
Upper Clinch River	0	28
Upper Cumberland River	3	0
<b>Total</b>	<b>7</b>	<b>59</b>

Source: Geospatial Information Data.

\* Privately owned wells used for drinking water and other uses.

The potential for future pollution of groundwater from acid mine drainage or other toxic discharges resulting from surface mining operations or surface disturbance would be eliminated from the designation area. The protection of ridgelines corridors and associated shallow aquifers would be limited under this alternative. The beneficial impact of this small amount of protection would translate into a slight decrease in adverse impacts to downstream waters thereby extending the benefits over a correspondingly wider area. However, because it would protect the least acreage of all of the action alternatives, alternative 5 would have limited long-term beneficial impacts on groundwater resources compared to the no-action alternative.

Under alternative 5, mining close to ridgelines and the continued presence of unreclaimed mines would result in adverse impacts to groundwater resources. Approximately 2,082 acres of previously mined land (1% of the evaluation area) is located within the designation area and under this alternative remining and associated reclamation operations would not be permitted within this area (table 6-18). Long-term adverse impacts to the quality and quantity of groundwater resources, especially the private wells and wellhead protection zones, would continue on a portion of this previously mined land within the designation area, especially if the previously mined coal seams are the higher sulfur content seams (i.e., Big Mary, Jellico, Murray, and Kent), which are more likely to result in acid water conditions. These seams comprise approximately 393 acres of previously mined land within the designation area and 0.2% of the evaluation area. The largest potential adverse impacts from unreclaimed mine lands would be in the South Fork Cumberland and Upper Clinch River watersheds because these watersheds have the most sensitive groundwater resources located in close proximity to potential surface mineable and/or augerable coal resources (table 6-28). The effects from unreclaimed mines would likely be fairly localized due to the relatively small acreage of previously mined area. Impacts to groundwater resources from unreclaimed mines would be long term and adverse compared to the no-action alternative where remining is not prohibited.

Underground and auger mining could occur within the portion of the evaluation area that is outside the designation area (159,804 acres); however adverse impacts could affect groundwater quality inside the designation area, resulting in potential localized long-term adverse impacts. The construction and operation of access and haul roads would be prohibited within the designation area but allowed within the evaluation area. However, road construction and operation would not result in adverse impacts to groundwater resources.

### **Cumulative Impacts**

Overall cumulative impacts on groundwater resources within the evaluation area would be adverse, as described above for alternative 1. The cumulative actions that have the potential to affect groundwater resources include mining, timber harvest, oil and gas production, recreation, and development. These activities would continue to result in water quality and quantity degradation over time although implementation of mitigation measures would minimize potential adverse impacts and help to improve water quality and other groundwater properties. The impacts of alternative 5, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on groundwater resources. Alternative 5 would provide the least benefit to overall cumulative impacts compared to the no-action alternative and other action alternatives because it results in the lowest area designated, although it would specifically designate areas associated with aquatic species.

## Conclusion

Alternative 5 would preclude surface coal mining and reduce the overall adverse impacts from potential future mining on both the designation area and the surrounding evaluation area. The small scope of the designation area and the protection of fewer sensitive groundwater resources would result in localized and relatively limited long-term beneficial impacts compared to the no-action alternative. The continued existence of unreclaimed previously mined land would result in long-term adverse impacts compared to the no-action alternative. However, no new or additional adverse impacts would be expected compared to the no-action alternative. Because alternative 5 would preclude surface coal mining and reduce the overall adverse impacts from potential future mining on both the designation area and the larger evaluation area, alternative 5 would result in localized long-term beneficial impacts compared to the no-action alternative. Violations of applicable water quality regulations are not anticipated due to the very localized scale of adverse impacts from unreclaimed mines within the designation area, compliance with Clean Water Act regulations and SMCRA performance requirements. Therefore, alternative 5 would not result in significant adverse impacts.

## ALTERNATIVE 6: REDUCED CORRIDOR DESIGNATION

The designation of a 600-foot corridor centered on 505 miles of ridgelines as unsuitable for surface coal mining would prevent surface coal mining operations, as well as any surface activities or surface impacts incident to underground coal mines on 35,592 acres. This area would be protected from potential adverse impacts from surface coal mining or re-mining operations, resulting in beneficial impacts on groundwater resources. However, because re-mining is prohibited under this alternative, unreclaimed abandoned mines inside the designation area would continue to adversely impact groundwater quality and quantity. Underground and auger mining would be located outside the designation area; however actual mining could take place underneath the designation area with potential groundwater quality and quantity impacts. Under this alternative, adverse impacts from mining operations located outside the designation area and the continued presence of unreclaimed mines inside the designation area would occur, as described in “General Impacts of Surface Coal Mining in Tennessee on Groundwater.” Regulatory requirements and permit conditions would reduce but not eliminate adverse effects.

Under alternative 6, the designation area including approximately 12,217 acres of potential surface mineable and/or augerable coal resources (7% of the evaluation area) would be protected from future surface coal mining operations (table 6-21). This alternative would benefit groundwater resources inside the designation area as well as hydrologically connected groundwater outside both the designation area and the evaluation area. For the purposes of the GIS-based quantitative analyses, sensitive groundwater resources are defined as wells and wellhead protection areas. According to the analyses, there are 16 private wells and 64 acres of wellhead protection zone located within or in close proximity to potential surface mineable and/or augerable coal resources in the designation area (table 6-29). The protection provided to these resources would result in beneficial impacts. There are 129 wells within the evaluation area but outside the protection of the designation area. This alternative would protect and would likely have the largest benefit in the South Fork Cumberland and Upper Clinch River watersheds due to the large number of numbers and acreages of sensitive groundwater resources in close proximity to potential surface mineable and/or augerable coal resources. The beneficial impacts within the Upper Cumberland River watershed would occur on a smaller scale.

The potential for pollution of groundwater from acid mine drainage or other toxic discharges would be eliminated from the designation area and would help ensure the protection of groundwater resources. The designation of areas at higher elevations would help protect shallow perched aquifers located within ridgelines corridors from degradation to water quality and quantity as well as protect downslope groundwater resources, resulting in a reduction in adverse impacts in downgradient locations and an extension of the benefits over a wider area. Alternative 6 would have long-term beneficial impacts on groundwater resources compared to the no-action alternative where mining operations and road development are permitted.

**TABLE 6-29: SENSITIVE GROUNDWATER RESOURCES IN CLOSE PROXIMITY TO POTENTIAL SURFACE MINEABLE AND/OR AUGERABLE COAL RESOURCES PROTECTED FROM SURFACE MINING UNDER ALTERNATIVE 6**

<b>Watershed</b>	<b>Number of Wells* (within 750 feet of Potential Surface Mineable and/or Augerable Coal Resources)</b>	<b>Wellhead Protection Zone Acres (within Potential Surface Mineable and/or Augerable Coal Resources)</b>
Emory River	0	0
Powell River	0	0
South Fork Cumberland River	11	36
Upper Clinch River	2	28
Upper Cumberland River	3	0
<b>Total</b>	<b>16</b>	<b>64</b>

Source: Geospatial Information Data.

\* Privately owned wells used for drinking water and other uses.

Approximately 6,789 acres of previously mined land (4% of the evaluation area) is located within the designation area. Under this alternative, remining and associated reclamation operations would not be permitted within this area (table 6-21). Long-term adverse impacts to the quality and quantity of groundwater resources would continue on a portion of this previously mined land within the designation area, especially if the previously mined coal seams are the higher sulfur content seams (i.e., Big Mary, Jellico, Murray, and Kent), which are more likely to result in acid water conditions. These seams comprise approximately 2,315 acres of previously mined land within the designation area and 1.3% of the evaluation area. Potential adverse impacts to groundwater resources from the unreclaimed land would be greater in the South Fork Cumberland and Upper Clinch River watersheds than other watersheds due to the number of private wells and acreage of wellhead protection zone located in close proximity to or within potential surface mineable and/or augerable coal resources (table 6-29). The Upper Cumberland, Emory, and Powell River watersheds have few to no private wells or wellhead protection zone acreage close to potential surface mineable and/or augerable coal resources, therefore the adverse impacts from unreclaimed mines would likely be minimal in these watersheds. The effects from unreclaimed mines would be likely be fairly localized within each watershed although within the South Fork Cumberland watershed these impacts would occur over a larger area compared to the other watersheds. Impacts to groundwater resources from unreclaimed mines would be localized, long term, and adverse compared to the no-action alternative where remining is not prohibited.

Underground and auger mining could occur within the portion of the evaluation area that is outside the designation area (136,543 acres); however adverse impacts could affect groundwater quality inside the designation area resulting in potential localized long-term adverse impacts. The construction and operation of access and haul roads would be prohibited within the designation area, therefore adverse impacts to groundwater resources from roads would not occur.

## Cumulative Impacts

Overall cumulative impacts on groundwater resources within the evaluation area would be adverse, as described above for alternative 1. The cumulative actions that have the potential to affect groundwater resources include mining, timber harvest, oil and gas production, recreation, and development. These activities would continue to result in water quality and quantity degradation over time although implementation of mitigation measures would minimize potential adverse impacts and help to improve water quality and other groundwater properties. The impacts of alternative 6, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on groundwater resources. Alternative 6 would have similar impacts as alternative 2 and would not contribute substantially to overall cumulative impacts, although would provide long-term benefits that could help offset some adverse impacts from cumulative actions.

## Conclusion

The scope of the designation area in alternative 6 and the protection it provides would reduce the potential for future adverse impacts from surface coal mining operations to groundwater resources, especially wells and wellhead protection zones, in the designation area and surrounding the evaluation area, resulting in widespread long-term beneficial impacts compared to the no-action alternative. However, no new or additional adverse impacts would be expected compared to the no-action alternative. The continued existence of unreclaimed previously mined land would result in localized long-term adverse impacts compared to the no-action alternative. Violations of applicable water quality regulations are not anticipated due to the very localized scale of adverse impacts from unreclaimed mines within the designation area, compliance with Clean Water Act regulations and SMCRA performance requirements. Therefore, alternative 6 would not result in significant adverse impacts.

# IMPACTS OF THE ALTERNATIVES ON WETLANDS

## METHODS FOR ANALYSIS

### Applicable Statutes, Regulations, and Policies

Two federal statutory provisions exist to protect wetlands: section 404 of the Clean Water Act and SMCRA. The Clean Water Act governs the dredging and filling of Waters of the US, which includes wetlands (33 USC § 1344). Wetlands are afforded protection under section 404 of the Clean Water Act and any impacts to wetlands require mitigation (33 USC § 401; 40 CFR § 332.1). The Clean Water Act at section 404 (b) points to guidelines for required mitigation. The “404(b)(1) Guidelines” were published in the Federal Register on April 10, 2008 (73 FR 19594). The guidelines prohibit the discharge of fill if it would cause or contribute to a violation of a water quality standard or cause or contribute to significant degradation of the waters of the United States (40 CFR §§ 230.10(b) and (c)(1)-(3)). The “404(b)(1) Guidelines” also require the US Army Corps of Engineers to analyze more than 15 different factors that could be impacted by the proposed action, including substrate, suspended particulates, turbidity, water quality, water circulation, water level fluctuations, salinity gradients, threatened and endangered species, aquatic organisms in the food web, other wildlife special aquatic sites, water supplies, fisheries, recreation, aesthetics, and parks (40 CFR §§ 230 (c)-(f)). The 404(b)(1) Guidelines provide that the US Army Corps of Engineers must ensure that the proposed discharges would not cause or contribute to significant adverse effects on human health or welfare, aquatic life, or aquatic ecosystems (40 CFR §§ 230.10(c)(1)-(3)).

SMCRA was enacted to provide a regulatory regime to balance protecting the environment and providing for the nation's energy needs (30 USC § 1201). As such, SMCRA was designed to work in concert with other federal laws and regulations including the Clean Water Act (30 USC § 1292(a)(3)). In addition, SMCRA requires that "[t]o the greatest extent practicable each federal agency shall cooperate with the Secretary and the States in carrying out" its provisions, and it directs the coordination of regulatory activities among departments and agencies responsible for implementation of identified statutes, including the Clean Water Act (30 USC §§ 1292(c), 1303(a)). In Tennessee, OSMRE administers and enforces SMCRA and also works together with the state Clean Water Act authority and the US Army Corps of Engineers to ensure both the Clean Water Act and SMCRA provide protection to wetlands. TDEC also has authority under the Clean Water Act, administered as the Tennessee Water Quality Control Act of 1977. TDEC has additional jurisdiction and permitting certification over wetlands under Aquatic Resource Alteration Permit regulations (TDEC Rule 0400-40-07) and section 401 of the Clean Water Act. These requirements, which may vary from the requirements of the Corps of Engineers, include mitigation measures, certification, and wetland determinations. The statutory and regulatory requirements pertaining to surface water also pertain to wetlands and are the same as those found in the "Impacts of the Alternatives on Surface Water" section of this PED/EIS.

### **Assumptions and Methodology**

The impact analysis for wetlands includes the identification of wetlands within the evaluation area. Wetlands are distributed across the landscape and the data sources to be consulted typically cover county-wide (or even larger) areas. The analysis of possible impacts was based on a review of literature, available data, maps, professional judgment, and existing conditions. The US Fish and Wildlife Service (USFWS) National Wetland Inventory documents wetlands throughout the evaluation area and is available in digital format. Additionally, environmentally sensitive wetlands have been documented in the Koppers Coal Reserve, a 53,000-acre tract of land. The Tennessee Valley Authority (TVA) owns the coal mineral rights of the entire Koppers Coal Reserve and the State of Tennessee owns most of the land surface and all of the timber and oil rights. The TWRA manages this property for the State as part of the former 50,000-acre Royal Blue Wildlife Management Area. The entire footprint of the former Royal Blue Wildlife Management Area rests within the NCWMA. The TVA conducted ground surveys in a 4,057-acre area (8% of the entire 53,000 acres) within the Koppers Coal Reserve from October 2002 through July 2004 to determine the presence of wetlands not identifiable on aerial photographs and to provide more detailed information of the natural features and ecological condition of the wetlands within the reserve. These ground surveys verified the existence of several environmentally sensitive wetlands (Unpublished TVA data) in the Koppers property. The highest concentrations were found in the Meadow Creek, Stinking Creek, and Ollis Creek watersheds. The potential impacts to wetlands in the evaluation area from coal mining include direct removal of the wetland, acid drainage, sedimentation, and alteration of the hydroperiod. Impacts on wetlands were qualitatively assessed in terms of the potential for increased or decreased disturbance in wetlands. Field investigations are not proposed as part of this methodology. The National Wetland Inventory data and GIS analysis and unpublished TVA data will be used to document existing wetland locations within the evaluation area and assess impacts of each alternative. Impacts to wetlands could require a detailed demonstration that there are no other practicable alternatives for minimizing or avoiding impacts to the particular wetland (Environmental Law Institute 2008).

## Area of Analysis

The main study area for wetlands includes the evaluation area. Because the location of individual mines within and outside the designation areas cannot be determined at this time and only a small amount (i.e., 2% of the evaluation area) of field verified wetland delineations have been conducted, the impacts on wetlands cannot be evaluated at a site-specific level. The potential impacts within and outside the designation areas are addressed at a landscape level; however, further surveys would be required prior to development of individual mining operations.

## GENERAL IMPACT OF COAL MINING IN TENNESSEE ON WETLANDS

Wetlands provide many important hydrologic, ecological, and water quality functions. Mining operations can have both direct and indirect impacts on wetlands. The most vulnerable wetlands are those located near past mining sites that could be impacted from remining operations and wetlands near existing coal reserves. The natural wetlands identified within the study areas include palustrine emergent, palustrine scrub-shrub, and palustrine forested wetland. In some areas, natural wetlands identified within the study areas occur as wetland complexes composed of two or more types of wetlands (i.e., palustrine scrub-shrub/forested wetland). The majority of artificial manmade or altered palustrine wetlands are identified as either palustrine unconsolidated bottom (PUB) or palustrine aquatic bed (PAB) with one of the following special modifiers: b = created or modified by beaver; d = partially drained/ditched; h = diked/impounded; r = artificial substrate; s = spoil, or x = excavated. In general, these wetlands are likely the result of past mining activity or beaver activity. Riverine wetlands are excluded from this analysis as it is assumed that no mining will occur within these areas and water quality impacts have been addressed in the “Impacts of the Alternatives on Surface Water” section. Direct impacts result when a mining operation is unable to avoid a wetland due to location of the mine and associated infrastructure. If an operator is unable to avoid a wetland during mining operations, this results in the loss of the wetland and the functions it provides. Mining operations and their associated infrastructure can have an indirect effect on adjacent wetlands as a result of runoff of sedimentation, acid mine drainage, and habitat disturbance. The loss of wetlands can result in habitat fragmentation directly affecting the life cycles of wetland dependent species (Brinson and Malvarez 2002).

The hydrology of a wetland is one of the most important factors in defining a wetland, and the hydroperiod (the frequency and duration of time that the wetland is saturated) is unique to each type of wetland (Mitsch and Gosselink 2000; EPA 2008). Mining operations can have direct and indirect impact to a wetlands hydroperiod by either increasing or decreasing the amount of water entering a wetland. Fluctuations in surface water and groundwater can have a direct effect on the hydroperiod, resulting in changes in the hydrologic, ecological, and water quality functions (Todd, Buttle, and Taylor 2006). For example, the wetland hydroperiod has a strong influence on both amphibian species richness and their presence/absence (Babbitt 2005). Many species of amphibians breed extensively or exclusively in small isolated wetlands, and the larvae of these species cannot persist if there is a disruptive change in the frequency, duration, and timing of the wetland hydroperiod (Babbitt 2005).

Active and abandoned coal mining operations have resulted in extensive ecological damage within affected wetlands from acid mine drainage and sedimentation, which have adversely impacted the water quality, hydroperiod, and vegetation within wetlands. Acid mine drainage introduces high levels of acidity and heavy metals into the wetland system through runoff and through direct drainage from mine sites. The acidity and the high metal concentrations can result in mortality within the biotic community (Lacki, Hammer, and Webster 1992; Mitsch and Gosselink 1993). While natural wetlands appear to have the capacity to buffer some of the acidity and absorb a certain amount of the pollutants running off mine sites, over time, the assimilative capacity will be saturated (Kent 1994; Weider 1993).

Coal mining alters the surface landscape by changing its configuration and physical properties. The magnitude of impacts to wetlands would increase relative to the spatial coverage of mining activities and the specific site conditions of a proposed surface coal mining operation. Coal mining operations would directly affect wetlands through the operation and infrastructure of the mine. Wetlands located within a mine site that are not permanently lost could be subject to modification or reduction of wetland functions.

Indirect effects from surface mining would include fragmentation of wetlands due to construction, changes in wetland hydroperiod due to fluctuations of surface runoff and groundwater levels, and changes in water quality due to sediment transport, dust, and acid mine drainage.

EPA has developed criteria to be used in the evaluation of discharges of dredged or fill material into waters of the United States under section 404 of the Clean Water Act. Further elaboration and clarification was provided in a memorandum of agreement between EPA and the US Army Corps of Engineers on Clean Water Act section 404(b)(1) Guidelines in March 1990 (55 FR 9211). This memorandum of agreement indicates that the US Army Corps of Engineers and EPA will strive to achieve a goal of no overall net loss of functions and values for wetlands. To achieve this goal the US Army Corps of Engineers and EPA have established a sequence by which proposed projects involving wetland impacts are to be evaluated. First, it must be determined that potential impacts have been avoided to the maximum extent practicable. Remaining impacts are to be minimized through appropriate and practicable steps including project modifications. Finally, compensatory mitigation is required for unavoidable adverse impacts that remain after all appropriate and practicable minimization has been incorporated.

Unavoidable impacts to wetlands, wildlife and aquatic resources require mitigation to offset ecological losses to habitat and their functional value to the local and regional environment. Such mitigation is prescribed in order to meet NEPA goals and objectives associated with substantial impacts and the selection of the preferred alternative as well as the least environmentally damaging practicable alternative. Additionally, impacts to waters of the United States, including wetlands, are regulated under state and federal laws including the Clean Water Act as regulated by the US Army Corps of Engineers pursuant to section 404 of the Act. As such, impacts to waters of the United States would require issuance of fill permits from the US Army Corps of Engineers with conditions anticipated to require mitigation for unavoidable impacts and losses of wetland and water resources.

Best management practices and performance standards, as described under “Applicable Statutes, Regulations, and Policies” would be implemented to minimize the adverse impacts to wetlands from permitted lands and haul road development. If during the mine permitting process a wetland was encountered and could not be avoided, mitigation measures for impacts would be developed on a site-specific basis. The total acreage of replacement wetlands would depend on the compensation ratios determined during the permitting process. If indirect effects were identified additional compensatory mitigation would be required by the permitting agencies.

The implementation of a reclamation plan would restore regulated wetlands and best management practices would reduce impacts but not entirely eliminate them. In some cases wetland acreage could increase following reclamation depending on the compensation ratios determined during the permitting process. In other cases, wetlands which formed as the result of past mining activities that are providing minimal wetlands functions could be improved during reclamation of remined areas. Over time reclamation would result in the improvement of wetland functions leading to long-term beneficial impacts to wetland resources, but would contribute to near-term adverse impacts to wetlands. Removal of wetlands would result in the loss of wetland functions; however, these functions would be replaced as part of the reclamation plan in accordance with regulatory requirements. Wetlands associated with mine

reclamation or constructed to address acid mine drainage problems have been known to enhance wildlife populations in some cases (Lacki, Hammer, and Webster 1992).

### **Underground and Auger Mining**

Underground and auger mining would be allowed within the evaluation area for all alternatives, although the adit and surface support operations would be required to locate outside of the petition areas for all of the alternatives with the exception of alternative 1. As a result, the amount of land where these types of coal mining activities would be allowed would vary according to each alternative. Removal of coal by underground methods creates a limited void in the stratigraphic column. Subsidence-related deformation of rocks above underground mines can consist of fracturing, fragmentation, caving and chimney collapse, sagging and bedding-plane separation. Underground mining could result in the fracturing of geologic strata, resulting in a change in groundwater flow and discharge at the surface, cracks and fissures can intercept or divert springs or seeps that provide water to wetlands (Schmid & Company Inc. 2000). Wetlands of different geomorphic settings tend to receive different dominant sources of water and have different hydroperiods (Brinson et al. 1998), both of which influence the types of organisms that are adapted to live there (Mitsch and Gosselink 2000). Potential impacts related to subsidence include changes in hydrology, plant communities, and hydroperiod. Although rare in Eastern Tennessee, if subsidence were to occur, it could result in both the loss and/or inadvertent creation of wetlands. In some circumstances underground mines require dewatering, which can alter wetland hydrology by either the drawdown or by disposal of unwanted groundwater to wetlands.

### **Remining**

Potential remining operations on pre-SMCRA mined areas that were left unreclaimed have the potential for mining-related impacts to wetlands that have established on abandoned mine sites. These impacts would be similar to those described above for both surface and underground mining operations. Removal of wetlands would result in the loss of wetland functions; however, these functions would be replaced as part of the reclamation plan in accordance with regulatory requirements. Also, as part of the remining process, reclamation would restore previously abandoned mined sites, thereby minimizing or eliminating, if possible, existing environmental issues such as erosion, acid mine drainage, and discharges of sediment and metals that can adversely affect wetlands. The removal or stabilization of mine tailings, wastes, and refuse piles from previously mined sites would prevent surface runoff from coming into contact with these materials and leaching acidic and toxic materials into surface water and associated wetlands.

Under alternatives where remining is prohibited, conditions at wetlands that were created or inadvertently created on old mining sites would remain unchanged. The continued existence of pre-SMCRA unreclaimed abandoned mined lands would at some sites result in continued acid mine drainage. Even though regulations prohibit acid mine drainage and regulate the treatment of discharge to meet effluent limits, acid mine and other polluted drainage can still occur at unreclaimed mines (Metesh, Jarrell, and Oravetz 1998).

Because of its low pH, acid mine drainage can have adverse effects on wetlands that are exposed and can stunt terrestrial plant growth and harm wetlands (Ochieng, Seanego, and Nkwonta 2010; Stephenson, Studiar, and Mc Quattie 1995; Stephen, Sencindiver, and Skousen 2003; ASMR 2004). The deposition of metals into wetlands can overload them and result in wetland degradation and destruction (Kalin 2004). Wetlands exposed to acid mine drainage show a significant reduction in plant species richness, which makes them vulnerable to invasive species (Stephenson, Studiar, and Mc Quattie 1995).

## **Roads**

Potential construction of access and haul roads to support surface, underground, and auger mining operations and re-mining and reclamation efforts could impact wetlands. Haul and access road construction would remove vegetation, disturb and expose soils, and increase the potential for erosion and runoff into adjacent wetlands. This could result in adverse impacts including increased sedimentation within the wetlands. Improperly designed and sized road culverts can either restrict or increase water flow altering the hydroperiod of a wetland. Operation of roads could also result in some erosive action through stormwater runoff leading to sediment discharge to wetlands.

However, most new roads could be designed to avoid or mitigate impacts. Implementation of best management practices and compliance with applicable SMCRA and other regulations would minimize adverse impacts from construction and operation of roads, resulting in long-term localized minor impacts on wetlands (Keller and Sherar 2003). In some cases, road construction may inadvertently create wetlands via erosion and sediment control structures, and road design. These wetlands provide some functions, but are generally not of high quality.

Figures 6-17, 6-18, 6-19, 6-20, and 6-21 show impacts of the alternatives to wetlands.

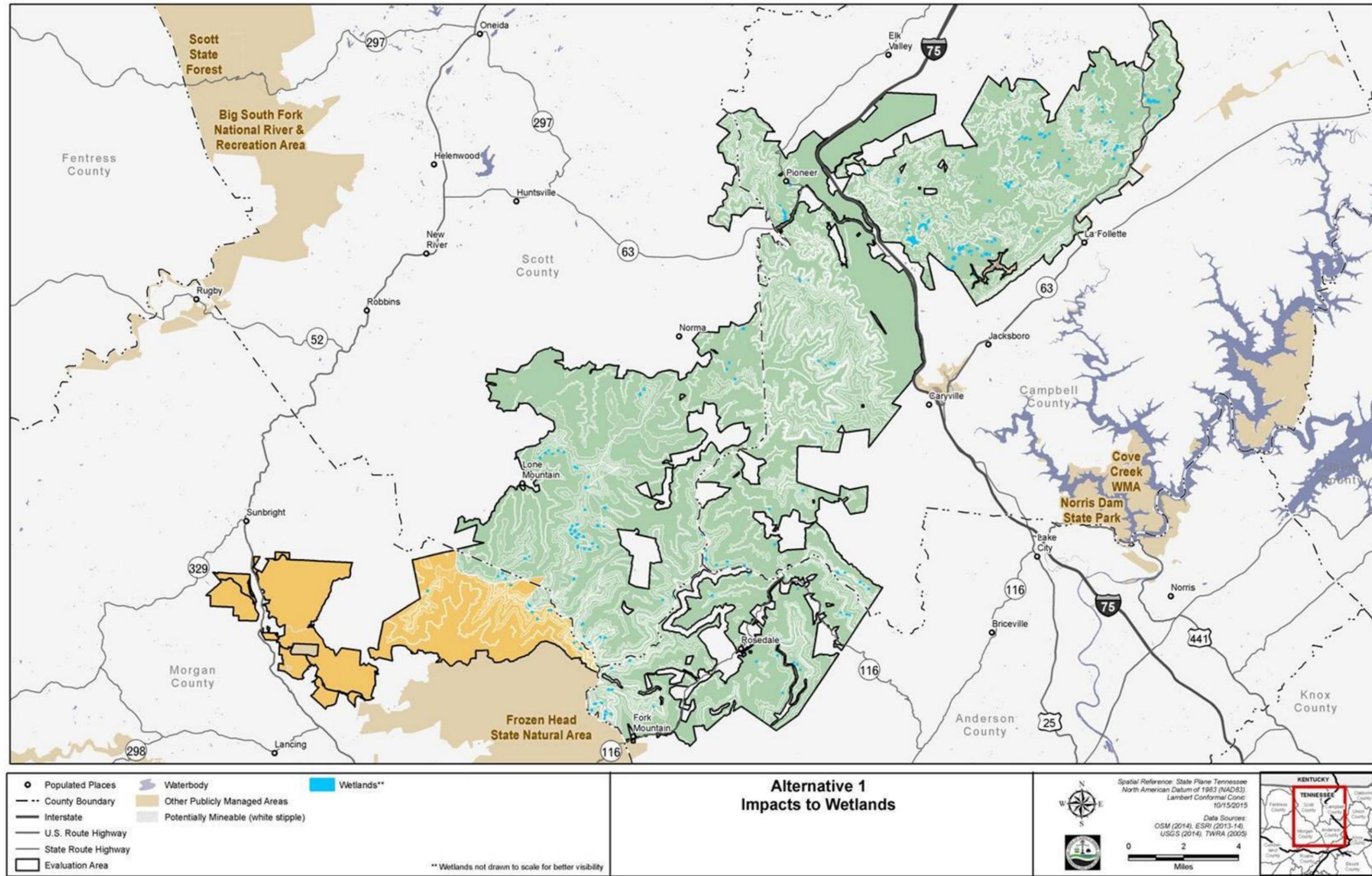


FIGURE 6-17: ALTERNATIVE 1 IMPACTS TO WETLANDS

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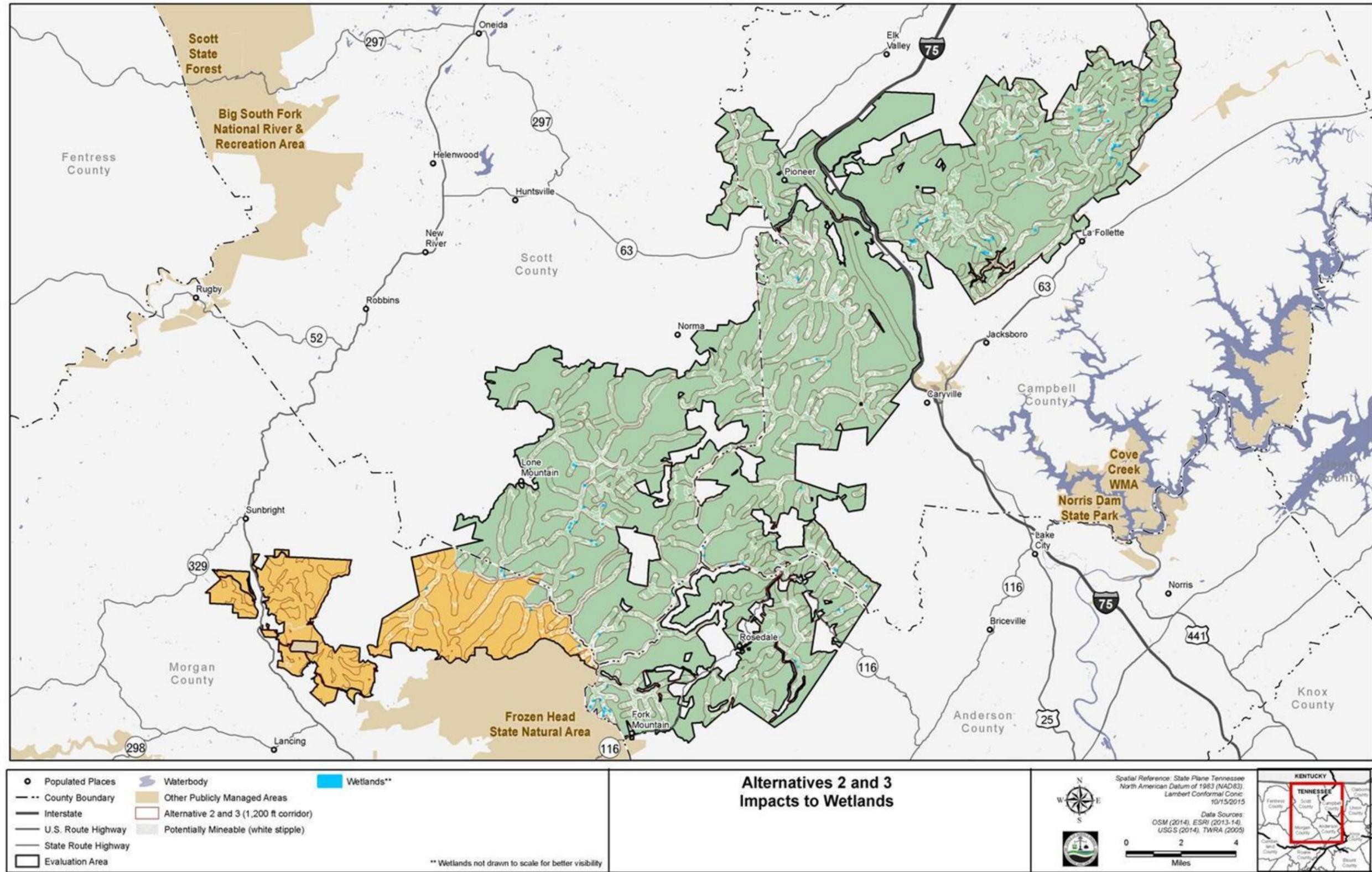


FIGURE 6-18: ALTERNATIVES 2 AND 3 IMPACTS TO WETLANDS

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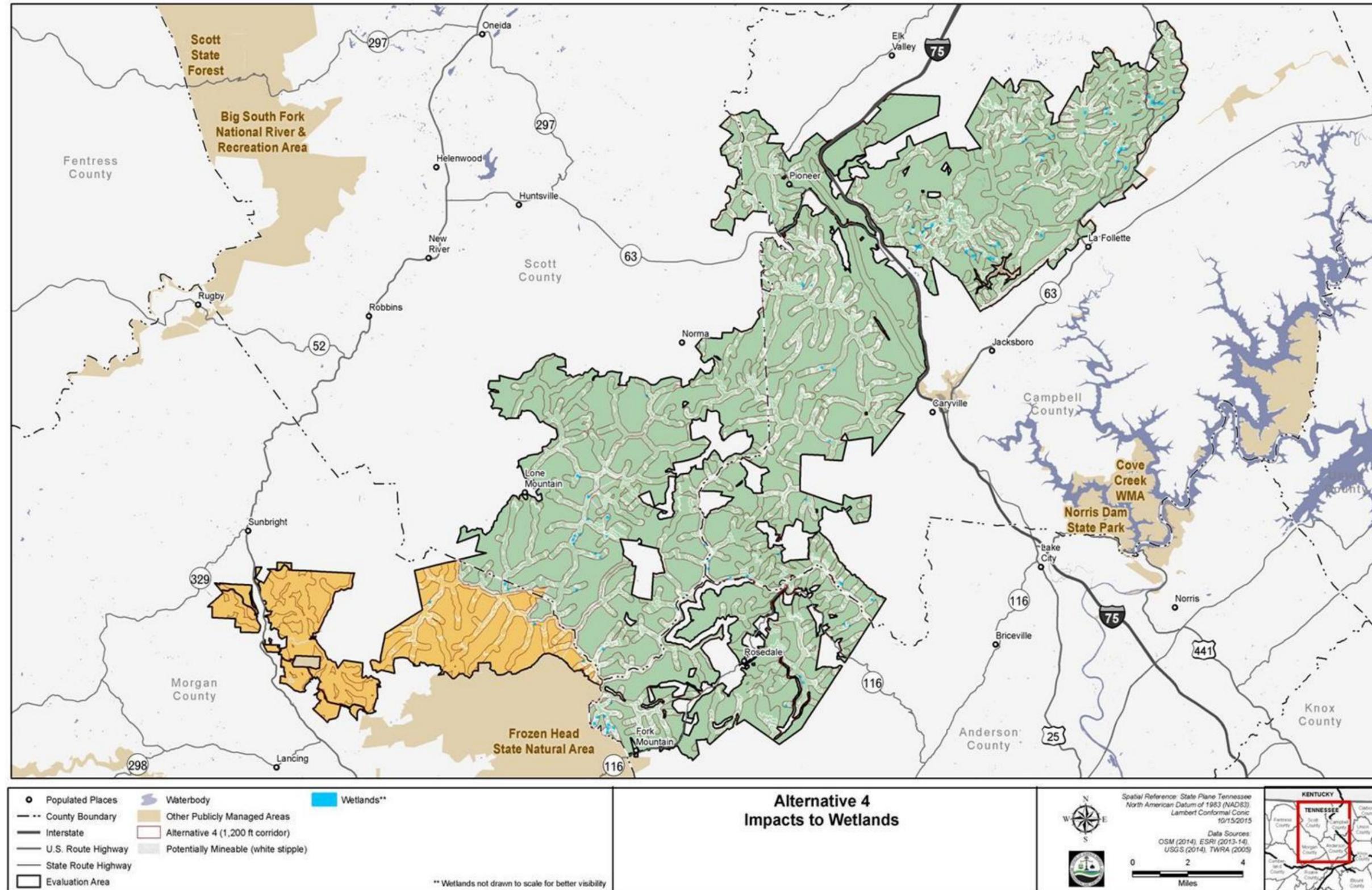


FIGURE 6-19: ALTERNATIVE 4 IMPACTS TO WETLANDS

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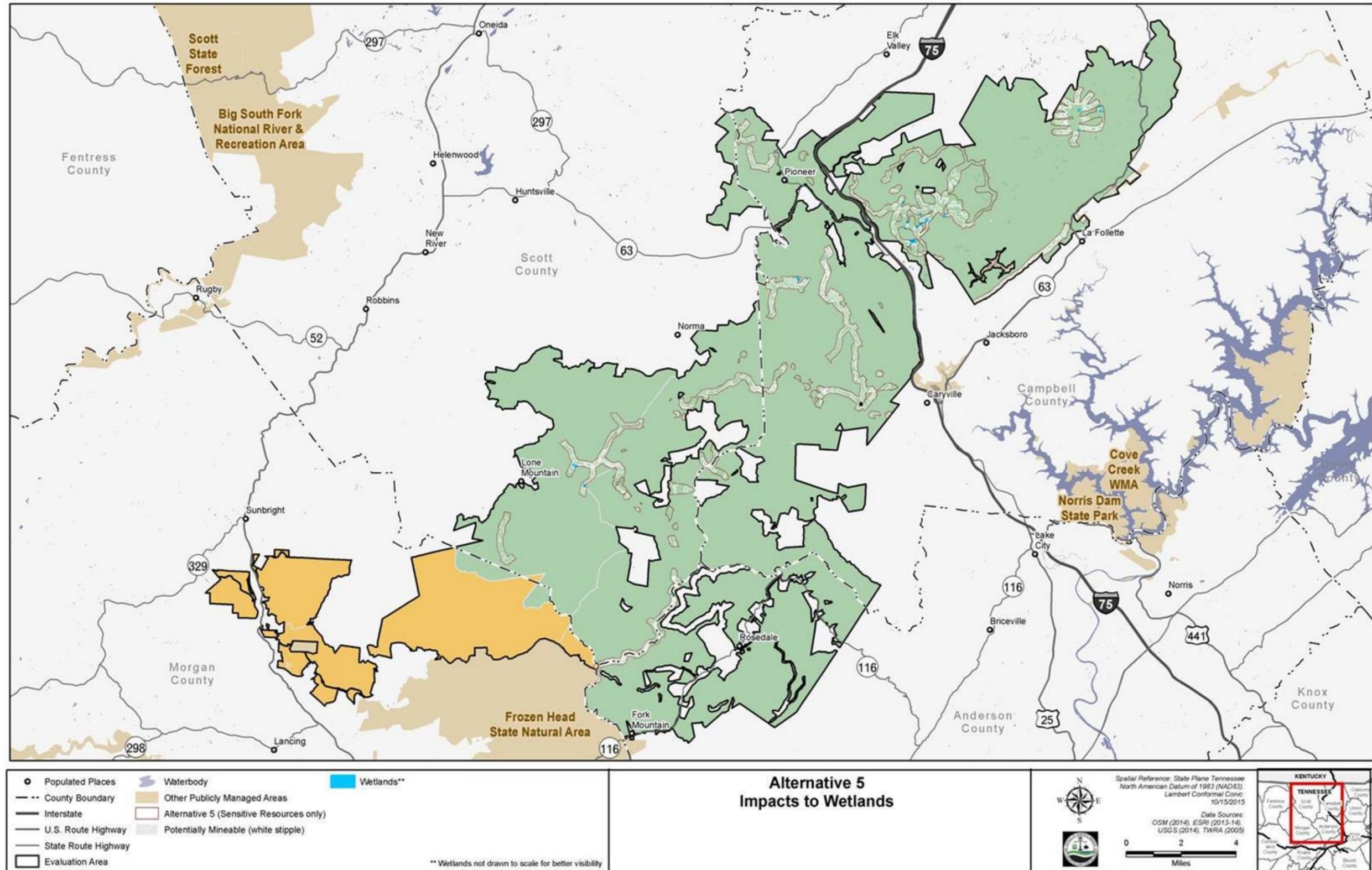


FIGURE 6-20: ALTERNATIVE 5 IMPACTS TO WETLANDS

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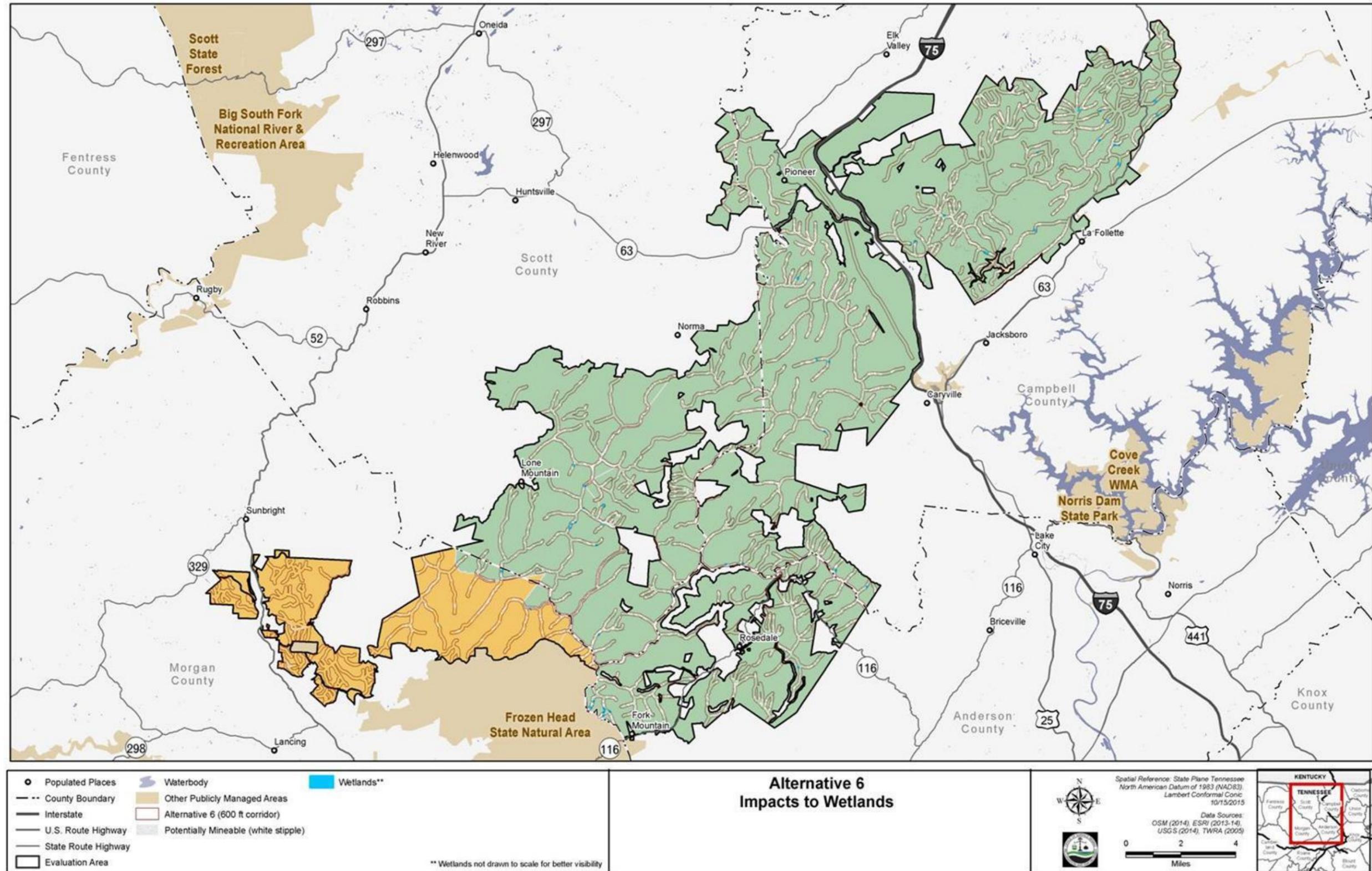


FIGURE 6-21: ALTERNATIVE 6 IMPACTS TO WETLANDS

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## **ALTERNATIVE 1: NO-ACTION ALTERNATIVE**

Under alternative 1 (no action), OSMRE would deny the State's petition to designate the subject lands as "unsuitable for surface coal mining operations" (30 CFR § 764.13). Therefore, the no-action alternative would allow for future and ongoing surface coal mining operations.

### **Direct and Indirect Impacts**

Under alternative 1 all forms of surface coal mining operations would be allowed including underground and auger mining. Under this alternative, unavoidable wetland impacts could occur as a result of removal of wetland vegetation or fill placed in a wetland during surface coal mining and re-mining activities; construction and use of haul roads; runoff of sedimentation into a wetland; acid mine drainage; and alteration of wetland hydroperiod. These impacts to wetlands are described in detail under "General Impacts of Coal Mining in Tennessee on Wetlands." Regulatory approval would be required for this action and performance standards related to location, design, construction, maintenance, and reclamation must be followed (Clean Water Act; 404(b)(1); 30 CFR § 816.97(f); 30 CFR part 816 and § 817; 30 CFR part 942).

Section 404 of the Clean Water Act, requires consideration of impacts to wetlands and waters of the United States and their associated functions and values. Other impacts considered include habitat fragmentation, stormwater runoff, sedimentation, hydrologic modifications, and temporary disturbance incurred during construction that may adversely affect the functions and values of a wetland. Wetland impacts would be mitigated according to the requirements of permits issued under section 404(a) of the Clean Water Act. Avoidance, minimization of impacts, and mitigation would be required for any jurisdictional wetlands, as described above in "General Impacts of Coal Mining in Tennessee on Wetlands." Best management practices and performance standards would be implemented to minimize the adverse impacts to wetlands. If during the mine permitting process a wetland was encountered and could not be avoided, mitigation measures for impacts would be developed on a site-specific basis. The total acreage of replacement wetlands would depend on the compensation ratios determined during the permitting process.

Underground and auger mining would be allowed within the evaluation area. Adverse impacts include indirect impacts from construction, and operation activities that cause minor fills, changes in wetland hydroperiod, and acid mine drainage. Wetland impacts would likely persist until reclamation of the area is complete. These impacts to wetlands are described in detail under "General Impacts of Coal Mining in Tennessee on Wetlands."

Both natural and artificial manmade or altered wetland types were identified within in the evaluation area and the potential impacts from surface coal mining and re-mining under alternative 1 are described in table 6-30. The natural wetlands identified within the study areas include palustrine emergent, palustrine scrub-shrub, and palustrine forested wetland. In some areas, natural wetlands identified within the study areas occur as wetland complexes composed of two or more types of wetlands (i.e., palustrine scrub-shrub/forested wetland). The majority of artificial manmade or altered palustrine wetlands are identified as either palustrine unconsolidated bottom (PUB) or palustrine aquatic bed (PAB)) with one of the following special modifiers: x = excavated and lies within a basin or channel that have been dug, gouged, blasted, or suctioned through artificial means by man; b = created or modified by beaver; h = diked/impounded. These wetlands have been created or modified by a manmade barrier or dam, or a dam created by beavers; this type of dam obstructs the inflow or outflow of water. In general, these wetlands are likely the result of past mining activity or beaver activity. Impacts to these artificial manmade or altered palustrine wetland/pond systems were also considered. Artificial manmade or altered palustrine wetland/pond systems that occur in the evaluation area and the potential impacts from surface

coal mining and remining are described in table 6-30. As described in the table, these natural wetlands and palustrine artificial manmade or altered wetlands and wetlands created or modified by beavers merely reflect the wetland type that could be impacted by surface coal mining and remining. Preliminary wetlands inventories of the evaluation area are based on USFWS National Wetland Inventory mapping and unpublished TVA data.

**TABLE 6-30: WETLAND TYPES POTENTIALLY AFFECTED BY SURFACE COAL MINING**

<b>Wetland Type</b>	<b>Wetlands In the Evaluation Area (acres)</b>	<b>Wetlands Potentially Impacted by Surface Coal Mining (acres)</b>
Palustrine Emergent (PEM)	12.0	1.0
Palustrine Scrub-Shrub (PSS)	21.4	<0.1
Palustrine Forested (PFO)	59.9	4.2
Palustrine Emergent/Pond (PEM/PUB)	1.2	0.0
Palustrine Forested/Scrub-Shrub/Emergent/Pond (PFO/PSS/PEM/PUB)	5.8	0.0
Palustrine Forested/Scrub-Shrub (PFO/PSS)	14.5	0.0
Palustrine Forested/Scrub-Shrub/Emergent (PFO/PSS/PEM)	0.6	0.0
Palustrine Scrub-Shrub/Emergent (PSS/PEM)	4.7	0.0
Palustrine Scrub-Shrub/Emergent/Pond (PSS/PEM/PUB)	12.2	0.0
Palustrine Pond (PUB)	<0.1	0.0
Palustrine created or modified by beaver (PFO, PSS, PEM, PUB) (b)	22.5	0.2
Palustrine artificial manmade or altered and created or modified by beaver (PFO, PSS, PEM, PUB) (x, b, h)	226.5	50.8
<b>Total</b>	<b>381.3</b>	<b>56.2</b>

According to the National Wetland Inventory and unpublished TVA data, the evaluation area contains approximately 381.3 acres of palustrine wetlands of these 56.2 acres of wetlands are within or within 100 feet of areas designated as potentially available for surface coal mining. The amount of wetlands identified within the evaluation area makes up less than 1% of the evaluation area. Approximately 1.0 acre of palustrine emergent wetland, 4.2 acres palustrine forested wetland, less than 0.1 acre of palustrine scrub/shrub wetland, 0.2 acre of palustrine wetlands created or modified by beaver, and 50.8 acres of palustrine artificial manmade or altered (Pond) wetlands and wetlands created or modified by beavers could be affected by potential surface coal mining under alternative 1. However, this loss of natural wetlands and palustrine artificial manmade or altered wetlands would be limited based on the average annual mining rate and the regulatory requirements for wetland protection. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on

engineering and economic factors and/or other free market conditions. Also, re-mining could potentially provide beneficial impacts by minimizing or eliminating, if possible, existing environmental issues such as erosion, acid mine drainage, and discharges of sediment and metals that can adversely affect nearby or downstream wetlands. However, alternative 1 could result in site-specific localized significant impacts to a wetland depending on their proximity to a mining operation

### **Cumulative Impacts**

Past, present, and reasonably foreseeable future actions that could impact wetlands include the new and existing permitted surface mining operations, re-mining of abandoned mines, forest practice operations, oil and gas operations, and construction and maintenance of road infrastructure and other land development. Ground-disturbing work associated with mining, forest practices, oil and gas operations, road maintenance, and implementation of erosion control measures could have both near- and long-term adverse impacts to wetlands. While wetlands may be disturbed by cumulative actions, the majority of impacts would require mitigation under section 404 of the Clean Water Act, and overall cumulative wetland impacts would be minor. For many types of development, such as oil and gas, disturbance of wetlands is avoided where possible. Where avoidance is not possible, mitigation measures for impacts to wetlands is evaluated on a site-specific basis.

The impacts of alternative 1, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on wetlands, because the compensation afforded by mitigation would not be required in all cases and wetlands may not be able to be avoided. Alternative 1 would contribute minor adverse cumulative effects considering the expected rate of mining, although the amount of acreage disturbed by any one activity or type of activity may not be directly proportional to wetland impacts because of the different types of links between surface disturbances (e.g., type of activity, soil type, and slope) and the potential for wetland impact. However, given the low number of acres expected to be mined and the regulatory protection for wetlands, alternative 1 would have a relatively small contribution to the overall adverse cumulative impact on wetlands.

### **Conclusion**

Alternative 1 (no action) could potentially impact wetlands at the mining site or within close proximity. Both near- and long-term adverse impacts to wetlands could result from mining activities. If a wetland was encountered and could not be avoided, mitigation measures for impacts would be developed on a site-specific basis. This could result in a short-term significant impact to the wetland depending on the proximity to a mining operation, the size of the impact, and effects to wetland function until the time when the wetland functions returned to a pre-impact state. The total acreage of replacement wetlands would depend on the compensation ratios determined during the permitting process. Best management practices and compliance with applicable regulations and permit conditions would minimize impacts to this resource and only a small percentage of the evaluation area would be mined based on the expected level of future surface coal mining operations (estimated on average at 112 acres per year or 3,360 acres over the 30-year planning timeframe, not all of which would be wetlands).

### **ALTERNATIVE 2: STATE PETITION DESIGNATION**

Under alternative 2, OSMRE would designate 67,326 acres of land as unsuitable for surface coal mining operations. This would include all public access lands as unsuitable for surface coal mining operations in the State's petition. Under this alternative, 505 miles of ridgelines with a 1,200-foot corridor (600 feet on both sides of the ridgeline) would be designated as unsuitable for surface coal mining. Mines currently permitted under SMCRA could not be designated (30 CFR § 762.13(b)). Underground and auger mining

would be allowed within the petition area, but no surface disturbances would occur within the petition area.

### Direct and Indirect Impacts

Under alternative 2, no impacts to wetlands other than those already authorized in the petition area would occur. However, impacts could continue as a result of existing permitted mines and issues related to unreclaimed mines in the petition area. In addition, underground and auger mining would be allowed underneath the petition area. These impacts to wetlands are described in detail under “General Impacts of Coal Mining in Tennessee on Wetlands.” The designation would have long-term widespread beneficial impacts on wetland resources by preventing most direct and indirect adverse impacts to wetland functions and values in the petition area.

Both natural and artificial manmade or altered wetland types in the petition area and the areas that could be protected from potential surface coal mining and re-mining under alternative 2 are described in table 6-31. As described in the table, these natural wetlands and palustrine artificial manmade or altered wetlands and wetlands created or modified by beavers merely reflect the wetland type that could be protected from surface coal mining and re-mining. Preliminary wetlands inventories of the evaluation area are based on USFWS National Wetland Inventory mapping and unpublished TVA data.

**TABLE 6-31: WETLAND TYPES POTENTIALLY IMPACTED UNDER ALTERNATIVE 2**

Wetland Type	Wetlands In the Evaluation Area (acres)	Wetlands Potentially Protected from Surface Coal Mining (acres)
Palustrine Emergent (PEM)	0.4	0.0
Palustrine Scrub-Shrub (PSS)	3.4	0.0
Palustrine Forested (PFO)	17.1	2.3
Palustrine Forested/Scrub-Shrub (PFO/PSS)	0.2	0.0
Palustrine created or modified by beaver (PFO, PSS, PEM, PUB) (b)	5.1	0.0
Palustrine artificial manmade or altered and created or modified by beaver (PFO, PSS, PEM, PUB) (x, b, h)	58.6	17.3
<b>Total</b>	<b>84.8</b>	<b>19.6</b>

According to the National Wetland Inventory and unpublished TVA data, the petition area contains approximately 84.8 acres of wetlands. The amount of wetlands identified within the petition area makes up less than 1% of the evaluation area. Approximately 2.3 acres of palustrine forested wetlands could be protected from potential surface coal mining under alternative 2. Approximately 17.3 acres of palustrine artificial manmade or altered wetlands and wetlands created or modified by beavers could be protected from surface coal mining under alternative 2.

Under this alternative, re-mining and associated reclamation operations would not be permitted within this area. Long-term adverse impacts to the quality and quantity of surface water and associated wetlands would continue on a portion of the unreclaimed land that was previously mined within the petition area, as described in “General Impacts of Surface Mining in Tennessee on Wetlands.” However, overall, alternative 2 would result in the protection of wetlands within potential mineable areas and open water in

potential mineable areas and greater long-term beneficial impacts compared to alternative 1. Alternative 2 would not result in any direct or indirect adverse impacts in the petition area, but could result in benefits through the protection of wetlands and possible adverse impacts due to the inability to reclaim and clean up pre-SMCRA abandoned mines. Given the rate of surface coal mining, the small amount of wetlands, and the small amount of open water located in potential mineable areas, it is expected that alternative 2 would have minor effects to wetlands.

### **Cumulative Impacts**

Past, present, and reasonably foreseeable future actions that could impact wetlands include the same cumulative actions as discussed under alternative 1, including the new and existing permitted surface mining operations, remining of abandoned mines, forest practice operations, oil and gas operations, and construction and maintenance of road infrastructure and other land development. While wetlands may be disturbed by cumulative impacts, the majority of impacts would require mitigation under section 404 of the Clean Water Act. The impacts of alternative 2, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on wetlands as the beneficial impacts on wetlands contributed by alternative 2 would be small compared to the impacts from underground mining activity and the presence of unreclaimed mines in the designation area.

### **Conclusion**

The designation of the petition area under alternative 2 would have long-term widespread beneficial impacts on wetland resources by preventing most direct and indirect adverse impacts to wetland functions and values and limiting further wetland loss in that area. Overall, alternative 2 would benefit wetlands but would still have some adverse effects because of underground mining activity and issues related to unreclaimed mines in the petition area. However, no new or additional adverse impacts would be expected compared to the no-action alternative. Alternative 2 would not result in significant impacts to wetlands.

### **ALTERNATIVE 3: STATE PETITION DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS**

Under alternative 3, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State's petition with a 1,200-foot ridgeline corridor, as described under alternative 2. Unlike alternative 2, alternative 3 would not prohibit remining (pursuant to 30 CFR chapter VII), but would require reclamation. Alternative 3 could also potentially allow construction and maintenance of haul roads inside the designation area.

### **Direct and Indirect Impacts**

Alternative 3 would not prohibit the remining of abandoned mines, underground and auger mining operations originating outside of the designation area, but tunneling and drilling under the petition area, and construction and maintenance of haul roads inside the petition area. Potential remining could result in impacts to wetlands that have been established on abandoned mine sites. These impacts to wetlands are described in detail under "Wetlands: General Impacts of Coal Mining in Tennessee. If during the remining permitting process a wetland was encountered and could not be avoided, mitigation measures for impacts would be developed on a site-specific basis. The total acreage of replacement wetlands would depend on the compensation ratios determined during the permitting process. Reclamation /cleanup done during remining could minimize or eliminate, if possible, existing environmental issues such as erosion, acid mine drainage, and discharges of sediment and metals that can affect surface waters and associated wetlands.

Potential access and haul roads would be constructed to support remining and reclamation efforts. Road construction and use and associated infrastructure, such as drainages and embankments, can alter wetlands within the vicinity. However, most roads could be designed to avoid impacts. If during road construction or maintenance a wetland was encountered and could not be avoided, mitigation measures for impacts would be developed on a site-specific basis. In some cases mining operations may inadvertently create wetlands via erosion and sediment control structures, or construction of access and haul roads.

Alternative 3 would have long-term beneficial impacts to wetlands by protecting wetlands within the designated area and preventing impacts associated with mining.

Wetland types in the designation area and the areas that could be protected from potential surface coal mining and the potential wetlands reclaimed following remining under alternative 3 are described in table 6-32. As described in the table, these natural wetlands and palustrine artificial manmade or altered (Pond) wetlands and wetlands created or modified by beavers merely reflect the wetland type that could be protected from surface coal mining and reclaimed following remining. Preliminary wetlands inventories of the evaluation area are based on USFWS National Wetland Inventory mapping and unpublished TVA data.

**TABLE 6-32: WETLAND TYPES POTENTIALLY PROTECTED UNDER ALTERNATIVE 3**

<b>Wetland Type</b>	<b>Wetlands In the Petition Area (acres)</b>	<b>Acres Potentially Protected from Surface Coal Mining (acres)</b>	<b>Acres Potentially Affected by Remining (acres)</b>
Palustrine Emergent (PEM)	0.4	0.0	0.0
Palustrine Scrub-Shrub (PSS)	3.4	0.0	0.0
Palustrine Forested (PFO)	17.1	2.3	0.0
Palustrine Forested/Scrub-Shrub (PFO/PSS)	0.2	0.0	0.0
Palustrine created or modified by beaver (PFO, PSS, PEM, PUB) (b)	5.1	0.0	0.0
Palustrine artificial manmade or altered and created or modified by beaver (PFO, PSS, PEM, PUB)(x, b, h)	58.6	17.3	24.2
<b>Total</b>	<b>84.8</b>	<b>19.6</b>	<b>24.2</b>

According to the National Wetland Inventory and unpublished TVA data, the petition area contains approximately 84.8 acres of wetlands. The amount of wetlands identified within the petition area makes up less than 1% of the evaluation area. Approximately 2.3 acres of palustrine forested wetlands could be protected from potential surface coal mining under alternative 3. Approximately 17.3 acres of palustrine artificial manmade or altered (Pond) wetlands and wetlands created or modified by beaver could be protected from potential surface coal mining under alternative 3. Approximately 24.2 acres of palustrine artificial manmade or altered (Pond) wetlands and wetlands created or modified by beaver are associated with areas that could be remined.

Alternative 3 would result in the protection of wetlands within potential mineable areas and open water in potential mineable areas and greater long-term beneficial impacts compared to alternative 1. However, there could be impacts to palustrine artificial manmade or altered (Pond) wetlands and wetlands created or modified by beaver. Potential remining and construction, along with use and maintenance of access and haul roads within the petition area and adjacent to protected ridgelines, could result in near- and long-term indirect adverse impacts to wetlands. However, protection of lands within the petition area from future mining activities would result in long-term beneficial impacts to wetlands by limiting the potential for removal of wetland vegetation or fill placed in a wetland during surface coal mining and remining activities; construction and use of haul roads; runoff of sedimentation into a wetland; acid mine drainage; and alteration of wetland hydroperiod.

### **Cumulative Impacts**

Past, present, and reasonably foreseeable future actions that could impact wetlands include the same cumulative actions as discussed under alternative 1, the new and existing permitted surface mining operations, remining of abandoned mines, forest practice operations, oil and gas operations, and construction and maintenance of road infrastructure and other land development. While wetlands may be disturbed by cumulative impacts, the majority of impacts would require mitigation under section 404 of the Clean Water Act. The impacts of alternative 3, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on wetlands largely due to the limited number of wetlands protected by alternative 3 and level of adverse effects associated with other actions. In addition approximately 24.2 acres of palustrine artificial manmade or altered (Pond) wetlands and wetlands created or modified by beaver could be affected by potential remining actions.

### **Conclusion**

Overall, alternative 3 would result in the protection of wetlands adjacent to potential mineable areas and open water in potential mineable areas, leading to greater long-term beneficial impacts than alternative 1. Potential remining and reclamation activities and access road construction and maintenance (within the petition area and adjacent to protected ridgelines) could result in near-term adverse impacts to wetlands. However, wetland mitigation plans would replace impacted wetlands as part of the reclamation plan in accordance with regulatory requirements, and potential remining and reclamation of abandoned mines could benefit wetlands by improving water quality. No new or additional adverse impacts would be expected compared to the no-action alternative. Given the rate of potential surface coal mining, the small amount of wetlands, and the small amount of open water located in potential mineable areas, it is expected that alternative 3 would not have significant impacts on wetlands.

### **ALTERNATIVE 4: EXPANDED CORRIDOR DESIGNATION WITH REMINING AND ROAD ACCESS (PREFERRED ALTERNATIVE)**

Under alternative 4, OSMRE would designate 76,133 acres as unsuitable for new surface coal mining operations; all public access lands proposed in the State's petition, as described under alternative 2, plus additional ridgelines. Like alternative 3, alternative 4 would not prohibit remining, construction and maintenance of haul roads, and underground and auger mining provided that the adit and surface support operations are located outside of the designation area.

### **Direct and Indirect Impacts**

Potential remining could result in impacts to wetlands that have been established on abandoned mine sites. These impacts to wetlands are described in detail under "General Impacts of Coal Mining in Tennessee on Wetlands." If during the remining permitting process a wetland was encountered and could

not be avoided, mitigation measures for impacts would be developed on a site-specific basis. Because of the concern of acid mine drainage from abandoned and unreclaimed mine sites, mitigated wetlands could help to improve the situation as wetlands have proven to be effective in treating acid mine drainage conditions (Costello 2002). In addition, reclamation and cleanup done during remining could minimize or eliminate existing environmental issues such as erosion, acid mine drainage, and discharges of sediment and metals that can affect surface waters and associated wetlands. The total acreage of any replacement wetlands would depend on the compensation ratios determined during the permitting process.

Potential access and haul roads could be constructed to support remining and reclamation efforts. Road construction and use and associated infrastructure, such as drainages and embankments, can alter wetlands within the vicinity. However, most roads could be designed to avoid impacts. If during road construction or maintenance a wetland was encountered and could not be avoided, mitigation measures for impacts would be developed on a site-specific basis. In some cases mining operations may inadvertently create wetlands via erosion and sediment control structures, or construction of access and haul roads.

Like alternative 3, alternative 4 would have long-term beneficial impacts to wetlands by protecting wetlands within the petition area and preventing impacts associated with mining. However, these beneficial impacts would be increased due to protection of ridgelines beyond those outlined in the State's petition.

Both natural and artificial manmade or altered wetland types in the designation area and the areas that could be protected from potential surface coal mining and the potential wetlands reclaimed following remining under alternative 4 are described in table 6-33. As described in the table, these natural wetland and palustrine artificial manmade or altered (Pond) wetlands and wetlands created or modified by beavers merely reflect the wetland type that could be protected from surface coal mining and reclaimed following remining. Preliminary wetlands inventories of the evaluation area are based on USFWS National Wetland Inventory mapping and unpublished TVA data.

**TABLE 6-33: WETLAND TYPES POTENTIALLY PROTECTED UNDER ALTERNATIVE 4 (PREFERRED ALTERNATIVE)**

<b>Wetland Type</b>	<b>Wetlands In the Designation Area (acres)</b>	<b>Acres Potentially Protected from Surface Coal Mining (acres)</b>	<b>Acres Potentially Affected by Remining (acres)</b>
Palustrine Emergent (PEM)	0.5	0.0	0.0
Palustrine Scrub/Shrub (PSS)	4.8	0.0	0.0
Palustrine Forested (PFO)	20.9	2.6	0.0
Palustrine Forested/Scrub-Shrub (PFO/PEM)	0.2	0.0	0.0
Palustrine created or modified by beaver (PFO, PSS, PEM, PUB) (b)	5.3	0.0	0.0
Palustrine artificial manmade or altered and created or modified by beaver (PFO, PSS, PEM, PUB)(x, b, h)	81.4	17.7	28.3
<b>Total</b>	<b>113.1</b>	<b>20.3</b>	<b>28.3</b>

According to the National Wetland Inventory and unpublished TVA data, the designation area contains approximately 113.1 acres of wetlands. The amount of wetlands identified within the designation area makes up less than 1% of the evaluation area. Approximately 2.6 acres of palustrine forested wetlands could be protected from potential surface coal mining under alternative 4. Approximately 17.4 acres of palustrine artificial manmade or altered (Pond) wetlands and wetlands created or modified by beaver could be protected from potential surface coal mining under alternative 4, and 28.3 acres of palustrine artificial manmade or altered (Pond) wetlands and wetlands created or modified by beaver associated with areas that could be potentially mined.

Alternative 4 would result in the protection of wetlands within potential mineable areas and open water in potential mineable areas and greater long-term beneficial impacts compared to alternative 1. Potential mining and construction, along with use and maintenance of potential access and haul roads within the designation area and adjacent to protected ridgelines, could potentially result in near- and long-term indirect adverse impacts to wetlands as well as long-term benefits from mining reclamation and cleanup. Protection of lands within the designation area from future mining activities would result in long-term beneficial impacts to wetlands by limiting the potential for removal of wetland vegetation or fill placed in a wetland during surface coal mining and potential mining activities; potential construction and use of haul roads; runoff of sedimentation into a wetland; acid mine drainage; and alteration of wetland hydroperiod.

Overall, alternative 4 would result in the protection of wetlands within potential mineable areas and open water in potential mineable areas and greater long-term beneficial impacts than alternative 1. Given the rate of surface coal mining, the small amount of wetlands, and the small amount of open water located in potential mineable areas, it is expected that alternative 4 would have minimal effects to wetlands.

### **Cumulative Impacts**

Past, present, and reasonably foreseeable future actions that could impact wetlands include the same cumulative actions as discussed under alternative 1, the new and existing permitted surface mining operations, potential mining of abandoned mines, forest practice operations, oil and gas operations, and construction and maintenance of road infrastructure and other land development. While wetlands may be disturbed by cumulative impacts, the majority of impacts would require mitigation under section 404 of the Clean Water Act. The impacts of alternative 4, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on wetlands given the area designated and the level of adverse effects from other actions. In addition, 28.3 acres of palustrine artificial manmade or altered (Pond) wetlands and wetlands created or modified by beavers would be affected by potential mining actions. Therefore, although alternative 4 would primarily contribute beneficial impacts on wetlands, the overall cumulative impact would be adverse.

### **Conclusion**

Impacts under alternative 4 would be nearly identical to those described under alternative 3, primarily beneficial. Potential mining and reclamation activities and haul road construction and maintenance (within the designation area and adjacent to protected ridgelines) could result in near-term adverse impacts to wetlands. However, wetland mitigation plans would replace impacted wetlands as part of the reclamation plan in accordance with regulatory requirements, and appropriate mining and reclamation of abandoned mines could benefit wetlands by improving water quality. No new or additional adverse impacts would be expected compared to the no-action alternative. Given the rate of surface coal mining, the small amount of wetlands, and the small amount of open water located in potential mineable areas, it is expected that alternative 4 would not have significant impacts on wetlands.

## ALTERNATIVE 5: TARGETED RESOURCE PROTECTION DESIGNATION

Under alternative 5, OSMRE would designate 12,331 acres of land as unsuitable for surface coal mining operations based on the presence of sensitive resources (see figure 3-4 in chapter 3). This designation differs from alternatives 2, 4, and 6, which designate protected areas based on ridgelines. Alternative 5 would protect environmentally sensitive habitat including unique forested and sphagnum wetlands within the upper headwater portions of Stinking Creek and Thompson Creek. Like alternative 2, alternative 5 would not allow construction of new access or haul roads within the protected area. Underground and auger mining would be allowed provided that the adit and surface support operations would be required to locate outside of the petition area.

### Direct and Indirect Impacts

Under alternative 5, no adverse impacts to wetlands would occur in the designation area. However, impacts could continue as a result of existing permitted mines and issues related to unreclaimed mines in the designation area, since no remining would occur. There are approximately 1,494 acres of previously surface mined area. In addition, underground and auger mining would be allowed underneath the evaluation area, which could result in impacts to wetlands from subsidence and fracturing of the local geologic strata. The designation would have long-term widespread beneficial impacts on rare and unique wetland resources by preventing most direct and indirect adverse impacts to wetland functions and values. These impacts would generally be the same as those described under alternative 2, but would occur in different locations.

Both natural and artificial manmade or altered wetland types in the designation area and the areas that could be protected from potential surface coal mining and remining under alternative 5 are described in table 6-34. As described in the table, these natural wetlands and palustrine artificial manmade or altered wetlands and wetland created or modified by beavers merely reflect the wetland type that could be protected from surface coal mining and remining. Preliminary wetlands inventories of the evaluation area are based on USFWS National Wetland Inventory mapping and unpublished TVA data.

**TABLE 6-34: WETLAND TYPES POTENTIALLY PROTECTED UNDER ALTERNATIVE 5**

Wetland Type	Wetlands In the Petition Area (acres)	Acres Potentially Protected from Surface Coal Mining (acres)	Acres Potentially Protected from Remining (acres)
Palustrine Emergent (PEM)	0.2	0.0	0.0
Palustrine Forested (PFO)	9.2	2.6	0.0
Palustrine artificial manmade or altered and created or modified by beaver (PFO, PSS, PEM, PUB) (x, b, h)	29.9	5.8	2.0
<b>Total</b>	<b>39.3</b>	<b>8.4</b>	<b>2.0</b>

According to the National Wetland Inventory and the unpublished TVA data, the designation area contains approximately 39.3 acres of wetlands. The amount of wetlands identified within the designation area makes up less than 1% of the total evaluation area. Approximately 2.6 acres of palustrine forested wetlands could be protected from potential surface coal mining under alternative 2. Approximately 5.8 acres of palustrine artificial manmade or altered (Pond) wetlands and wetlands created or modified by beaver could be protected from potential surface coal mining under alternative 5. Additionally, previously

mined areas where open water occurs that would not be remined total approximately 2.0 acres (though areas that were previously augered could not be feasibly remined).

Overall, alternative 5 would result in the protection of wetlands within potential mineable areas and open water in potential mineable areas and greater long-term beneficial impacts than alternative 1. Alternative 5 would not result in any direct or indirect adverse impacts in the designation area, but could result in benefits through the protection of wetlands, and adverse impacts due to the inability to remine and reclaim areas that may have water quality problems that can potentially affect downstream surface waters and wetlands. Given the rate of surface coal mining, the lack of wetlands, and the small amount of wetlands and open water located in potential mineable areas, it is expected that alternative 5 would have minimal effects to wetlands.

### **Cumulative Impacts**

Past, present, and reasonably foreseeable future actions that could impact wetlands include the same cumulative actions as discussed under alternative 1, the new and existing permitted surface mining operations, remining of abandoned mines, forest practice operations, oil and gas operations, and construction and maintenance of road infrastructure and other land development. While wetlands may be disturbed by cumulative impacts, the majority of impacts would require mitigation under section 404 of the Clean Water Act. The impacts of alternative 5, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on wetlands as the beneficial contributions from alternative 5 would be small compared to the overall cumulative impacts from underground mining activity and the continued presence of unreclaimed mines in the designation area.

### **Conclusion**

Similar to alternative 2, alternative 5 would have mainly long-term widespread beneficial impacts on wetland resources in the designation area. Because the alternative does not allow any new mining within the designation area, it is expected that there would be no new impacts to the existing wetlands; therefore, preservation of these wetlands would be seen as beneficial, but would still have some adverse effects because of issues related to unreclaimed mines in the designation area. However, no new or additional adverse impacts would be expected compared to the no-action alternative. Overall, alternative 5 would have beneficial effects compared to the no-action alternative and impacts would not be significant.

## **ALTERNATIVE 6: REDUCED CORRIDOR DESIGNATION**

Under alternative 6, OSMRE would designate 39,106 acres of land as unsuitable for surface coal mining. Lands protected under alternative 6 would be the same as those protected under alternatives 2 and 3, except that the corridor width would be reduced by half (600-foot corridor instead of 1,200-foot corridor). Underground and auger mining would be allowed within the petition area, but no surface disturbances would occur within the designated area.

### **Direct and Indirect Impacts**

Impacts to wetlands under alternative 6 would be the same as those described under alternative 2, although less area would be protected given the smaller potential designation area. The prohibition of additional mining activities would have long-term widespread beneficial impacts on wetland resources by preventing most direct and indirect adverse impacts to wetland functions and values.

Both natural and artificial manmade or altered wetland types in the designation area and the areas that could be protected from potential surface coal mining and remining under alternative 6 are described in

table 6-35. As described in the table, these natural wetlands and palustrine artificial manmade or altered wetlands and wetlands created or modified by beavers merely reflect the wetland type that could be protected from surface coal mining and re-mining. Preliminary wetlands inventories of the evaluation area are based on USFWS National Wetland Inventory mapping and unpublished TVA data.

**TABLE 6-35: WETLAND TYPES POTENTIALLY PROTECTED UNDER ALTERNATIVE 6**

Wetland Type	Wetlands In the Designation Area (acres)	Acres Potentially Protected from Surface Coal Mining (acres)	Acres Potentially Protected from Remining (acres)
Palustrine Scrub-Shrub (PSS)	0.2	0.0	0.0
Palustrine Forested (PFO)	3.7	<0.1	0.0
Palustrine created or modified by beaver (PFO, PSS, PEM, PUB) (b)	2.1	0.0	0.0
Palustrine artificial manmade or altered and created or modified by beaver (PFO, PSS, PEM, PUB) (x, b, h)	28.4	8.3	10.8
<b>Total</b>	<b>34.4</b>	<b>8.3</b>	<b>10.8</b>

According to the National Wetland Inventory and unpublished TVA data, the designation area contains approximately 34.4 acres of wetlands. The amount of wetlands identified within the designation area makes up less than 1% of the evaluation area. Less than 0.01 acres of palustrine forested wetlands could be protected from potential surface coal mining under alternative 6. Approximately 8.3 acres of palustrine artificial manmade or altered (Pond) wetlands and wetlands created or modified by beaver could be protected from potential surface coal mining under alternative 6. Additionally, previously mined areas where open water occurs that would not be re-mined total approximately 10.8 acres (though areas that were previously augered could not be feasibly re-mined).

Under this alternative, re-mining and associated reclamation operations would not be permitted within this area. Long-term adverse impacts to the quality and quantity of surface water and associated wetlands would continue on a portion of the unreclaimed land that was previously mined within the petition area, as described in “General Impacts of Surface Mining in Tennessee on Wetlands.” However, overall, alternative 6 would result in the protection of wetlands within potential mineable areas and open water in potential mineable areas and greater long-term beneficial impacts than alternative 1. Alternative 6 would not result in any significant direct or indirect adverse impacts in the designation area, but could result in benefits through the protection of wetlands and possible adverse impacts due to the inability to reclaim and clean up pre-SMCRA abandoned mines. Given the rate of surface coal mining, the small amount of wetlands, and the small amount of open water located in potential mineable areas, it is expected that alternative 6 would have minimal beneficial effects to wetlands.

### Cumulative Impacts

Past, present, and reasonably foreseeable future actions that could impact wetlands include the same cumulative actions as discussed under alternative 1, the new and existing permitted surface mining operations, re-mining of abandoned mines, forest practice operations, oil and gas operations, and construction and maintenance of road infrastructure and other land development. While wetlands may be disturbed by cumulative impacts, the majority of impacts would require mitigation under section 404 of the Clean Water Act. The impacts of alternative 6, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on wetlands, as the beneficial contributions of alternative 6

would be small when compared to the overall cumulative impact from underground mining activity and issues related to the continued presence of unreclaimed mines in the designation area.

## **Conclusion**

Similar to alternative 2, the protection of lands within the designation area from future mining activities would have long-term widespread beneficial impacts on wetland resources in the designation area by preventing most direct and indirect adverse impacts to wetland functions and values and limiting further loss. Overall, alternative 6 would benefit wetlands but would still have some adverse effects because of underground mining activity and issues related to unreclaimed mines in the designation area. No new or additional adverse impacts would be expected compared to the no-action alternative. Given the rate of surface coal mining, the small amount of wetlands, and the small amount of open water located in potential mineable areas, it is expected that alternative 6 would have minor effects on wetlands.

# **IMPACTS OF THE ALTERNATIVES ON SOILS AND VEGETATION**

## **METHODS FOR ANALYSIS**

### **Applicable Statues, Regulations, and Policies**

Soils comprise the thin, weathered surface layer that overlies rock or other parent material. They are the medium in which most plant growth occurs, and their thickness, fertility, and structure are significant determinants of plant and ecosystem productivity. Soils are affected by underlying geologic material, climate, topography, biological factors, and time. Under 30 CFR § 816.22(a), the operator must remove all topsoil, which 30 CFR § 701.5 defines as consisting of the A and E soil horizons, before otherwise disturbing the land. If the topsoil is less than six inches in thickness, the operator must remove the top six inches of unconsolidated material. The topsoil must be either redistributed on a portion of the mine site upon which backfilling and grading has been completed or stockpiled until redistribution can occur. Under 30 CFR § 816.22(d), the topsoil must be redistributed in a manner that achieves an approximately uniform, stable thickness when consistent with the postmining land use, contours, and surface-water drainage systems. Soil thickness may be varied to the extent that such variations would help meet specific revegetation goals identified in the permit.

If the soil is prime farmland historically used for cropland, 30 CFR § 823.12(b) requires salvage and redistribution of not only all topsoil, but also enough material from the B and C soil horizons to reconstruct a soil with a depth of at least 48 inches, unless the premining soil contains a subsurface horizon at a lesser depth that inhibits or prevents root penetration. Paragraph (e) of 30 CFR § 816.22 allows the regulatory authority to require salvage and redistribution of the B and C soil horizons for non-prime farmland if those horizons are necessary to meet revegetation requirements.

Soils reconstructed after mining differ biologically, physically, and chemically from their premining counterparts. They are more uniform in texture, organic matter content, and thickness. Historically, soils on reclaimed mine sites are more compacted and contain higher amounts of rock fragments than unmined soils (Bussler et al. 1984). However, specialized soil handling techniques can minimize compaction and reduce the adverse impacts of compaction on soil productivity and the hydrologic regime.

Prior to the implementation of SMCRA, coal mining activities often destroyed or degraded the topsoil. In addition, erosion of soil and mine spoil has caused serious sedimentation problems with resultant negative impacts to water quality and aquatic organisms. The legacy of these past practices can be seen today on pre-SMCRA abandoned coal mine sites. Mining operations removed or mishandled large amounts of soil at both surface and underground mining operations. Soils were lost or compacted during mining and

construction of ancillary facilities such as buildings and roads. Operations were frequently conducted without regard to protection of the soil resource.

Subsequent to the enactment of SMCRA, topsoil handling improved, but the methods used to remove and redistribute topsoil sometimes resulted in excessive compaction, which reduces the pore space for air and water and impedes root growth, making revegetation with desirable species more difficult and the reclaimed site less productive. Long-term storage of soil can adversely alter texture and structure. In addition, mycorrhizae, soil organisms, and organic matter do not persist long in stockpiled topsoil.

The regulations implementing SMCRA are intended to minimize the impacts of mining on topsoil. In particular, 30 CFR §§ 779.21, 780.18, 784.13, 816.22, and 817.22 require that the topsoil be removed as a separate layer from the area to be disturbed, and then segregated. If the topsoil is less than six inches thick, the topsoil and the unconsolidated materials immediately below the topsoil must be removed and the mixture treated as topsoil. In cases where the topsoil is of insufficient quantity or poor quality for sustaining vegetation, the operator may use selected overburden materials as a topsoil substitute or supplement. However, before doing so, the operator must demonstrate to the regulatory authority that the resulting soil medium will be equal to or more suitable for sustaining vegetation than the existing topsoil, and that the resulting soil medium is the best available in the permit area to support revegetation. The operator must recover these substitute or supplemental materials as a separate layer from the area to be disturbed and then segregate them.

The regulations require that the operator segregate and stockpile topsoil and topsoil substitutes and supplements after removal when it is impractical to redistribute those materials promptly on regraded areas. Stockpiled materials must be selectively placed on a stable site within the permit area and protected from contaminants, unnecessary compaction, and wind and water erosion that could interfere with revegetation. A quick-growing vegetative cover or other measures may be used for protection.

The operator must redistribute topsoil and topsoil substitutes and supplements in a manner that achieves an approximately uniform, stable thickness when consistent with the approved postmining land use, contours, and surface-water drainage systems. However, the thickness of the redistributed materials may vary to the extent necessary to meet the specific revegetation goals identified in the permit. In addition, redistribution must be done in a manner that prevents excess compaction of the materials and protects them from wind and water erosion before and after seeding and planting.

Existing regulations also include provisions allowing the regulatory authority, at its discretion, to require that the operator separately remove, segregate, stockpile, and redistribute the B and C soil horizons and underlying materials or a portion thereof if necessary to comply with revegetation requirements.

The regulations at 30 CFR § 785.17 and part 823 establish special requirements for prime farmland. The operator must salvage and redistribute the A, E, B, and C soil horizons to (1) an aggregate depth of at least 48 inches, (2) a lesser depth equal to the depth to a subsurface horizon in the natural soil that inhibits or prevents root penetration, or (3) a greater depth if determined necessary to restore the original soil productive capacity. The regulations also require use of soil reconstruction specifications developed by the US Natural Resources Conservation Service.

The regulations at 30 CFR §§ 816.111 through 816.116 and §§ 817.111 through 817.116 require use of native species in revegetation, although introduced species are permitted under certain conditions. As described in this section, salvage, storage, and redistribution of topsoil (the A and E soil horizons) is required for all operations, with the proviso that operations on prime farmland historically used for cropland typically must salvage, store, and redistribute the B and C soil horizons to the extent needed to provide a minimum of 48 inches of soil on the reclaimed area. Selected overburden materials may be used

in place of the topsoil and subsoil if they meet specified criteria and are approved by the regulatory authority.

Under conditions of natural succession, establishment of a forest on bare soil would take 15 to 20 years (Groninger et al. 2007), or longer. The initial loss of forest habitat because of mining activities would be expected to have a negative impact on soils in these forested areas (Belnap and Eldridge 2001).

### **Documented Impacts on Forest and Other Ecosystems**

Mining activities can greatly influence forests and other terrestrial habitats due to the necessity to initially clear vegetation from the site to accommodate the mining activity. Land clearing for any activity, including coal mining, results in localized reduction in the extent of natural forest, shrubland, grassland, and arid (e.g., cryptobiotic soil) communities, and may reduce populations of locally important medicinal and culturally sensitive plants. Those reductions become long-term if the use of the land changes after mining is complete, or if the restoration of the impacted environmental component itself occurs only over a long timeframe, as with cryptobiotic soils.

Mining activity under existing regulations frequently leads to a changed land use on the reclaimed site in comparison to the use of the land prior to mining. When mining occurs on federal lands, the federal land managing agency determines the postmining land use and OSMRE as the regulatory authority is required to consult with the managing agency to determine any special requirements related to achieving the postmining land use (30 CFR § 740.4(c)(2)). Otherwise the permanent program performance standards at 30 CFR §§ 816.33 and 817.133 require that all disturbed areas be restored to a condition capable of supporting the uses they were capable of supporting before the mining, or to support a higher or better use. The regulatory authority may approve a change to a “higher or better use” if the landowner or land management agency successfully demonstrates the proposed change would be safe, compliant with other state and federal laws and reasonably certain to be achievable. Mining can facilitate conversion of land by making it economically feasible to clear and recontour a site, since these activities would transpire as a matter of course during the mining activity.

Land transformation reduces the availability of habitats for some species, and increases the availability for others. The conversion of a site from forest to grassland for example is positive for grassland bird species, but negative for forest dwelling bird species. Habitat loss is a leading cause of decline of some organisms (Vitousek et al. 1997) including salamanders in West Virginia (Wood and Williams 2013), and mining activities cause acute changes to the landscape that often create unsuitable conditions for a variety of species (Carlisle et al. 2008).

In addition to the reduction in the acreage of premining habitats, this land transformation produces discontinuous patches, or fragments, within the original habitat that remains. Where continuous habitat once existed, patches of premining and postmining (i.e., transformed) habitat now exists, and in general the size of a habitat is the primary determinant of the number of species it can support (Rosenzweig 1995). This habitat fragmentation often times does not provide sufficient continuous cover, forage, or area to support the original wildlife populations that existed before mining and may cause species to become threatened or endangered, and can contribute to species extinction (Rosenzweig 1995). Bird, mammal, and insect species of forest interiors may refuse to cross even very short distances of open areas (e.g., land transformed by mining), reducing their ability to feed, reproduce, and maintain healthy populations (Laurance and Bierregaard 1997; Primack 2002). Crooks et al. (2001) examined the impact of habitat fragmentation on eight bird species in chaparral and sagebrush communities of the United States and found that smaller habitat fragments had higher rates of extinction and lower rates of colonization by the birds.

As species of plants and animals are often adapted to narrow ranges of environmental conditions, changes in those conditions may make the habitat unsuitable once it is fragmented. Habitat fragmentation also produces more edge habitat where interior habitat once existed. These edge habitats have reduced quality for some species due to changes in light, temperature, humidity, and wind, as well as increases in the incidence of fire (Stevens and Husband 1998). Nests located along the edge may be more vulnerable to discovery and predation. Each effect can significantly influence the vitality and composition of species within the fragment (Primack 2002). Shade-tolerant plant species and humidity-sensitive animals, such as amphibians, are often rapidly eliminated in edge habitats; invasive plants along the habitat edge can disperse seeds into the habitat interior where they may become established (Primack 2002).

As with any type of land clearing activity, land clearing for mining increases the likelihood that invasive species can take hold within the cleared areas and encroach into surrounding intact habitats (Hobbs and Humphries 1995). Surface mining techniques (such as area mining) involve more surface disturbance and therefore a higher potential for encouraging encroachment of invasive species. Land clearing continues in phases through the active operation of the mine; invasive plant species that colonize one area then become established and spread to other areas as mining progresses (Richardson et al. 2000).

Because many invasive species are aggressive early colonizers of disturbed areas, even temporary spoil/overburden piles can offer invasive plants a foothold for establishment (Richardson et al. 2000). The magnitude of the adverse impacts may differ among coal extraction methods, depending on their methods of disposal. The dragline method of area mining has relatively lower potential for adverse impacts, as the excess spoil is placed in the cut or strip, reducing the area required for disposal, which in turn reduces the area available for invasive species to become established. Other mining methods, such as underground mining, open-pit mining, and mountaintop removal mining may have Moderate to High Adverse impacts related to the spread of invasive species, as they often require larger areas for spoil disposal compared to other coal extraction methods. This is not universally true, however. In a study of terrestrial plant populations of forested and reclaimed sites, Handel (2003) found few invasive species on mined sites within the study area.

The OSMRE supports the Forestry Reclamation Approach for reclaiming coal mined lands and establishing forests as the post-mining land use. The approach is based on five steps that are intended to provide a suitable rooting medium, create non-compacted topsoil, use ground cover compatible with growing trees, plant two types of trees (early successional and commercially valuable), and use proper tree planting techniques.

### **Assumptions and Methodology**

A substantial body of scientific literature has described the impacts of underground and surface coal mining operations on the environment. The National Land Cover Database of 2011 (NLCD 2011) was consulted to identify vegetation cover baseline conditions and composition in the NCWMA and ERTCE Area. The analysis of the vegetation considered that changes in plant community size, integrity, or continuity could occur as a result of the implementation of various mining activities. This analysis included an evaluation of the potential for proposed actions to favor the establishment or expansion of nonnative species. Activities related to mining that could occur under each of the alternatives are described in detail in “Chapter 3: Alternatives,” including initial vegetation clearing; development of access and haul roads; underground and augering mining operations; remining and new surface coal mining operations; reclamation operations; and vegetation maintenance along access and haul roads.

Permit requirements and performance standards would decrease the severity of impacts from underground and augering mining operations. However, remining, new surface coal mining operations, access and haul

road construction and maintenance activities, and associated vegetation removal, would subject plant communities to impacts, disturbance, and impacts from invasive species.

The primary assessment of impacts on vegetation considers potential impacts of all mining-related activities on all vegetation, regardless of vegetation type, both regionally and site specific. The regional context for assessing impacts to vegetation includes the following:

- vegetation is part of the larger, contiguous diverse ecosystem; and
- vegetation is the basis of the ecological community meaning that other important resources depend on vegetation.

The presence and abundance of nonnative (or exotic) plants in the affected vegetation types is an important consideration as many nonnative plant species are stimulated to grow and reproduce as a result of clearing or other disturbance. The presence of some nonnative plant species can have substantial adverse impacts on native vegetation, including the following:

- They can out-compete native plants for light, nutrients, water and growing space, which, in the worst case, can lead to extinction or local extirpation of rare plant species;
- They can degrade the quality of wildlife habitat by out-competing native food sources, or altering nesting or resting habitat; and
- They can disrupt the genetic integrity of native plants if crossbreeding occurs.
- Because of the extensive vegetation cover in the NCWMA and ERTCE Area, it is assumed that any mining activity would result in some adverse impacts to vegetation, since it would be almost impossible to avoid vegetated areas.

The programmatic analysis of impacts is followed by a site-specific context for assessing impacts to vegetation and special consideration of impacts unique to individual vegetation types. Direct adverse impacts on vegetation are assessed and measured in terms of areal extent (e.g., acres) where mineable coal resources identified in “Chapter 5: Evaluation of Coal Resources” occur and where, if permitted mining-related activities could cause the direct loss of vegetation and habitat as a result of clearing. Direct beneficial impacts on vegetation were assessed and measured in terms of aerial extent (e.g., acres) where mineable coal resources identified in “Chapter 5: Evaluation of Coal Resources” occur and where, if designated as unsuitable for mining-related activities, vegetation and habitat would be protected. Concurrent reclamation of vegetation disturbed or affected by mining-related activities (30 CFR §§ 816.111 and 715.20) and Tennessee revegetation requirements (30 CFR § 942.816[f]) were considered when analyzing impacts to vegetation. The following parameters were considered when assessing site-specific impacts and impacts unique to individual vegetation types:

- the areal extent and relative abundance or rarity of the vegetation type in the evaluation area and in the region;
- the areal extent of mineable coal resources identified in “Chapter 5: Evaluation of Coal Resources” in the evaluation area and in the petition area;
- the amount of vegetation that would be lost due to mining operation activities;
- the amount of each vegetation type lost due to mining operation activities;
- the amount of mixed mesophytic forest that would be permanently replaced by maintained herbaceous or scrub-shrub vegetation;

- SMCRA (30 CFR §§ 816.111 and 715.20) and Tennessee (30 CFR § 942.816[f]) revegetation requirements; and
- the presence and abundance of nonnative plants within, or adjacent to the vegetation types affected.

### **Area of Analysis**

The geographic evaluation area for this resource is the evaluation area, which includes the NCWMA and ERTCE Area. The geographic evaluation area for assessing impacts to vegetation under a regional context includes the Cumberland Mountains. The geographic evaluation area for assessing impacts to vegetation under a site-specific context includes the locations of mineable coal resources identified in “Chapter 5: Evaluation of Coal Resources” within the petition area under each alternative. The area of analysis may extend beyond the evaluation area boundaries for some cumulative impact assessments.

### **GENERAL IMPACT OF COAL MINING IN TENNESSEE ON SOILS AND VEGETATION**

Vegetation impacts from surface mining operations include direct loss of vegetation and habitat as a result of clearing on the permit area; alteration of the substrate caused primarily by overburden removal; and development of access and haul roads and other ancillary facilities. Site preparation may include complete removal and clearing of vegetation using heavy construction equipment. Most of the area cleared would be second growth mixed-mesophytic hardwood forest communities. These hardwood forests have value as timber resources, wildlife habitat, and communities containing rare plant and animal species. They also contribute to the regulation of climate and watershed dynamics. The impact on second growth forest areas would depend on the amount of new disturbance and, in the cases of remaining on unreclaimed areas, the successional stages that have been reached on the old mine sites. For new mines, stable native plant communities would be lost in the near term. However, creation of openings in the mixed-mesophytic hardwood forests would provide more forest edge, which could enhance the plant species diversity of the general area (Yahner 1988). The disturbance caused by mining can delay the return to a mature deciduous forest ecosystem by 50 years or more (Zipper et al. 2011; Skousen, Ziemkiewicz, and Venable 2006; Palmer et al. 2010). If a different postmining land use is approved, the native plant community would be altered permanently.

Mining activities can greatly influence forests and other terrestrial habitats due to the necessity to initially clear vegetation from the site to accommodate the mining activity. Land clearing for any activity, including coal mining, results in localized reduction in the extent of natural forest, shrubland, and grassland communities. Those reductions become long-term if the use of the land changes after mining is complete, or if the restoration of the impacted environmental component itself occurs only over a long timeframe.

In addition to the reduction in the extent of communities, land transformation produces discontinuous patches and edge effects within the extents of communities that remain. Habitat fragmentation and edge effects can change forest structure, composition, and ecological processes, resulting in indirect impacts to forest-dependent species (Wickham et al. 2007). Communities that were once continuous may become divided into separate fragments that do not provide sufficient cover or forage to support wildlife movements between fragments (Rosenzweig 1995). Fragmentation produces more edges where continuous blocks of habitats are broken up into one or more habitat types. These areas have reduced habitat quality for some interior species due to changes in light, temperature, humidity, and wind, as well as increases in the incidence of fire (Handel 2003). On the other hand, due to the different microclimate associated with these areas, edge habitats are often more diverse than the interior habitat and contain unique wildlife assemblages (Yahner 1988). Each effect can significantly influence the vitality and

composition of species within the newly broken habitat (Primack 2002). As species of plants and animals are often adapted to narrow ranges of environmental conditions, changes in those conditions may make the habitat unsuitable once it is fragmented. Shade-tolerant plant species and humidity-sensitive animals, such as amphibians, are often rapidly eliminated; invasive plants along the habitat edge can disperse seeds into the habitat interior where they may become established in recently disturbed areas (Primack 2002).

Ground disturbance could also promote the introduction of exotic species. Land clearing for mining increases the likelihood that invasive species can take hold within the cleared areas and encroach into surrounding intact habitats (Hobbs and Humphries 1995). Surface mining techniques (such as area mining) involve more surface disturbance and therefore a higher potential for encouraging encroachment of invasive species. Land clearing continues in phases through the active operation of the mine; invasive plant species that colonize one area then become established and spread to other areas (Richardson et al. 2000).

Because many invasive species are aggressive early colonizers of disturbed areas, even temporary spoil/overburden piles can offer invasive plants a foothold for establishment (Richardson et al. 2000). The magnitude of the adverse impacts may differ among coal extraction methods, depending on their methods of disposal. The dragline method of area mining has relatively less potential for adverse impacts, as the excess spoil is placed in the cut or strip, reducing the area required for disposal, which in turn reduces the area available for invasive species to become established. Other mining methods, such as underground mining and open-pit mining, may have moderate to high adverse impacts related to the spread of invasive species, as they often require larger areas for spoil disposal than other coal extraction methods increasing the area available for invasive species to become established. This is not universally true, however. In a study of terrestrial plant populations of forested and reclaimed sites, Handel (2003) found few invasive species on mined sites within the study area. These long-term adverse impacts could be minimized by using already disturbed areas and using existing haul roads. In addition, exotic vegetation control plans are a part of every plan of operations (30 CFR § 816.111).

Other adverse impacts to vegetation include the use of herbicides to control site vegetation that could drift or migrate off site, causing damage to non-target vegetation in nearby areas. There are also impacts related to removal of the forest associated with mining. Studies have shown that trees help remove carbon dioxide from the air and sequester carbon in biological tissue. This process is known as “carbon sequestration.” Thus, the removal of forests means that trees are not present to sequester carbon from the air. Other impacts also occur as the wildlife species occupying the premining environmental niches are replaced by a different type of wildlife community adapted to the newly established environment of the reclaimed mine site (see “Impacts of the Alternatives on Aquatic and Terrestrial Species” and “Impacts of the Alternatives on Air Quality” sections of this chapter).

Impacts from the salvage and redistribution of soils during mining and reclamation would include changes in physical, biological, and chemical properties of the soil resources. Following reclamation, the soils would be unlike premining soils in texture, structure, color, accumulation of clays, organic matter, microbial populations, and chemical composition (Bozeman 2014; Galajda 1999). Impacts to soils from mining would include loss of soil development and horizons, soil erosion from the disturbed areas and stockpiles, reduction of favorable physical and chemical properties, reduction in biological activity, and changes in nutrient levels (Bozeman 2014; Ghose 2004). However, performance standards under federal regulations would minimize the amount of bare soil exposed at any one time. National Pollutant Discharge Elimination System permits require implementation of best management practices and stormwater erosion sedimentation plans be in place prior to mining (33 USC § 1342). Surface mining operations must also use appropriate sediment control measures to control erosion on steep slope areas.

Replacement of soils during reclamation would start the soil development process again. It would take decades for soil horizons to develop again (Sencindiver and Ammons 2001). The reclaimed soils would have different physical, biological, and chemical properties than the premining soils. Soil profiles would be permanently impacted by mining activities because the reestablished soil profile would be different than pre-mining conditions. They would tend to be more uniform in type, thickness, and texture. Soil chemistry and soil nutrient distribution would be more uniform. Specific impacts to soil resources would include an increase in the near-surface bulk density of the reclaimed soil resources (Rai, Paul, and Singh 2010; Marashi and Scullion 2004; Sheoran, Sheoran, and Poonia 2010). As a result, the average soil infiltration rates would generally decrease, which would increase the potential for runoff and soil erosion. However 20 CFR §§ 715.16 and 816.22 require topsoil or best available growth medium to be salvaged for reclamation. Soil properties would return over time with reclamation. As a result, adverse impacts on soils would be both near and long term.

## **Reclamation**

Applicable performance standards at 30 CFR part 816 through § 817.100 require concurrent reclamation of areas disturbed or affected by surface coal mining operations. In Tennessee rough backfilling and grading must follow coal removal by no more than 60 days or 1,500 linear feet (i.e., only 1,500 feet can be exposed at one time)(30 CFR part 942). As a result, the near-term adverse impacts due to the loss of vegetation and soils as a result of clearing on the permit area would be minimized and areas disturbed by surface coal mining operations would be stabilized with herbaceous vegetation within three to six months, and woody species would be established within three to 12 months after final grading of backfilled slopes. Once reclamation is complete all mined land would be returned to a condition equal or better than premining use and productivity (30 CFR §§ 816.133 and 715.13).

The regulations at 30 CFR §§ 816.111 and 817.111 provide that the permittee must establish reclaimed lands that would attain a vegetative cover that is diverse, effective, and permanent. Such cover would be composed of plant species native to the region or approved introduced plant species capable of achieving the postmining land use. Revegetation of a closed or abandoned mine site that results in a different type of ground cover, such as grassland openings in a forested area or shrubland or forest in a pasture, would provide for plant community diversity.

Reclamation of a site to return it to a mature deciduous forest ecosystem can be delayed by 50 years or more (Zipper et al. 2011; Skousen, Ziemkiewicz, and Venable 2006; Palmer et al. 2010). When a previously forested site is reclaimed to a forest, a long-term change in plant community structure and composition often occurs. If there is a change in postmining land use this would result in a permanent change in plant community structure and composition. Mining activity under existing regulations frequently leads to a changed land use on the reclaimed site in comparison to the use of the land prior to mining. The permanent program performance standards at 30 CFR § 816.133 require that all disturbed areas be restored to a condition capable of supporting the uses they were capable of supporting before the mining, or to support a higher or better use. A change may be approved to a “higher or better use” if the landowner or land management agency successfully demonstrates the proposed change would be safe, compliant with other state and federal laws and reasonably certain to be achievable. Standards to evaluate revegetation for success are found at 30 CFR §§ 816 and 817.116. The regulations provide a basis on which the revegetation can be evaluated on its effectiveness for the approved postmining land use and the general requirements of 30 CFR § 816.111. In lieu of the requirements of 30 CFR §§ 816.116 and 117 (b)(1) through (b)(3), the regulation at 30 CFR §§ 942.816 and 817(e) provides revegetation success standards for surface and underground mining activities specific to Tennessee. These standards establish the amount of ground cover and types of vegetative cover that must be established before a mine site is considered successfully reclaimed. An applicant is also required to post a performance bond to cover the cost of reclamation.

If original topsoil is not salvaged and overburden materials are used as a substitute during reclamation, the seed bank contained within the topsoil is not returned to the site to facilitate reestablishment of vegetation. Additionally, the loss of soil organic matter reduces the quality of the soil for vegetative regrowth, as does the compaction of the soil during filling and grading. Full productivity of a site may be delayed as a result (Angel et al. 2005; Zipper et al. 2011).

The regulations implementing SMCRA are intended to minimize the impacts of mining on topsoil, which the rules at 30 CFR § 701.5 define as the A and E soil horizons. In particular, 30 CFR §§ 779.21, 780.18, 784.13, 816.22, and 817.22 require that the topsoil be removed as a separate layer from the area to be disturbed, and then segregated. If the topsoil is less than six inches thick, the topsoil and the unconsolidated materials immediately below the topsoil can be removed and the mixture treated as topsoil. In cases where the topsoil is of insufficient quantity or poor quality for sustaining vegetation, the operator may use selected overburden materials as a topsoil substitute or supplement. However, before doing so, the operator must demonstrate that the resulting soil medium will be equal to or more suitable for sustaining vegetation than the existing topsoil, and that the resulting soil medium is the best available in the permit area to support revegetation. The operator must recover these substitute or supplemental materials as a separate layer from the area to be disturbed and then segregate them.

The regulations require that the operator segregate and stockpile topsoil and topsoil substitutes and supplements after removal when it is impractical to redistribute those materials promptly on regraded areas. Stockpiled materials must be selectively placed on a stable site within the permit area and protected from contaminants, unnecessary compaction, and wind and water erosion that could interfere with revegetation. A quick-growing vegetative cover or other measures may be used for protection.

Subsequent to the enactment of SMCRA, topsoil handling improved, but the methods used to remove and redistribute topsoil sometimes have resulted in excessive compaction, which reduces the pore space for air and water and impedes root growth, making reclamation more difficult and the reclaimed site less productive. Long-term storage can adversely alter topsoil texture and structure. In addition, mycorrhizae (a fungus that grows in association with plant roots), soil organisms, and organic matter do not persist long in stockpiled topsoil (Holl, Zipper, and Burger 2009).

Regrading of the postmining landscape is completed to approximate original contour is required by SMCRA. Research has shown that reduced grading and soil compaction is critical for survival and growth of planted seedlings (Angel et al. 2005; Gilland and McCarthy 2014). Alteration of substrate may cause potential long-term adverse impacts including changes in drainage patterns, disruption of soil organisms responsible for nutrient recycling, changes in soil structure and soil composition (which affects nutrients and moisture availability) and changes in soil chemistry (Holl, Zipper, and Burger 2009). Use of heavy construction equipment could cause compaction and rutting of soils and release oil and other contaminating and hazardous substances that could harm or kill vegetation.

Mine reforestation studies consistently have revealed negative relationships between soil density and tree survival and between soil density and tree growth. Dense soils impede root growth and water infiltration, and limit soil water holding capacity. The lack of air spaces within dense soils limits oxygen availability, further inhibiting the growth and function of roots and soil microbes, leading to poor water and nutrient uptake (Zipper et al. 2011). The reclamation practices used to achieve approximate original contour generally produce a compacted rooting medium making it unsuitable for most forest species and often impairs plant productivity (Angel et al. 2005; Zipper et al. 2011).

Mine operators commonly apply herbaceous vegetation seed during reclamation. Excessive herbaceous competition on mine sites will impair survival and growth of planted trees (Zipper et al. 2011). Research done on older mine sites that were seeded showed only sparse tree cover several decades after reclamation

(Skousen, Ziemkiewicz, and Venable 2006). Therefore, herbaceous vegetation that is low in stature and in water and nutrient demands should be planted to limit competition with both planted trees and potential plant competitors (Zipper et al. 2011).

Due to the short bond release period of current mining legislation operators may use reclamation strategies proven to address short-term concerns of providing erosion control and minimizing acid mine drainage. Such strategies include efforts focused on maximizing short-term goals, such as providing high ground cover to minimize erosion, rather than restoring a diversity of species (Holl 2002; Holl, Zipper, and Burger 2009). Recent research performed on previously mined sites shows that while the number of forest species colonizing reclaimed sites increased over time and appeared to be approaching that of adjacent, less-disturbed, hardwood forest, some forest species were not present on reclaimed sites (Holl and Cairns 1994; Holl 2002). Reclaimed sites are often dominated by known habitat generalists and on a per area basis there is a lower diversity on reclaimed sites than adjacent, less disturbed sites (Holl 2002; Beckage et al. 2000; Elliott et al. 1999).

### **Underground and Auger Mining**

Underground mining would produce minor alteration of vegetation communities due to the direct elimination or disturbance of vegetation at the mine mouth and on access and haul roads and would result in slightly worse conditions to soils at the mine entrances and staging areas where soil profiles would be disturb soil. Underground mining operations are generally associated with much more limited surface disturbances than are surface mines, and as such have substantially less impact on resources such as vegetation. However, as underground mines typically operate for a longer period than surface mines, the duration of impacts would occur over a longer period. While underground mining can also cause subsidence or changes to groundwater levels, which may alter growth patterns and species composition of terrestrial vegetation, these impacts are not common. Underground coal mining operations in Tennessee use room and pillar operations and in general do not result in subsidence. In most instances where subsidence related to underground mining in Tennessee has occurred the mine operator has not followed an approved mining plan (30 CFR § 780.23). The likelihood of subsidence would be minimized through adherence to an approved mining plan. In remining areas where auger mining is used, soils would be impacted but on a smaller scale than surface coal mining operations.

### **Remining**

Potential remining would have similar impacts to mining. Vegetation impacts from remining include soil removal and compaction and removal of primary successional native plant communities from the site. In most cases, these adverse impacts are offset by the fact that remining of an abandoned or previously mined area would reduce existing problems associated with inadequate vegetation and result in restoration of adequate vegetation to the site and overburden and spoil stabilization, and would thereby reduce continued uncontrolled erosion and offsite pollution. The potential for erosion would increase with exposed soils, which creates the potential for temporarily worse soil conditions than those that currently exist. However, reclamation would start the soil development process itself and would place soils on bare or eroded areas, a long-term beneficial effect.

The disturbance caused by remining can delay the return to a mature deciduous forest ecosystem by 50 years or more (Zipper et al. 2011; Skousen, Ziemkiewicz, and Venable 2006; Palmer et al. 2010). Once reclamation of a remined site is complete there would be long-term beneficial impacts through the reclamation of an abandoned or previously mined site to the soil and vegetation community that would be equal to or better than premining soil and vegetation, and problems associated with uncontrolled erosion would be reduced.

## **Roads**

The potential development of access and haul roads would be necessary to accommodate larger trucks. Secondary roads would be developed to carry employee traffic, equipment, and supplies for surface mining and underground mining. Clearing for access and haul roads requires clearing and grading of road rights-of-way and would be limited to certain areas, so they would have minimal and localized adverse impacts on vegetation and soils. Impacts on vegetation on lands adjacent to mines and access and haul roads may occur as a result of dust, which could reduce the rate of photosynthesis (Thompson et al. 1984). Access and haul road use would result in increases in dust in the immediate vicinity of the roads. Periodic rains and watering of access and haul roads and work areas would minimize this impact, with no long-term adverse impacts likely to result because of dust.

Figures 6-22, 6-23, 6-24, 6-25, and 6-26 show impacts of the alternatives to vegetation.

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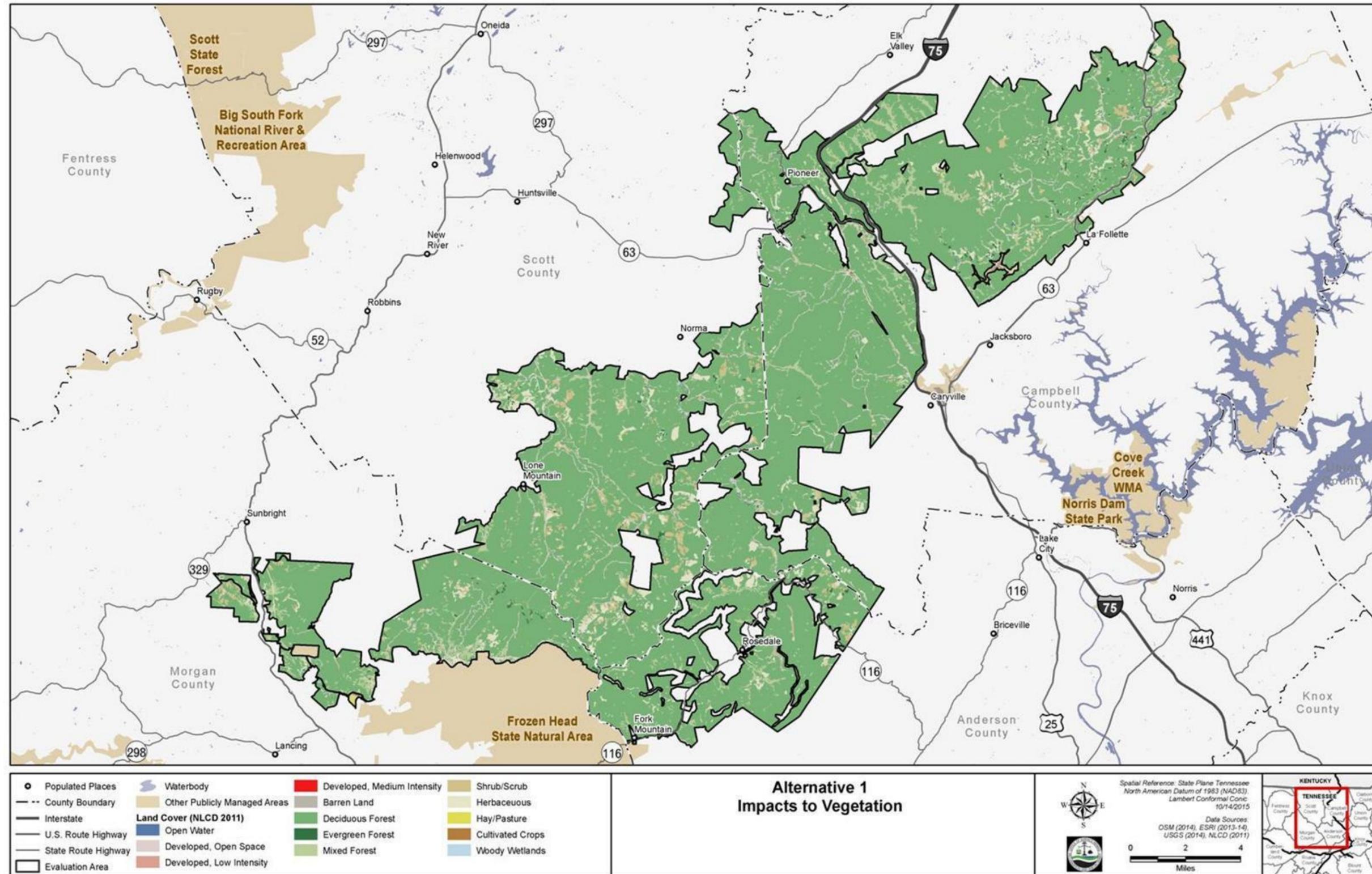


FIGURE 6-22: ALTERNATIVE 1 IMPACTS TO VEGETATION

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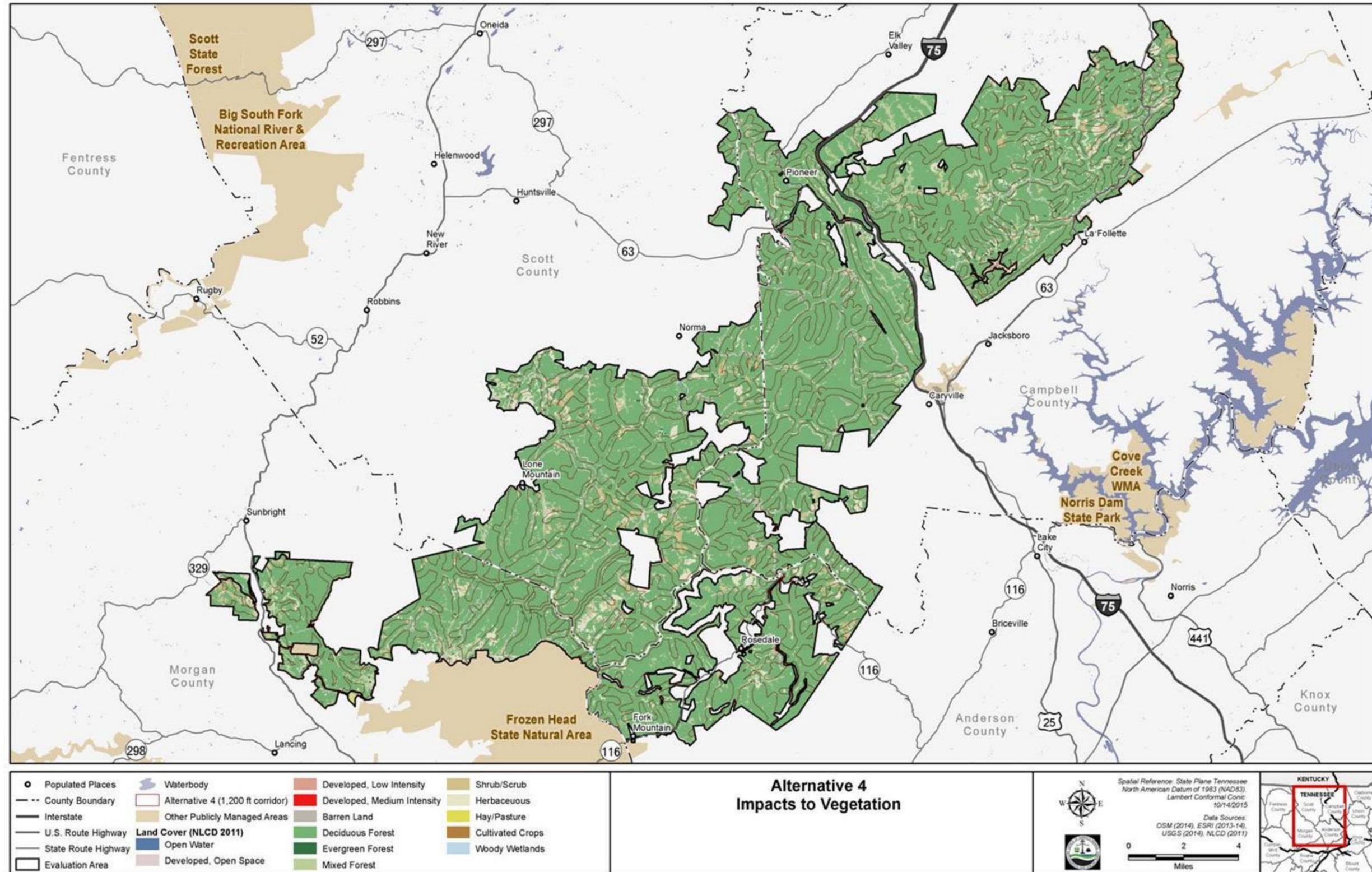


FIGURE 6-24: ALTERNATIVE 4 IMPACTS TO VEGETATION

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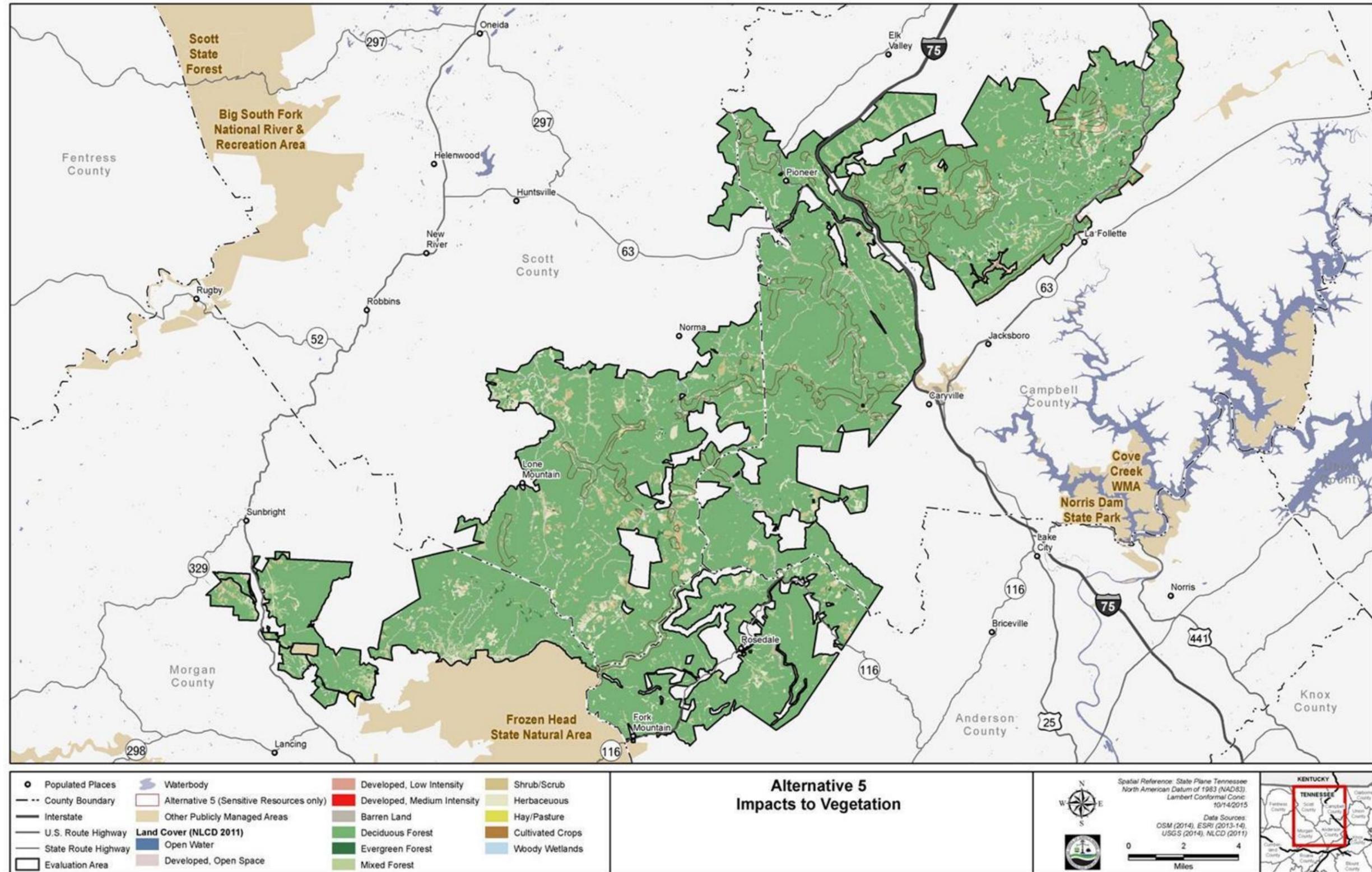


FIGURE 6-25: ALTERNATIVE 5 IMPACTS TO VEGETATION

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## **ALTERNATIVE 1: NO-ACTION ALTERNATIVE**

Under alternative 1, OSMRE would deny the State's petition to designate the subject lands as "unsuitable for surface coal mining operations" (30 CFR § 764.13). Therefore, the no-action alternative would have the same effect as deciding not to designate any of the petition area as unsuitable for surface coal mining operations. Under this alternative, surface coal mining within the petition and evaluation areas would continue to be authorized and all types of mining operations and activities would continue, including surface, underground, augering, and re-mining. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions.

### **Direct and Indirect Impacts**

Impacts to soils under alternative 1 would include loss of soil development and horizons, soil erosion from the disturbed areas and stockpiles, reduction of favorable physical and chemical properties, reduction in biological activity, and changes in nutrient levels, as described above under the "General Impacts of Surface Coal Mining on Soils and Vegetation" section.

Near- and long-term direct adverse impacts to vegetation would occur due to vegetation being removed or crushed during potential surface coal mining and re-mining operations. Additional impacts could occur from alteration of the substrate, the introduction and spread of exotic plant species, possible erosion and sedimentation, haul road use, or the long-term change in plant community and structure due to the delay of returning a mature deciduous forest to pre-existing conditions. Fragmentation would result in long-term indirect adverse due to the length of time required to reclaim a mature deciduous forest to pre-existing conditions. These impacts to vegetation are described in detail under "General Impacts of Coal Mining in Tennessee on Vegetation." Regulatory approval would be required for this action and performance standards related to location, design, construction, maintenance, and reclamation must be followed (30 CFR part 780; 30 CFR part 816 and § 817; 30 CFR part 942). Best management practices and performance standards, as described under "Applicable Statutes, Regulations, and Policies" would be implemented to minimize the adverse impacts to vegetation from permitted lands and haul road development.

Vegetation types in the evaluation area and the potential impacts from surface coal mining and re-mining are described in table 6-36. As described in the table, these potential impacts merely reflect the vegetation type that could be impacted by surface coal mining and re-mining.

Approximately 68,445 acres of soils and vegetation could be affected by potential surface coal mining and re-mining operations under alternative 1. This accounts for 39.73% of the soils and vegetation in the evaluation area. Under the no-action alternative approximately 44,910 acres of soil and vegetation could be impacted in potential surface mineable areas occurring in the evaluation area. However, this loss of soil and vegetation would be limited based on average annual mining rate. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year. OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions. In fact, over a 30-year period only 3,360 acres of the evaluation area would likely be subject to surface coal mining operations. Overall, it is expected that soils and vegetation would be adversely affected by surface coal mining operations under alternative 1, although given the rate of surface coal mining, impacts would not occur at a large or landscape scale.

**TABLE 6-36: VEGETATION TYPES POTENTIALLY AFFECTED BY SURFACE COAL MINING AND REMINING UNDER ALTERNATIVE 1**

Vegetation Type	Acres Potentially Impacted by Surface Coal Mining	Acres Potentially Impacted by Remining	Percent of the Evaluation Area Impacted
Barren Land	86	94	0.10
Deciduous Forest	39,529	20,283	34.73
Evergreen Forest	255	210	0.27
Mixed Forest	1,104	483	0.92
Shrub/Scrub	845	431	0.74
Herbaceous	1,911	1,529	2.00
Wetlands	56	57	0.06
Hay/Pasture	8	0	<0.00
Developed	1,116	448	0.91
<b>Total</b>	<b>44,910</b>	<b>23,535</b>	<b>39.73</b>

### Cumulative Impacts

Past, present, and reasonably foreseeable future coal mining activities would have adverse impacts on soils and vegetation. Coal mining activities have occurred within the petition area at varying levels of intensity for more than 100 years (TWRA n.d.). Past abandoned mine lands that were not reclaimed to a satisfactory soil or vegetation community equal to pre-action soil and/or vegetation have long-term adverse impacts on soil and vegetation.

Timber harvesting would have near-term adverse impacts on soils and vegetation due to the removal of trees and other vegetation, the use of heavy equipment, and haul road development. These activities would also result in long-term adverse impacts on vegetation due to the length of time required for a typical forest community to fully re-establish to premining conditions. However, the implementation of the Appalachian Regional Reforestation Initiative would limit the adverse impacts.

Past, present, and reasonably foreseeable future oil and gas production would have adverse impacts on soils and vegetation. There are 289 oil and gas wells within the boundaries of the evaluation area. Drilling and production operations would cause direct loss of soils and vegetation and habitat as a result of clearing, contouring, construction, and maintenance of work areas and a potential for leaks and spills of drilling muds, hydrocarbons, produced waters or treatment chemicals. Past oil and gas production sites that were not reclaimed have long-term adverse impacts on soils and vegetation.

Present and reasonably foreseeable future recreational activities, such as off-highway vehicle use, contribute to the adverse impacts to soils and vegetation but would be minimal over the entire evaluation area. Road construction and residential and commercial development involve the disturbance and removal of soils and vegetation with associated near- and long-term adverse effects.

The impacts of alternative 1, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on soils and vegetation. Based on the expected level of surface mining and the reclamation requirements of SMCRA, overall adverse impacts contributed by alternative 1 would be minor.

## Conclusion

Alternative 1 would have both near- and long-term adverse direct and indirect impacts. These adverse impacts would be minimized on new mine areas once a site is reclaimed. Long-term beneficial impacts would be realized once a remined site is reclaimed. Therefore, because best management practices and compliance with applicable regulations and permit conditions would minimize impacts to this resource and because only 2% of the evaluation area would be mined based on the expected level of future surface coal mining operations (a maximum of 3,360 acres over the 30-year planning timeframe), alternative 1 would not have potential for significant adverse impacts to soils and vegetation.

## ALTERNATIVE 2: STATE PETITION DESIGNATION

Under alternative 2, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State's petition. Under this alternative, 505 miles of ridgelines with a 1,200-foot corridor (600 feet on both sides of the ridgeline) would be designated as unsuitable for surface coal mining.

### Direct and Indirect Impacts

Under alternative 2, no new surface mining would be allowed in the 67,326-acre petition area; as a result, there would be no surface disturbance within the petition area. Alternative 2 would be expected to result in near- and long-term direct and indirect beneficial impacts. The prohibition of additional mining activities would protect soils and vegetation within the petition area and preventing impacts associated with mining, resulting in a long-term beneficial impact.

Soils and vegetation downslope of ridgelines not protected under alternative 2 would potentially be adversely impacted in the near term and long term due to the development of new mines and roads in those areas and the potential for increased runoff and sedimentation from the removal of soils and vegetation. Underground and auger mining could be permitted outside the petition area but would cause no impacts to soils and vegetation within the petition area. The impacts of underground and auger mining and the development of new access and haul roads permitted outside the petition area would be as described under alternative 1. Remining would not be permitted in the petition area under this alternative and therefore long-term adverse impacts would continue on abandoned or previously mined sites that were mined prior to SMCRA within the petition area. However, near-term impacts to the soils and vegetation that have reestablished on the sites would be adverse.

Vegetation types in the evaluation area and the potential vegetation acres protected from surface coal mining and remining are described in table 6-37. As described in the table, these vegetation acres potentially merely reflect the vegetation types that could be protected from surface coal mining and remining.

Approximately 34,558 acres of soils and vegetation could be protected from potential surface coal mining and remining operations under alternative 2. This accounts for 20.06% of the soil and vegetation in the evaluation area. Under alternative 2 approximately 22,154 acres of soils and vegetation would be protected in probable surface mineable areas occurring in the petition area. However, previously mined areas that would not be reclaimed total approximately 12,404 acres.

**TABLE 6-37: VEGETATION TYPES POTENTIALLY PROTECTED FROM SURFACE COAL MINING AND REMINING UNDER ALTERNATIVE 2**

<b>Vegetation Type</b>	<b>Acres Potentially Protected from Surface Mining</b>	<b>Acres Potentially Protected from Remining</b>	<b>Percent of the Evaluation Area Impacted</b>
Barren Land	33	27	0.03
Deciduous Forest	19,527	10,687	17.54
Evergreen Forest	189	139	0.19
Mixed Forest	293	244	0.31
Shrub/Scrub	438	243	0.40
Herbaceous	1,078	769	1.07
Wetlands	20	24	0.03
Hay/Pasture	6	0	<0.00
Developed	570	271	0.49
<b>Total</b>	<b>22,154</b>	<b>12,404</b>	<b>20.06</b>

Overall, alternative 2 would result in the protection of soils and vegetation, especially ridgeline forested communities, and greater long-term beneficial impacts than alternative 1. Alternative 2 would not result in any direct or indirect adverse impacts in the petition area, but could result in substantial benefits through the protection of soils and vegetation. However, the beneficial impacts of reclamation on the potential soil and vegetation acres protected from remining would not occur. These impacts would not be substantial given the rate of surface coal mining, and impacts would not occur at a large or landscape scale.

### **Cumulative Impacts**

Past and present cumulative actions that have impacted soils and vegetation in the evaluation area include pre- and post-SMCRA surface coal mining, underground mining, timber harvest, oil and gas production, recreation, and construction and development. Cumulative impacts on soils and vegetation in the evaluation area would be adverse, as described under alternative 1. The impacts of alternative 2, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on vegetation and soils. Alternative 2 would seek to protect soils and vegetation on ridgelines in the petition area from future surface coal mining operations, but would not allow remining and associated reclamation in the 67,326-acre petition area. Alternative 2 would not contribute substantially to the adverse cumulative impacts to soils and vegetation and would contribute benefits based on the protection of forested ridgelines.

### **Conclusion**

Alternative 2 would have both near- and long-term direct and indirect beneficial impacts. The protection of lands within the petition area from future mining activities would lead to more beneficial impacts compared to alternative 1. Minor adverse impacts would occur because remining and associated reclamation would not be permitted. However, no new or additional adverse impacts would be expected compared to the no-action alternative. Adverse impacts would not be at a large or landscape scale and it is unlikely that impacts would be significant.

### **ALTERNATIVE 3: STATE PETITION DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS**

Under alternative 3, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State’s petition with a 1,200-foot ridgeline corridor, as described under alternative 2. Unlike alternative 2, alternative 3 would not prohibit re-mining (pursuant to 30 CFR chapter VII), but would require reclamation. Alternative 3 could also allow potential construction and maintenance of haul roads inside the designation area.

#### **Direct and Indirect Impacts**

Near- and long-term direct adverse impacts to soils and vegetation would occur due to soils and vegetation being removed and vegetation being crushed during potential re-mining and construction and maintenance of haul roads; alteration of the substrate; the introduction and spread of exotic plant species; possible erosion and sedimentation; and the long-term change in plant community and structure due to the delay of returning a mature deciduous forest to pre-existing conditions. However, reclamation of lands previously mined prior to the implementation of SMCRA in 1977 and left unreclaimed could result in long-term benefits for soils and vegetation. Fragmentation would result in long-term indirect adverse impacts due to the length of time required to reclaim a mature deciduous forest to pre-existing conditions. These impacts to vegetation are described in detail under “General Impacts of Coal Mining in Tennessee on Vegetation.” Best management practices and compliance with applicable regulations and permit conditions would minimize, but not eliminate impacts to this resource.

Alternative 3 would have long-term beneficial impacts to soils and vegetation by protecting them both within the petition area and preventing impacts associated with mining.

Vegetation types in the evaluation area and the potential vegetation acres protected from surface coal mining and potential vegetation reclaimed following potential re-mining are described in table 6-38. As described in the table, these potential impacts merely reflect the vegetation type that could be protected from surface coal mining and reclaimed following re-mining.

**TABLE 6-38: VEGETATION TYPES POTENTIALLY PROTECTED AND AFFECTED UNDER ALTERNATIVE 3**

<b>Vegetation Type</b>	<b>Acres Potentially Protected from Surface Coal Mining</b>	<b>Percent of the Evaluation Area</b>	<b>Acres Potentially Impacted by Re-mining</b>	<b>Percent of the Evaluation Area Impacted</b>
Barren Land	33	0.02	27	0.02
Deciduous Forest	19,527	11.34	10,687	6.21
Evergreen Forest	189	0.11	139	0.08
Mixed Forest	293	0.17	244	0.14
Shrub/Scrub	438	0.25	243	0.14
Herbaceous	1,078	0.63	769	0.47
Wetlands	20	0.01	24	0.01
Hay/Pasture	6	<0.00	0	<0.00
Developed	1,339	0.78	271	0.16
<b>Total</b>	<b>22,923</b>	<b>13.31</b>	<b>12,404</b>	<b>7.23</b>

Approximately 12,404 acres of soils and vegetation could be affected by potential remining operations under alternative 3. However, previously mined areas that would be potentially remined would also be reclaimed (though areas that were previously augered could not be feasibly remined). Approximately 22,923 acres of soils and vegetation could be protected from potential surface coal mining under alternative 3. The areas that would be reclaimed account for 7.23 percent and the areas that would be protected from surface mining account for 13.31% of the vegetation in the evaluation area.

Alternative 3 would result in near- and long-term adverse and beneficial impacts to vegetation. Potential remining and construction, along with use and maintenance of access and haul roads within the petition area and adjacent to protected ridgelines, would result in near- and long-term adverse impacts to soils and vegetation. However, protection of lands within the petition area from future mining activities would result in long-term beneficial impacts to soils and vegetation by limiting the potential for soils and vegetation being removed or vegetation being crushed during potential remining and construction and maintenance of haul roads; alteration of the substrate; the introduction and spread of exotic plant species; possible erosion and sedimentation; and the long-term change in plant community and structure due to the delay of returning a mature deciduous forest to pre-existing conditions. However, these impacts would not be substantial given the rate of surface coal mining, and impacts would not occur at a large or landscape scale.

Underground and auger mining could occur if originating outside of the designation area with minimal and localized impacts to soils and vegetation at the mining location located outside of the petition area. Potential development of both access and haul roads and mine reclamation would also be allowed under this alternative. Existing haul roads would be used when available, but alternative 3 could allow for the potential construction of new roads to be used for remining. Impacts to soils and vegetation from road construction include removal of soils and vegetation and erosion, although erosion control would be required as mitigation.

Where roads are needed, road construction would result in adverse impacts by compacting the soil profile and increasing the hazard of runoff and erosion. These impacts could be mitigated to a large extent with best management practices.

### **Cumulative Impacts**

Similar to alternative 2, past and present cumulative actions that have impacted soils and vegetation in the evaluation area include pre- and post-SMCRA surface coal mining, underground mining, timber harvest, oil and gas production, recreation, and construction and development. The impacts of alternative 3, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on vegetation and soils. Alternative 3 would protect soils and vegetation on ridgelines from future surface coal mining operations, but remining would result in direct adverse impacts to soils and vegetation. The duration of the impact would depend on the successional stages that have been reached on the old mine sites. Reclamation of lands previously mined prior to the implementation of SMCRA could help offset these adverse impacts and result in long-term benefits. These adverse and beneficial impacts of alternative 3 overall would not significantly contribute to the cumulative impacts to vegetation.

### **Conclusion**

Alternative 3 would result in the protection of soils and vegetation and greater long-term beneficial impacts than alternative 1. Alternative 3 would result in direct or indirect adverse impacts, but could result in substantial benefits through the protection of soils and vegetation and the reclamation of lands previously mined prior to the implementation of SMCRA in 1977 and left unreclaimed. No new or additional adverse impacts would be expected compared to the no-action alternative. However, given the

rate of surface coal mining, and the fact that impacts would not occur at a large or landscape scale it is unlikely that the impacts would be significant.

#### **ALTERNATIVE 4: EXPANDED CORRIDOR DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS (PREFERRED ALTERNATIVE)**

Under alternative 4, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State's petition, as described under alternative 2, and on additional ridgelines. Like alternative 3, alternative 4 would not prohibit re-mining, reclamation activities, and construction and maintenance of haul roads within the designation area and protected ridgeline boundaries.

#### **Direct and Indirect Impacts**

Like alternative 3, alternative 4 would result in near- and long-term direct adverse impacts to soils and vegetation due to soils and vegetation being removed and vegetation being crushed during potential re-mining and construction and maintenance of haul roads; alteration of the substrate; the introduction and spread of exotic plant species; possible erosion and sedimentation; and the long-term change in plant community and structure due to the delay of returning a mature deciduous forest to pre-existing conditions. Also, as described under alternative 3, reclamation of lands previously mined prior to the implementation of SMCRA in 1977 and left unreclaimed could result in long-term benefits for soils and vegetation. Fragmentation would result in long-term indirect adverse due to the length of time required to reclaim a mature deciduous forest to pre-existing conditions. These impacts to vegetation are described in detail under "General Impacts of Coal Mining in Tennessee on Vegetation." Best management practices and compliance with applicable regulations and permit conditions would minimize, but not eliminate impacts to this resource.

Similar to alternative 3, alternative 4 would have long-term beneficial impacts to soils and vegetation by protecting vegetation within the designation area and preventing associated adverse impacts. However, these beneficial impacts would be increased due to protection of ridgelines beyond those outlined in the State's petition.

Vegetation types in the evaluation area and the potential vegetation acres protected from surface coal mining and potential vegetation reclaimed following potential re-mining are described in table 6-39. As described in the table, these potential impacts merely reflect the vegetation type that could be protected from surface coal mining and reclaimed following re-mining.

Approximately 13,477 acres of soils and vegetation could be affected by potential re-mining operations under alternative 4. However, previously mined areas that could be potentially re-mined would also be reclaimed (though areas that were previously augered could not be feasibly re-mined). Approximately 24,328 acres of soils and vegetation could be protected from potential surface coal mining under alternative 4. The areas that would be reclaimed and protected account for 21.96% of the soils and vegetation in the evaluation area.

Potential re-mining and construction, along with use and maintenance of access and haul roads within the petition area and adjacent to protected ridgelines, would result in near- and long-term adverse impacts on soils and vegetation. However, protection of lands within the petition area from future mining activities would result in long-term beneficial impacts to soils and vegetation by limiting the potential for vegetation being removed or crushed during re-mining and construction and maintenance of haul roads; alteration of the substrate; the introduction and spread of exotic plant species; possible erosion and

sedimentation; and the long-term change in plant community and structure due to the delay of returning a mature deciduous forest to pre-existing conditions.

**TABLE 6-39: VEGETATION TYPES POTENTIALLY PROTECTED AND AFFECTED UNDER ALTERNATIVE 4 (PREFERRED ALTERNATIVE)**

Vegetation Type	Acres Potentially Protected from Surface Coal Mining	Acres Potentially Impacted by Remining	Percent of the Evaluation Area Impacted
Barren Land	35	31	0.04
Deciduous Forest	21,481	11,586	19.20
Evergreen Forest	197	147	0.20
Mixed Forest	325	255	0.34
Shrub/Scrub	471	261	0.43
Herbaceous	1,170	860	1.18
Wetlands	20	28	0.03
Hay/Pasture	6	0	<0.00
Developed	623	309	0.54
<b>Total</b>	<b>24,328</b>	<b>13,477</b>	<b>21.96</b>

Underground and auger mining could occur outside of the designation area and remove coal from under the designation area. However this would have no impact on soils and vegetation within petition area. Development of both access and haul roads and mine reclamation could also be potentially allowed under this alternative. Existing haul roads would be used when available, but alternative 4 could potentially allow for the construction of new roads to be used for remining. Impacts to soils and vegetation from road construction include removal of soils and vegetation and potential erosion, but limits of clearing and erosion control measures would help to reduce impacts.

### Cumulative Impacts

Cumulative impacts from other actions would be the same as alternative 3. Past and present cumulative actions that have impacted soils and vegetation in the evaluation area include pre- and post-SMCRA surface coal mining, underground mining, timber harvest, oil and gas production, recreation, and construction and development. The impacts of alternative 4, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on vegetation and soils. Potential remining under alternative 4 would result in direct adverse impacts to soils and vegetation, but reclamation of lands previously mined prior to the implementation of SMCRA could help offset these adverse impacts and result in long-term benefits. Alternative 4 would protect soils and vegetation on ridgelines from future surface coal mining operations. The adverse and beneficial impacts of alternative 4 overall would not significantly contribute to the cumulative impacts to soils and vegetation.

### Conclusion

Alternative 4 would result in near- and long-term adverse and beneficial impacts on soils and vegetation. Overall, alternative 4 would result in the protection of soils and vegetation and greater long-term beneficial impacts than alternative 1. Under alternative 4 it is expected that there would be some adverse impact to soils and vegetation from potential remining activities. However, the reclamation of the mining activities would address the effects of potential mining and restore these soils and vegetation, and over time soils and vegetation would stabilize.

Alternative 4 would result in direct or indirect adverse impacts, but could result in substantial benefits through the protection of vegetation and soils and the reclamation of lands previously mined prior to the implementation of SMCRA in 1977 and left unreclaimed. However, no new or additional adverse impacts would be expected compared to the no-action alternative. Given the rate of potential surface coal mining, and the fact that impacts would not occur at a large or landscape scale, it is unlikely that the impacts would be significant. Adverse impacts under alternative 4 would be nearly identical to those described under alternative 3, but would be slightly reduced due to protection of additional ridgelines.

## **ALTERNATIVE 5: TARGETED RESOURCE PROTECTION DESIGNATION**

Under alternative 5, OSMRE would designate lands as unsuitable for surface coal mining operations based on the presence of sensitive resources. Alternative 5 would protect environmentally sensitive habitat areas including portions of Stinking Creek and Thompson Creek within the Upper Cumberland watershed.

### **Direct and Indirect Impacts**

Under alternative 5, no new surface mining would be allowed in the 12,331-acre designation area; as a result, there would be no surface disturbance within this area. The majority of soils and vegetation would remain intact and the designation would protect 5,453 acres that are located in probable surface mineable coal seams. Approximately 1,495 acres falls in areas that have been previously surfaced mined, and no remining would occur under this alternative, which would reduce near-term adverse effects from disturbing soils and vegetation that have developed on the site, but would eliminate the opportunity to reclaim soils and vegetation on bare or eroded areas. Impacts to soils and vegetation are expected to be near- and long-term direct and indirect beneficial. These impacts would generally be the same as those described under alternative 2, but would occur in different locations. The prohibition of additional mining activities adjacent to environmentally sensitive habitat would protect soils and vegetation within the petition area and prevent associated adverse impacts, resulting in a long-term beneficial impact.

Soils and vegetation downslope of ridgelines not protected under alternative 5 would potentially be adversely impacted in the near term and long term due to the development of new mines and roads in those areas and associated increased runoff and sedimentation due to the removal of soils and vegetation. Underground and auger mining could be permitted outside the petition area causing no impacts to soils and vegetation within the petition area. The impacts from underground and auger mining and the development of new access and haul roads permitted outside the petition area would be as described under alternative 1. Remining is not permitted in the designation area and therefore long-term adverse impacts would continue on abandoned or previously mined sites that were mined prior to SMCRA regulations within the petition area.

Vegetation types in the evaluation area and the potential vegetation acres protected from surface coal mining and remining are described in table 6-40. As described in the table, these potential impacts merely reflect the vegetation types that could be protected from surface coal mining and remining.

Under alternative 5, considerably less soils and vegetation would be protected in the designation area than under the other action alternatives. Approximately 7,538 acres of soils and vegetation could be protected from potential surface coal mining and remining operations under alternative 5. This accounts for 4.37% of the soils and vegetation in the evaluation area. Under alternative 5 approximately 5,453 acres of soils and vegetation would be protected in probable surface mineable areas occurring in the evaluation area. However, previously mined areas that would not be reclaimed total approximately 2,085 acres (though areas that were previously augered could not be feasibly remined).

**TABLE 6-40: VEGETATION TYPES POTENTIALLY PROTECTED UNDER ALTERNATIVE 5**

<b>Vegetation Type</b>	<b>Acres Potentially Protected from Surface Coal Mining</b>	<b>Acres Potentially Protected from Remining</b>	<b>Percent of the Evaluation Area</b>
Barren Land	0	0	0.00
Deciduous Forest	4,880	1,746	3.85
Evergreen Forest	17	6	0.01
Mixed Forest	69	24	0.05
Shrub/Scrub	79	42	0.07
Herbaceous	196	163	0.21
Wetlands	8	2	0.01
Hay/Pasture	5	0	<0.00
Developed	199	102	0.17
<b>Total</b>	<b>5,453</b>	<b>2,085</b>	<b>4.37</b>

### **Cumulative Impacts**

Similar to alternative 2, past and present cumulative actions would continue to impact soils and vegetation. The impacts of alternative 5, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on vegetation and soils. Alternative 5 would provide cumulative benefits to soils and vegetation from the protection of the ridgelines and 5,453 acres of probable surface mineable soils, but still contribute a small adverse impact from the prohibition on remining, which would limit opportunities to reclaim soils and vegetation on pre- SMCRA mining sites.

### **Conclusion**

Alternative 5 would have both near- and long-term direct and indirect beneficial impacts. Overall, alternative 5 would result in the protection of soils and vegetation and greater long-term beneficial impacts than under alternative 1. However, alternative 5 would protect the least amount of vegetation and soil along ridgelines of all action alternatives. Alternative 5 would not result in any direct or indirect adverse impacts, but could result in some benefits through the protection of soils and vegetation. However, the beneficial impacts of reclamation on the potential vegetation acres protected from remining would not occur. Given the rate of surface coal mining, and the fact that impacts would not occur at a large or landscape scale, it is unlikely that the impacts would be significant.

### **ALTERNATIVE 6: REDUCED CORRIDOR DESIGNATION**

Under alternative 6, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State's petition. Lands protected under alternative 6 would be the same as those protected under alternatives 2 and 3, except that the corridor width would be reduced by half (600-foot corridor instead of 1,200-foot corridor).

### **Direct and Indirect Impacts**

The designation would have long-term widespread beneficial impacts on soils and vegetation by preventing most direct and indirect adverse impacts to soils and vegetation on 12,232 probable mineable acres in the designation area. Impacts to soils and vegetation under alternative 6 would be similar to those

described under alternative 2; however the protected area would be about half the area protected under alternative 2. Also, remining would not be permitted, limiting the ability to reclaim soils and vegetation on pre-SMCRA mine sites, causing a long-term adverse impact.

Underground and auger mining could be permitted outside the petition area causing no impacts to soils and vegetation within the petition area. The impacts from underground and auger mining and the development of new access and haul roads permitted outside the petition area would be as described under alternative 1. Remining is not permitted in the petition area; therefore, long-term adverse impacts would continue on abandoned or previously mined sites that were mined prior to SMCRA regulations within the petition area.

Vegetation types in the evaluation area and the potential vegetation acres protected from surface coal mining and remining are described in table 6-41. As described in the table, these potential impacts merely reflect the vegetation types that could be protected from surface coal mining and remining.

**TABLE 6-41: VEGETATION TYPES POTENTIALLY PROTECTED UNDER ALTERNATIVE 6**

Vegetation Type	Acres Potentially Protected from Surface Coal Mining	Acres Potentially Protected from Remining	Percent of the Evaluation Area Impacted
Barren Land	25	15	0.02
Deciduous Forest	10,674	5,729	9.52
Evergreen Forest	120	82	0.12
Mixed Forest	99	120	0.13
Shrub/Scrub	260	164	0.25
Herbaceous	708	506	0.70
Wetlands	8	11	0.01
Hay/Pasture	3	0	<0.00
Developed	335	178	0.10
<b>Total</b>	<b>12,232</b>	<b>6,805</b>	<b>10.85</b>

Approximately 19,037 acres of soils and vegetation could be protected from potential surface coal mining and remining operations under alternative 6. This accounts for 10.85% of the soils and vegetation in the evaluation area. Under alternative 6 approximately 12,232 acres of soils and vegetation would be protected in probable surface mineable areas occurring in the evaluation area. However, previously mined areas that would not be reclaimed total approximately 6,805 acres (though areas that were previously augered could not be feasibly remined).

**Cumulative Impacts**

Past and present cumulative actions under alternative 6 would be similar in type and duration as those described under alternative 2. The impacts of alternative 6, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on vegetation and soils. The adverse and beneficial impacts of alternative 6 overall would not significantly contribute to the cumulative impacts to soils and vegetation.

## **Conclusion**

Alternative 6 would result in both near- and long-term direct and indirect beneficial impacts. Similar to alternative 2, the protection of lands within the designation area from future mining activities would result in beneficial impacts compared to alternative 1. However, the beneficial impacts of reclamation on the potential soils and vegetation acres protected from remining would not occur, and adverse effects would continue on lands that have not been reclaimed. Alternative 6 would not result in any substantial direct or indirect adverse impacts, but could result in benefits through the protection of soils and vegetation. However, given the rate of surface coal mining, and the fact that impacts would not occur at a large or landscape scale, it is unlikely that the impacts would be significant.

## **IMPACTS OF THE ALTERNATIVES ON AQUATIC AND TERRESTRIAL SPECIES**

### **METHODS FOR ANALYSIS**

#### **Applicable Statutes, Regulations, and Policies**

Coal mining alters the surface landscape by changing its configuration and physical properties. The short- and long-term disturbance created by surface and underground coal extraction significantly changes the biological resources of surface lands. Specifically, coal mining affects: (1) the biological composition, or the number and proportion of habitat types (e.g., the amount of forest, length of stream habitat); (2) the biological structure, or the geographical arrangement of the habitat types; and (3) the biological function, or how these arranged habitat types interact with their respective plant and animal species. These effects vary in temporal and spatial scale; in some instances, these effects extend past the coal mining permit boundary and after final bond release.

Several existing laws and regulations address protection of the terrestrial and aquatic biological resources that occur near coal mining areas. The following discussion in this section identifies the laws and regulations protecting fish, terrestrial fauna, and endangered species, with a focus on key aspects of SMCRA and the Endangered Species Act.

#### **Surface Mining Control and Reclamation Act**

Section 515 of SMCRA requires that, “to the extent possible using the best technology currently available,” surface coal mining operations “minimize disturbances and adverse impacts ... on fish, wildlife, and related environmental values, and achieve enhancement of such resources where practicable” (30 USC § 1265(b)(24)). This provision applies to any fish, wildlife, or related environmental values identified during the permitting process that require protective measures to minimize disturbances and adverse impacts or enhancement of such resources.

Fish, wildlife, and related environmental values are addressed directly within the implementing regulations of SMCRA. To achieve the mandate of section 515, OSMRE regulations include specific requirements for these resources from the permit application stage, during mining through the requirement for enhancement measures, and during consideration and implementation of the postmining land use.

The implementing regulations for SMCRA require the permit application to contain information on fish and wildlife resources within the permit and adjacent area (30 CFR § 780.16(a)). The regulatory authority determines the required scope and level of detail for such information in consultation with state and

federal agencies responsible for fish and wildlife. Each application must include a description of how, to the extent possible using best technology currently available, the operator would minimize disturbances and adverse impacts on fish and wildlife and related environmental values, including compliance with the Endangered Species Act. This is the protection and enhancement plan specifically required by 30 CFR § 780.16(b).

The protection and enhancement plan is required to be consistent with applicable performance standards at 30 CFR §§ 816.97 and 817.97 that require the operator to include protective measures for use during active phases of the mining operation, and to include proactive measures to minimize or avoid impacts. For example, 30 CFR §§ 816.97(e) and 817.97(e) require that each operator shall, to the extent possible using best technology currently available:

- Ensure that electric power lines and other transmission facilities used for, or incidental to, surface mining activities on the permit area are designed and constructed to minimize electrocution hazards to raptors, except where the regulatory authority determines that such requirements are unnecessary;
- Locate and operate haul and access roads to avoid or minimize impacts on important fish and wildlife species or other species protected by state or federal law;
- Design fences, overland conveyors, and other potential barriers to permit passage for large mammals, except where the regulatory authority determines that such requirements are unnecessary; and
- Use fencing, covers, or other appropriate methods to exclude wildlife from ponds that contain hazardous concentrations of toxic-forming materials.

The regulations at 30 CFR §§ 816.97(f) and 817.97(f) provide additional protections for wetlands and habitats of unusually high value for fish and wildlife. The operator must avoid disturbances to, enhance where practicable, restore, or replace, wetlands and riparian vegetation along rivers and streams and bordering ponds and lakes. Surface mining activities must avoid disturbances to, enhance where practicable, or restore, habitats of unusually high value for fish and wildlife.

The regulations also require an applicant who intends to select certain postmining land uses to incorporate specific measures to the benefit of fish and wildlife resources. The regulations at 30 CFR §§ 816.97(g) and 817.97(g) require that, where fish and wildlife habitat would be part of the postmining land use, the reclamation plan must include plant species selected on the basis of the following criteria:

- Their proven nutritional value for fish or wildlife;
- Their use as cover for fish or wildlife; and
- Their ability to support and enhance fish or wildlife habitat after the release of performance bonds. The selected plants must be grouped and distributed to optimize edge effect, cover, and other benefits to fish and wildlife.

The regulations at 30 CFR §§ 816.97(h) and 817.97(h) require that, where cropland would be the postmining land use, and where appropriate for wildlife- and crop-management practices, the operator must intersperse fields with trees, hedges, or fence rows throughout the harvested area to break up large blocks of monoculture and to diversify habitat types for birds and other animals. Likewise, 30 CFR §§ 816.97(i) and 817.97(i) require that, where residential, public service, or industrial uses are to be the postmining land use, and where consistent with the approved postmining land use, the operator must

intersperse reclaimed lands with greenbelts using species of grass, shrubs, and trees useful as food and cover for wildlife.

Beyond these specific requirements that pertain to consideration and protection of fish, wildlife and related environmental values, there are many aspects of the implementing regulations that affect the mining operation and in turn affect the impacts of the operation on biological resources. For example, current SMCRA implementing regulation requirements for spoil placement, activities in and within streams, and reclamation all have impacts either directly or indirectly on biological resources by allowing activities to occur in certain habitats, and by restricting them in others.

**Fish and Wildlife Protection and Enhancement:** Section 515(b)(24) and 516(b)(11) of SMCRA (30 USC §§ 1265(b)(24) and 1266(b)(11)) require that surface coal mining and reclamation operations minimize disturbances and adverse impacts of the operation on fish, wildlife, and related environmental values to the extent possible using the best technology currently available; they also require enhancement of those resources where practicable. The existing regulations (the no-action alternative) at 30 CFR §§ 773.15(j), 816.97(b), and 817.97(b) prohibit the approval of a permit or the conduct of mining activity likely to jeopardize endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. The existing regulations at 30 CFR §§ 780.16 and 784.21 require that each permit application include fish and wildlife resource information and a fish and wildlife protection plan. The existing regulations at 30 CFR §§ 816.97(a) and (e) and 817.97(a) and (e) contain corresponding performance standards requiring enhancement of fish, wildlife, and related environmental values where practicable; they also require implementation of protective measures during mining in all cases. The remainder of existing 30 CFR §§ 816.97 and 817.97 require additional protective measures for fish and wildlife, including avoidance of disturbances to, restoration, or replacement of wetlands, riparian vegetation, and other habitats of unusually high value for fish and wildlife.

### **Clean Water Act**

The Clean Water Act (33 USC §§ 1251–1387), implemented by the EPA in 1972, establishes federal water quality standards and prohibits the discharge any pollutant from a point source into navigable waters of the United States, unless a permit is obtained under the National Pollution Discharge Elimination System program. Section 404 of the Clean Water Act (33 USC § 1344(a)) specifically regulates the discharge of dredged or fill materials into waters of the United States, including wetlands. A full discussion of mining regulations and best management practices designed to prevent or minimize impacts to water quality is provided in the “Impacts of the Alternatives on Surface Water.”

### **Tennessee Responsible Mining Act of 2009**

The Tennessee Responsible Mining Act (2009 Tenn. Pub. Acts 289), established at the state level in Tennessee in 2009, provides additional protections for aquatic species and habitats by limiting impacts due to coal mining. The Tennessee Responsible Mining Act lays out specific requirements for obtaining a permit for activities related to the surface mining of coal or the surface effects of underground mining in the State of Tennessee. Among the most important protections for aquatic species and habitats established by the Tennessee Responsible Mining Act is a regulation that with limited exceptions prohibits coal mining or disposal of spoil or coal waste materials within 100 feet of the ordinary high water mark of any stream, further reinforcing the SMCRA Stream Buffer Zone regulation at the state level. The limited exceptions allow disturbance within 100 feet of a stream for stream crossings. These exceptions include activities designed to improve the quality of stream segments previously disturbed by mining and the removal of coal from its original location that does not cause the loss of stream function and do not cause a discharge of pollutants in violation of water quality criteria. However, as noted above, stream crossings would still require a permit from the US Army Corps of Engineers under Section 404 of the Clean Water

Act. Under the Tennessee Responsible Mining Act, if the state determines that surface coal mining at a particular site will violate water quality standards because acid mine drainage from the site will not be amenable to treatment with proven technology both during the permit period or subsequent to completion of mining activities, the State's permit must be denied.

### **Assumptions and Methodology**

This analysis covers aquatic and terrestrial communities found in the NCWMA and Emory River Tract Conservation Easement, including portions of the South Fork of the Cumberland River, upper portions of the Cumberland River mainstem, Upper Clinch River, and Emory River watersheds. However, as there can be no surface coal mining occurring in the Emory River watershed, no impacts to aquatic species from surface coal mining operations are expected in the watershed. Each of the six alternatives within the Evaluation Area is examined for their potential impact to aquatic fish and wildlife species, compared to existing conditions (alternative 1: the no-action alternative) and the action alternatives (alternatives 2–6). Species lists were obtained from USFWS, TWRA, relevant scientific literature, and site-specific surveys where available. All rare, threatened, and endangered aquatic species are discussed in the section “Impacts of the Alternatives on Special-Status Species.”

The impact analysis includes a description of potential impacts of each alternative to each species or groups of species, and their associated habitats, known to occur or likely to occur within the evaluation area. Since this PED/EIS does not consider any site-specific mining applications, the analysis provided is more general in nature, as all the action alternatives would afford varying levels of protection compared to the no-action alternative. Impacts were assessed in terms of the potential for increased or decreased disturbance to each species or group of species, compared to the no-action alternative. Potential for increased or decreased disturbance to aquatic species was based on the proximity of fish and wildlife habitat to minable coal resources identified in “Chapter 5: Evaluation of Coal Resources.” Species were grouped where appropriate based on overlap in habitat and similarity of impacts under each alternative. Individual species were analyzed only as necessary.

Direct, indirect, and cumulative impacts were considered. Conclusions were based on overall impacts to aquatic and terrestrial species occurring within the petition or designation area and determination of impact duration and intensity was described for each alternative.

It was assumed for the purposes of this analysis that impacts to aquatic species are most likely to occur in habitats adjacent to and downstream of active mining areas, and that impacts would be limited to the area within the buffer area used to analyze alternatives from mining activities. It was also assumed that all coal resources within the designation area could potentially be mined. Therefore, although designating any portion of the evaluation area as unsuitable for surface mining would result in long-term benefits to fish and wildlife in the affected area, it is assumed that alternatives which do not prohibit future mining activities would eventually result in adverse impacts to fish and wildlife species, commensurate with mining. For alternatives that allow re-mining, it was assumed that re-mining would be most likely to occur adjacent to unmined coal resources. Specific known locations of coal resources are identified in “Chapter 5: Evaluation of Coal Resources.” Impacts to terrestrial species were based on both the potential impacts to wildlife habitat in the evaluation area and the alternatives and the direct or indirect effects to groups of wildlife based on the best available information. Additional species-specific analysis can be found in the “Special-Status Species” analysis.

## Area of Analysis

The area of analysis for aquatic species includes all aquatic habitats within the evaluation area and aquatic habitats outside the evaluation area that are connected by a contiguous stream or waterway, and are within the buffer area used to analyze alternatives from mining activities occurring inside the evaluation area. The area of analysis for terrestrial wildlife is restricted to the evaluation area where mining activities could occur.

## GENERAL IMPACTS OF SURFACE COAL MINING IN TENNESSEE

**Aquatic Species:** Coal mining can adversely affect aquatic fish and wildlife species and their habitats both directly and indirectly. Direct impacts to aquatic species would include any mining-related activities that would result in direct mortality of species or destruction of habitat. In Tennessee, direct impacts to aquatic species due to surface mining activities would be extremely limited and would occur only at permitted stream crossings, as mining activities within 100 feet of the ordinary high water mark of any stream are otherwise prohibited under SMCRA (30 CFR §§ 816.57 and 817.57) and the Tennessee Responsible Mining Act (2009 Tenn. Pub. Acts 289). Indirect impacts of surface coal mining on aquatic species occur primarily as a result of habitat and water quality degradation. Indirect impacts to aquatic species include increased sedimentation and turbidity, changes in water chemistry including acidification, and habitat contamination due to the introduction or mobilization of chemical pollutants (EPA 2011). Impacts to water quality in streams and other aquatic habitats receiving mine drainage or runoff as a result of surface coal mining operations in turn impact the aquatic species that inhabit those water bodies (Letterman and Mitsch 1978; Pond et al. 2008; Daniel et al. 2015). Therefore, mining impacts to aquatic species are closely related to impacts to surface water resources.

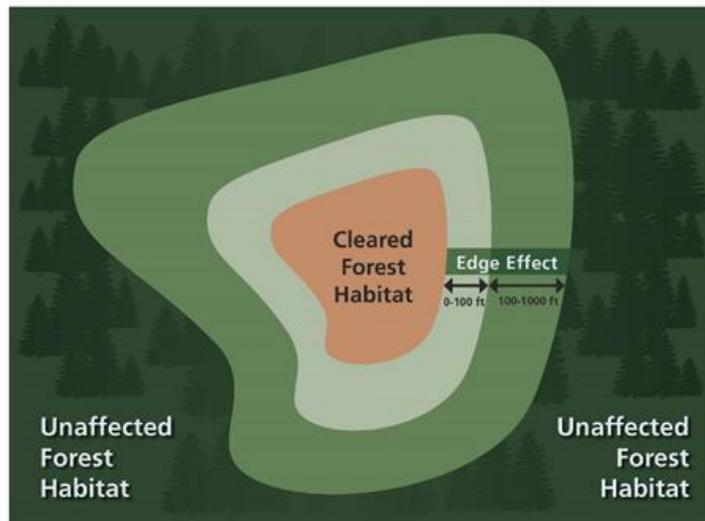
Removal of soils and vegetation for surface coal mining operations can lead to increased runoff and sedimentation, creating high turbidity conditions in rivers and streams. This can potentially impact a variety of aquatic species including fishes, mussels, amphibians, and various benthic macroinvertebrates (Newcombe and Jensen 1996; Kemp et al. 2011; Daniel et al. 2015). High turbidity environments reduce respiratory function in many fish, amphibian, and benthic macroinvertebrate species (Wood and Armitage 1997; Kemp et al. 2011). High turbidity can also limit the ability of fish and other species to find food or prey due to decreased visibility in the water column. Additionally, food resources may be less abundant due to an overall decrease in system productivity resulting from turbidity-driven light attenuation (Wood and Armitage 1997). Increased turbidity has also been shown to reduce reproductive efficiency in fish and amphibians, by creating layers of silt on substrate surfaces, which can bury eggs or prevent them from properly attaching (Henley et al. 2010). Implementing regulations for SMCRA (30 CFR §§ 816.57 and 817.57), the Clean Water Act (33 USC § 1344(a)), and the Tennessee Responsible Mining Act (2009 Tenn. Pub. Acts 289), described above under the “Applicable Statutes, Regulations, and Policies” Section, would limit impacts due to sedimentation and turbidity, but would not eliminate them completely. A detailed discussion of federal and state water quality regulations is provided in the section “Impacts of the Alternatives on Water Resources.”

Coal mining can also indirectly impact aquatic species by altering water chemistry in streams and other aquatic habitats, which receive mine drainage or runoff. Changes in water chemistry associated with mining activities include reduced pH (acidification), changes in redox conditions (transfer of electrons between chemical species resulting in changes in oxidation state), and increased conductivity (Kimmel and Argent 2009; Palmer et al. 2010; Lindberg et al. 2011). Impacts to aquatic communities as a result of mine drainage and runoff have been well documented and generally lead to reduced species abundance, reduced diversity, and general impairment of ecosystem structure and function (Letterman and Mitsch 1978; DeNicola and Stapleton 2002; Hogsden and Harding 2012). Bottom-up food web alterations can occur as a result of decreased algal and macroinvertebrate abundance associated with mine drainage and

runoff (Warner 1971; Verb and Vis 2000; Hogsden and Harding 2012). Increased conductivity, and reduced pH associated with coal mining have been shown to specifically reduce species richness and abundance among amphibians (Hecnar and M'Closkey 1996).

Surface coal mining can also result in the release or mobilization of chemical pollutants into surface waters, which can also indirectly impact aquatic species. Chemical contaminants introduced or mobilized by coal mining activities, especially metals, can affect most aquatic species, resulting in impairment of ecosystem function (Palmer et al. 2010). Selenium is of particular concern in aquatic ecosystems associated with coal mining (EPA 2011). Selenium is released into the environment from coal ash and coal mine waste, and enters aquatic ecosystems where aquatic organisms are exposed. Selenium can reach toxic concentration in aquatic ecosystems associated with coal mining and can bio-accumulate through food webs via trophic transfer (Orr et al. 2006). Compliance with mining regulations and water quality standards outlined in SMCRA (30 CFR §§ 816.57 and 817.57), Clean Water Act (33 USC § 1344(a)) and the Tennessee Responsible Mining Act (2009 Tenn. Pub. Acts 289), and discussed above under the “Applicable Statutes, Regulations, and Policies” section, would effectively minimize, but not eliminate indirect adverse impacts to aquatic species due to water quality degradation.

**Terrestrial Species:** There is little literature on the direct impacts of coal mining on terrestrial wildlife (Buehler and Percy 2012). Direct impacts from mining can result in local wildlife being displaced, injured, or killed, especially those species that lack the mobility to escape mining activities such as small mammals, reptiles and amphibians (Buehler and Percy 2012). As areas are cleared of vegetation in preparation of mining activities, species are displaced to adjacent lands. This displacement can result in missed breeding opportunities or lower survival rates (Buehler and Percy 2012). This type of habitat disturbance has been documented to affect small mammal populations and alter species composition (Geier and Best 1980). In addition, the clearing of forested habitat creates habitat fragmentation and edge, which can change forest structure, composition, and ecological processes, resulting in indirect impacts to forest-dependent wildlife species (Wickham et al. 2007), including small mammals and large mammals such as black bear and bobcat. Habitat fragmentation can result in localized population extirpations as species populations become isolated due to habitat loss (Jackson 2000). In forested areas, fragmentation and the creation of habitat edges has been documented to have a major effect on forest songbirds (Askins 1994). The presence of a forest edge can result in increased predation, brood parasitism, and species competitions and the effect can extend up to 150 feet into the forest (Wood, Bosworth, and Dettmers 2006). In 2005, Wood and others documented lower cerulean warbler territory density adjacent to reclaimed mine edges (Wood, Bosworth, and Dettmers 2006). Wood, Bosworth, and Dettmers (2006) found that the edge effect of reclaimed mines extended over 1,000 feet into the forest. USFWS made a similar conclusion stating that the “introduction of hard edges may result in greater local population declines” and that the continued “degradation or removal of suitable mature and old-growth hardwood



**FIGURE 6-27: ILLUSTRATION OF EDGE EFFECT FROM HABITAT DISTURBANCE**

Best 1980). In addition, the clearing of forested habitat creates habitat fragmentation and edge, which can change forest structure, composition, and ecological processes, resulting in indirect impacts to forest-dependent wildlife species (Wickham et al. 2007), including small mammals and large mammals such as black bear and bobcat. Habitat fragmentation can result in localized population extirpations as species populations become isolated due to habitat loss (Jackson 2000). In forested areas, fragmentation and the creation of habitat edges has been documented to have a major effect on forest songbirds (Askins 1994). The presence of a forest edge can result in increased predation, brood parasitism, and species competitions and the effect can extend up to 150 feet into the forest (Wood, Bosworth, and Dettmers 2006). In 2005, Wood and others documented lower cerulean warbler territory density adjacent to reclaimed mine edges (Wood, Bosworth, and Dettmers 2006). Wood, Bosworth, and Dettmers (2006) found that the edge effect of reclaimed mines extended over 1,000 feet into the forest. USFWS made a similar conclusion stating that the “introduction of hard edges may result in greater local population declines” and that the continued “degradation or removal of suitable mature and old-growth hardwood

forestland will result in reductions in nesting opportunities, and that accumulation of habitat losses is likely to result” in overall species decline (USFWS 2006a). USFWS cautioned that “[e]ffects in a relatively small portion of the [cerulean warbler] species range... could contribute disproportionately to the population decline” (USFWS 2006a). For an illustration of edge effects as a result of habitat disturbance, see figure 6-27. For edge effects associated with each of the alternatives see figures 6-28, 6-29, 6-30, 6-31, and 6-32.

Wildlife impacts from mine reclamation vary depending of the reclamation plan, time span for reclamation to occur and the species of wildlife being considered. Site reclamation can result in changes to species-specific “relative abundance, survival, reproduction, movements, foraging behavior and other behavioral traits” (Buehler and Percy 2012). Because of the time between clearing the forest and reclamation, avian communities tend to shift from forest bird communities to those more typical of an early successional habitat (Buehler and Percy 2012). These early successional habitats can attract a different species that might otherwise not be present in the area (Ingold 2002). Grassland species attracted to reclaimed sites include a variety of song birds, grassland raptors such as the Northern harrier and the short-eared owl and games species such as the eastern wild turkey (Buehler and Percy 2012). Some species like black bear may benefit seasonally as variation in habitat provides berries and other food sources along forest edges, and hard mast in interior habitat (Buehler and Percy 2012).

Other wildlife species such as small mammals can be impacted by reclamation depending on the proximity of the source population necessary for recolonizing the area and the habitat structure and composition of the reclaimed area (Buehler and Percy 2012). Surface mining reclamation may delay recolonization due to the lack of woody debris that has been documented as important for small mammal populations (Geier and Best 1980). Typical reclamation results in compacted soils creating a condition that inhibits woody plant establishment and results in areas that lack woody debris (Larkin et al. 2008). Therefore, the type of reclamation could affect the small mammal population seeking to colonize the area. Large mammals such as elk and deer often benefit from reclamation efforts as it creates edge habitat and associated food resources in terms of grass and scrub species (Buehler and Percy 2012). TWRA would be a party to any reclamation actions that would occur in the evaluation area where they own and manage the surface rights and would prescribe desired habitat conditions according to the long-terms goals of any reclamation actions (TWRA 1992).

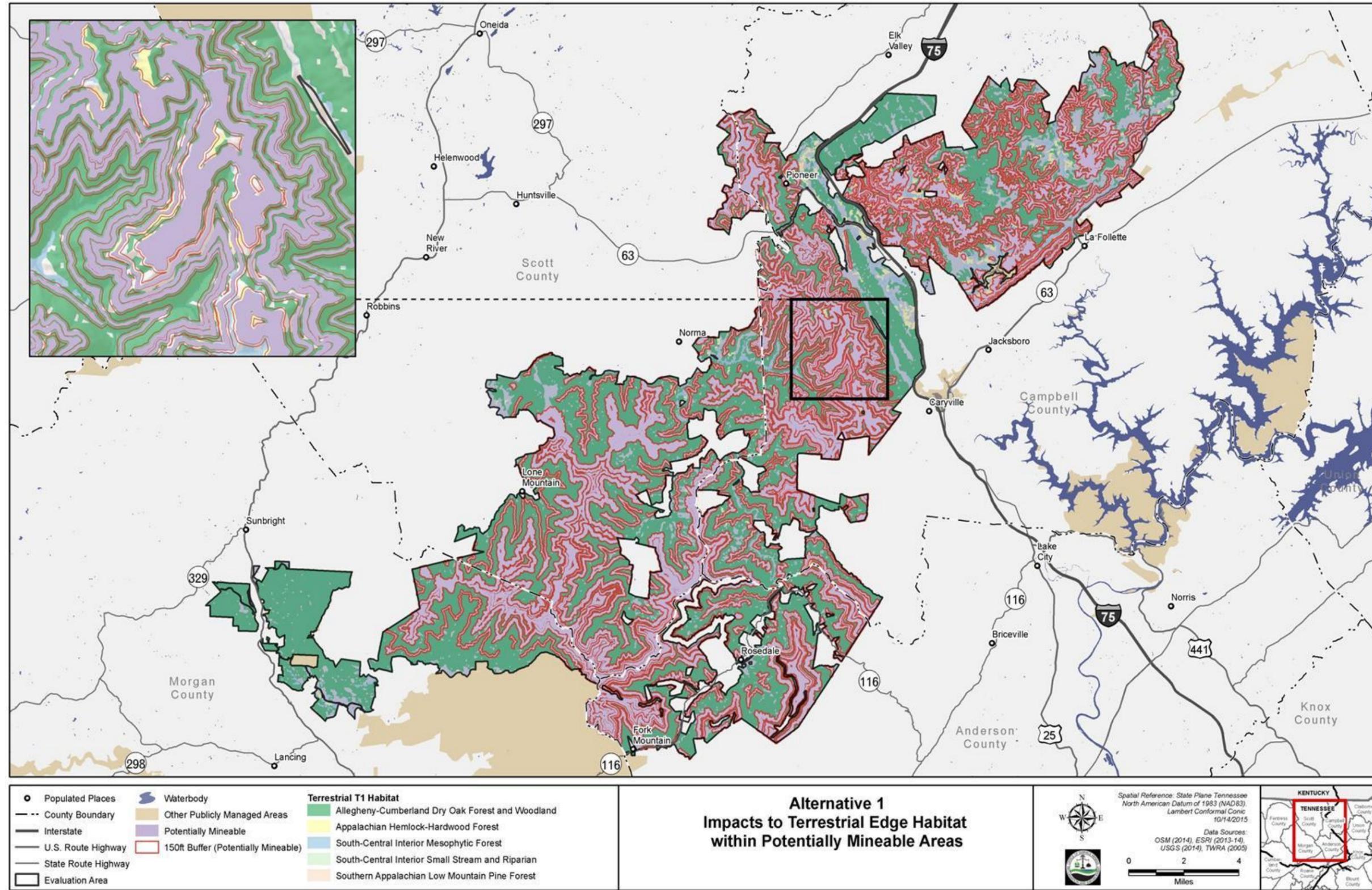


FIGURE 6-28: ALTERNATIVE 1 IMPACTS TO TERRESTRIAL EDGE HABITAT WITHIN POTENTIALLY MINEABLE AREAS

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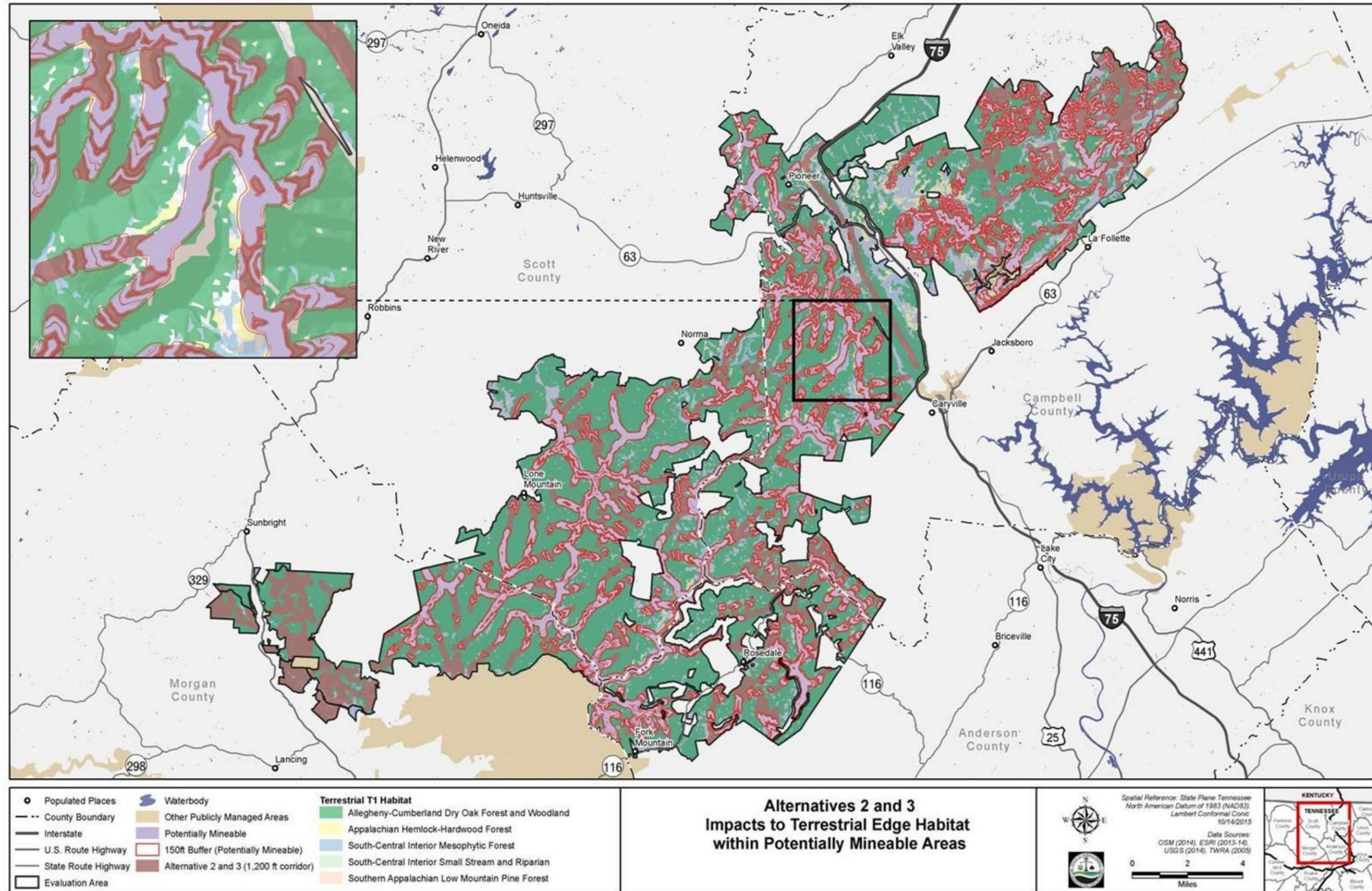


FIGURE 6-29: ALTERNATIVES 2 AND 3 IMPACTS TO TERRESTRIAL EDGE HABITAT WITHIN POTENTIALLY MINEABLE AREAS

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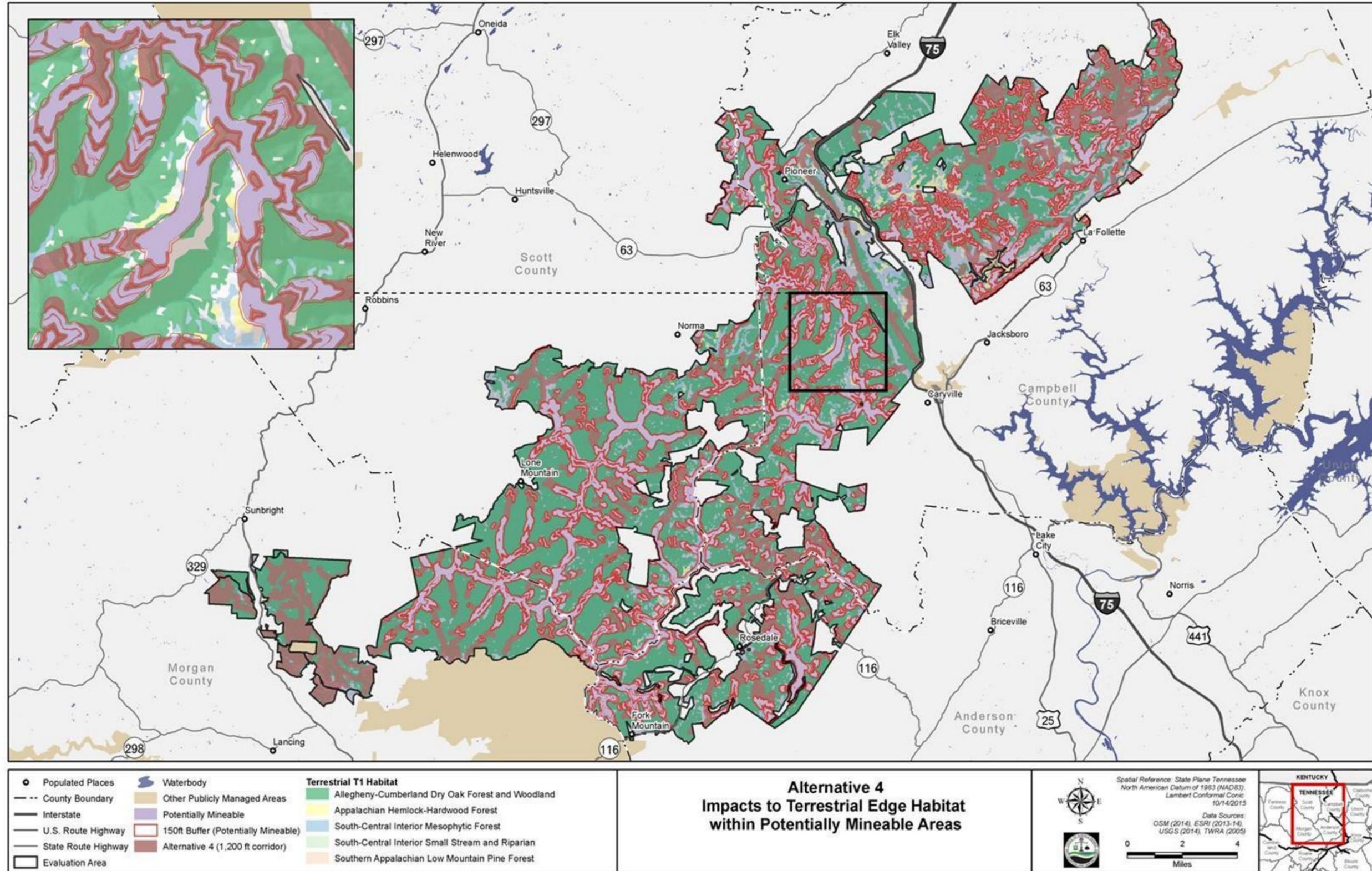


FIGURE 6-30: ALTERNATIVE 4 IMPACTS TO TERRESTRIAL EDGE HABITAT WITHIN POTENTIALLY MINEABLE AREAS

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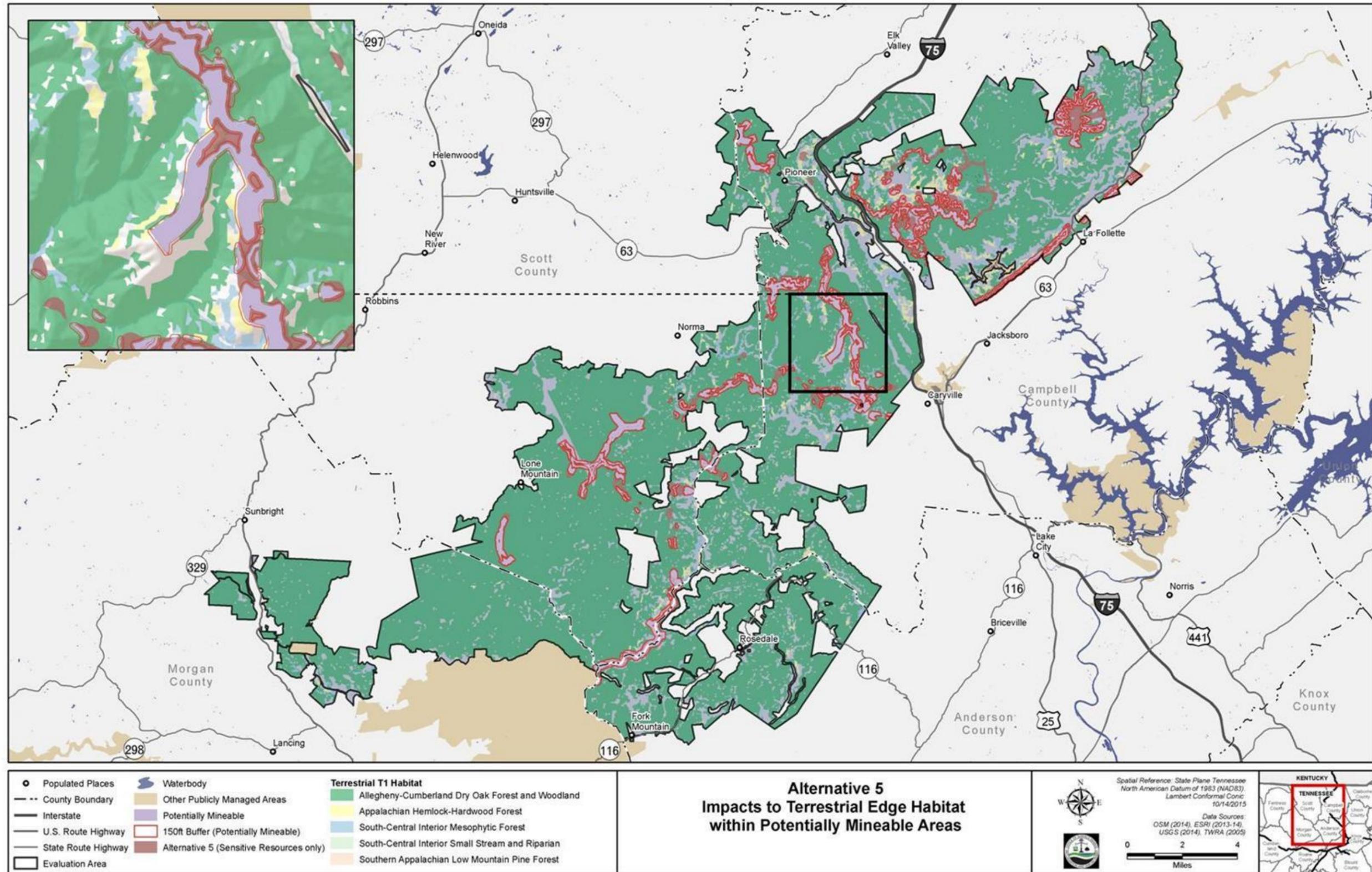


FIGURE 6-31: ALTERNATIVE 5 IMPACTS TO TERRESTRIAL EDGE HABITAT WITHIN POTENTIALLY MINEABLE AREAS

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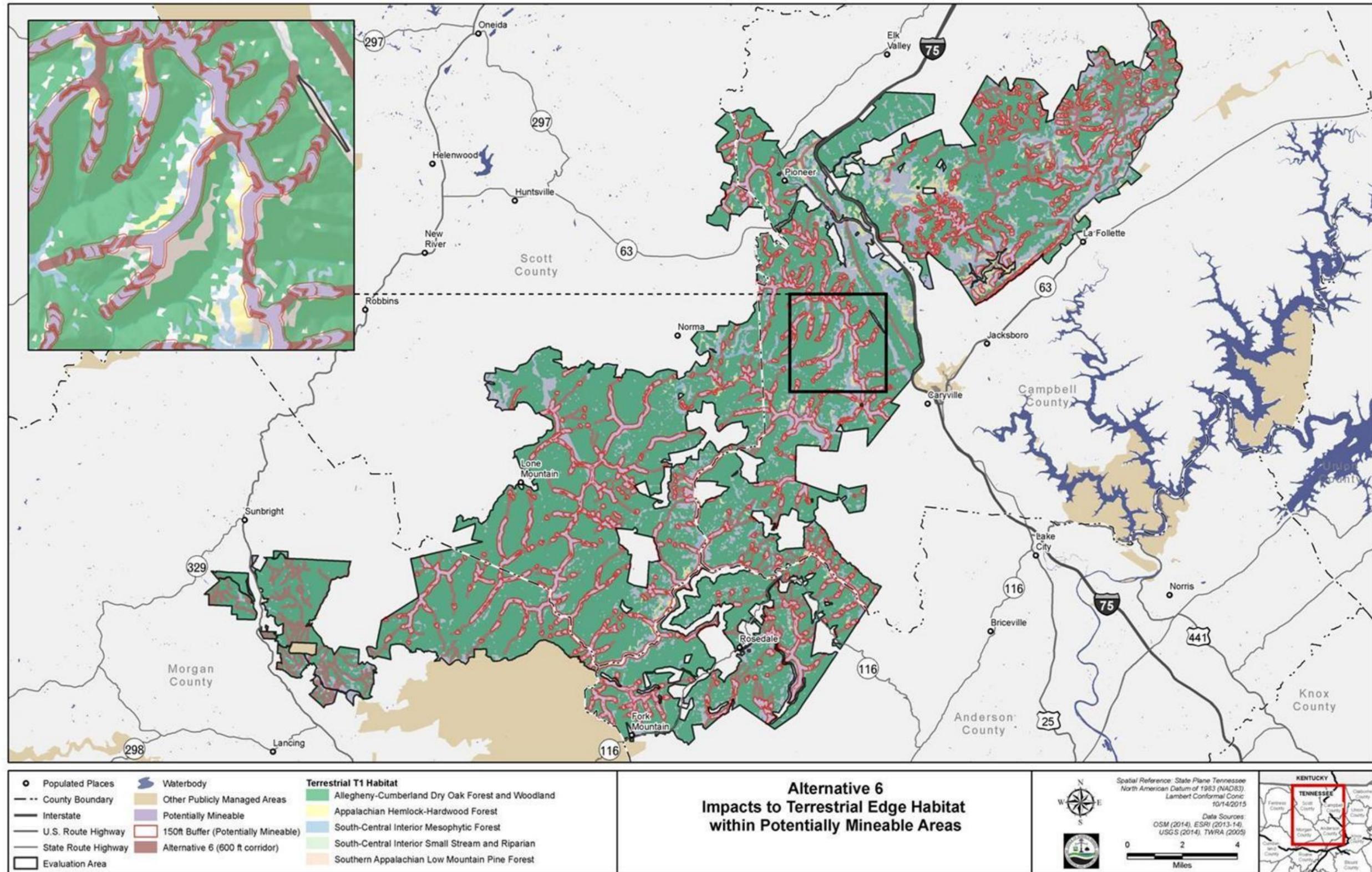


FIGURE 6-32: ALTERNATIVE 6 IMPACTS TO TERRESTRIAL EDGE HABITAT WITHIN POTENTIALLY MINEABLE AREAS

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## Underground and Auger Mining

**Aquatic Species:** Any impacts to surface waters as a result of underground mining activities could indirectly impact aquatic fish and wildlife species. However, few impacts to surface waters as a result of underground mining are expected. Therefore, negligible impacts to aquatic fish and wildlife species are anticipated as a result of underground mining. A full discussion underground mining impacts on surface water resources is provided in the “Impacts of the Alternatives on Water Resources” section.

**Terrestrial Species:** Underground mining typically results in fewer impacts to terrestrial wildlife compared to surface mining largely as a result of the smaller scale of the impact on habitat. However, the type of impact would be similar to those described above (i.e., habitat loss, fragmentation, mortality, etc.). Some species may benefit from abandoned coal mine shafts, such as bats that use such areas for roosts and hibernacula (Buehler and Percy 2012).

## Remining

**Aquatic Species:** Remining may contribute to near-term impacts to aquatic species generally due to mobilization of sediments or contaminants and associated degradation of water quality. However, reclamation of lands previously mined prior to the implementation of SMCRA in 1977 and left unreclaimed could possibly result in long-term benefits to aquatic species generally if adverse impacts to water quality are mitigated (Kleinmann 2000).

The continued existence of pre-SMCRA unreclaimed abandoned mined lands may result in long-term adverse impacts to aquatic species, commensurate with impacts to water quality. Acid mine drainage and other polluted drainage from pre-SMCRA unreclaimed mines has been shown to impact aquatic species, alter food webs, and impair ecosystem function (Letterman and Mitsch 1978; Warner 1971; DeNicola and Stapleton 2002; Hogsden and Harding 2012).

**Terrestrial Species:** Remining would likely have similar impacts to wildlife generally as surface coal mining and reclamation; however the affected area would likely be smaller. Some species could be adversely affected as remining would disturb habitat that has been established for the last fifty years or more. Remining may have the greatest impact on forest-dependent species such as ruffed grouse, oven birds, black bears, and bobcats. This could result in displacing wildlife to other adjacent areas (Buehler and Percy 2012).

However, the failure to reclaim previously mined areas could result in continued acid mine drainage that could impact terrestrial and aquatic species of reptiles and amphibians and those species that prey upon them (Buehler and Percy 2012).

## Roads

**Aquatic Species:** The construction, use, and maintenance of access or haul roads associated with mining activities would disturb vegetation and soils, potentially leading to increased erosion and runoff. This may contribute to the degradation of water quality due to increased turbidity, sedimentation, and the potential introduction or mobilization of pollutants, potentially impacting aquatic species in habitats downslope of roads (Tsunokawa and Hoban 1997). Road construction would represent a pulse event—where single events of sediment loading occur related to storm events—likely resulting in near-term impacts to aquatic species. Required sediment controls such as sumps and ponds would reduce but not eliminate impacts to aquatic species. The use and maintenance of access or haul roads would be ongoing, resulting in long-term impacts to aquatic species and habitats.

**Terrestrial Species:** The construction and operation of roads can result in a number of impacts to terrestrial wildlife. These impacts include the direct loss of habitat through road clearing, degradation of habitat quality, habitat fragmentation, species avoidance, and the disruption of processes that maintain regional populations (Jackson 2000). In addition, the construction and use of roads can cause wildlife-vehicle collisions, resulting in wildlife injury or mortality (Jaeger, Fahring, and Ewald 2006). Roads can also result in increased wildlife exploitation, such as game species like black bear, bobcat, deer, and elk, by providing access to hunters or poachers (Jackson 2000). Finally, road construction and use can result in reduced access to important habitats. For example, studies have concluded that adverse impacts to local populations of turtles and amphibians may occur when terrestrial habitat and aquatic habitat are separated (Jackson 1996).

### **TWRA Priority Habitat**

TWRA identified aquatic and terrestrial priority habitat in the development of Tennessee's Comprehensive Wildlife Conservation Strategy (2005). Priority habitat was identified based on concentrations of the rarest and most viable species of great conservation need. More plainly it is the species prioritization score (rarity  $\times$  viability) overlaid onto habitats. Prioritization is meant to identify areas that provide the best opportunity for conservation work (i.e., species are either more rare or found in more functional habitat and conservation actions have the potential to abate impacts to species; TWRA 2005). Priority habitat is ranked from very high to low. A very-high rating suggests that a conservation action can restore a species or eliminate adverse impacts to them; whereas a low rating indicates that there is a small probability that conservation actions can restore species or reduce impacts to them (TWRA 2005). Figures 6-33, 6-34, 6-35, 6-36, 6-37, 6-38, 6-39, 6-40, 6-41 and 6-42 show impacts to aquatic and terrestrial priority habitat for the alternatives. The impact analysis follows the figures.

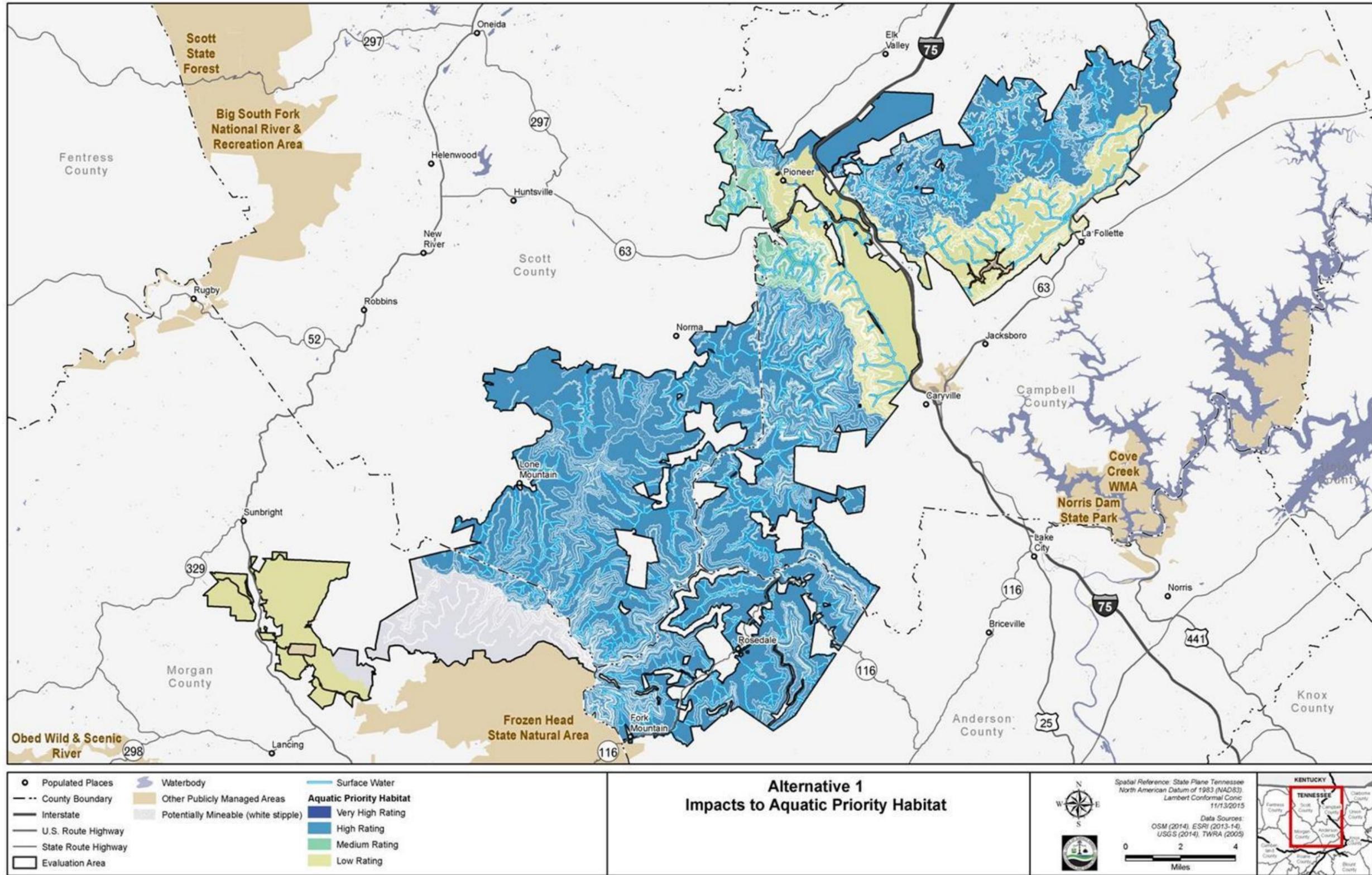


FIGURE 6-33: ALTERNATIVE 1 IMPACTS TO AQUATIC PRIORITY HABITAT

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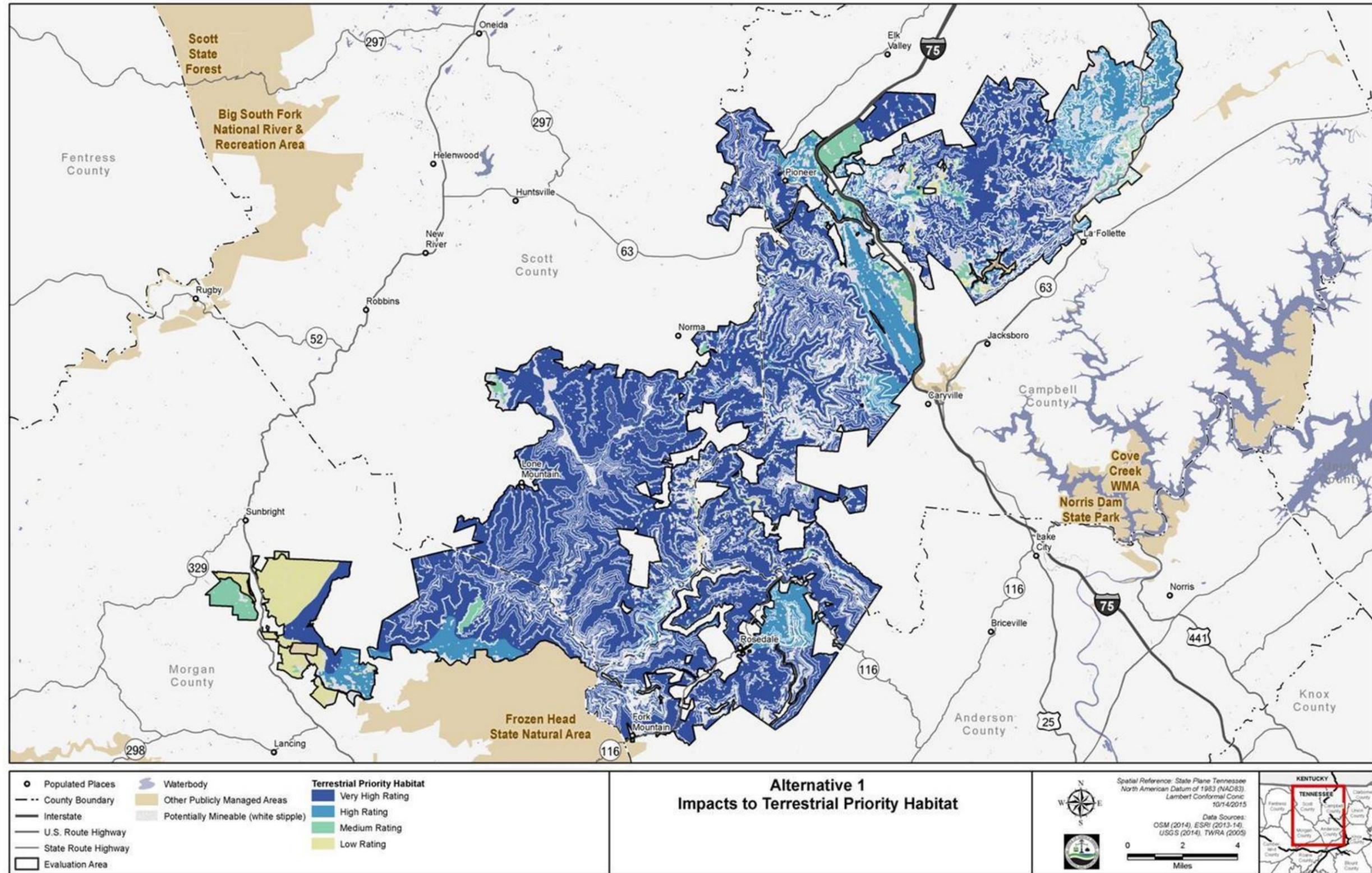


FIGURE 6-34: ALTERNATIVE 1 IMPACTS TO TERRESTRIAL PRIORITY HABITAT

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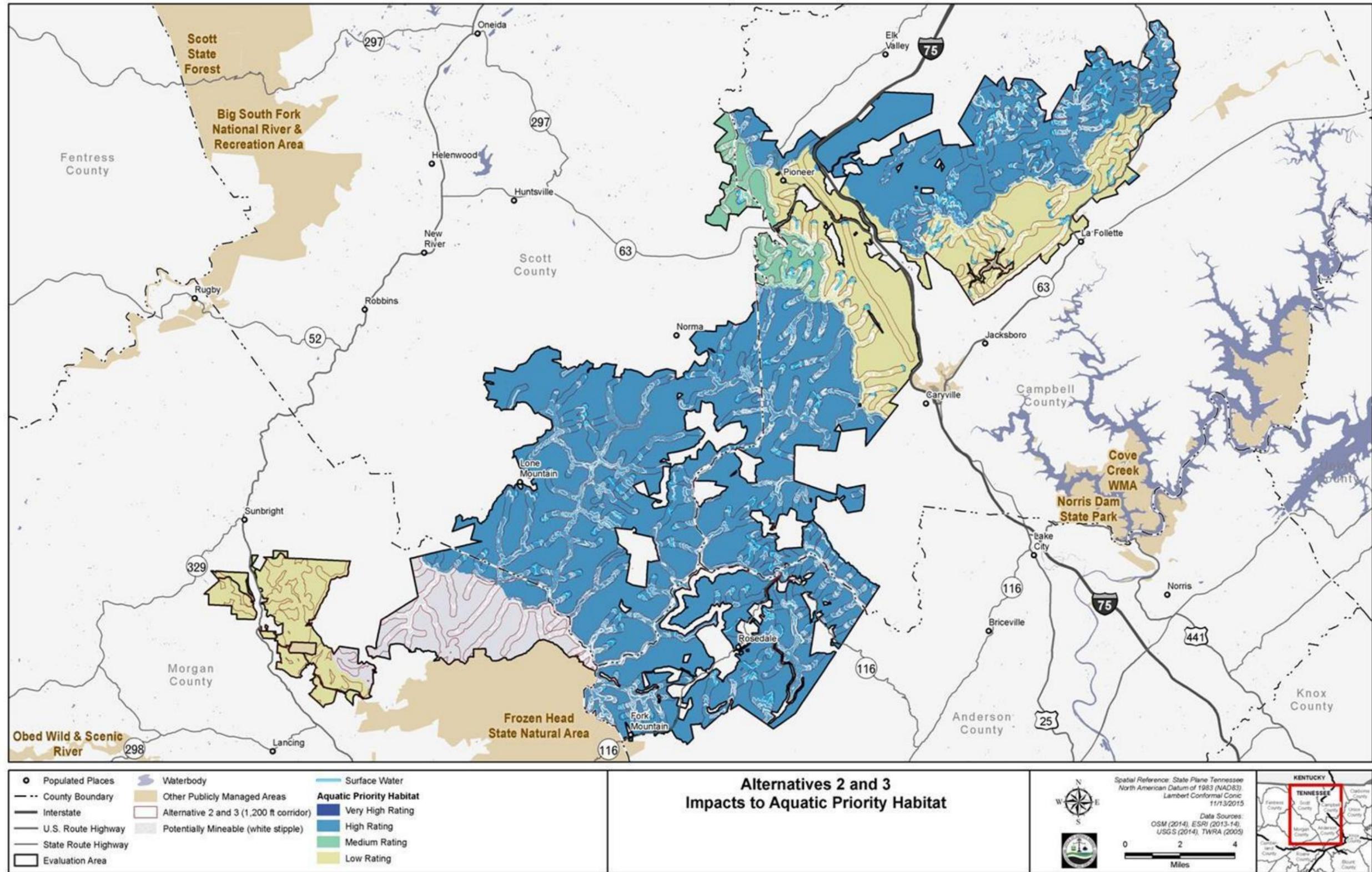


FIGURE 6-35: ALTERNATIVES 2 AND 3 IMPACTS TO AQUATIC PRIORITY HABITAT

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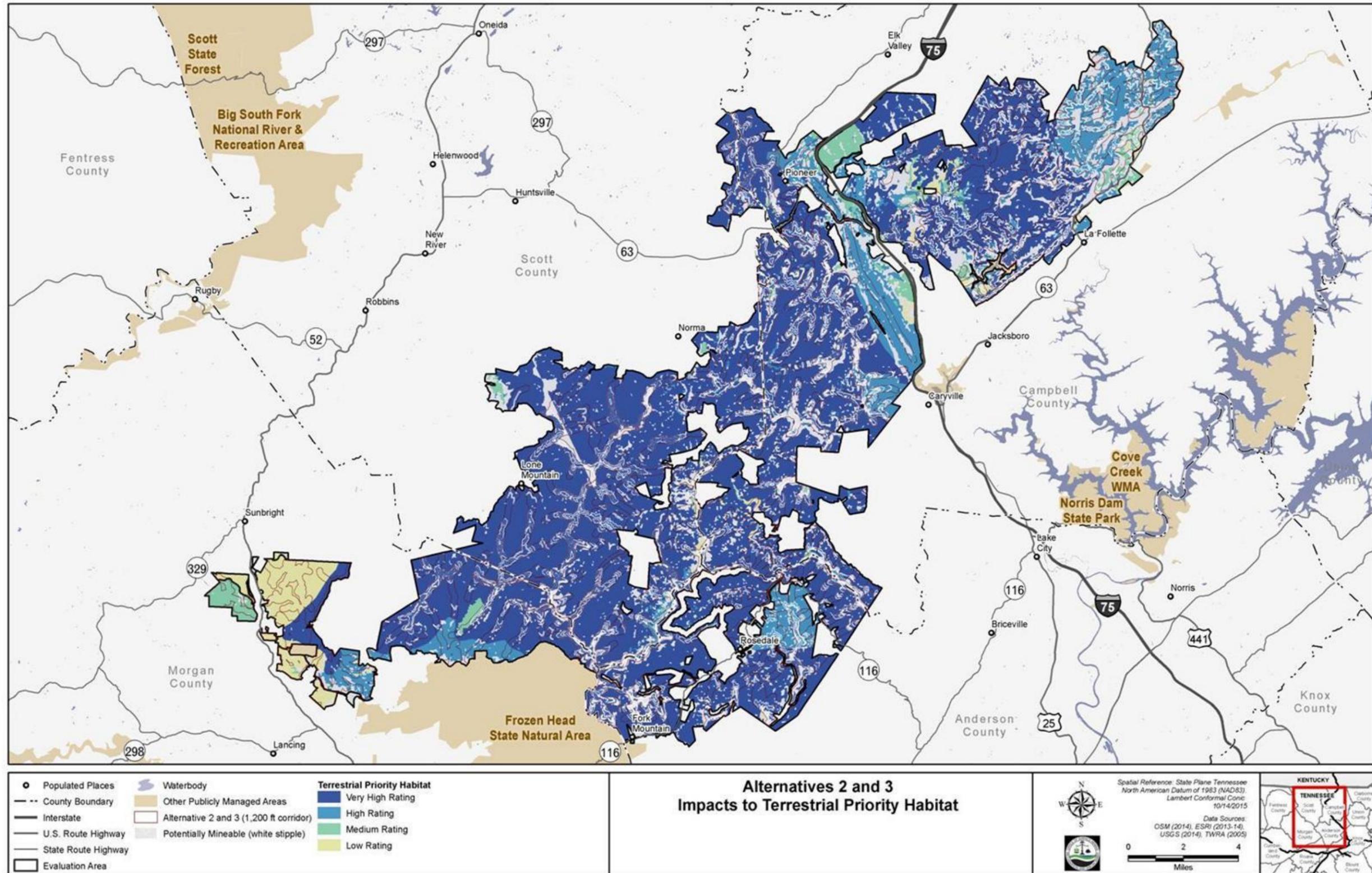


FIGURE 6-36: ALTERNATIVES 2 AND 3 IMPACTS TO TERRESTRIAL PRIORITY HABITAT

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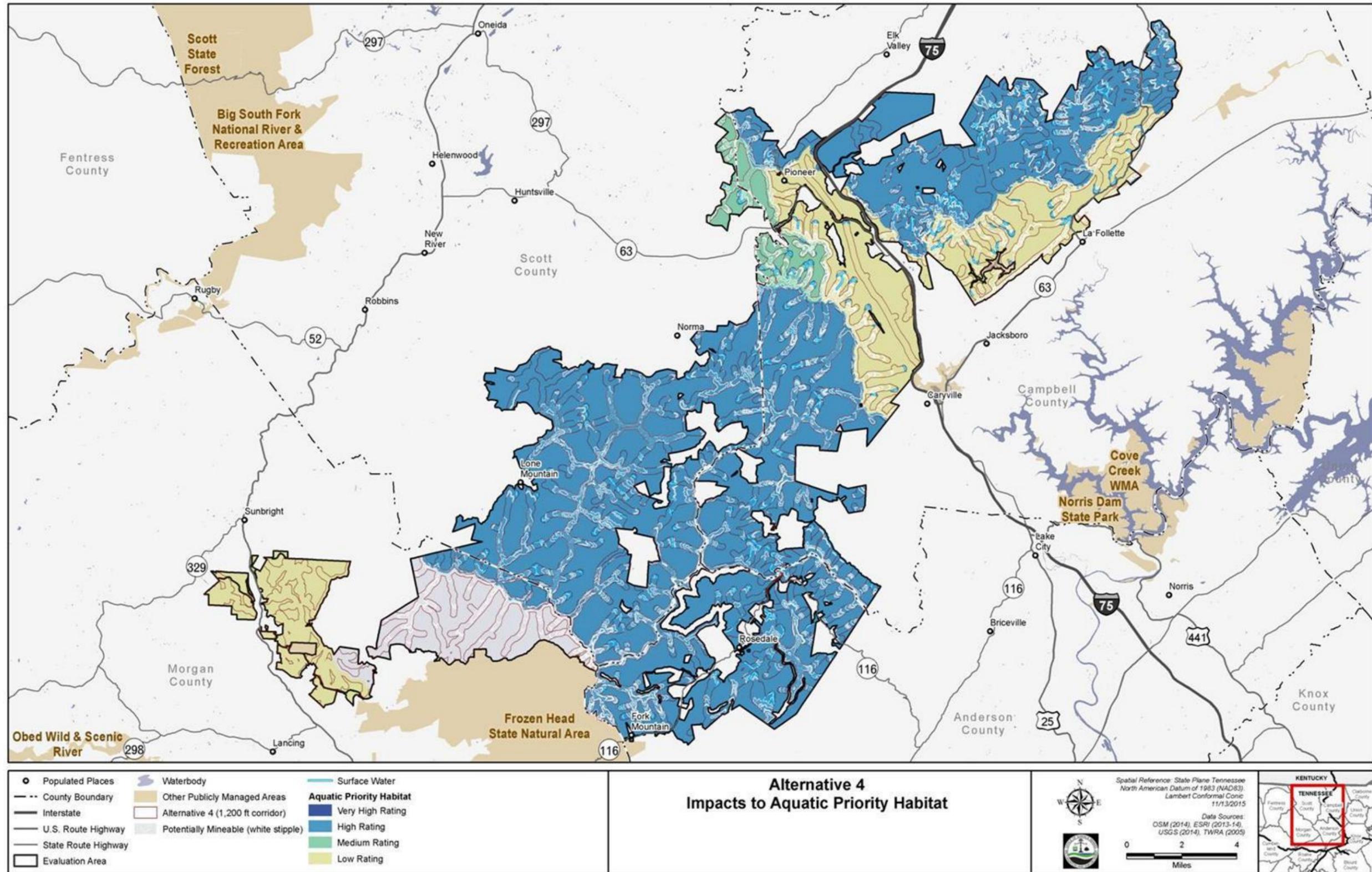


FIGURE 6-37: ALTERNATIVE 4 IMPACTS TO AQUATIC PRIORITY HABITAT

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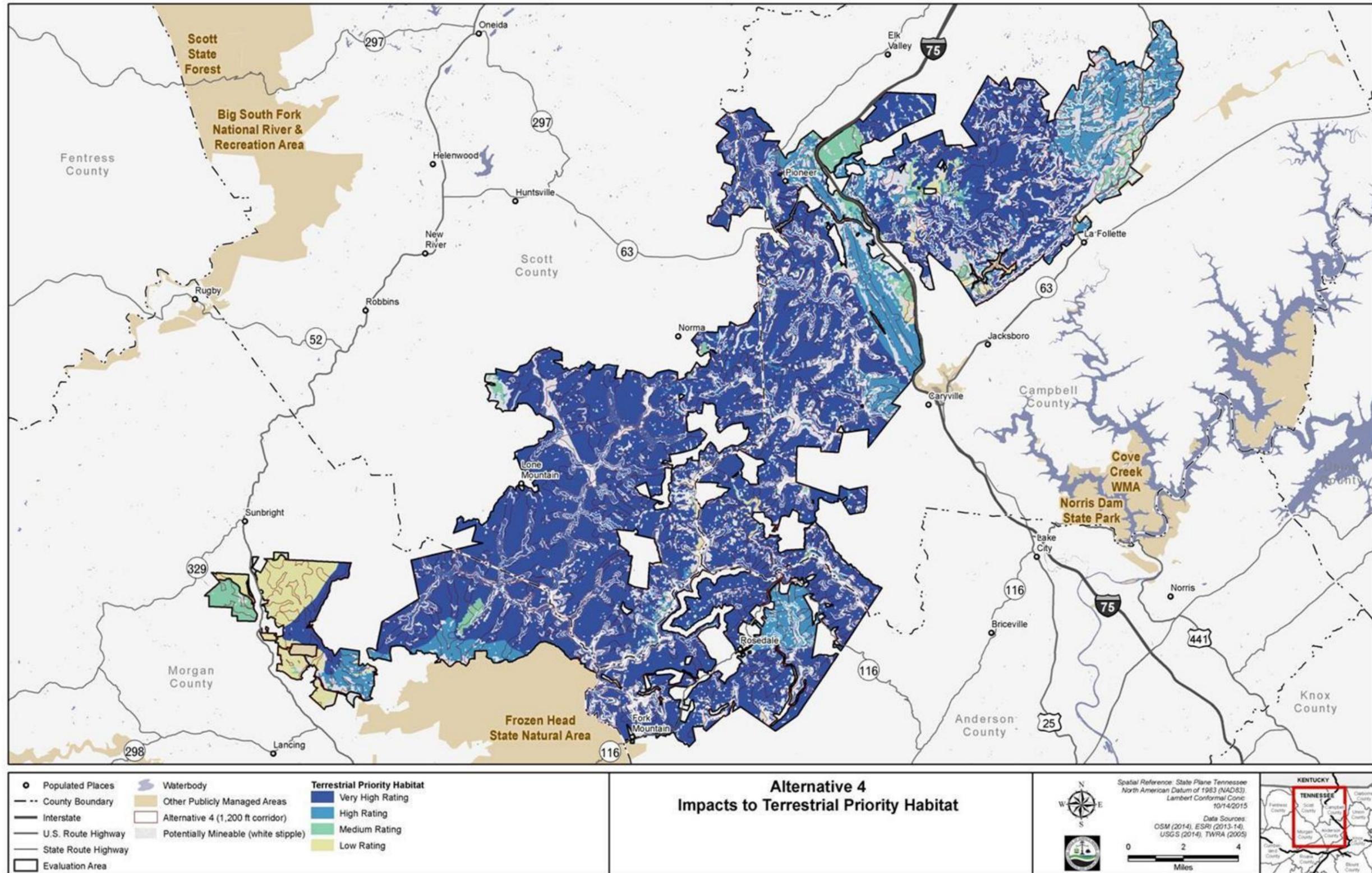


FIGURE 6-38: ALTERNATIVE 4 IMPACTS TO TERRESTRIAL PRIORITY HABITAT

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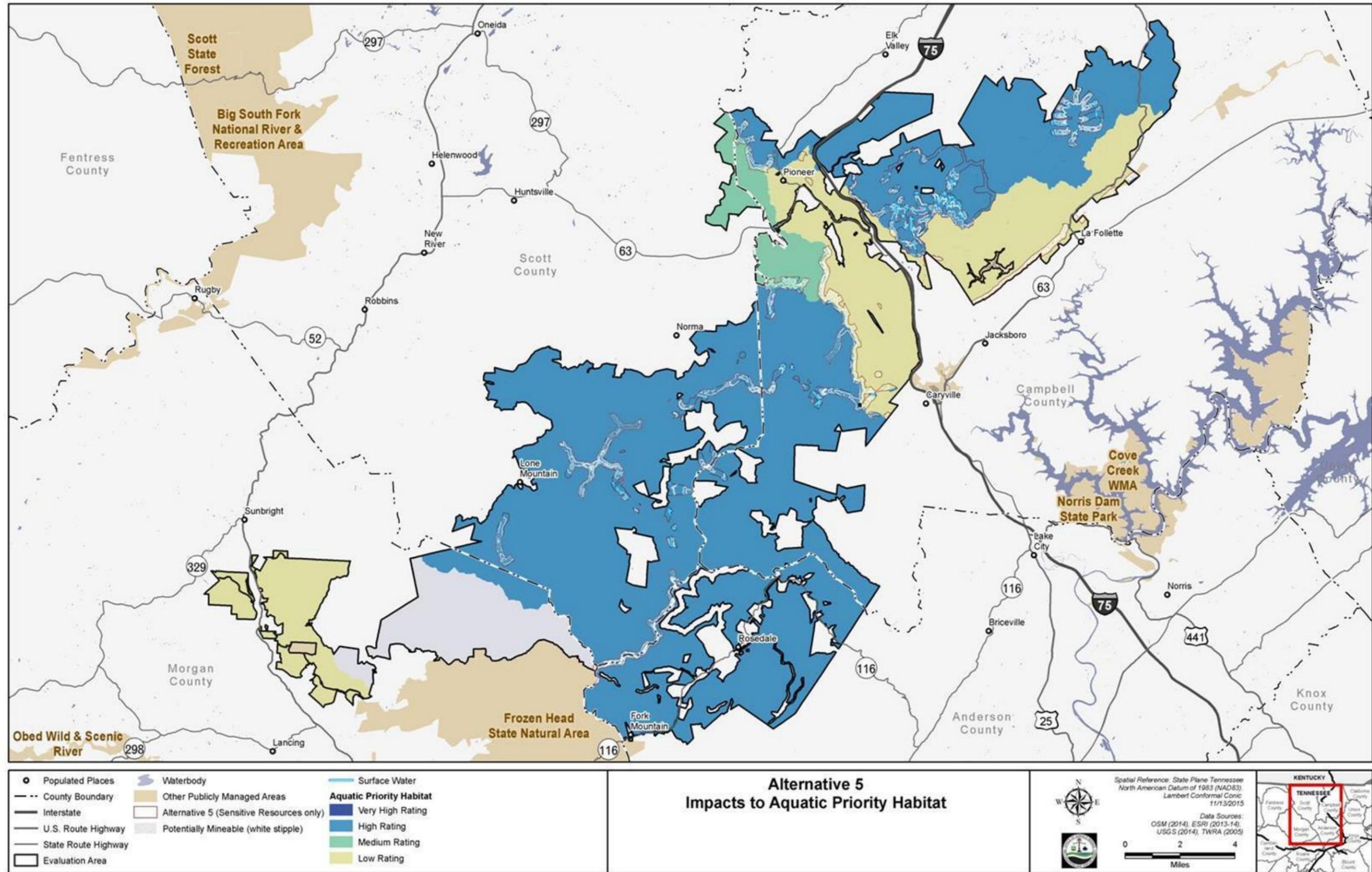


FIGURE 6-39: ALTERNATIVE 5 IMPACTS TO AQUATIC PRIORITY HABITAT

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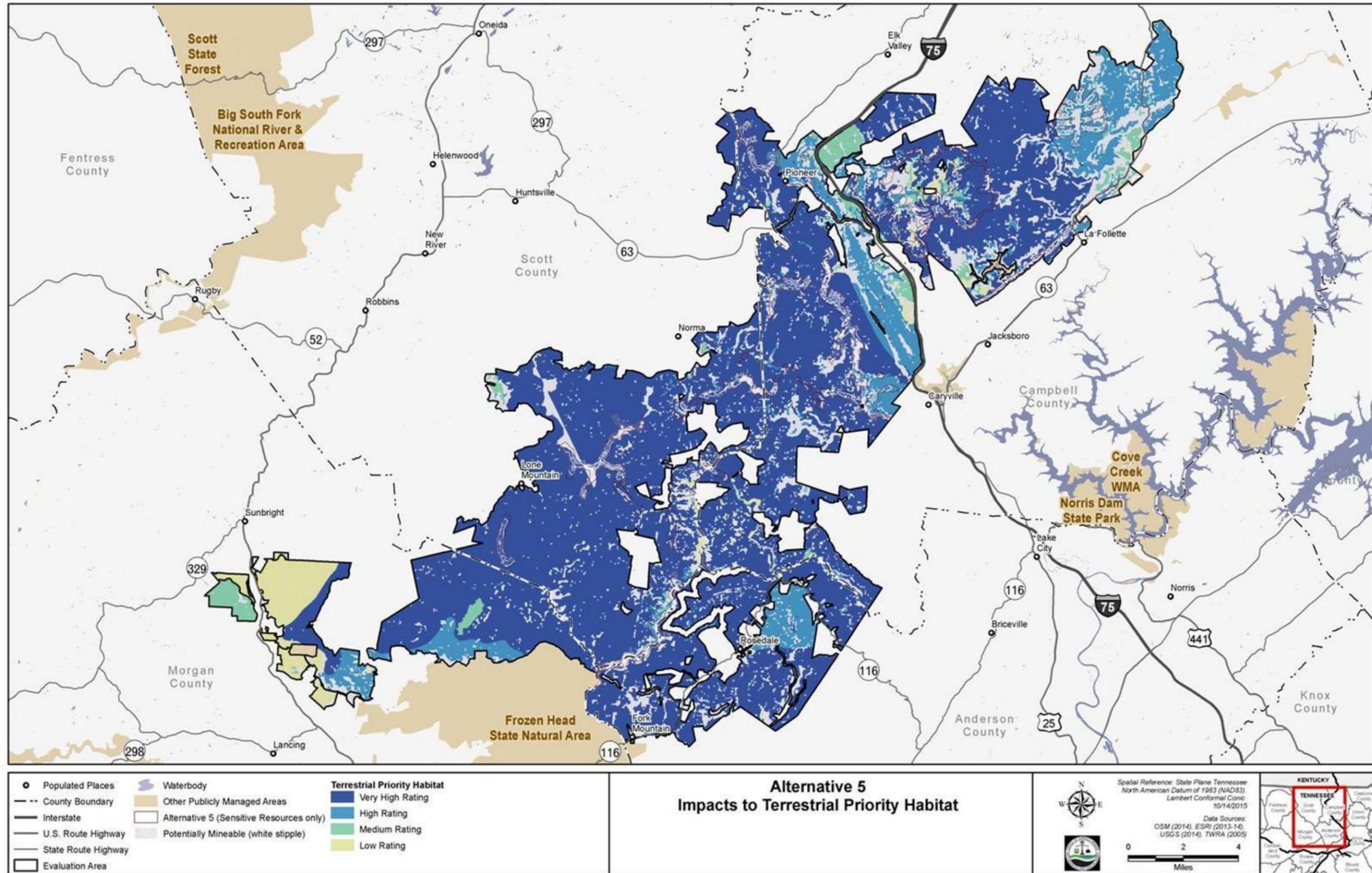


FIGURE 6-40: ALTERNATIVE 5 IMPACTS TO TERRESTRIAL PRIORITY HABITAT

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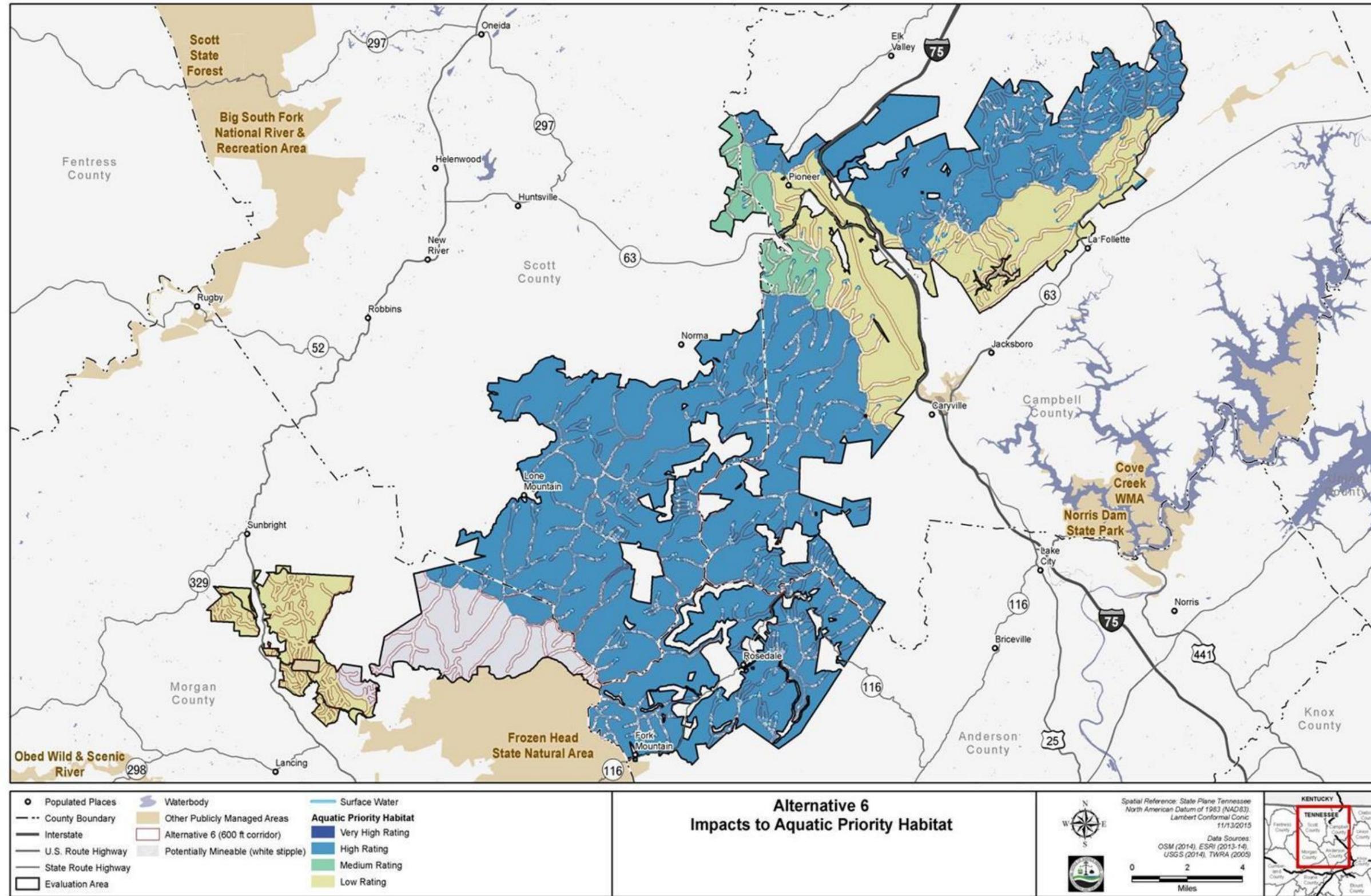


FIGURE 6-41: ALTERNATIVE 6 IMPACTS TO AQUATIC PRIORITY HABITAT

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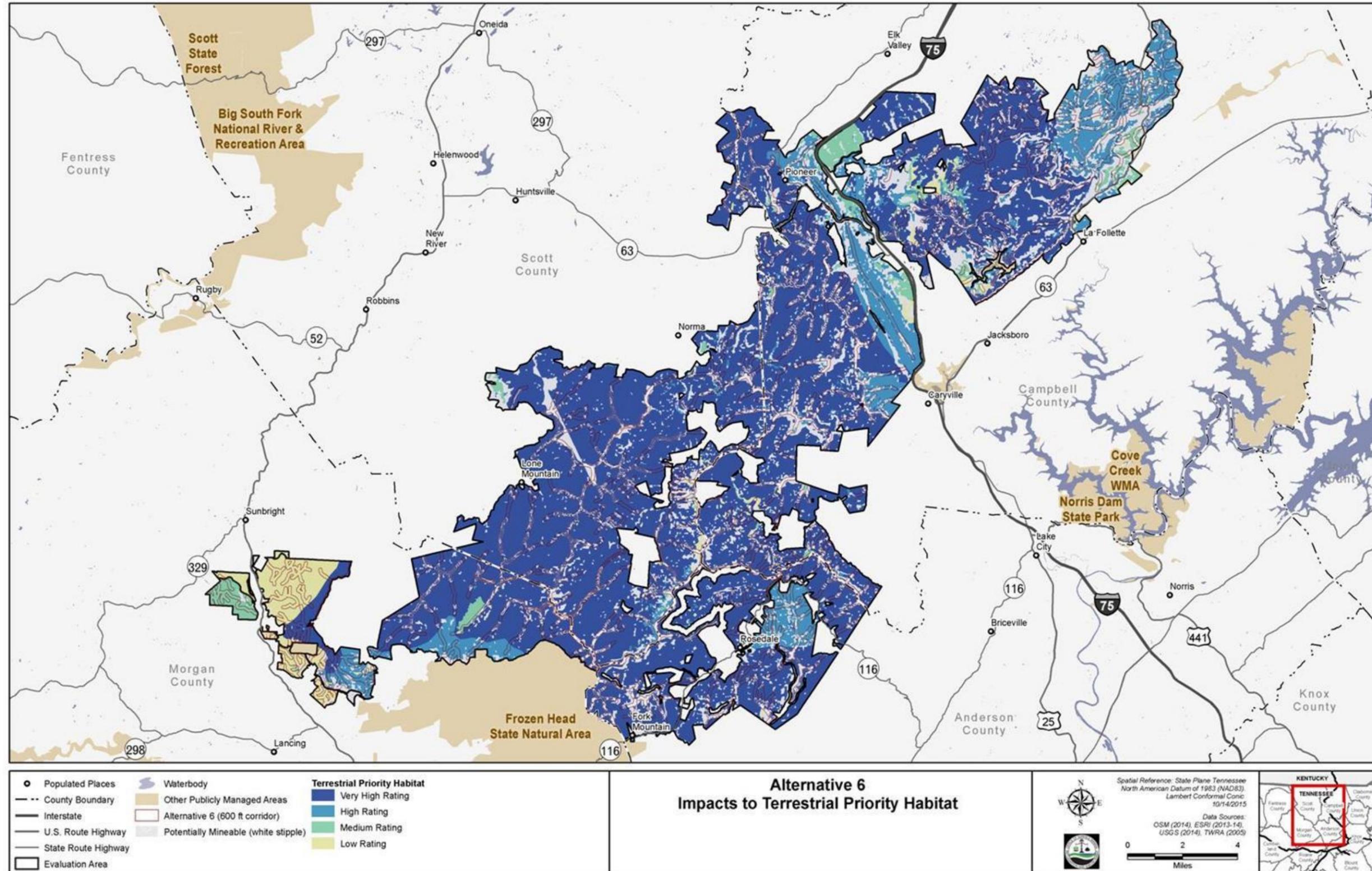


FIGURE 6-42: ALTERNATIVE 6 IMPACTS TO TERRESTRIAL PRIORITY HABITAT

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## **ALTERNATIVE 1: NO-ACTION ALTERNATIVE**

Under alternative 1, the no-action alternative, OSMRE would deny the state petition to designate the subject lands as “unsuitable for surface coal mining operations” (30 CFR § 764.13). Fish and wildlife communities and habitats would not receive additional protection. Alternative 1 would provide the least protection to fish and wildlife species of all of the considered alternatives.

### **Direct and Indirect Impacts**

**Aquatic Species:** Alternative 1 would result in direct and indirect impacts to aquatic species. Direct impacts would be extremely limited. Indirect impacts to aquatic species under the no-action alternative would include habitat and water quality degradation. Impacts to streams and other aquatic habitats as a result of continued surface coal mining operations throughout the evaluation area would affect the aquatic species that inhabit those water bodies (Letterman and Mitsch 1978; Pond et al. 2008; Daniel et al. 2015).

Many of the fish and other aquatic species found throughout the evaluation area would be impacted by increased turbidity, changes in water chemistry, and possible contamination of surface waters associated with surface coal mining activities including haul road construction and maintenance (Newcombe and Jensen 1996; Kemp et al. 2011; Daniel et al. 2015). These impacts may result in reduced abundance of food resources (Warner 1971; Verb and Vis 2000; Hogsden and Harding 2012), decreased respiratory function (Wood and Armitage 1997; Kemp et al. 2011), and reduced reproductive efficiency (Newcombe and Jensen 1996; Jezierska et al. 2008; Kemp et al. 2011), as described under “General Impacts of Surface Coal Mining in Tennessee on Aquatic and Terrestrial Species.” Benthic fish species are especially susceptible to impacts associated with mining and are likely to be the most heavily impacted groups (Letterman and Mitsch 1978; DeNicola and Stapleton 2002).

Mussels are particularly sensitive to water quality and would likely be among the species more heavily impacted by water quality degradation (Layzer, Gordon, and Anderson 1993; Watters 1999). Mussels and other mollusks found in water bodies within with the evaluation area also have little to no mobility in their adult life stages, making relocation impossible for many species. Many of the mussel species in the affected area have limited geographic distribution, further intensifying impacts to these species. Many of the mussel species found within the evaluation area are threatened or endangered, and impacts to them are analyzed in the “Impacts of the Alternatives on Aquatic and Terrestrial Species” and “Impacts of the Alternatives on Special-Status Species” sections.

Amphibian species would be impacted by water quality degradation in many of the same ways as fish under the no-action alternative. Indirect impacts to amphibians would occur as a result of increased turbidity, changes in water chemistry, and possible contamination of surface waters associated with surface coal mining activities. Increased turbidity and sedimentation would decrease respiratory function in species with gills during one or more of their life stages, compromise feeding efficiency and food resource abundance, and reduce reproductive success (Wood and Armitage 1997; Henley et al. 2010; Kemp et al. 2011). Amphibians are sensitive to contaminants and changes in water chemistry associated with coal mining and reductions in species richness and abundance among amphibian communities have been observed in habitats exposed to coal mining impacts (Hecnar and M'Closkey 1996; Zocche et al. 2013).

Benthic macroinvertebrates would be similarly affected under the no-action alternative as additional coal mining activities are permitted. Respiration, reproduction, and feeding ability would be reduced due to turbidity, sedimentation, and reduced system productivity (Wood and Armitage 1997; Kemp et al. 2011). Contamination and changes in water chemistry associated with mining activities have also been shown to adversely impact benthic macroinvertebrate assemblages (Warner 1971; DeNicola and Stapleton 2002;

Hogsden and Harding 2012). Benthic macroinvertebrate communities play an important role in aquatic food webs and are often considered to be a proxy for overall ecosystem health (EPA 2012b).

Under the no-action alternative, approximately 945 miles of aquatic habitats in the evaluation area would potentially be impacted, including approximately 355 miles of Tier 1 priority habitat (279 miles high; 15 miles medium; 60 miles low) (figure 6-33). This represents the total distance of streams inside the evaluation area that are located within the buffer area used to analyze alternatives from possible mining activities. Possible future mining activities within the evaluation area could also impact additional habitat outside the evaluation area within the buffer area used to analyze alternatives from mineable coal resources within the evaluation area. Impacts to aquatic species would occur in portions of the Cumberland River (including Upper Cumberland and Big South Fork), Clinch River, and Powell River watersheds within the evaluation area. The no-action alternative would result in adverse impacts to nearly all aquatic species within the affected area to some degree. However, because some species or groups are more sensitive to water quality impacts, loss of species or biodiversity may occur, potentially, resulting in changes in the structure and function of aquatic communities (Warner 1971; Palmer et al. 2010; Traister et al. 2013).

Although the no-action alternative has the greatest potential to adversely impact aquatic species and habitat of all considered alternatives, best management practices and compliance with applicable regulations and permit conditions would minimize all of the potential impacts described above. Because the no-action alternative would have primarily indirect impacts on aquatic fish and wildlife species, impacts to this resource would be closely coupled with impacts to surface water resources. Permit requirements and best management practices include reclamation (including stream restoration), revegetation, drainage control, and protection of fish, wildlife, and related environmental values, as described in “Chapter 3: Alternatives.” Additionally, re-mining may contribute to short-term adverse impacts to aquatic species generally, but could possibly contribute to long-term beneficial impacts due to reclamation of previously mined lands left unreclaimed prior to the implementation of SMCRA through the reduction of acid mine drainage (Kleinmann 2000). Impacts to aquatic species may result in no change to existing conditions or slightly degraded conditions.

**Terrestrial Species:** Under the no-action alternative, direct and indirect impacts to terrestrial species would be similar to the typical impacts caused by surface coal mining operations, as described above in the “General Impacts of Surface Coal Mining in Tennessee on Aquatic and Terrestrial Species” section. Adverse impacts to terrestrial species could include habitat loss or degradation and species disturbance, injury or mortality.

Under the no-action alternative, approximately 38,110 acres of tier 1 priority habitat could be affected from future surface coal mining operations through land clearing necessary to access the coal resources. TWRA defines tier 1 priority habitat as habitat necessary for a group of species in greatest conservation need. The tier 1 species classifications are based on a species rarity and viability. In addition, approximately 10.3% of 17,688 acres of previously mined areas (some of this area was previously augured mined and not subject to re-mining) could be subject to re-mining affecting tier 1 terrestrial habitat. Table 6-42 describes the amount of tier 1 habitat classes that would be impacted by mining and re-mining under alternative 1. These calculations do not include the potential construction of access and haul roads, which would result in greater amounts of habitat affected.

**TABLE 6-42 ACRES OF TERRESTRIAL TIER 1 PRIORITY HABITAT POTENTIALLY AFFECTED BY SURFACE COAL MINING AND REMINING UNDER ALTERNATIVE 1**

Habitat Classes*	Acres Potentially Affected by Surface Coal Mining	Percent of Evaluation Area	Acres Potentially Affected by Remining	Percent of Evaluation Area
Low	373	0.22	137	0.08
Medium	563	0.33	252	0.15
High	3,565	2.07	2,887	1.68
Very High	33,609	19.54	14,412	8.38
<b>Total</b>	<b>38,110</b>	<b>22.16</b>	<b>17,688</b>	<b>10.29</b>

\* Habitat classes developed by TWRA based on species rarity and viability and represent the relative biological condition (TWRA 2005).

In addition to habitat loss, the creation of habitat edges can also result in overall habitat degradation. For example, the conversion of deciduous forest to grasslands could result in creating edge effect on 21,490 acres. This calculation is based on the result of edge effect degrading habitat within 100 feet from the edge of the cleared areas. Since the effects of edges can vary depending on the species being evaluated (Wickham et al. 2007), the areas between 100 feet and 1,000 feet were also measured. This is most often the case of “hard edges”—an abrupt change of habitat types. When edges effect is measures out to 1,000 feet, the no-action alternative could result in an additional 62,530 acres of degraded habitat.

Under alternative 1, remining could result in habitat removal and degradation through the development of edge. As described above, approximately 17,688 acres of previously mined areas could be remined directly affecting the habitat that has developed there. The creation of cleared areas would result in the creation of an edge effect degrading up to 6,813 acres of habitat measured at 100 feet from the edge of the cleared areas. Since the effects of edges can vary, the areas between 100 feet and 1,000 feet were also measured. Depending on the species, the no action could result in degrading an additional 36,884 acres of habitat extending up to 1,000 feet. See figure 6-27 for an illustration of edge effect as a result of forest clearing.

As described under “General Impacts of Surface Coal Mining in Tennessee on Aquatic and Terrestrial Species,” terrestrial wildlife would experience both direct and indirect impacts from implementation of the no-action alternative. Direct impacts include the injury or mortality of species unable to flee active vegetation clearing areas including areas cleared for the development of access and haul roads. Species such as small mammals, reptiles, and amphibians that lack the mobility to escape to safe areas would be most adversely impacted. Roosting bats or nocturnal birds may be disproportionately affected because they would be disturbed during tree removal activities, resulting in need to search for unaffected suitable habitat. However, these impacts would be limited to the footprint of the surface coal mine and would be short-term in nature—lasting only during forest clearing activities. However, the loss of roosting habitat would continue in the long term until reclamation is complete and larger trees regrow. Noise associated with mining operations would also impact terrestrial species; for these impacts see the “Impacts of the Alternatives on the Natural Soundscape” section.

Additional injury and mortality may also result from the development and use of access and haul roads. Wildlife-vehicle collisions could result in the injury or mortality of wildlife (Jaeger, Fahring, and Ewald 2006). This type of impact would also affect more mobile species such as deer, elk, owls and other birds species (Trobulak and Frissell 2000; Kindall et al. 2011). In addition, these new roads can result in increased access for consumptive wildlife activities such as hunting and poaching (Jackson 2000). Kindall et al. found that vehicle collisions were responsible for 8.1% of total mortality of elk in the Cumberland

Mountains over a five-year period (2011). They documented that hunting and poaching were responsible for 1.6% and 12.9% respectively (Kindall et al. 2011). Some species like vultures and other scavengers may benefit from increased road-kill (Trobulak and Frissell 2000).

Some species would benefit from mining and re-mining as reclamation occurs and early successional habitat is created. See discussion of “General Impacts of Surface Coal Mining in Tennessee” above. Overall, more forest-dependent species and those less mobile would be most impacted by surface coal mining activities that would result in long-term adverse impacts until reclamation is complete, whereas species that exploit early successional habitat and disturbance would benefit in the short and long term. Based on an average annual mining rate (112 acres per year) throughout the evaluation area, it is unlikely that widely distributed common species would be significantly impacted or would need regulatory protection. In the event that small, isolated populations are adversely impacted, significant impacts to those populations could occur.

### **Cumulative Impacts**

**Aquatic Species:** Surface coal mining operations and haul road construction and maintenance activities upstream or adjacent to the petition area would continue to impact aquatic species due to sedimentation and water quality degradation, although impacts would be minimized by compliance with best management practices along with all applicable regulations and permit conditions. In addition, other actions such as timber harvest, oil and gas development, recreation development, and recreational use could degrade water conditions over time and have detrimental impacts on aquatic habitat. Aquatic species would also be impacted by fishing and other consumptive uses. The impacts of alternative 1, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on aquatic species. The no-action alternative would contribute substantially to the overall adverse cumulative impacts to aquatic species.

**Terrestrial Species:** Habitat loss and degradation would cause the largest impacts to terrestrial wildlife. Past and present cumulative actions that have impacted terrestrial habitat in the evaluation area include pre- and post-SMCRA surface coal mining, underground mining, timber harvest, oil and gas production, electrical and gas transmission, and recreation. These actions have converted, removed and fragmented habitat, resulting in habitat edges, and have resulted in direct disturbances, injuries, and mortality to terrestrial wildlife populations. Many of these activities are expected to continue into the future. Timber harvest practices will likely change after 2017 for certain areas of the evaluation area when timber rights transfer to TWRA, likely providing habitat improvements. The impacts of alternative 1, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on terrestrial species. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions. In addition, direct mortality from vegetation clearing and road development and use would contribute to other sources of human-caused mortalities such as hunting and poaching for certain game species. Based on this level of surface mining, the no-action alternative would not likely contribute substantially to the overall adverse cumulative impacts to terrestrial species. However, this conclusion would be further informed based on where surface coal mining operations would occur. For example, if mining operations were concentrated in particularly important habitat or near an isolated population, then when combined with other actions, those activities could contribute substantially to the overall adverse impacts.

## Conclusion

In conclusion, alternative 1 (no action) would have near- and long-term adverse impacts to aquatic and terrestrial species generally. Alternative 1 would potentially impact up to approximately 945 miles of aquatic habitat located within the buffer area used to analyze alternatives from mineable coal resources within the evaluation area. Surface coal mining operations and related activities would result in water quality degradation including surface water contamination, changes in water chemistry, and increased sedimentation of streams and other water bodies within and adjacent to the evaluation area, potentially resulting in habitat loss or degradation, changes in aquatic community structure and function, and potential loss of species or biodiversity. Best management practices and compliance with applicable regulations and permit conditions would minimize impacts to this resource. Remining may contribute to short-term impacts but associated reclamation could improve water quality and aquatic habit conditions in the long term.

Approximately 38,110 acres of terrestrial tier 1 priority habitat could be affected through land clearing necessary to access the coal resources. Remining and road development would also occur, resulting in impacts to terrestrial species. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions. Given this assumed rate of mining, it is unlikely that widely distributed common species would be significantly impacted, resulting in the need for regulatory protection. In the event that small, isolated populations are adversely impacted, significant impacts to those populations could occur.

## ALTERNATIVE 2: STATE PETITION DESIGNATION

Under alternative 2, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State's petition and petition area map (see figure 3-1 in chapter 3). Under this alternative, 505 miles of ridgelines with a 1,200-foot corridor (600 feet on both sides of the ridgeline) would be designated as unsuitable for surface coal mining.

### Direct and Indirect Impacts

**Aquatic Species:** Alternative 2 would result in near- and long-term indirect beneficial impacts to aquatic species generally. The prohibition of additional surface coal mining operations would protect aquatic resources and habitat within petition area and in areas downstream, and could potentially help facilitate ecosystem recovery, representing a long-term beneficial impact. Impacts would result in improved resource conditions in comparison to the no-action alternative.

Under alternative 2, approximately 356 miles of aquatic habitats in the evaluation area could be protected from future surface coal mining activities, including approximately 81 miles of Tier 1 priority habitat (63 miles high; 3 miles medium; 13 miles low) (figure 6-35). Alternative 2 could also protect additional aquatic habitat outside the evaluation area located within the buffer area used to analyze alternatives from otherwise potentially mineable coal resources within the evaluation area. Aquatic species generally within all of the watersheds within the evaluation area would receive protection under alternative 2.

**Terrestrial Species:** Under alternative 2, approximately 18,436 acres of tier 1 priority habitat could be protected from future surface coal mining operations. In addition, since remining would not be allowed, an additional 9,086 acres would be protected. Table 6-43 describes the amount of tier 1 habitat by stress classification that would be protected from surface coal mining and remining under alternative 2.

**TABLE 6-43: ACRES OF TERRESTRIAL TIER 1 PRIORITY HABITAT POTENTIALLY PROTECTED FROM SURFACE COAL MINING AND REMINING UNDER ALTERNATIVE 2**

Habitat Classes	Acres Protected from Surface Coal Mining	Percent of Evaluation Area Impacted	Acres Protected from Remining	Percent of Evaluation Area Impacted
Low	186	0.03	59	0.03
Medium	277	0.16	155	0.09
High	1,969	1.14	1,795	1.04
Very High	16,004	9.30	7,077	4.11
<b>Total</b>	<b>18,436</b>	<b>10.63</b>	<b>9,086</b>	<b>5.27</b>

The protection of habitat under alternative 2 would result in maintaining interior forest habitat and eliminating the potential for habitat degradation as a result of the creation of edges for up to 11,933 acres (measured at 100 feet from the edge of potentially mineable areas where hard habitat edges would be created). Since the effects of edges can vary depending type of edge and the species being evaluated, the areas between 100 feet and 1,000 feet was also measured. Depending on the species, the alternative 2 would result in additional 59,906 acres of habitat protected from degradation due to the creation of an edge effect extending up to 1,000 feet.

Since remining would not be allowed under alternative 2, additional areas would not be subject to habitat degradation as a result of the creation of edge and the associated effects.

Since there could be no surface coal mining operations under alternative 2, direct and indirect adverse impacts to terrestrial species would not occur. Species would benefit from maintaining intact habitat; especially forest-dependent bird species, small mammals and bats. Additional protections of surface water resources would further protect certain reptile and amphibian species. However, this would be limited by the continued potential for acid mine drainage and other adverse impacts from unreclaimed pre-SMCRA surface mines.

### Cumulative Impacts

**Aquatic Species:** Surface coal mining operations and access and haul road construction and maintenance activities upstream or adjacent to the petition area would continue to impact aquatic species due to sedimentation and water quality degradation, although impacts would be minimized by compliance with best management practices along with all applicable regulations and permit conditions. In addition, other actions such as timber harvest, oil and gas development, recreation development, and recreational use would degrade water conditions over time and have detrimental impacts on aquatic habitat. Aquatic species would also be impacted by fishing and other consumptive uses. The impacts of alternative 2, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on aquatic species. However, alternative 2 would not contribute to the overall adverse cumulative impacts to aquatic species and could help to offset adverse cumulative impacts.

**Terrestrial Species:** As described under the no-action alternative, habitat loss and degradation would result in some of the largest impacts to terrestrial species. Past and present cumulative actions that have impacted terrestrial habitat in the evaluation area include pre- and post-SMCRA surface coal mining, underground mining, timber harvest, oil and gas production, electrical and gas transmission, and recreation. These actions have converted, removed, and fragmented habitat, resulting in habitat edges, early successional forests, and resulted in direct disturbances, injuries, and mortality to terrestrial special-status species and populations. Many of these activities are expected to continue into the future. The

impacts of alternative 2, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on terrestrial species. However, alternative 2 would seek to protect areas from future surface coal mining operations. This would provide benefits to terrestrial species and would not contribute to overall adverse cumulative impacts.

## Conclusion

Alternative 2 would result in near- and long-term beneficial impacts to aquatic and terrestrial species. Protection of lands within the petition area from future surface coal mining activities would result in long-term beneficial impacts to aquatic and terrestrial species by limiting further injury and potentially facilitating ecosystem recovery. Alternative 2 would result in the protection of approximately 356 miles of aquatic habitat and 18,436 acres of terrestrial tier 1 priority habitat from impacts related to coal mining activities, although any areas that have water quality issues from pre-SMCRA mining would not be remined or reclaimed, resulting in continued adverse effects on aquatic species. The beneficial impacts would be increased in comparison to the no-action alternative. No new or additional adverse impacts would occur compared to the no-action alternative. Alternative 2 would not result in significant adverse impacts.

## ALTERNATIVE 3: STATE PETITION DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS

Under alternative 3, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State's petition with a 1,200-foot ridgeline corridor, as described under alternative 2 (see figure 3-2 in chapter 3). Unlike alternative 2, alternative 3 would not prohibit remining (pursuant to 30 CFR chapter VII), with required reclamation. Alternative 3 could also potentially allow construction and maintenance of haul roads inside the designation area.

## Direct and Indirect Impacts

**Aquatic Species:** Alternative 3 would result in near- and long-term adverse indirect impacts to aquatic species due to the construction and maintenance of haul roads inside the designation area. Alternative 3 would not prohibit remining, which could further contribute to near-term adverse impacts due to water quality degradation potentially including surface water contamination, changes in water chemistry, and increased runoff and sedimentation in rivers and streams as a result of disturbance of terrestrial habitats, as described under "General Impacts of Surface Coal Mining in Tennessee on Aquatic and Terrestrial Species." Following remining, reclamation of lands previously mined prior to the implementation of SMCRA in 1977 and left unreclaimed would result in long-term benefits to aquatic species. In addition, protection of lands within the designation area from future surface coal mining operations under alternative 3 would result in long-term beneficial impacts to aquatic resources by limiting further injury and potentially facilitating ecosystem recovery.

Impacts to aquatic species under alternative 3 would be of the same type as those described under alternative 2, but with slightly intensified adverse impacts for the duration of remining activities. Specific adverse impacts to aquatic species would include habitat loss and destruction due to sedimentation and water quality degradation, potentially resulting in a loss of species or biodiversity, and changes in aquatic community structure and function. Like alternative 2, under alternative 3 approximately 356 miles of aquatic habitats in the evaluation area could be protected from future surface coal mining operations, including approximately 81 miles of Tier 1 priority habitat (63 miles high; 3 miles medium; 13 miles low) (figure 6-35). Alternative 3 could also protect additional aquatic habitat outside the evaluation area are located within the buffer area used to analyze alternatives from otherwise potentially mineable coal resources within the evaluation area. Impacts to aquatic species would occur in portions of the

Cumberland River (including Upper Cumberland and Big South Fork), Clinch River, and Powell River watersheds within the evaluation area. Best management practices as well as compliance with applicable regulations and permit conditions would minimize but not eliminate impacts to this resource.

Additionally, potential remining may contribute to short-term adverse impacts to aquatic species generally, but could possibly contribute to long-term beneficial impacts due to reclamation of previously mined lands left unreclaimed prior to the implementation of SMCRA if adverse impacts to water quality are mitigated (Kleinmann 2000). Although there could be near-term adverse impacts, alternative 3 would result in improved conditions in comparison to alternative 1.

**Terrestrial Species:** Under alternative 3, approximately 18,436 acres of tier 1 priority habitat could be protected from future surface coal mining operations. Table 6-44 describes the amount of tier 1 habitat that would be protected from surface coal mining under alternative 3.

**TABLE 6-44: ACRES OF TERRESTRIAL TIER 1 PRIORITY HABITAT POTENTIALLY PROTECTED FROM SURFACE COAL MINING UNDER ALTERNATIVE 3**

Habitat Classes	Acres Protected from Surface Coal Mining	Percent of Evaluation Area Impacted
Low	186	0.03
Medium	277	0.16
High	1,969	1.14
Very High	16,004	9.30
<b>Total</b>	<b>18,436</b>	<b>10.63</b>

The protection of habitat under alternative 3 would result in maintaining interior forest habitat by eliminating habitat degradation as a result of the creation of edge effect of up to 11,933 acres of habitat measured at 100 feet from the edge of potentially mineable areas. Since the effects of edges can vary depending on the species being evaluated, the areas between 100 feet and 1,000 feet were also measured. Depending on the species, the alternative 3 would result in additional 59,906 acres of habitat protected from degradation as a result of edge effect extending up to 1,000 feet.

Under alternative 3, remining and the associated construction of access and haul roads would result in the clearing of terrestrial tier 1 priority habitat. Potential remining alone could account for the loss of 9,086 acres. Table 6-45 provides the acres of tier 1 priority habitat that could be affected by potential remining operations under alternative 3.

**TABLE 6-45: ACRES OF TERRESTRIAL TIER 1 PRIORITY HABITAT POTENTIALLY AFFECTED BY REMINING UNDER ALTERNATIVE 3**

Habitat Classes	Acres Potentially Affected by Remining	Percent of Evaluation Area Impacted
Low	59	0.03
Medium	155	0.09
High	1,795	1.04
Very High	7,077	4.11
<b>Total</b>	<b>9,086</b>	<b>5.27</b>

As a result of potential remining and associated reclamation, alternative 3 could result in the creation of 9,086 acres of early successional habitat. This habitat would provide benefits for a variety of species such as grassland songbirds, raptors such as the Northern harrier and the short-eared owl and games species such as the eastern wild turkey, deer and elk (Buehler and Percy 2012).

Under alternative 3, potential remining could result in the development of edge effect, although given that the area was previously disturbed, it would likely create a “soft edge”—where the transition between habitats is gradual. Remining could result in the creation of edge effect for up to 4,975 acres of habitat measured at 100 feet from the edge remining and access road areas. Since the effects of edges can vary, the areas between 100 feet and 1000 feet were also measured. Depending on the species, the alternative 3 could result in additional 34,726 acres of habitat affected between 100 and 1,000 feet.

Direct and indirect impacts to terrestrial wildlife would be similar to those described above under alternative 1; however, they would be over a much smaller area due to the prohibition of new surface coal mines. Impacts associated with potential remining, reclamation, and road development and use could occur. However, based on an average potential mining rate of approximately 112 acres per year, it is unlikely that widely distributed common species would be significantly impacted. In the event that small, isolated or less mobile populations are adversely impacted, significant impacts to those populations could occur.

## **Cumulative Impacts**

**Aquatic Species:** Surface coal mining operations upstream in the watershed of or adjacent to the designation area and haul road construction and maintenance inside and upstream or adjacent to the designation area would continue to impact aquatic species generally due to sedimentation and water quality degradation, although impacts would be minimized by compliance with best management practices along with all applicable regulations and permit conditions. In addition, other actions such as timber harvest, oil and gas development, recreation development, and recreational use would degrade water conditions over time having detrimental impacts on aquatic habitat. The impacts of alternative 3, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on aquatic species generally. Overall, alternative 3 would only contribute minimally to adverse cumulative impacts in the near term during remining efforts and could offset adverse cumulative impacts in the long term.

**Terrestrial Species:** As described under the no-action alternative, habitat loss and degradation results in some of the largest impacts to terrestrial species. Past and present cumulative actions that have impacted terrestrial habitat in the evaluation area include pre- and post-SMCRA surface coal mining, underground mining, timber harvest, oil and gas production, electrical and gas transmission, and recreation. Many of these activities are expected to continue into the future. Timber harvest practices will likely change after 2017 when timber rights for a portion of the evaluation area transfer to TWRA, likely providing habitat improvements to multiple species.

The impacts of alternative 3, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on terrestrial species. Alternative 3 would protect terrestrial habitat from future surface coal mining operations on ridgelines. This would provide benefits to a variety of terrestrial species. Potential remining and reclamation could also occur under alternative 3, which would result in short-term adverse impacts to some species but would generally provide overall long-term benefits. Overall, alternative 3 would not contribute substantially to adverse cumulative impacts.

## Conclusion

Alternative 3 would result in near- and long-term adverse and beneficial impacts to aquatic and terrestrial species. Potential remining and reclamation activities along with haul road construction and maintenance within the designation area and adjacent to protected ridgelines would result in near- and long-term adverse impacts to aquatic and terrestrial species. However, protection of lands within the designation area from future surface coal mining operations would result in long-term beneficial impacts by limiting further injury and potentially facilitating ecosystem recovery. Alternative 3 would result in the protection of approximately 356 miles of aquatic habitat and approximately 18,436 acres of terrestrial tier 1 priority habitat from impacts related to coal mining activities. Overall, alternative 3 would result in near- and long-term adverse and beneficial impacts resulting in improved conditions in comparison to the no-action alternative. However, no new or additional adverse impacts would occur compared to the no-action alternative. Alternative 3 would not likely result in significant adverse impacts, unless potential remining would adversely affect small, isolated or less mobile populations of aquatic or terrestrial species. However, pursuant to SMCRA Section 515(b)(24), 30 USC § 1265(b)(24), operators would be required to “minimize disturbances and adverse impacts . . . to fish, wildlife, and related environmental values.”

## **ALTERNATIVE 4: EXPANDED CORRIDOR DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS (PREFERRED ALTERNATIVE)**

Under alternative 4, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State’s petition, as described under alternative 2, and on additional ridgelines (see figure 3-3 in chapter 3). Like alternative 3, alternative 4 would not prohibit remining and construction and maintenance of haul roads within the designation area and protected ridgeline boundaries.

## **Direct and Indirect Impacts**

**Aquatic Species:** Like alternative 3, alternative 4 would result in near- and long-term indirect adverse impacts to aquatic species generally due to the potential construction and maintenance of haul roads inside and adjacent to the designation area and protected ridgeline boundaries. Also, as described under alternative 3, potential remining could contribute to near-term adverse impacts. However, post-remining reclamation of lands previously mined prior to the implementation of SMCRA in 1977 and left unreclaimed could possibly result in long-term benefits to aquatic species generally if adverse impacts to water quality are mitigated (Kleinmann 2000). Alternative 4 would result in long-term beneficial impacts to aquatic resources generally by limiting further injury and potentially facilitating ecosystem recovery.

Impacts to aquatic species under alternative 4 would be similar in type and scale to those described under alternative 3. Under alternative 4, approximately 360 miles of aquatic habitats in the evaluation area could be protected from future surface coal mining operations, including approximately 87 miles of Tier 1 priority habitat (66 miles high; 4 miles medium; 15 miles low) (figure 6-37). Alternative 4 could also protect additional aquatic habitat outside the evaluation area located within the buffer area used to analyze alternatives from otherwise potentially mineable coal resources within the evaluation area. Specific adverse impacts to aquatic species would include habitat loss and destruction due to sedimentation and water quality degradation, potentially resulting in changes in aquatic community structure and function. In the near term, impacts to aquatic species would occur in portions of the Cumberland River (including Upper Cumberland and Big South Fork), Clinch River, and Powell River watersheds within the evaluation area. Best management practices and compliance with applicable regulations and permit conditions would minimize, but not eliminate impacts to this resource. Alternative 4 would result in near- and long-term adverse impacts but conditions would be improved in comparison to the no-action alternative.

**Terrestrial Species:** Under alternative 4, approximately 19,728 acres of tier 1 priority habitat could be protected from future surface coal mining operations. Table 6-46 describes the amount of tier 1 habitat that would be protected from surface coal mining under alternative 4.

**TABLE 6-46: ACRES OF TERRESTRIAL TIER 1 PRIORITY HABITAT POTENTIALLY PROTECTED FROM SURFACE COAL MINING UNDER ALTERNATIVE 4 (PREFERRED ALTERNATIVE)**

Habitat Classes	Acres Protected from Potential Surface Coal Mining	Percent of Evaluation Area Impacted
Low	194	0.11
Medium	325	0.19
High	2,119	1.23
Very High	17,090	9.94
<b>Total</b>	<b>19,728</b>	<b>11.47</b>

The protection of habitat under alternative 4 would result in maintaining interior forest habitat by eliminating habitat degradation as a result of the creation of edge effect for up to 13,208 acres measured at 100 feet from the edge of potentially mineable areas. Since the effects of edges can vary depending on the species being evaluated, the areas between 100 feet and 1,000 feet were also measured. Depending on the species, the alternative 4 would result in up to 64,610 additional acres of habitat protected from degradation as a result of no new surface coal mining operations.

Under alternative 4, remining and the associated construction of access and haul roads would result in the clearing of 9,903 acres. Table 6-47 provides the acres of tier 1 priority habitat that could be affected by potential remining operations under alternative 4.

**TABLE 6-47: ACRES OF TERRESTRIAL TIER 1 PRIORITY HABITAT POTENTIALLY AFFECTED BY REMINING UNDER ALTERNATIVE 4 (PREFERRED ALTERNATIVE)**

Habitat Classes	Acres Potentially Affected by Potential Remining	Percent of Evaluation Area Impacted
Low	64	0.04
Medium	159	0.09
High	1,858	1.08
Very High	7,822	4.55
<b>Total</b>	<b>9,903</b>	<b>5.76</b>

As a result of potential remining and associated reclamation, alternative 4 could result in the creation of 9,903 acres of early successional habitat. This habitat would provide benefits for a variety of species such as grassland song birds, raptors such as the northern harrier and the short-eared owl and games species such as the eastern wild turkey, deer, and elk (Buehler and Percy 2012).

Similar to alternative 3, remining could result in the development of edge effect, although given that the area was previously disturbed, it would likely create a “soft edge”—where the transition between habitats is gradual. Remining could result in the creation of edge effect for up to 5,323 acres of habitat measured at 100 feet from the edge of the cleared areas. Since the effects of edges can vary, the areas between 100 feet and 1,000 feet were also measured. Depending on the species, the alternative 4 could result in up to 36,727 additional acres habitat degradation between 100 and 1,000 feet.

Direct and indirect impacts to terrestrial wildlife would be similar to those described above under alternative 1; however, they would be over a much smaller area due to the prohibition of new surface coal mines. The impacts associated with potential re-mining, reclamation, and road development and use could be slightly greater than under alternative 3. However, based on an average mining rate of approximately 112 acres per year, it is unlikely that widely distributed common species would be significantly impacted resulting. In the event that small, isolated or less mobile populations are adversely impacted, significant impacts to those populations could occur.

## Cumulative Impacts

**Aquatic Species:** As with alternative 3, actions as described in “Past, Present, and Future Activities Common to All Alternatives that might Contribute to Cumulative Impacts” would degrade water conditions over time and have detrimental impacts on aquatic habitat, although impacts would be minimized by compliance with best management practices along with all applicable regulations and permit conditions. The impacts of alternative 4, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on aquatic species generally. Overall, alternative 4 would only contribute minimally to adverse cumulative impacts in the near term during re-mining efforts and could offset adverse cumulative impacts in the long term.

**Terrestrial Species:** As described under the alternative 3 above, habitat loss and degradation results in some of the largest impacts to terrestrial species generally. Past and present cumulative actions that have impacted terrestrial habitat in the evaluation area include pre- and post-SMCRA surface coal mining, underground mining, timber harvest, oil and gas production, electrical and gas transmission, and recreation. Many of these activities are expected to continue into the future.

The impacts of alternative 4, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on terrestrial species. Alternative 4 would protect terrestrial habitat from future surface coal mining operations on ridgelines and would provide benefits to a variety of terrestrial species. Potential re-mining and reclamation could also occur under alternative 4, which would result in short-term adverse impacts to some species but would generally provide overall long-term benefits. Overall, alternative 4 would not contribute substantially to overall adverse cumulative impacts.

## Conclusion

Alternative 4 would result in near- and long-term adverse and beneficial impacts to aquatic and terrestrial species generally. Potential re-mining and haul road construction and maintenance within the designation area and adjacent to protected ridgelines could result in near- and long-term adverse impacts. However, post-re-mining reclamation of lands previously mined prior to the implementation of SMCRA in 1977 and left unreclaimed would result in long-term benefits to aquatic and terrestrial species generally. Protection of lands within the designation area from future mining activities would also result in long-term beneficial impacts by limiting further injury and potentially facilitating ecosystem recovery. Adverse impacts under alternative 4 would be nearly identical to those described under alternative 3. Alternative 4 would result in the protection of approximately 354 miles of aquatic habitat and approximately 19,728 acres of terrestrial tier 1 priority habitat from impacts related to coal mining activities. No new or additional adverse impacts would occur compared to the no-action alternative. The net effect of adverse and beneficial impacts under alternative 4 would result in generally improved conditions in comparison to the no-action alternative. Alternative 4 would not result in significant adverse impacts, unless potential re-mining would adversely affect small, isolated or less mobile populations of aquatic or terrestrial species. However, pursuant to SMCRA Section 515(b)(24), 30 USC § 1265(b)(24), operators would be required to “minimize disturbances and adverse impacts . . . to fish, wildlife, and related environmental values.”

## ALTERNATIVE 5: TARGETED RESOURCE PROTECTION DESIGNATION

Under alternative 5, OSMRE would designate lands as unsuitable for surface coal mining operations based on the presence of sensitive resources (see figure 3-4 in chapter 3). This designation differs from alternatives 2, 3, 4, and 6, which would designate protected areas based on ridgelines. Alternative 5 would protect some environmentally sensitive habitat areas including portions of Stinking Creek and Thompson Creek within the Upper Cumberland watershed.

### Direct and Indirect Impacts

**Aquatic Species:** The prohibition of additional surface coal mining operations adjacent to environmentally sensitive habitat areas would offer protection to aquatic species generally within the protected area, and could potentially help facilitate ecosystem recovery in portions of the protected watersheds including Stinking Creek and Thompson Creek in the upper Cumberland and upper Clinch River watersheds, respectively. This would result in a long-term beneficial impact to aquatic species in these areas. Stinking Creek is known to support a population of the Cumberland arrow darter (*Etheostoma sagitta*), a federal candidate species for listing under the Endangered Species Act, and portions of Stinking Creek within the evaluation area have been classified under the Nationwide Rivers Inventory (Carter et al. 2012). Impacts to aquatic species generally in the portions of the protected watersheds would be further reduced by the prohibition on the construction of new access and haul roads in the protected area. Aquatic habitats downslope of ridgelines not protected under alternative 5 would potentially be adversely impacted in the near term and long term due to increased runoff and sedimentation in rivers and streams due to the removal of soils and vegetation. Best management practices as well as compliance with applicable regulations and permit conditions would generally minimize impacts to aquatic fish and wildlife species and their habitats.

Under alternative 5, approximately 381 miles of 303d listed waters in the evaluation area could be protected from future surface coal mining operations, including approximately 14 miles of Tier 1 priority habitat (13 miles high; 1 mile medium; 0.5 miles low) (figure 6-39) given its focus on protecting certain water resources. Alternative 5 could also protect additional aquatic habitat outside the evaluation area and are located within the buffer area used to analyze alternatives from otherwise potentially mineable coal resources within the evaluation area. Impacts to aquatic species under alternative 5 would vary by location. Some locations would be more heavily impacted, while other locations would receive greater protection due to the geographical differences in protected area designations, than all other alternatives. Portions of Stinking Creek and Thompson Creek would receive the greatest protection under alternative 5. Specific adverse impacts to aquatic species would include habitat loss and destruction due to sedimentation and water quality degradation outside protected areas, similar to the no-action alternative, potentially resulting in changes in aquatic community structure and function. Impacts to aquatic species may occur in portions of the Cumberland River (including Upper Cumberland and Big South Fork), Clinch River, and Powell River watersheds within the evaluation area, but alternative 5 would provide maximum protection to those species found in the Upper Cumberland watershed, compared to all other alternatives. Alternative 5 would provide the greatest overall protection to aquatic species in terms of habitat area of all alternatives. Overall, alternative 5 would result in generally improved conditions for aquatic fish and wildlife in comparison to the no-action alternative.

**Terrestrial Species:** Under alternative 5, approximately 4,409 acres of tier 1 priority habitat could be protected from future surface coal mining operations. In addition, since remining would not be allowed, an additional 1,422 acres would be protected. Table 6-48 describes the amount of tier 1 habitat that would be protected from surface coal mining and remining under alternative 5.

The protection of habitat under alternative 5 would result in maintaining interior forest habitat by eliminating habitat degradation from the creation of edge effect for up to 3,243 acres of habitat measured at 100 feet from the edge of potentially mineable areas. Since the effects of edges can vary depending on the species being evaluated, the areas between 100 feet and 1,000 feet were also measured. Depending on the species, the alternative 5 would result in up to 16,861 additional acres of habitat protected from edge effect extending up to 1,000 feet.

**TABLE 6-48: ACRES OF TERRESTRIAL TIER 1 PRIORITY HABITAT POTENTIALLY PROTECTED FROM SURFACE COAL MINING AND REMINING UNDER ALTERNATIVE 5**

Habitat Classes	Acres Protected from Surface Coal Mining	Percent of Evaluation Area Impacted	Acres Protected from Remining	Percent of Evaluation Area Impacted
Low	36	0.02	3	0.002
Medium	93	0.05	7	0.004
High	704	0.41	245	0.14
Very High	3,576	2.08	1,167	0.68
<b>Total</b>	<b>4,409</b>	<b>2.56</b>	<b>1,422</b>	<b>0.826</b>

Since remining would not be allowed under alternative 5, associated remining areas would not be subject to habitat degradation and natural reforestation would continue. This alternative would result in the protection of 894 and 7,906 acres of habitat measured at 100 feet and 1,000 feet respectively.

Since there could be no surface coal mining operations under alternative 5, direct and indirect adverse impacts to terrestrial species generally would be the same as those described for alternative 2 above.

### Cumulative Impacts

**Aquatic Species:** Surface coal mining operations upstream or adjacent to the designation area and haul road construction and maintenance inside and upstream or adjacent to the designation area would continue to impact aquatic species generally due to sedimentation and water quality degradation, although impacts would be minimized by compliance with best management practices along with all applicable regulations and permit conditions. In addition, other actions such as timber harvest, oil and gas development, recreation development, and recreational use would degrade water conditions over time and have detrimental impacts on aquatic habitat. The impacts of alternative 5, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on aquatic species generally. However, alternative 5 would not contribute to adverse cumulative impacts and might slightly contribute beneficial impacts that help offset adverse impacts.

**Terrestrial Species:** Past and present cumulative actions that have impacted terrestrial habitat in the evaluation area include pre- and post-SMCRA surface coal mining, underground mining, timber harvest, oil and gas production, electrical and gas transmission, and recreation. These actions have converted, removed, and fragmented habitat, resulting in habitat edges, mixed-aged forests, and resulted in direct disturbances, injuries, and mortality to terrestrial special-status species and populations. Many of these activities are expected to continue into the future. The impacts of alternative 5, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on terrestrial species generally. However, alternative 5 would protect ridgelines from future surface coal mining operations, which would generally provide benefits to terrestrial species and would not contribute to overall adverse cumulative impacts.

## Conclusion

Alternative 5 would result in near- and long-term beneficial impacts to aquatic species. Alternative 5 would result in the protection of approximately 381 miles of aquatic habitat and approximately 4,409 acres of tier 1 priority habitat from impacts related to coal mining activities. Alternative 5 would protect the most aquatic habitat, though the least terrestrial habitat, of all of the action alternatives. Protection of lands within the designated area from future surface coal mining operations would result in long-term beneficial impacts by limiting further injury. No new or additional adverse impacts would occur compared to the no-action alternative. The beneficial impacts to aquatic and terrestrial species under alternative 5 would be increased in comparison to the no-action alternative. Alternative 5 would not result in significant adverse impacts.

## ALTERNATIVE 6: REDUCED CORRIDOR DESIGNATION

Under alternative 6, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State's petition except that the corridor width would be reduced by half (600-foot corridor instead of 1,200-foot corridor). No remining or new access roads would be allowed within the designation area but haul roads would likely be constructed outside the designation area.

### Direct and Indirect Impacts

**Aquatic Species:** The prohibition of additional surface coal mining operations would offer protection to aquatic resources and habitat within the designation area, and could potentially help facilitate ecosystem recovery, representing a long-term beneficial impact.

Impacts to aquatic species in general under alternative 6 would be the same as those described under alternative 2, but to a lesser extent because the protected area would be half the area protected under alternative 2. Under alternative 6, approximately 356 miles of aquatic habitats in the evaluation area could be protected from future surface coal mining operations, including approximately 26 miles of Tier 1 priority habitat (21 miles high; 1 mile medium; 4 miles low) (figure 6-41). Alternative 6 could also protect additional aquatic habitat outside the evaluation area located within the buffer area used to analyze alternatives from otherwise potentially mineable coal resources within the evaluation area. Because remining would not occur under alternative 6, aquatic species generally would not be subjected to associated short-term adverse impacts, but would also not receive potential benefits from reclamation of previously mined lands left unreclaimed prior to the implementation of SMCRA, which could potentially improve water quality in the long term (Kleinmann 2000). Current conditions would persist. Impacts would generally result in slightly improved resource conditions in comparison to the no-action alternative.

**Terrestrial Species:** Under alternative 6, approximately 10,065 acres of tier 1 priority habitat in the designation area could be protected from future surface coal mining operations. In addition, since remining would not be allowed, an additional 1,422 acres would be protected. Table 6-49 describes the amount of tier 1 habitat that would be protected from surface coal mining and remining under alternative 6.

**TABLE 6-49: ACRES OF TERRESTRIAL TIER 1 PRIORITY HABITAT POTENTIALLY PROTECTED FROM SURFACE COAL MINING AND REMINING UNDER ALTERNATIVE 6**

Habitat Classes	Acres Protected from Surface Coal Mining	Percent of Evaluation Area Impacted	Acres Protected from Remining	Percent of Evaluation Area Impacted
Low	97	0.06	29	0.02
Medium	153	0.09	81	0.05
High	1,061	0.62	1,033	0.60
Very High	8,754	5.09	3,766	2.19
<b>Total</b>	<b>10,065</b>	<b>5.86</b>	<b>4,909</b>	<b>2.86</b>

The protection of habitat under alternative 6 would result in maintaining interior forest habitat by eliminating the potential for habitat degradation as a result of the creation of edge effect for up to 8,259 acres of habitat measured at 100 feet from the edge of potentially mineable areas. Since the effects of edges can vary depending on the species being evaluated, the habitat between 100 feet and 1,000 feet was also assessed. Depending on the species, the alternative 6 would result in up to 59,254 additional acres of habitat protected from edge effect extending up to 1,000 feet.

Since remining would not be allowed under alternative 6, additional areas would not be subject to the creation of edge and the associated effects. This alternative would result in the protection from edge effect at 100 feet and out to 1,000 feet of 3,780 and 33,244 respectively.

Since there could be no surface coal mining operations under alternative 6, direct and indirect adverse impacts to terrestrial species generally would be similar as those described for alternative 2 above.

### Cumulative Impacts

**Aquatic Species:** Similar to alternative 2, cumulative actions would degrade water conditions over time and would have a detrimental impact on aquatic habitat, although impacts would be minimized by compliance with best management practices along with all applicable regulations and permit conditions. Cumulative impacts would be similar to alternative 2 described above, with overall adverse cumulative impacts from all actions. However, alternative 6 would contribute more to cumulative impacts as a result of the smaller area designated and potential for surface coal mining operations. Alternative 6 would not contribute to the overall adverse cumulative impacts to aquatic species generally and could contribute beneficial impacts that would help offset adverse impacts.

**Terrestrial Species:** Past and present cumulative actions that have impacted terrestrial habitat in the evaluation area include pre- and post-SMCRA surface coal mining, underground mining, timber harvest, oil and gas production, electrical and gas transmission, and recreation. These actions have converted, removed, and fragmented habitat, resulting in habitat edges, mixed-aged forests, and direct disturbances, injuries and mortality to terrestrial special-status species and populations. Many of these activities are expected to continue into the future. The impacts of alternative 6, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on terrestrial species. However, alternative 6 would protect ridgeline areas from future surface coal mining operations. This would provide benefits to terrestrial species generally and would not contribute to overall adverse cumulative impacts.

## Conclusion

Alternative 6 would result in near- and long-term beneficial impacts to aquatic and terrestrial species generally. The protection of lands within the designation area from future mining activities would result in long-term beneficial impacts by limiting further injury and potentially facilitating ecosystem recovery. Alternative 2 would result in the protection of approximately 356 miles of aquatic habitat and approximately 10,065 acres of terrestrial tier 1 priority habitat from impacts related to coal mining activities. No new or additional adverse impacts would occur compared to the no-action alternative. Increased beneficial impacts to aquatic and terrestrial species generally under alternative 6 would occur compared to the no-action alternative. Alternative 6 would not result in significant adverse impacts.

## IMPACTS OF THE ALTERNATIVES ON SPECIAL-STATUS SPECIES

### METHODS FOR ANALYSIS

This section analyzes impacts on federally and state-listed threatened and endangered species (including federally proposed and candidate species) present or potentially present in the evaluation area (see “Chapter 3: Alternatives”). Impacts to designated critical habitat occurring within the evaluation area are also analyzed.

### Applicable Statutes, Regulations, and Policies

#### The Endangered Species Act and Surface Mining Control and Reclamation Act

**Purpose of the Endangered Species Act:** Prior to the enactment of SMCRA, Congress, in 1973, enacted the Endangered Species Act to, among other purposes, “provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved [and] to provide a program for the conservation of such endangered species and threatened species...” (16 USC § 1531(b)). Through the Endangered Species Act, Congress declared “that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall use their authorities in furtherance of the purposes of the [Endangered Species Act]” (16 USC § 1531(c)).

To carry out these purposes and the policies, Endangered Species Act section 7(a)(1) requires all federal agencies, in consultation and with the assistance of the USFWS, to use their authorities to carry out programs for the conservation of endangered and threatened species (16 USC § 1536(a)(1)). Section 7(a)(2) requires each federal agency, in consultation with the USFWS, “to insure that any action authorized, funded, or carried out...is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of [critical] habitat...” (16 USC § 1536(a)(2)). Section 7(a)(4) requires federal agencies to confer with the USFWS on any agency action that is likely to jeopardize the continued existence of any species proposed for listing or result in adverse modification of proposed critical habitat (16 USC § 1536(a)(4)). Each agency is required to use and provide the USFWS with the best scientific and commercial data available when undergoing consultation in order to determine the effects of its action upon listed species or critical habitat (16 USC § 1536; 50 CFR § 402.14(d)(2)). The Endangered Species Act regulations outlining the substantive and procedural requirements for section 7(a)(2) consultation are codified at 50 CFR part 402. The regulations require the federal agency taking the action to formally consult with the USFWS if its action “may affect” a listed species (50 CFR § 402.14(a)).

On September 24, 1996, the USFWS issued a biological opinion and conference report to OSMRE (USFWS 1996c) on the continuation and approval and conduct of surface coal mining and reclamation operations under state and federal regulatory programs adopted pursuant to SMCRA where such

operations may adversely affect species listed as threatened or endangered or designated critical habitat under the Endangered Species Act. After reviewing SMCRA, its implementing regulations, the effects of the proposed action, and the cumulative effects of future state, tribal, local or private actions that are reasonably certain to occur, the USFWS concluded in the 1996 biological opinion that surface coal mining and reclamation operations conducted in accordance with properly-implemented regulatory programs under SMCRA are not likely to jeopardize the continued existence of Endangered Species Act-listed or proposed species or future listed species and are not likely to result in the destruction or adverse modification of designated or proposed critical habitat. The incidental take statement in the 1996 biological opinion exempted state regulatory authorities, including OSMRE in federal program states, from the prohibitions of section 9 of the Endangered Species Act if it complied with the terms and conditions included in the incidental take statement.

The terms and conditions are as follows:

1. The regulatory authority, acting in accordance with the applicable SMCRA regulatory program, must implement and require compliance with any species-specific protective measures developed by the USFWS field office and the regulatory authority (with the involvement, as appropriate, of the permittee and OSMRE).
2. Whenever possible, the regulatory authority must quantify the take resulting from activities carried out under this program. Whenever a dead or impaired individual of a listed species is found, the local USFWS office must be notified within one working day of the discovery.
3. Whenever the regulatory authority decides not to implement one or more of the species-specific measures recommended by the USFWS, it must provide a written explanation to the USFWS. If the USFWS does not concur, the issue must be elevated through the chain of command of the regulatory authority, the USFWS, and (to the extent appropriate) OSMRE for resolution.

The “fish, wildlife, and related environmental values” described in section 515 of SMCRA clearly encompass threatened or endangered species or their critical habitats. Existing OSMRE regulations require that applicants for surface coal mining operations provide sufficient fish and wildlife resources information for the proposed permit area and adjacent area to design a protection and enhancement plan that complies with sections 7 and 9 of the Endangered Species Act and minimizes disturbances and adverse impacts on fish, wildlife, and related environmental values, and enhances those resources where practicable (30 CFR § 780.16). Before a regulatory authority can approve the permit application, the regulatory authority must find that the “operation would not affect the continued existence of endangered or threatened species or result in destruction or adverse modification of their critical habitats, as determined under the Endangered Species Act of 1973” (30 CFR § 773.15(j)).

USFWS field staff provides technical assistance and recommendations to OSMRE and the appropriate regulatory authority. The regulatory authority ensures that any listed species or designated critical habitats are considered as the application is developed. As part of the process of ensuring full compliance with SMCRA and the Endangered Species Act, OSMRE and state regulatory authorities have worked with USFWS to develop protection and enhancement plans and guidelines for commonly encountered threatened and endangered species. As of 2013, protection and enhancement plans were developed for the Indiana Bat (*Myotis sodalis*) and the blackside dace (*Chrosomus cumberlandensis*) (OSMRE 2013; USFWS 2004a).

## ASSUMPTIONS AND METHODOLOGY

Direct, indirect, and cumulative impacts to species-status species by alternative were analyzed. Conclusions were based on overall impacts to special-status species known to occur or which may potentially occur within the evaluation area and level of impact duration and intensity was ascribed to each alternative. Species lists were obtained from USFWS, TWRA, relevant scientific literature, and site-specific surveys where available. Species were grouped where appropriate based on overlap in habitat and similarity of impacts under each alternative.

**Aquatic Special-Status Species:** The impact analysis for aquatic special-status species includes a description of potential impacts of each alternative to each species or groups of species, as appropriate, and their associated habitats, known to occur or which may occur within the evaluation area. Impacts to aquatic special-status species were assessed in terms of the potential for increased or decreased disturbance to each species or group of species, compared to alternative 1 (the no-action alternative). Potential for increased or decreased disturbance to aquatic special-status species was based on the proximity of aquatic habitats where special-status species are known to occur or may potentially occur in areas drained by lands containing minable coal resources (identified in “Chapter 5: Evaluation of Coal Resources”).

As described in “Chapter 4: Affected Environment,” the evaluation area could contain as many as 36 aquatic special-status species. It is assumed for the purposes of this analysis that impacts to aquatic special-status species are mostly like to occur in habitats adjacent to and downstream of active mining areas where special-status species are known to occur or may potentially occur, and impacts would be limited to within the buffer area used to analyze alternatives from mining activities. It is also assumed that all coal resources within the designation area could potentially be mined. For alternatives that do not prohibit remining, it is assumed that remining would be most likely to occur adjacent to unmined coal resources. Specific locations of mineable coal resources are identified in “Chapter 5: Evaluation of Coal Resources.” Where mitigation is required to reduce and rectify adverse impacts on special-status species, appropriate measures would be determined in collaboration with USFWS and other applicable agencies. Decisions regarding mitigation actions for specific species would be informed by protection and enhancement plans, or other guiding documents as available. Currently, a protection and enhancement plan exists for only one of the aquatic special-status species analyzed herein: blackside dace (USFWS 2009a).

The conservation easement for the Emory River Tract prohibits the owner of the mineral estate from engaging in mining. In addition, the area lacks commercially viable coal resources. Therefore, no surface coal mining would occur in the Emory River watershed. Therefore no impacts to aquatic species from surface coal mining operations are expected in the watershed. The Emory River is the only known location of the federally endangered Alabama lampmussel within the evaluation area (Simmons 2011; Dinkins, Faust, and Ahlstedt 2012). The Emory River also contains the only critical habitat within the evaluation area, which has been designated for the federally threatened spotfin chub (USFWS 1977). Consequently, no impacts to the Alabama lampmussel or the spotfin chub or its critical habitat are anticipated under any of the alternatives discussed below.

**Terrestrial Special-Status Species:** As described in “Chapter 4: Affected Environment,” the evaluation area could contain a number of special-status bird species, three bat species, and one species of snake. None of the bird species are listed under the Endangered Species Act, though a number of them are listed as birds of conservation concern, state-designated in need of management, or state listed. In order to effectively assess the potential impacts to the numerous bird species, the following analysis includes the two state-listed species (Bewick’s wren and northern saw-whet owl) and two species that can be

considered as representative species of particular habitat types important to other birds (cerulean warbler and golden-winged warbler). The following analysis also assesses the potential impacts to the federally and state-listed endangered gray bat and Indiana bat and federally threatened northern long-eared bat. Finally the species-specific analysis includes an assessment of impacts to the northern pinesnake, a state threatened species.

Impacts to terrestrial special-status species are based largely on impacts to TWRA-derived terrestrial tier 1 priority habitat associated with each species. Depending on the species evaluated other factors such as elevation, edge effect, and potential injury and mortality are also assessed. Since there are no proposed surface coal mining operations to evaluate, the analysis focuses on potentially mineable areas and areas previously mined. It should be noted that the number generated for previously mined areas likely over-estimates acreage as some of those areas were augured and are not subject to re-mining. Figures 6-43, 6-44, 6-45, 6-46, and 6-47 show impacts of each of the alternatives to cerulean warbler habitat.

**Plant Special-Status Species:** As discussed in “Chapter 4: Affected Environment,” there are two federally threatened plant species, the Cumberland rosemary and Virginia spiraea; and one federally endangered plant species, the Cumberland sandwort, and five state-listed plant species found within the approximately 172,000-acre evaluation area. There are a total of 20 plant species found in the Cumberland Mountains physiographic province within Tennessee as listed by the Tennessee Natural Heritage Program on the Rare Plant List.

The impact analysis includes a description of potential impacts of each alternative to each plant species likely to inhabit areas potentially affected, as appropriate, and their associated habitats. Specific impacts on special-status plant species are described in this section for listed plant species known to be present or with the potential to be found inside the evaluation area (see “Chapter 4: Affected Environment”).

Direct impacts on special-status plant species are assessed and measured in terms of areal extent (e.g., acres) where mineable coal resources identified in “Chapter 5: Evaluation of Coal Resources” occur and where, if permitted, mining-related activities could cause the direct loss of habitat preferred by special-status plant species compared to the no-action alternative. Direct beneficial impacts on special-status plant species were assessed and measured in terms of aerial extent, where mineable coal resources occur and where, if designated as unsuitable for mining-related activities, special-status plant species occurrences and preferred habitat would be protected. The following parameters were considered when assessing impacts to special-status plant species:

- the areal extent of mineable coal resources identified in “Chapter 5: Evaluation of Coal Resources” in the evaluation area and in the petition area;
- the proximity of known occurrences of plant special-status species to mineable coal resources identified in “Chapter 5: Evaluation of Coal Resources”; and
- the amount of habitat preferred by plant special-status species that would be lost due to mining operation activities.

Habitat preferences for the plant special-status species were derived from USFWS Recovery Plans and 5-year Reviews (USFWS 1996a, 1996b, 2011, 1992, 2013) and NatureServe (NatureServe 2015). Habitats (derived from the National Land Cover Database) include deciduous forest, mixed forest, grasslands, evergreen forest, scrub/shrub, and wetlands.

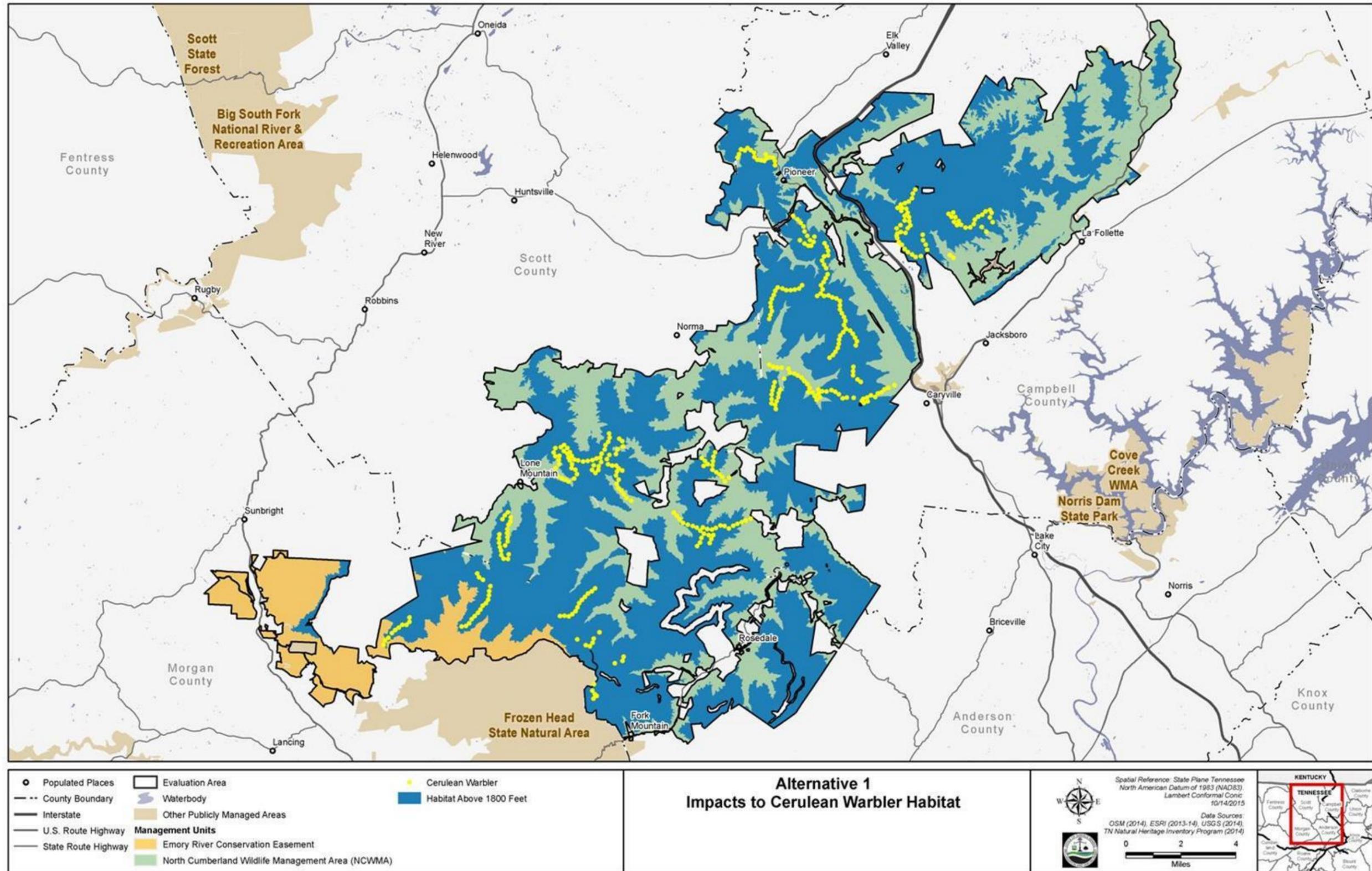


FIGURE 6-43: ALTERNATIVE 1 IMPACTS TO CERULEAN WARBLER HABITAT

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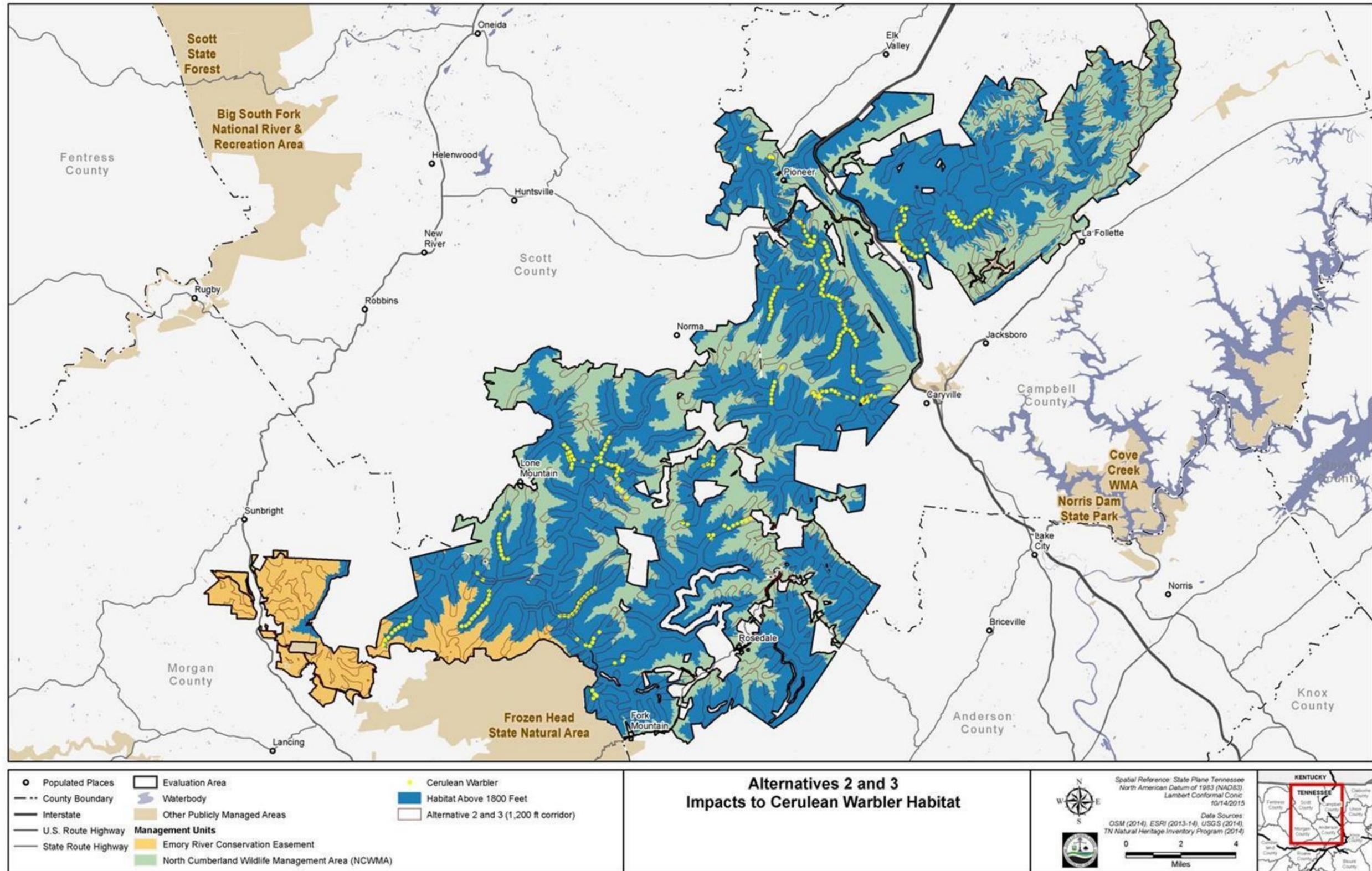


FIGURE 6-44: ALTERNATIVES 2 AND 3 IMPACTS TO CERULEAN WARBLER HABITAT

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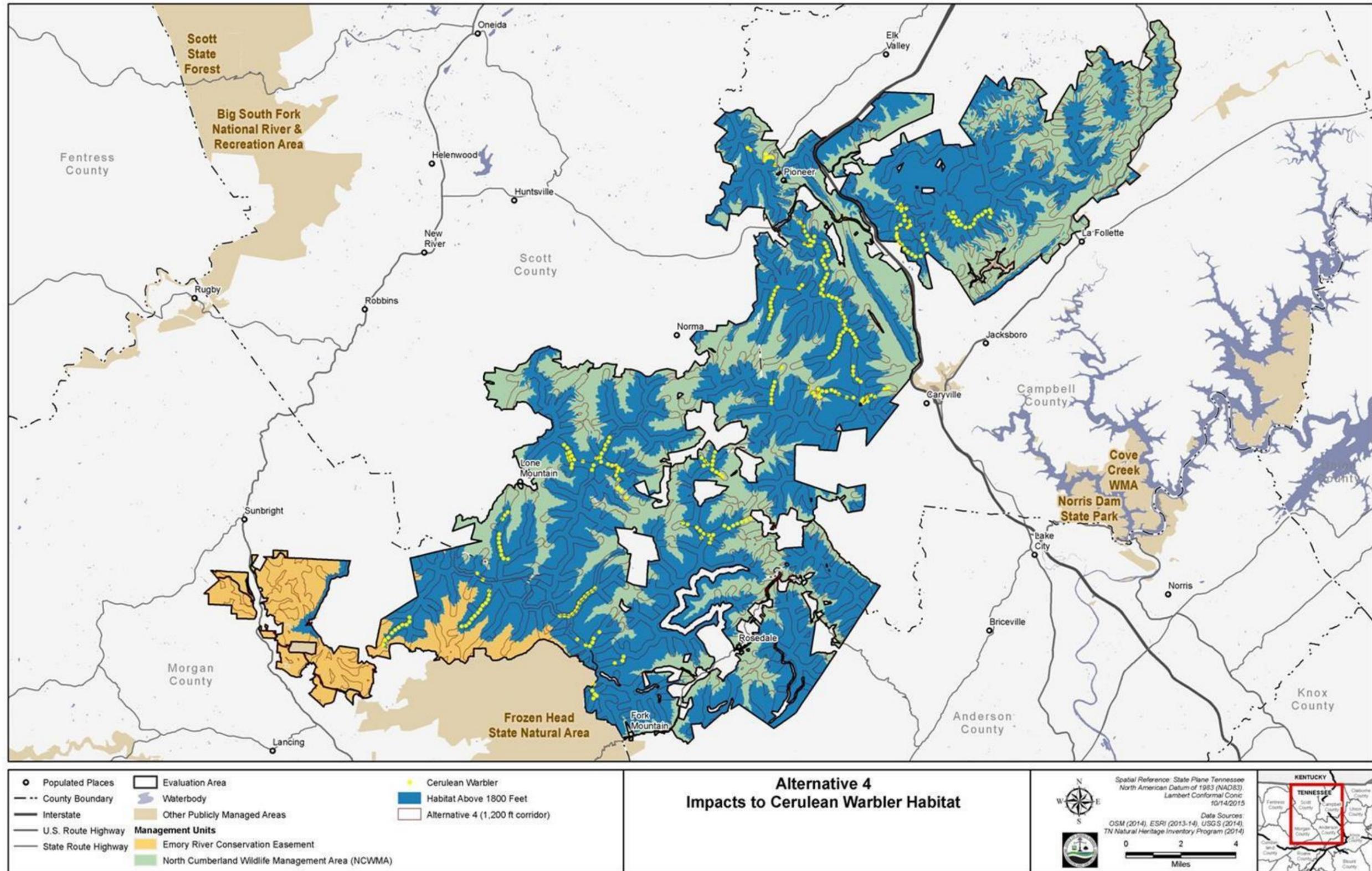


FIGURE 6-45: ALTERNATIVE 4 IMPACTS TO CERULEAN WARBLER HABITAT

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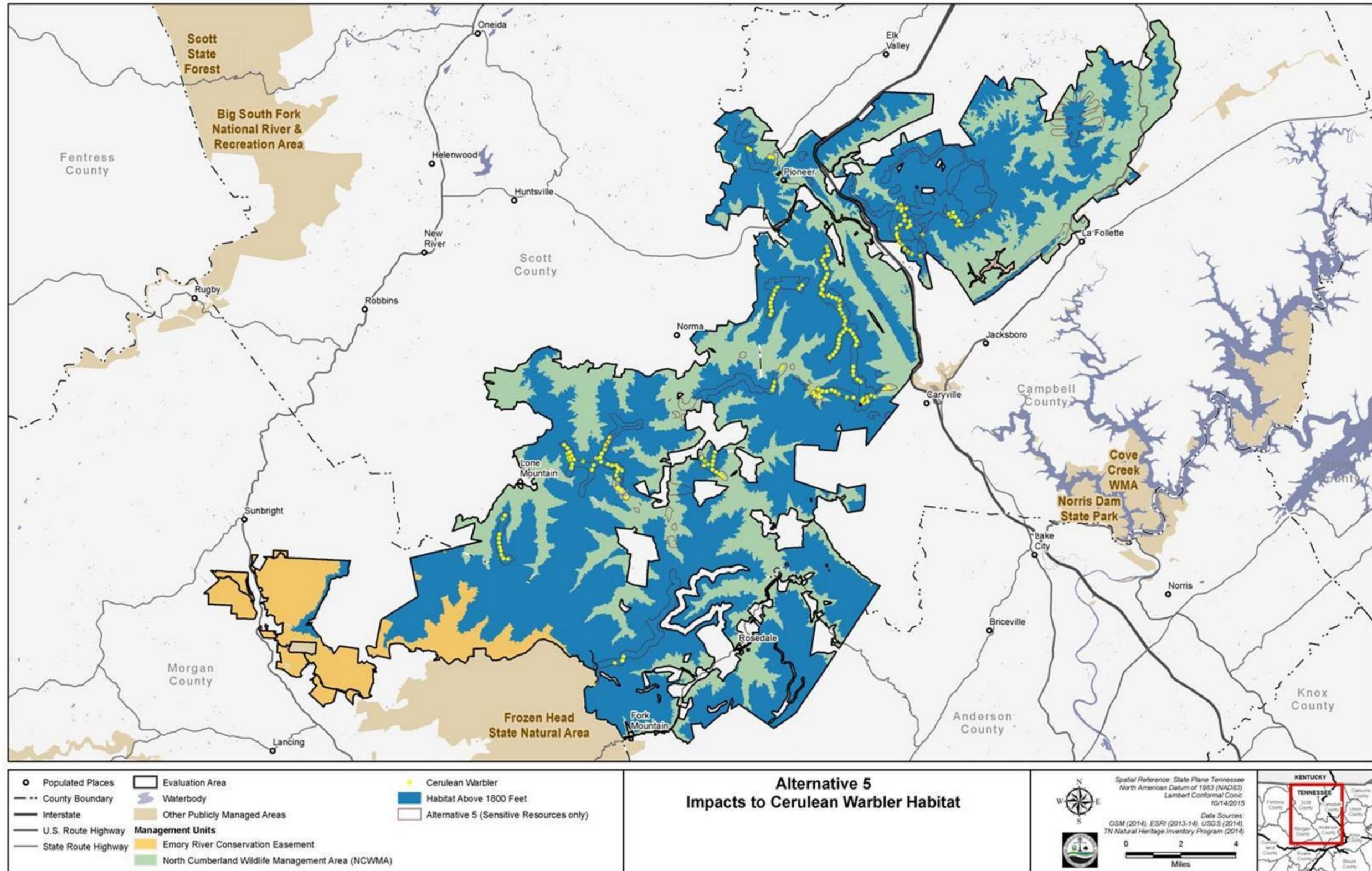


FIGURE 6-46: ALTERNATIVE 5 IMPACTS TO CERULEAN WARBLER HABITAT

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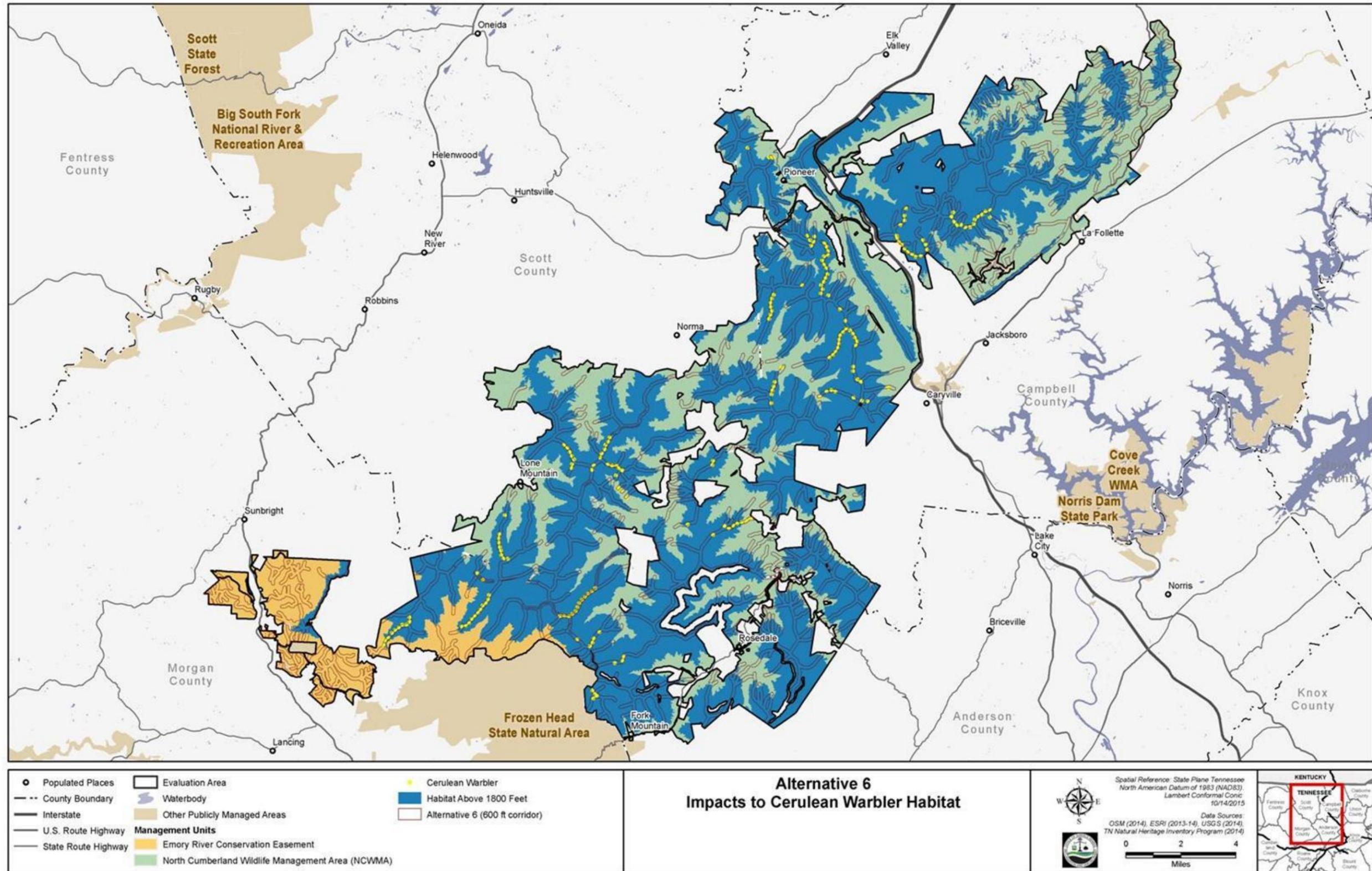


FIGURE 6-47: ALTERNATIVE 6 IMPACTS TO CERULEAN WARBLER HABITAT

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## Area of Analysis

The area of analysis for special-status aquatic species includes all aquatic habitats where special-status species are known to occur or may potentially occur. The analysis area also includes aquatic habitats outside the evaluation area that are connected by a contiguous stream or waterway, and are within the buffer area used to analyze alternatives from mining activities occurring inside the evaluation area, where special-status species are known to occur or may potentially occur. The area of analysis for terrestrial species is restricted to the evaluation area where mining activities could occur. The area of analysis for plant species includes all habitats within the evaluation area where special-status plant species are known to occur or may potentially occur.

## GENERAL IMPACT OF COAL MINING IN TENNESSEE ON SPECIAL-STATUS SPECIES

### Aquatic Special-Status Species

General impacts of surface coal mining to aquatic special-status species would be nearly identical to those discussed in the “Impacts of the Alternatives on Aquatic and Terrestrial Species” section and include both direct and indirect impacts to aquatic special-status species. Direct impacts to aquatic species would include any mining-related activities that would result in direct mortality of species or destruction of habitat. Assuming compliance with federal and state regulations, the only possibility of direct impacts to aquatic special-status species as a result of surface coal mining in Tennessee would occur at stream crossings. Federal regulations that prevent direct impacts to aquatic habitats include SMCRA section 515(b)(22)(D) [(30 CFR § 715.15, part 816, and part 817], which regulates the placement spoil in surface waters; the SMCRA stream buffer zone regulation (30 CFR §§ 816.57 and 817.57), which prohibits mining activities within 100 feet of the ordinary high water mark of any stream (except for reclamation of streams during re-mining); and section 404 of the Clean Water Act (33 USC § 1344(a)), which regulates the discharge of dredged or fill material, including discharges associated with surface coal mining, into surface waters. State-level regulations that prevent direct impacts to aquatic habitats include the Tennessee Responsible Mining Act (2009 Tenn. Pub. Acts 289), which also prohibits coal mining or disposal of spoil or coal waste materials within 100 feet of the ordinary high water mark of any stream. Stream crossings could be permitted under Clean Water Act section 404 provided that water quality standards are maintained.

Indirect impacts to aquatic special-status species occur primarily as a result of habitat and water quality degradation including increased sedimentation and turbidity, changes in water chemistry including acidification, and habitat contamination due to the introduction or mobilization of chemical pollutants (Letterman and Mitsch 1978; Pond et al. 2008; EPA 2011; Daniel et al. 2015). These impacts and their effects on aquatic species are discussed in detail in the “Impacts of the Alternatives on Aquatic and Terrestrial Species” section and are closely connected to mining impacts to surface water resources.

Impacts of surface mining to aquatic species, as described in the “Impacts of the Alternatives on Aquatic and Terrestrial Species” section, may have greater population-level effects on special-status species due to their limited numbers and frequent sensitivity to environmental disturbances (Buehler and Percy 2012). The majority of aquatic special-status species in Tennessee are fishes and mussels (TNHP 2009). Therefore, impacts to these species groups may be of particular concern. Each application for mining must include a description of how, to the extent possible using best technology currently available, the operator would minimize disturbances and adverse impacts on fish and wildlife and related environmental values, including compliance with the Endangered Species Act. This is the protection and enhancement plan specifically required by 30 CFR § 780.16(b). This plan must at a minimum apply to species and habitats identified under 30 CFR § 780.16(a) and must include protective measures to be used during mining and enhancement measures to be used during the reclamation / postmining phase of the operation

to develop aquatic and terrestrial habitat. The protection and enhancement plan is required to be consistent with applicable performance standards at 30 CFR §§ 816.97 and 817.97. No mining activities can be conducted that are likely to jeopardize the continued existence of species listed under the Endangered Species Act, adversely modify designated critical habitats, or result in unlawful taking of listed species. Using best technology currently available, these performance standards also require the operator to minimize impacts to fish, wildlife, and related environmental values and achieve enhancement of such resources where practicable.

On September 24, 1996, the Service issued a biological opinion and conference report to OSMRE (USFWS 1996) on the continuation and approval and conduct of surface coal mining and reclamation operations under state and federal regulatory programs adopted pursuant SMCRA where such operations may adversely affect species listed as threatened or endangered or designated critical habitat under the Endangered Species Act. After reviewing SMCRA, its implementing regulations, the effects of the proposed action, and the cumulative effects of future State, Tribal, local or private actions that are reasonably certain to occur, the Service concluded in the 1996 biological opinion that surface coal mining and reclamation operations conducted in accordance with properly-implemented regulatory programs under SMCRA are not likely to jeopardize the continued existence of Endangered Species Act-listed or proposed species or future listed species and are not likely to result in the destruction of adverse modification of designated or proposed critical habitat. The incidental take statement in the 1996 biological opinion exempted OSMRE or the state regulatory authority from the prohibitions of section 9 of the Endangered Species Act if it complied with the terms and conditions included in the incidental take statement.

Compliance with the federal and state regulations and guidelines for surface mining, including the avoidance of mining activities within 100 feet of the ordinary high water mark of any stream, as discussed above under the “Applicable Statutes, Regulations, and Policies” section would minimize, but not eliminate adverse impacts to aquatic special-status species.

### **Terrestrial Special-Status Species**

General impacts of surface coal mining to terrestrial special-status species would be nearly identical to those discussed in the “Impacts of the Alternatives on Aquatic and Terrestrial Species” section and include both direct and indirect impacts. Direct impacts can result in local wildlife being displaced, injured, or killed, especially those species that lack the mobility to escape mining activities such as small mammals, reptiles and amphibians (Buehler and Percy 2012). As areas are cleared of vegetation in preparation of mining activities, species are displaced to adjacent lands. This displacement can result in missed breeding opportunities or lower survival rates (Buehler and Percy 2012).

In addition, the clearing of forested habitat creates habitat fragmentation and edge, which can change forest structure, composition, and ecological processes, resulting in indirect impacts to forest-dependent special-status species (Wickham et al. 2007). Habitat fragmentation can result in localized population extirpations as species populations become isolated due to habitat loss (Jackson 2000). In forested areas, fragmentation and the creation of habitat edges has been documented to have a major effect on forest songbirds (Askins 1994). The presence of a forest edge can result in increased predation, brood parasitism, and species competitions and the effect can extend up to 150 feet into the forest (Wood, Bosworth, and Dettmers 2006). Wood and others (2006) also documented edge effect of reclaimed mines extending over 1,000 feet into the forest. USFWS made a similar conclusion stating that the “introduction of hard edges may result in greater local population declines” and that the continued “degradation or removal of suitable mature and old-growth hardwood forestland will result in reductions in nesting opportunities, and that accumulation of habitat losses is likely to result” in overall species decline

(USFWS 2006a). USFWS cautioned that “[e]ffects in a relatively small portion of the species range... could contribute disproportionately to the population decline” (USFWS 2006a).

Wildlife impacts from mine reclamation vary depending of the reclamation plan, time span for reclamation to occur and the species of wildlife being considered. Site reclamation can result in changes to species-specific “relative abundance, survival, reproduction, movements, foraging behavior and other behavioral traits” (Buehler and Percy 2012). Because of the time between clearing the forest and reclamation, avian communities tend to shift from forest bird communities to those more typical of an early successional habitat (Buehler and Percy 2012). As described by the draft management plan for the Royal Blue Wildlife Management Area and the Surface Use Plan for the Sundquist Wildlife Management Area, TWRA would be a party to any reclamation actions that would occur in the evaluation area and would prescribe desired habitat conditions the reclamation would be designed to achieve in the long term.

### **Plant Special-Status Species**

Impacts of surface mining on plants special-status species are typically a result of direct elimination during land clearing operations. Pursuant to 30 CFR §§ 816.97 and 817.97, should any endangered or threatened plant species be found to exist within an impact area of any proposed mining, no mining activity could be conducted that would jeopardize the continued existence of those species. In these instances, OSMRE would follow established coordination procedures pursuant to section 7 of the Endangered Species Act with the USFWS and the TDEC, Natural Heritage Inventory Program to prevent adverse impacts and to identify whether, and under what conditions, the operator may proceed.

Surface coal mining operations would cause long-term adverse impacts due to the loss of any undetected plant special-status species from clearing on the permit area and other activities associated with surface coal mining operations (i.e., development of access and haul roads). If previously undetected populations are present, direct adverse effects of mining activities would include destruction of individuals and suitable habitat during soil disturbance and compaction, materials stockpiling, short-term vegetation removal, and tree removal. Clearing of forested areas could include repeated disturbance that would cause the continued destruction of individuals and suitable habitat, and would create conditions suitable for an increase in invasive plants. Equipment used during construction and maintenance could crush, bury, or dig up undetected individuals. Potential indirect effects on undetected populations include changes in local habitat suitability and availability and an increase in invasive species that may out-compete native species. The likelihood of these impacts would be minimized through the appropriate avoidance and best management practices in and near areas known to harbor plant special-status species, such as avoiding areas or use of timing restrictions.

Given that the large majority of the evaluation area is mature deciduous forest, the clearing of these forested areas could adversely impact plant special-status species that prefer forested habitat. According to the National Wetland Inventory, wetlands occur within the evaluation area. If a mining operation is unable to avoid a wetland due to location of the mine and associated infrastructure, special-status species that prefer wetland habitat could be adversely impacted.

### **Underground and Auger Mining**

**Aquatic Special-Status Species:** Any impacts to surface waters as a result of underground mining activities could indirectly impact aquatic fish and wildlife species including special-status species. However, impacts to surface waters as a result of underground mining are not expected. Therefore, no impacts to aquatic special-status species are anticipated as a result of underground mining. A full discussion underground mining impacts on surface water resources is provided in the “Impacts of the Alternatives on Water Resources” section.

**Terrestrial Special-Status Species:** Underground mining typically results in fewer impacts to terrestrial species than surface mining largely as a result of the smaller size of the impact. However, the type of impact would be similar to those described above (i.e., habitat loss, fragmentation, mortality, etc.). Some species may benefit from pre-SMCRA abandoned coal mine shafts, such as bats that use such areas for roosts and hibernacula (Buehler and Percy 2012).

**Plant Special-Status Species:** Underground mining typically results in fewer impacts to plant species than surface mining largely as a result of the smaller size of the impact. However, the type of impact would be similar to those described above (i.e., spread of exotic plant species, loss of individuals, habitat alteration, etc.). Plant special-status species that require open (non-forested) habitat could be enhanced due to clearing of forested areas.

## Remining

**Aquatic Special-Status Species:** Potential remining may contribute to near-term adverse impacts to aquatic special-status species due to mobilization of sediments or contaminants and associated degradation of water quality. However, reclamation of lands previously mined prior to the implementation of SMCRA in 1977 and left unreclaimed could result in long-term benefits by eliminating ongoing water quality degradation associated with unreclaimed mines including possible acid mine drainage.

The continued existence of pre-SMCRA unreclaimed abandoned mined lands may result in long-term adverse impacts to aquatic species, including special-status species. These impacts would be commensurate with impacts to water quality. Acid mine drainage and other polluted drainage from pre-SMCRA unreclaimed mines has been shown to impact aquatic species, alter food webs, and impair ecosystem function (Letterman and Mitsch 1978; Warner 1971; DeNicola and Stapleton 2002; Hogsden and Harding 2012).

**Terrestrial Special-Status Species:** Potential remining would likely have similar impacts to terrestrial species as surface coal mining and reclamation; however the area would likely be smaller. Some species could be affected as remining would disturb habitat that has been established for the last fifty years or more. This could result in displacing species to other adjacent areas (Buehler and Percy 2012).

**Plant Special-Status Species:** Potential remining may impact undetected plant special-status species as a result of direct elimination during land clearing operations. However, long-term beneficial impacts would result from the reclamation of an abandoned or previously mined site to a vegetation community equal to or better than premining vegetation and a reduction in the problems associated with uncontrolled erosion.

## Roads

**Aquatic Special-Status Species:** The potential construction, use, and maintenance of access or haul roads associated with mining activities may disturb vegetation and soils, potentially leading to increased erosion runoff. This may contribute to the degradation of water quality due to increased turbidity, sedimentation, and the potential introduction or mobilization of pollutants, potentially impacting aquatic species, including special-status species, in habitats downslope of roads (Tsunokawa and Hoban 1997). Additionally, aquatic species may be impacted at stream crossings by culvert installation and maintenance, which could disrupt or impede fish movement. However, 30 CFR §§ 816.97(e) and 817.97(e) require that each operator must, to the extent possible using best technology currently available, locate and operate haul and access roads so as to avoid or minimize impacts on important fish and wildlife species or other species protected by state or federal law. Additionally, roads on coal require the construction of sumps to control sediment runoff; or, the drainage is required to be routed to a sediment

pond. Road construction would represent a pulse event, likely resulting in near-term impacts to aquatic species. However, use and maintenance of access or haul roads would be ongoing, resulting in long-term impacts to aquatic species and habitats.

**Terrestrial Special-Status Species:** The potential construction and operation of roads can result in a number of impacts to terrestrial species. These impacts include the direct loss of habitat through road clearing, degradation of habitat quality, habitat fragmentation, species avoidance, and the disruption of processes that maintain regional populations (Jackson 2000). In addition, the construction and use of roads can cause wildlife-vehicle collisions, resulting in wildlife injury or mortality (Jaeger, Fahring, and Ewald 2006). Roads can also result in increased wildlife exploitation by providing access to hunters or poachers (Jackson 2000). Finally, road construction and use can result in reduced access of terrestrial species to important habitats. For example, studies have concluded that adverse impacts to local populations of turtles and amphibians occur when terrestrial habitat and aquatic habitat are separated (Jackson 1996).

**Plant Special-Status Species:** The potential construction, use, and maintenance of access or haul roads associated with mining activities may disturb vegetation and soils due to clearing of vegetation and materials stockpiling, potentially leading to the direct or indirect removal of undetected plant special-status species and a potential increase in invasive species competition.

## **ALTERNATIVE 1: NO-ACTION ALTERNATIVE**

Under alternative 1, OSMRE would deny the State's petition to designate the subject lands as "unsuitable for surface coal mining operations" (30 CFR § 764.13). Therefore, the no-action alternative would have the same effect as deciding not to designate any of the petition area as unsuitable for surface coal mining operations. Alternative 1 is considered to have the largest impact of all of the considered alternatives.

## **Direct and Indirect Impacts**

**Aquatic Special-Status Species:** Alternative 1 could result in direct and indirect impacts to aquatic special-status species. Direct impacts would be extremely limited. One possible exception is when remining occurs, some streams could be "mined through" if it has been determined that they were degraded by the previous pre-SMCRA mining and that reclamation related to remining would result in long-term benefits. Because direct impacts would likely be avoided or mitigated as part of compliance with the Endangered Species Act, it is anticipated that aquatic-special-status species would be affected mainly by indirect impacts due to coal mining activities. Indirect impacts to aquatic special-status species occur primarily as a result of habitat and water quality degradation including increased sedimentation and turbidity, changes in water chemistry including acidification, and habitat contamination due to the introduction or mobilization of chemical pollutants (Letterman and Mitsch 1978; Pond et al. 2008; EPA 2011; Daniel et al. 2015). These impacts and their effects on aquatic species are discussed in detail in the "Impacts of the Alternatives on Aquatic and Terrestrial Species" section and are closely connected to mining impacts to surface water resources. Impacts to streams and other aquatic habitats as a result of continued surface coal mining operations throughout the evaluation area would affect the aquatic species that inhabit those water bodies (Letterman and Mitsch 1978; Pond et al. 2008; Daniel et al. 2015). Aquatic special-status species in the evaluation area consist of 12 fishes, 22 mussels, one snail, and one crayfish.

Alternative 1 may result in adverse impacts to approximately 945 miles of aquatic habitat including habitat known to contain special-status species. Under alternative 1, four special-status fishes could be adversely impacted (table-50) by increased turbidity, changes in water chemistry, and possible contamination of surface waters associated with surface coal mining activities including haul road construction and maintenance (Newcombe and Jensen 1996; Kemp et al. 2011; Daniel et al. 2015). These impacts may

result in reduced abundance of food resources (Warner 1971; Verb and Vis 2000; Hogsden and Harding 2012), decreased respiratory function (Wood and Armitage 1997; Kemp et al. 2011), and reduced reproductive efficiency (Newcombe and Jensen 1996; Jezierska et al. 2008; Kemp et al. 2011). Special-status fish species known to occur or potentially occurring within the buffer area used to analyze alternatives from possible mining activities include ashy darter, blackside dace, Cumberland arrow darter, and silverjaw minnow. Although not listed as threatened or endangered at the federal or state level, two species, emerald darter and rosyface shiner, are state designated “deemed in need of management,” and may also occur within the buffer area used to analyze alternatives from possible mining activities and may also be impacted under alternative 1. No other special-status fish species potentially occurring within the evaluation area are known to occur within the buffer area used to analyze alternatives from possible mining activities. However, if present, impacts would be the same as those for other listed species. Only one species, spotfin chub has designated critical habitat adjacent to the evaluation area. However, spotfin chub critical habitat is located in a portion of the Emory River, which borders the evaluation area to the south along the boundary of the ERTCE (USFWS 1977). Because there would be no surface coal mining in the Emory River watershed, no impacts to spotfin chub or its critical habitat are anticipated.

**TABLE 6-50: SUMMARY OF IMPACTS TO SPECIAL-STATUS FISH UNDER THE ALTERNATIVES**

Common name	Scientific Name	Status	Presence in Evaluation Area	Alt 1**	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Ashy darter	<i>Etheostoma cinereum</i>	ST	Found in numerous streams in the evaluation area, including the Tennessee River basin	Minor	Minor	Minor	Minor	Minor	Minor
Blackside dace	<i>Chrosomus cumberlandensis</i>	FT ST	Occurs primarily in the Clear Fork drainage, but was discovered in Straight Fork, a tributary to the New River.	Minor	Minor	Minor	Minor	Moderate	Minor
Blue sucker	<i>Cycleptus elongatus</i>	ST	Occurs in Anderson and Campbell Counties	No impact					
Cumberland arrow darter	<i>Etheostoma sagitta</i>	FC	Known to occur in Campbell and Scott Counties within evaluation area	Minor	Minor	Minor	Minor	Moderate	Minor
Cumberland darter	<i>Etheostoma susanae</i>	FE SE	Known to exist is Morgan and Scott Counties and reported in creeks in the upper Cumberland River watershed	No impact					
Duskytail darter (Tuxedo darter)*	<i>Etheostoma percnum</i> <i>(Etheostoma lemiscatum)*</i>	FE SE	Occurs in the Big South Fork River	No impact					

Common name	Scientific Name	Status	Presence in Evaluation Area	Alt 1**	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Redlips darter	<i>Etheostoma maydeni</i>	ST	Occurs in the Cumberland River system in Big South Fork	No impact					
Slender chub	<i>Erimystax cahni</i>	FT ST	Historically found in the Holston, Powell, and Clinch Rivers	No impact					
Sickle darter	<i>Percina williamsi</i>	ST	Potentially present in Morgan County	No impact					
Silverjaw minnow	<i>Notropis buccatus</i>	ST	Listed as being present in Campbell County	Minor	Minor	Minor	Minor	Minor	Minor
Spotfin chub	<i>Erimonax monachus</i>	FT ST	Occurs in the Emory River	No impact					
Yellowfin madtom	<i>Noturus flavipinnis</i>	FT ST	Occurs in the Clinch and Powell Rivers	No impact					

Federal listings: FE = federally endangered; FT = federally threatened.

State listings: SE = state endangered; ST = state threatened.

\* Although the duskytail darter (*E. percnum*) is the officially listed taxon, the taxon that occurs in the evaluation area is actually the tuxedo darter (*E. lemiscatum*) (Blanton and Jenkins 2008).

\*\* NEPA Impact Level Definitions: **No Impact**—Neither individuals nor habitat of the species would be directly or indirectly affected. **Minor**—Impacts on individuals or habitat would be measurable or perceptible and local, but there would be no mortality to individuals and no long-term impact on the overall distribution, abundance, or viability of the population. **Moderate**—Impacts would be sufficient to cause mortality to individuals and/or a loss of habitat, resulting in a change in the population or subpopulation (e.g., abundance, distribution, quantity, or viability). However, the impact would remain local and temporary. Mitigation would be necessary to reduce and rectify adverse impacts.

Of the 22 special-status mussel species potentially occurring in the evaluation area, only one species, the Cumberland elktoe occurs within the buffer area used to analyze alternatives from possible future mining activities and could be adversely impacted under alternative 1 (table 6-51). No other special-status mussels potentially occurring within the evaluation area are known to occur within the buffer area used to analyze alternatives from possible mining activities. However, if present, impacts would be the same as those for other listed species. Mussels are particularly sensitive to water quality and would likely be among the more heavily impacted species groups, along with other benthic species (Letterman and Mitsch 1978; Layzer, Gordon, and Anderson 1993; DeNicola and Stapleton 2002). Mussels also have little to no mobility in their adult life stages, making relocation impossible for many species. Therefore, alternative 1 could result in higher mortality of special-status mussels than the other alternatives. Many of the mussel species that occur within the evaluation area have narrow ranges and limited distribution, further intensifying potential impacts to these species (Watters 1999). Furthermore, many of these mussel species require a fish host for successful reproduction (USFWS 2004b). Thus, any impacts to host fish species may also impact the reproductive ability of dependent mussel species. Five host fish species have been identified for the Cumberland elktoe: whitetail shiner (*Cyprinella galactura*), northern hogsucker (*Hypentelium nigricans*), rock bass (*Ambloplites rupestris*), longear sunfish (*Lepomis megalotis*), and rainbow darter (*Etheostoma caeruleum*) (Gordon and Layzer 1993), all of which are likely to be present in the evaluation area.

**TABLE 6-51: SUMMARY OF IMPACTS TO LISTED MOLLUSK SPECIES UNDER THE ALTERNATIVES**

Common name	Scientific Name	Status	Presence in Evaluation Area	Alt 1**	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Anthony riversnail	<i>Athearnia anthonyi</i>	FE SE	In Anderson and Campbell Counties	No impact					
Alabama lampmussel	<i>Lampsilis virescens</i>	FE SE	Emory River	No impact					
Birdwing pearl mussel	<i>Lemiox rimosus</i>	FE SE	Documented in the upper Clinch River watersheds	No impact					
Cracking pearl mussel	<i>Hemistena lata</i>	FE SE	Believed to be present in Clinch River	No impact					
Cumberland bean	<i>Villosa trabalis</i>	FE SE	Documented in Morgan and Scott Counties and Big South Fork	No impact					
Cumberland elktoe	<i>Alasmidonta atropurpurea</i>	FE SE	Restricted to tributaries of the upper Cumberland River	Minor	Minor	Minor	Minor	Minor	Minor
Cumberlandian combshell	<i>Epioblasma brevidens</i>	FE SE	Documented in the upper and Clinch and Powell drainages and the Big South Fork of the Cumberland River	No impact					
Dromedary pearl mussel	<i>Dromus dromas</i>	FE SE	Documented in upper Clinch and Powell Rivers	No impact					
Fanshell	<i>Cyprogenia stegaria</i>	FE SE	Documented in the upper and Lower Clinch drainages	No impact					
Finerayed pigtoe	<i>Fusconaia cuneolus</i>	FE SE	Found in the Clinch River and Powell River drainages	No impact					
Fluted kidneyshell	<i>Ptychobranchus subtentum</i>	FE	Documented in the Clinch and Powell Rivers and the Big South Fork of the Cumberland River	No impact					

Impacts of the Alternatives on Special-Status Species

Common name	Scientific Name	Status	Presence in Evaluation Area	Alt 1**	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Littlewing pearl mussel	<i>Pegias fabula</i>	FE SE	Documented in the upper Clinch River and the Big South Fork of the Cumberland River	No impact					
Orangefoot pimpleback	<i>Plethobasus cooperianus</i>	FE SE	Documented in the Clinch, Powell, and Cumberland Rivers	No impact					
Oyster mussel	<i>Epioblasma capsaeformis</i>	FE SE	Documented to occur in the Big South Fork	No impact					
Pink mucket	<i>Lampsilis abrupta</i>	FE SE	Documented in the upper Clinch River	No impact					
Purple bean	<i>Villosa perpurpurea</i>	FE SE	Could occur upper Clinch and Powell Rivers	No impact					
Rough pigtoe	<i>Pleurobema plenum</i>	FE SE	Could occur upper Clinch and Powell Rivers	No impact					
Rough rabbitsfoot	<i>Quadrula cylindrica strigillata</i>	FE SE	Could occur upper Clinch and Powell Rivers	No impact					
Sheepnose mussel	<i>Plethobasus cyphus</i>	FE	Documented in the Clinch and Powell Rivers	No impact					
Shiny pigtoe	<i>Fusconaia cor</i>	FE SE	Documented in the upper Clinch and Powell River	No impact					
Slabside pearl mussel	<i>Pleuroaia dolabellodes</i>	FE SE	Documented in the upper Clinch and Powell River	No impact					
Spectacle-case	<i>Cumberlandia monodonta</i>	FE	Documented in the Upper Clinch	No impact					
Tan riffleshell	<i>Epioblasma florentina walkeri</i>	FE SE	Documented in Big South Fork River and the upper Clinch River	No impact					

Federal listings: FE = federally endangered; FT = federally threatened.

State listings: SE = state endangered; ST = state threatened.

\*NEPA Impact Level Definitions: **No Impact**—Neither individuals nor habitat of the species would be directly or indirectly affected. **Minor**—Impacts on individuals or habitat would be measurable or perceptible and local, but there would be no mortality to individuals and no long-term impact on the overall distribution, abundance, or viability of the population. **Moderate**—Impacts would be sufficient to cause mortality to individuals and/or a loss of habitat, resulting in a change in the population or subpopulation (e.g., abundance, distribution, quantity, or viability). However, the impact would remain local and temporary. Mitigation would be necessary to reduce and rectify adverse impacts.

One state-level endangered crustacean is known to occur in the evaluation area: the valley flame crayfish (*Cambarus deweesae*), which is known to be present in the Clinch River and Emory River. Because there would be no surface coal mining in the Emory River watershed, no impacts to the Emory River population of the valley flame crayfish would occur (table 6-52). Even if present, this species is particularly tolerant to disturbances and is not likely to be impacted (Morgan and McMahon 1982; DiStefano et al. 1991; NatureServe 2014).

Under alternative 1, ashy darter, blackside dace, Cumberland arrow darter, and silverjaw minnow within the evaluation area could be adversely impacted in the near and long term, along with emerald darter and rosyface shiner. Some aquatic habitats outside of the evaluation area would also likely be impacted due to sediment transport, acid mine drainage, and other water quality impacts. Impacts to aquatic special-status species would occur in portions of the Cumberland River and Clinch River watersheds within the evaluation area. Because there would be no surface coal mining in the Emory River, the Emory River watershed would not be impacted. Exact locations of species occurrences are not known for all species. Therefore, if present within the buffer area used to analyze alternatives from potential mining activities, impacts to each species would be of the same type and intensity as those described under “General Impacts of Surface Coal Mining in Tennessee on Special-Status Species.”

**TABLE 6-52: SUMMARY OF IMPACTS TO OTHER LISTED AQUATIC SPECIES UNDER THE ALTERNATIVES**

Common name	Scientific Name	Status	Presence in Evaluation Area	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Valley flame crayfish	<i>Cambarus deweesae</i>	ST	Known to occur in the Clinch and Emory River drainages in Anderson and Campbell Counties	No impact					

Federal listings: FE = federally endangered; FT = federally threatened.  
 State listings: SE = state endangered; ST = state threatened.

Although the no-action alternative has the greatest potential to adversely impact aquatic special-status species and habitat of all considered alternatives, best management practices and compliance with applicable regulations described above under the “Applicable Statutes, Regulations, and Policies” section and permit conditions would minimize, but not eliminate potential impacts to aquatic special-status species. Furthermore, any action that could potentially impact federally listed species would require consultation with USFWS.

**Terrestrial Special-Status Species:** As described above, surface coal mining operations have the potential to impact terrestrial species-status species of birds, mammals, and reptiles. The following discussion analyzes impacts to all federally and state-listed terrestrial species that could occur in the evaluation area.

Bewick’s wren, a state endangered bird species, is typically found in rural, agricultural areas with brushy hedgerows and old buildings. There are no known occurrences of this species in the evaluation area. The closest confirmed sighting is in Rutherford County, Tennessee over 90 miles away. In addition, this species is not being considered in the TWRA draft habitat conservation plan for activities on the NCWMA. The wren’s preferred habitat makes up less than 1% of the evaluation area, which is over 90% forested. Consequently, it is highly unlikely that surface coal mining operations would impact this species, therefore the no-action alternative would have no impact on the Bewick’s wren.

The northern saw-whet owl, a state threatened species, inhabits spruce-fir forests above 5,000 feet in elevation. There are no known occurrences of this species in the evaluation area. Although there is a small portion of the evaluation area made up of evergreen forest (approx. 0.43%), none of the area is above 5,000 feet in elevation. The highest points in the evaluation area are under 3,500 feet in elevation. In addition, this species is not being considered in the TWRA draft habitat conservation plan for activities on the NCWMA. Given the lack of suitable habitat for the northern saw-whet owl, it is expected that the no-action alternative would have no impact on the species.

The cerulean warbler, a USFWS bird of conservation concern, is a small neotropical migrant interior forest species. This species has faced extensive habitat loss over the last century (Robbins, Fitzpatrick, and Hamel 1989). In Tennessee, the cerulean warbler requires large tracts of mature deciduous forests (Robbins, Fitzpatrick, and Hamel 1989). In addition, these warblers are more apt to occur higher up slopes along ridgelines rather than in bottomlands (Wood, Bosworth, and Dettmers 2006) and on north- to east facing slopes. Buehler and others (2006) found when comparing five breeding areas that three out of five areas were population sinks—areas that had no to low populations with little increase due to poor quality habitat. In this study, the petition area was found to be one of two areas capable of sustaining a stable population in good years (Buehler et al. 2006). The authors suggested that in order to allow for a stable population, habitat loss should be minimized.

This species population has experienced a negative trend with an overall 3–4% decline in the last 30 years (USFWS 2006a). The USFWS was petitioned to list cerulean warbler as threatened under the Endangered Species Act. However, at the time of this review, the USFWS determined that the listing was not warranted (USFWS 2006a). As part of the review of the species status, the USFWS identified four primary mechanisms contributing to the species decline. Each of these contributors is caused by habitat loss.

1. Reduction in available nesting sites and suitable breeding territory characteristics because of loss or degradation of habitat.
2. Reduction in foraging success resulting from decreased prey abundance, primarily on the wintering grounds in South America.
3. Increased predation throughout the species' annual range and nest parasitism of cerulean warblers in their breeding grounds, resulting from habitat fragmentation.
4. Loss of migration habitat (USFWS 2006a).

Buehler et al. (2006) found that the 2005 Cumberland Mountain population “may compose >20% of the range-wide population.” Buehler and others predict that surface coal mining could displace upwards of 8,000 breeding pairs in the NCWMA or roughly 4% of the overall species population. Although reclamation of surface coal mining operations is required for SMCRA-permitted sites, Welton (2014) suggests that the methods would be “insufficient to replace [the] habitat in a biologically relevant timeframe.” Threats to cerulean warbler habitat include forest timber activities and land clearing for other activities.

The Tennessee State Wildlife Action Plan identifies a number of preferred and suitable habitats for this species, some of which occur in the NCWMA. Approximately 1,803 acres of South-Central Interior Mesophytic Forest—a preferred habitat—could be affected by potential surface coal mining operations. This accounts for 1.05% of the habitat in the evaluation area. Table 6-53 describes the cerulean warbler habitat that could be impacted under the no-action alternative.

**TABLE 6-53: CERULEAN WARBLER HABITAT POTENTIALLY AFFECTED BY SURFACE COAL MINING**

Habitat Type	Preference	Area Potentially Impacted by Surface Coal Mining (acres)	Percent of the Evaluation Area
South-Central Interior Mesophytic Forest	Preferred	1,803	1.05
Allegheny-Cumberland Dry Oak Forest and Woodland	Suitable	52,090	30.28
Appalachian (Hemlock)-Northern Hardwood Forest	Suitable	1,867	1.09
<b>Total</b>		<b>55,760</b>	<b>32.42</b>

Note: Actual acreage impacted would be restricted to an average of 112 acres per year or approximately 3,360 acres over a 30-year period.

In 2005, Buehler, Welton, and Beach (2006) estimated that the Cumberland Mountains in Tennessee provide over 80,000 hectare (roughly 198,000 acres) of potential cerulean warbler habitat. Buehler, Welton, and Beach studied potential warbler habitat for the Royal Blue Unit Wildlife Management Area and Sundquist Unit Wildlife Management Area. Buehler, Welton, and Beach predicted that 59% of the Royal Blue Unit was suitable habitat and that the unit could support approximately 1/3 of the Cumberland Mountains cerulean warbler populations (approximately 13,000 breeding pairs). Similarly, the study found that 50.5% of the Sundquist Unit was suitable cerulean warbler habitat that could support approximately 3,500 breeding pairs (Buehler, Welton, and Beach 2006). The study also found that the coal reserves on the Royal Blue Unit generally overlapped the same area as warbler habitat. In the long term, the removal of habitat during surface coal mining operations could result in cerulean warbler habitat loss of up to 24% of the potential habitat in the Cumberland Mountains. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year. OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions. Therefore, this loss of habitat would be limited and would take almost 500 years of surface coal mining to eliminate all cerulean warbler habitat in the evaluation area. In fact, over a 30-year period only 3,360 acres of the evaluation area would likely be subject to surface coal mining operations.

The TWRA has been developing a habitat conservation plan that establishes reserves of core breeding and foraging habitat and sets management strategies above elevations of 1,800 feet, such as no harvesting more than 10% of the habitat above 2,100 feet over 30 years (Welton 2014). Under the no-action alternative, approximately 36,651 acres of potentially mineable areas occur above 1,800 feet in elevation, roughly 21.3% of the evaluation area. In addition, previously mined areas that could be reclaimed above 1,800 feet total approximately 18,049 acres (though areas that were previously augered could not be feasibly remined). Although limited by the average annual mining rate (112 acres per year), any surface coal mining above 1,800 feet in elevation, including remining, would likely have a disproportionate impact on the cerulean warbler given its importance as core breeding habitat.

Edge effect and forest fragmentation can also limit cerulean warbler abundance and distribution (Wood, Bosworth, and Dettmers 2006). The presence of a forest edge can result in increased predation, brood parasitism, and species competitions and the effect can extend up to 150 feet into the forest (Wood, Bosworth, and Dettmers 2006). In 2005, Wood and others documented lower cerulean warbler territory density adjacent to reclaimed mine edges (Wood, Bosworth, and Dettmers 2006). Wood and others (2006) found that the effect of a “hard” edge created as a result of reclaimed mines extended over 1,000 feet into the forest. USFWS made a similar conclusion stating that the “introduction of hard edges may result in greater local population declines” and that the continued “degradation or removal of suitable

mature and old-growth hardwood forestland will result in reductions in nesting opportunities, and that accumulation of habitat losses is likely to result” in overall species decline (USFWS 2006a). In a review of the literature, Wood and others (2006) found that cerulean warblers were tolerant of edges such as forest gaps from roads, trails, and minimal silvicultural treatments, whereas they were negatively affected by “extensive hard edge of reclaimed mines.” Therefore it is unlikely that the warblers would be impacted by the edges created by access and haul roads. Table 6-54 provides the area where edge effects could be experienced by cerulean warblers and similar species as a result of new surface coal mining and remining based on forest fragmentation and edge resulting in effects out to 150 feet compared to edge effects associated with a “hard” edge out to 1,000 feet.

**TABLE 6-54: EDGE HABITAT POTENTIALLY CREATED BY SURFACE COAL MINING**

Type of Mining	Edge at 150 Feet (acres)	Edge 150-1,000 Feet (acres)
Surface Coal Mining	30,044	53,976
Remining	9,793	33,904
<b>Total</b>	<b>39,837</b>	<b>87,880</b>

When considering the potential loss of habitat through land conversion for surface coal mining operations and the potential impacts that the edge would have on degrading unconverted lands, the area of potential impact is quite large. However, this impact would be limited by the annual average rate of surface coal mining operations currently assumed to occur in the evaluation area (approximately 112 acres per year). Impacts to the cerulean warbler and other forest-dependent species is expected to be both direct and indirect and occur in the long term as new areas are identified for surface coal mining operations. If surface coal mining, including remining, were occur above 1,800 feet in elevation it is likely that impact would be adverse and significant over the long term.

The golden-winged warbler, a state species in need of management and one that is being evaluated for potential listing in the Endangered Species Act, is a small song bird that inhabits scrubby secondary growth, such as old surface mine benches. The species has been documented a number of times in the evaluation area (TDEC 2015b).

The Tennessee State Wildlife Action Plan identifies a number of preferred and suitable habitats for this species, some of which occur in the NCWMA. Preferred habitat for the golden-winged warbler is Cumberland Sandstone Glade and Barrens; however this habitat does not exist in the evaluation area. Suitable habitat in the evaluation area and the potential impacts from surface coal mining and remining are described in table 6-55.

**TABLE 6-55: GOLDEN-WINGED WARBLER HABITAT POTENTIALLY AFFECTED BY SURFACE COAL MINING**

Habitat Type	Preference	Area Potentially Impacted by Surface Coal Mining (acres)	Percent of the Evaluation Area
South-Central Interior Mesophytic Forest	Suitable	1,803	1.05
Allegheny-Cumberland Dry Oak Forest and Woodland	Suitable	52,090	30.28
Appalachian (Hemlock)-Northern Hardwood Forest	Suitable	1,867	1.09
<b>Total</b>		<b>55,760</b>	<b>32.42</b>

Note: Actual acreage impacted would be likely restricted to an average of 112 acres per year or approximately 3,360 acres over a 30-year period.

These potential impacts as described in the table merely reflect the habitat type that could be impacted by surface coal mining. This could result in some benefits to the golden-wing warbler and other species that require disturbed habitats and edge. Under the no-action alternative, surface coal mining operations would also create edge habitat, which may allow for increases in golden-winged warbler populations. Under the no-action alternative edge habitat (from the area of disturbance into the forest for approximately 100 feet) could be created on approximately 21,490 acres of potentially mineable areas; whereas 6,813 acres of edge habitat could be created in previously mined areas subject to re-mining (although some of these areas would not support re-mining). In addition, this would temporarily eliminate some warbler habitat during the re-mining operations. However, similar to the discussion of the cerulean warbler above, the creation of new habitat would be limited by the annual rate of surface coal mining in the evaluation area. In the long term, the no-action alternative could provide direct short-term adverse impacts during mining operations, but long-term indirect benefits through the creation of habitat.

The gray bat, a federally and state-endangered species, is a small migratory bat that resides exclusively in caves in forested areas. This species uses only eight caves in Tennessee for hibernation and USFWS (2014c) has no records of any gray bat hibernacula within or near the evaluation area. Gray bat foraging habitat consists of the open waters of streams, rivers, lakes, and reservoirs as they are highly dependent on aquatic insects (USFWS 2009b). It is estimated that gray bats forage within 10 feet of the surface of open water (USFWS 2009b). Given its strong affinity to open water and caves, this species is not being considered in the TWRA draft habitat conservation plan for activities on the NCWMA. Since the species presence is unlikely, the no-action alternative would have no impact on it. Gray bats may use open water areas in the evaluation area for feeding; however, all surface mining would be restricted within 100 feet of streams and therefore would not disrupt the bat's foraging opportunities. In the event the species is found within the evaluation area, impacts would be similar to those described for the Indiana bat in that gray bats could be temporarily disturbed when flying between caves and foraging areas and could avoid areas of active surface coal mining. Deep mining could result in benefits to gray bats as mine shafts could serve as hibernacula. Noise generated by surface mining operations may also impact gray bats. For a general discussion on noise impacts to wildlife see the section "Impacts of the Alternatives on the Natural Soundscape." Daytime noise generated by mining operations, such as the operation of heavy equipment and blasting, has the potential to disturb roosting bats causing them to expend energy during the day as they avoid the disturbance. However, noises such as blasting cease at dusk and would not interfere with bat feeding times.

The Indiana bat, a federally and state-endangered species, is a small bat that is a permanent resident in Tennessee and currently occurs in the NCWMA in portions of Campbell County. These bats are restricted to underground hibernacula of caves or cave-like condition (e.g., abandoned mines). In summer months, most roost sites are found under the shedding bark of dead trees 5 inches diameter at breast height or greater (USFWS 2007b). These roost sites require direct sunlight for half the day and are often found along wooded edges or forest gaps. Although the USFWS (2014c) has no records of any Indiana bat hibernacula within or near the evaluation area, the species may still use the NCWMA for foraging and roosting habitat. The closest documented Indiana bat hibernacula, New Mammoth Cave, a priority 1 / 2 category cave, is less than 2 miles from the evaluation area. Indiana bats typically forage in semi-open to closed forested habitats, forest edges, and riparian areas (USFWS 2007b).

The Tennessee State Wildlife Action Plan identifies a number of preferred and suitable habitats for this species, some of which occur in the NCWMA. TWRA identifies South-Central Interior Small Stream, and Riparian Areas as preferred habitat, although neither occurs in the evaluation area (TWRA 2015c). Suitable habitat in the evaluation area and the potential impacts from surface coal mining and re-mining are described in table 6-56. In addition, vegetation clearing for access road development would eliminate additional suitable roosting and foraging habitat. However, similar to the discussion of the cerulean

warbler above, the loss of habitat would be limited by the annual rate of surface coal mining in the evaluation area.

**TABLE 6-56: INDIANA BAT HABITAT POTENTIALLY AFFECTED BY SURFACE COAL MINING**

Habitat Type	Preference	Area Potentially Impacted by Surface Coal Mining (acres)	Percent of the Evaluation Area
Southern Appalachian Low-Elevation Pine Forest	Suitable	35	0.02
Allegheny-Cumberland Dry Oak Forest and Woodland	Suitable	52,090	30.28
Appalachian (Hemlock)-Northern Hardwood Forest	Suitable	1,867	1.09
South-Central Interior Mesophytic Forest	Suitable	1,803	1.05
<b>Total</b>		<b>55,795</b>	<b>32.44</b>

Note: Actual acreage impacted would be likely restricted to an average of 112 acres per year or approximately 3,360 acres over a 30-year period.

Besides the general loss of habitat, impacts to Indiana bats could occur as result of the loss of specific roosting areas by the removal of large trees (greater than 60 cm diameter at breast height) or the collapsing or filling of cave entrances (TWRA 2015c). Tree removal is typically restricted to the period of October 15 through March 31 to minimize disturbance (USFWS 2009c). However, even with measures in place, the Indiana bat could be affected by surface coal mining operations under the no-action alternative. Noise impacts would be the same as those described for gray bats above. Given the wide distribution of the species and the small amount of area cleared for surface coal mining per year, it is unlikely the impacts would be significant.

The northern long-eared bat, a federally threatened species, generally occurs in Scott and Campbell Counties in the central portion of the NCWMA. While the USFWS (2014c) does not have any northern long-eared bat hibernacula records within the evaluation area, they do have a hibernacula record within a mile of the southeast corner of evaluation area, just below the Buffalo Mountain Wind Farm. During summer months, northern long-eared bats roost and raise young in both live trees and snags, but can include caves and mines (USFWS 2015a). In most tracking studies, roost trees are primarily hardwoods (USFWS 2015a). Over 90% of the evaluation area is comprised of hardwood forests. Therefore, it is likely that northern long-eared bats are using forested habitats, small caves or abandoned mines within portions of the evaluation area. Noise impacts would be the same as those described for gray bats above. The Tennessee State Wildlife Action Plan did not identify any preferred or suitable habitat for this species.

The conversion of forests is one of the primary threats to summer habitat of the northern long-eared bat (USFWS 2015a). The removal of trees, like that necessary for conducting surface coal mining operations, can lead to the loss of suitable roosting or foraging habitat, fragmentation of forest patches, removal of travel corridors, and the direct injury or mortality of individual animals (USFWS 2015a). It is suggested that the loss of nursery trees and foraging areas from logging or other major land use changes could adversely impact local breeding populations (NatureServe 2010). Injury or mortality would likely occur during the tree removal process as bats are roosting and unable to move to other areas (USFWS 2015a).

Under the no-action alternative, potential surface coal mining and remaining operations could result in the clearing of 55,796 acres of forest habitat. This would equate to approximately 32.44% of the evaluation

area. In addition, vegetation clearing for access road development would eliminate additional suitable roosting and foraging habitat. Potential re-mining in the evaluation area could result in 17,687 acres (or a portion available for reclamation) of previously mine areas being redisturbed, areas that could provide roosting and foraging habitat for the bats.

Studies seem to indicate that northern long-eared bats prefer roosting habitat on upper and middle slopes, although the exact elevation is not reported (USFWS 2015a). However, many of the areas subject to surface coal mining operations are along ridgelines or in the upper slope area. For an example of potentially affected areas over 1,800 feet in elevation see the discussion on cerulean warbler above.

Mining operations, especially underground mining, can also affect bats through mine passage collapse and reclamation activities if mines are used by bats for hibernating (USFWS 2015a). This issue is somewhat mitigated through protections already put in place for species like the Indiana bat (USFWS 2015a).

Overall, it is expected that the northern long-eared bat could be affected by surface coal mining operations under the no-action alternative, although given the rate of surface coal mining and the wide distribution of the species, it is unlikely the impacts would be significant.

The northern pinesnake, a state threatened species, is an upland snake found in pine and mixed pine and oak forest habitats, and known to occur in Anderson and Morgan Counties. However, there have been no documented occurrences of the northern pinesnake in the NCWMA. As the name would indicate, pinesnakes are most often found in pine-dominated forests; however they spend their time in areas of these types of forests that have been disturbed. Pine forests make up about 0.43% of the evaluation area. Based on the TWRA draft habitat conservation plan, pinesnakes need large functional tracts of barrens or savannahs (greater than 1,000 acres); open, dry woodland habitat; and regular fires to open canopy and understory (NatureServe 2009). The Tennessee State Wildlife Action Plan identifies a number of preferred and suitable habitats for this species, some of which occur in the NCWMA. TWRA identifies Southern Appalachian Low-Elevation Pine Forest as preferred habitat (TWRA 2015c). Suitable habitat in the evaluation area and the potential impacts from surface coal mining and re-mining are described in table 6-57.

Given the lack of preferred habitat (approximately 35 acres) and lack of documented evidence of occurrence in the evaluation area, it is expected that the no-action alternative would have no impact on the northern pinesnake. However, if present the snake could be both adversely and beneficially impacted by surface coal mining operations. The clearing of vegetation to allow for surface coal mining operations could result in the injury or mortality of individuals unable to leave the area and reduce some of the already limited habitat. In addition, the development and use of roads could also lead to habitat loss or the injury or mortality of individual snakes (NatureServe 2009). However, the reclamation of surface coal mining operations could provide the large savannah-like openings that pinesnake prefer, providing benefits over time.

**TABLE 6-57: NORTHERN PINESNAKE HABITAT POTENTIALLY AFFECTED BY SURFACE COAL MINING**

Habitat Type	Preference	Area Potentially Impacted by Surface Coal Mining (acres)	Percent of the Evaluation Area
Southern Appalachian Low-Elevation Pine Forest	Preferred	35	0.02
Allegheny-Cumberland Dry Oak Forest and Woodland	Suitable	52,090	30.28
Appalachian (Hemlock)-Northern Hardwood Forest	Suitable	1,867	1.09
South-Central Interior Mesophytic Forest	Suitable	1,803	1.05
<b>Total</b>		<b>55,795</b>	<b>32.44</b>

Note: Actual acreage impacted would be likely restricted to an average of 112 acres per year or approximately 3,360 acres over a 30-year period.

**Plant Special-Status Species:** There are no known occurrences of the three federally listed special-status plant species in the evaluation area. Cumberland rosemary and Virginia spiraea prefer floodplain habitats and/or creek edges. Direct impacts to floodplains and streams would be extremely limited and would occur only at permitted stream crossings, as mining activities in streams are otherwise prohibited under federal (30 CFR §§ 816.57 and 817.57) and state law (2009 Tenn. Pub. Acts 289). It is unlikely that any stream crossing would be permitted in an area specifically known to contain special-status species, particularly federally listed species, which receive the highest levels of protection under the Endangered Species Act. Consequently it is highly unlikely that surface coal mining operations would impact these species, therefore alternative 1 would have no direct effect on the Cumberland rosemary, Virginia spiraea, or the Cumberland sandwort. Indirect effects would occur due to increased surface disturbance and the potential for introduction of nonnative, invasive plants into upstream portions of watersheds where Cumberland rosemary and Virginia spiraea occur, creating the potential for dispersal into occupied habitat downstream.

There are known occurrences of three state-listed plant special-status species (table 6-58) and suitable habitat for five additional plant special-status species in the evaluation area (table 6-58). Two additional state-listed species occur near the evaluation area. Seven of these species prefer forested habitat and three prefer wet areas including swamps and floodplains.

**TABLE 6-58: KNOWN OCCURRENCES OF PLANT SPECIAL-STATUS SPECIES**

Species	Proximity to Potential Surface Coal Mining and Remining Areas
Pale Corydalis	Within 1,600 feet
Butternut	Within 100 feet
Ozark bunchflower	Occurrence within potential mineable area
American ginseng	Occurrence within potential mineable area
Tuberclad rein-orchid	Occurrence within potential mineable area

The Ozark bunchflower occurs primarily on lower slopes and stream terraces in moist, hardwood forests, usually over basic soils. Similar to other interior-forest species, threats include logging and clearing of hardwood forests, among others (NatureServe 2014). As described in the petitioner's letter, there are only

nine known populations in Tennessee and two of those are within the NCWMA. These two documented populations occur above 1,800 feet within or adjacent to cerulean warbler core areas and within the State’s petition area.

In contrast to the Ozark bunchflower, the pale corydalis is found in two habitat types: rocky sites on dry to dry-mesic, well-drained, often acidic soils; and recently disturbed sites, including burned areas. Pale corydalis has a limited distribution and occurs in restricted, infrequent habitat (NatureServe 2014). Similar to the bunchflower, there are only two documented occurrences of this plant within the NCWMA. These plants are also found above 1,800 feet in the State’s petition area. Both of these species could be impacted under the no-action alternative depending where future surface coal mining operations are planned.

Under alternative 1, potential surface coal mining and remining operations could result in the clearing of 62,329 acres of suitable forest habitat and four acres of wetland habitat. This accounts for 35.92% of the habitat in the evaluation area. In addition, vegetation clearing for access road development would eliminate additional preferred habitat. Table 6-59 describes the plant special-status species habitat that could be impacted under alternative 1. As described in the table, these potential impacts merely reflect the habitat type that could be impacted by surface coal mining.

When considering the potential loss of habitat through land conversion for surface coal mining operations the area of potential impact is quite large. Impacts to plant special-status species is expected to be both direct and indirect and occur in the long term as new areas are identified for surface coal mining operations.

**TABLE 6-59: HABITAT TYPES POTENTIALLY AFFECTED BY SURFACE COAL MINING AND REMINING**

Habitat Type	Acres Potentially Impacted by Surface Coal Mining and Remining	Percent of the Evaluation Area
Deciduous Forest	59,812	34.73
Evergreen Forest	465	0.27
Mixed Forest	2,052	0.92
Wetland	4	<0.01
<b>Total</b>	<b>62,333</b>	<b>35.92</b>

Note: Actual acreage impacted would be likely restricted to an average of 112 acres per year or approximately 3,360 acres over a 30-year period.

Regulatory approval would be required for this action and performance standards related to location, design, construction, maintenance, and reclamation must be followed (30 CFR part 780; 30 CFR parts 816 and 817; 30 CFR part 942). Best management practices and performance standards, as described under “Applicable Statutes, Regulations, and Policies” would be implemented to minimize, but not eliminate the potential adverse impacts to plant special-status species from permitted lands and haul road development. Furthermore, any action that could potentially impact federally listed species would require consultation with USFWS.

Overall, it is expected that state-listed plant special-status species could be affected by surface coal mining operations under the alternative 1. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or

other free market conditions. Therefore given this expected rate of surface coal mining, it is unlikely the impacts would be significant.

### **Cumulative Impacts**

**Aquatic Special-Status Species:** Coal mining and haul road construction and maintenance activities upstream or adjacent to the evaluation area would cause sedimentation and water quality degradation and thus impact special-status aquatic species, although impacts would be minimized by compliance with best management practices along with all applicable regulations and permit conditions. In addition, other actions such as timber harvest, oil and gas development, recreation development, and recreational use could degrade water conditions over time and have detrimental impacts on aquatic habitat. The impacts of alternative 1, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on aquatic special-status species. The no-action alternative would contribute substantially to the overall adverse cumulative impacts to special-status aquatic species.

**Terrestrial Special-Status Species:** Habitat loss and degradation results in some of the largest impacts to those special-status species being evaluated. In addition, white nose syndrome—a fungal infection decimating bat colonies throughout the eastern United States—would continue to result in bat mortality and could result in added need for protections. Past and present cumulative actions that have impacted terrestrial habitat in the evaluation area include pre- and post-SMCRA surface coal mining, underground mining, timber harvest, oil and gas production, electrical and gas transmission, and recreation. These actions have converted, removed, and fragmented habitat, resulting in habitat edges, mixed-aged forests, and resulted in direct disturbances, injuries, and mortality to terrestrial special-status species and populations. Many of these activities are expected to continue into the future. Timber harvest practices on approximately 75,145 acres will likely change after 2017 when timber rights transfer to TWRA, likely providing habitat improvements to multiple species. The impacts of alternative 1, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on terrestrial special-status species. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions. Therefore, based on the expected level of surface mining, the no-action alternative would not likely contribute substantially to the overall adverse cumulative impacts to special-status terrestrial species. However, this conclusion would be further informed based on where surface coal mining operations would occur. For example, if mining operations were concentrated in particularly important habitat to a special-status species, then when combined with other actions, it could contribute substantially to the overall adverse impacts.

**Plant Special-Status Species:** Past, present, and reasonably foreseeable future coal mining and oil and gas production activities would have adverse impacts on plant special-status species. Coal mining activities have occurred within the petition area at varying levels of intensity for more than 100 years (TWRA n.d.). There are 289 oil and gas wells within the boundaries of the evaluation area. The majority of these wells are located in the northeastern portion of the evaluation area within the Upper Cumberland River watershed and in the southwestern portion of the evaluation area within the South Fork Cumberland and Emory River watersheds. Drilling and production operations could cause direct loss of plant special-status species as a result of clearing, contouring, construction, and maintenance of pads, roads, flowlines, pipelines, and other ancillary facilities. Site preparation may include clearing, grading, cutting, filling, and leveling of the pad using heavy equipment. Impacts from the continued use of access and haul roads that support oil and gas production would have long-term direct adverse impacts on plant special-status species due to removal of undetected plant special-status species.

Present and future mining, timber harvesting, oil and gas production, and present development and construction would have long-term adverse impacts to individual undetected special-status plant species that are removed during clearing activities related to these activities.

The impacts of alternative 1, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on plant special-status species if there is a loss of any undetected special-status plant species. If this occurred from surface mining, alternative 1 could contribute substantially to the overall cumulative impacts.

## **Conclusion**

Alternative 1 (no action) would have near- and long-term adverse impacts to aquatic and terrestrial special-status species. Surface mining and related activities would result in increased sedimentation of streams and other water bodies within and adjacent to the petition area, resulting in the potential for habitat degradation for some aquatic special-status species within the evaluation area. Habitat loss and degradation and the potential for injury or mortality could occur for both aquatic and terrestrial species. Some species may benefit from active reclamation of mine sites. Depending on where surface coal mining operations occurred, some species could experience significant adverse impact to important habitat areas. Alternative 1 would have a greater potential than existing conditions to adversely affect undetected special-status plant species and their habitat and would have long-term adverse impacts to plant special-status species due to habitat loss. Best management practices and compliance with applicable regulations and permit conditions would minimize, but not eliminate impacts to this resource.

## **ALTERNATIVE 2: STATE PETITION DESIGNATION**

Under alternative 2, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State's petition. Under this alternative, 505 miles of ridgelines with a 1,200-foot corridor (600 feet on both sides of the ridgeline) would be designated as unsuitable for surface coal mining.

## **Direct and Indirect Impacts**

**Aquatic Special-Status Species:** Alternative 2 would result in near- and long-term indirect beneficial impacts to aquatic special-status species. The prohibition of additional mining activities would serve to protect aquatic species and habitat within petition area, and could potentially help facilitate ecosystem and species recovery, representing a long-term beneficial impact.

Impacts to aquatic special-status species would occur in portions of the Cumberland River and Clinch River watersheds within the evaluation area. There would be no surface coal mining in the Emory River, thus the Emory River watershed would not be impacted. Under alternative 2, five special-status species within the evaluation area could potentially be adversely impacted. These species include ashy darter, blackside dace, Cumberland arrow darter, silverjaw minnow, and Cumberland elktoe. Although not listed as threatened or endangered at the federal or state level, two species, emerald darter and rosyface shiner, are "deemed in need of management" at the state level in Tennessee, and may also occur within the buffer area used to analyze alternatives from possible mining activities and may also be impacted under alternative 2. No other special-status fish species potentially occurring within the evaluation area are known to occur within the buffer area used to analyze alternatives from possible mining activities. However, if present, impacts would be the same as those for other listed species. Potential impacts to aquatic special-status species under alternative 2 are presented in tables 6-50, 6-51 and 6-52. Alternative 2 may result in indirect adverse impacts to known habitat for those species shown in table 6-60. However, alternative 2 still provides greater protection to all aquatic special-species and their habitats than the no-

action alternative, resulting in overall beneficial impacts compared to the no-action alternative. Tables 6-51 and 6-52 show impacts on listed mollusks and other aquatic species. Overall impacts result in improved conditions in comparison to under the no-action alternative.

**TABLE 6-60: AQUATIC SPECIAL-STATUS SPECIES HABITAT POTENTIALLY IMPACTED UNDER ALTERNATIVE 2**

Species	Miles of Habitat Potentially Impacted
Ashy darter	2.41
Blackside dace	1.23
Cumberland arrow darter	1.37
Silverjaw minnow	1.37
Cumberland elktoe	0.17

**Terrestrial Special-Status Species:** Bewick's wren, a state endangered species, is typically found in rural, agricultural areas with brushy hedgerows and old buildings. There are no known occurrences of this species in the evaluation area. The closest confirmed sighting is in Rutherford County, Tennessee over 90 miles away from the evaluation area. The wren's preferred habitat makes up less than 1% of the evaluation area, which is over 90% forested. Consequently, alternative 2 would have no impact on the Bewick's wren.

The northern saw-whet owl, a state threatened species, inhabits spruce-fir forests above 5,000 feet in elevation. There are no known occurrences of this species in the evaluation area. Although there is a small portion of the evaluation area made up of evergreen forest (approximately 0.43%), none of the area is above 5,000 feet in elevation. The highest points in the evaluation area are under 3,500 feet in elevation. Given the lack of suitable habitat for the northern saw-whet owl, it is expected that the alternative 2 would have no impact on the northern saw-whet owl.

The cerulean warbler, a USFWS bird of conservation concern, is a small neotropical migrant interior forest species. A recent study documented that of 365 cerulean warblers detected in the NCWMA, 91% of the birds, and 95% of the high-density sites are located in the petition area or within 100 feet of the petition area boundary (Welton 2014).

The Tennessee State Wildlife Action Plan identifies a number of preferred and suitable habitats for this species, some of which occur in the NCWMA. This alternative could result in up to 18,431 acres of cerulean warbler habitat being protected. Table 6-61 describes the cerulean warbler habitat that could be protected under alternative 2.

**TABLE 6-61: CERULEAN WARBLER HABITAT POTENTIALLY PROTECTED**

Habitat Type	Preference	Acres Potentially Protected	Percent of the Evaluation Area Impacted
South-Central Interior Mesophytic Forest	Preferred	615	0.36
Allegheny-Cumberland Dry Oak Forest and Woodland	Suitable	17,321	10.07
Appalachian (Hemlock)-Northern Hardwood Forest	Suitable	495	0.29
<b>Total</b>		<b>18,431</b>	<b>10.72</b>

The TWRA has been developing a habitat conservation plan that establishes reserves of core breeding and foraging habitat and sets timber management strategies above elevations of 1,800 feet, such as limiting the types of silvicultural practices that could occur or limiting harvest to no more than 10% of the habitat above 2,100 feet over 30 years (Welton 2014). Under alternative 2, approximately 19,483 acres of potentially mineable area that occurs above 1,800 feet in elevation could be protected, roughly 11.3% of the evaluation area.

As described above, edge effect and forest fragmentation limit cerulean warbler abundance and distribution. Since surface coal mining operations (including remining) would not occur under alternative 2, there would be no impacts associated with the creation of new edge habitat. This would result in the protection of an additional 16,937 acres of forest habitat from being degraded within 150 feet of a potentially mineable area. This area would increase to 54,742 acres within 1,000 feet of a potentially mineable area.

Overall, alternative 2 would result in the protection of cerulean warbler habitat in high-use areas (over 1,800 feet in elevation) compared to the no-action alternative. In addition it would not allow for the creation of any additional edge habitat further impacting intact habitat. Therefore alternative 2 would not result in any direct or indirect adverse impacts, but could result in substantial benefits through the protection of habitat for the warbler and other forest-dependent species.

The golden-winged warbler, a state species in need of management and one that is being evaluated for potential listing in the Endangered Species Act, is a small song bird that inhabits scrubby secondary growth, such as old surface mine benches. The species has been documented a number of times in the evaluation area. As describe above, the Tennessee State Wildlife Action Plan identifies a number of suitable habitats for this species, some of which occur in the NCWMA. This alternative could result in up to 18,431 acres of warbler habitat being protected. Table 6-62 describes the golden-winged warbler habitat that could be protected under alternative 2.

**TABLE 6-62: GOLDEN-WINGED WARBLER HABITAT POTENTIALLY PROTECTED**

Habitat Type	Preference	Acres Potentially Protected	Percent of the Evaluation Area Impacted
South-Central Interior Mesophytic Forest	Suitable	615	0.36
Allegheny-Cumberland Dry Oak Forest and Woodland	Suitable	17,321	10.07
Appalachian (Hemlock)-Northern Hardwood Forest	Suitable	495	0.29
<b>Total</b>		<b>18,431</b>	<b>10.72</b>

Note: Actual acreage impacted would be likely restricted to an average of 112 acres per year or approximately 3,360 acres over a 30-year period.

In addition, alternative 2 would not allow for the remining of previously mined areas. This would result in protecting existing edge habitat created by old surface mine benches. Unless managed for early successional species, these areas would likely return to forested conditions in the long term. The inability to remine under this alternative would result in maintaining approximately 9,078 acres in edge-type habitat potentially benefitting the golden-winged warbler and other early successional species.

The gray bat, a federally and state-endangered species, is a small migratory bat that resides in caves in forested areas. This species uses only eight caves in Tennessee for hibernation and USFWS (2014c) has no records of any gray bat hibernacula within or near the evaluation area. In addition, this species is not

being considered in the TWRA draft habitat conservation plan for activities on the NCWMA. Since the species presence is unlikely, alternative 2 would have no impact on it. In the event the species is found within the evaluation area, impacts would be similar to those described for the Indiana bat.

The Indiana bat, a federally and state-endangered species, is small bat that is a permanent resident in Tennessee and currently occurs in the NCWMA in portions of Campbell County. Although the USFWS (2014) has no records of any Indiana bat hibernacula within or near the evaluation area, the species may still use the NCWMA for foraging and roosting habitat. An Indiana bat hibernacula, New Mammoth Cave, a priority 1 / 2 category cave, is less than 2 miles from the evaluation area. This alternative could result in up to 18,436 acres of Indiana bat habitat being protected and potentially improved if uncleared areas are allowed to mature and large snags develop over time. Table 6-63 describes the Indiana bat habitat that could be protected under alternative 2.

In addition to the potential roost and foraging areas protected under alternative 2, additional habitat would also be protected as a result of the inability to remine and reclaim previously mined area. This could result in an additional 9,086 acres of roosting and foraging habitat protected from future operations.

Underground mining outside the petition area could still occur and may provide some additional benefits, as caves and mine shafts could be used as hibernacula sites.

**TABLE 6-63: INDIANA BAT HABITAT POTENTIALLY PROTECTED**

Habitat Type	Preference	Acres Potentially Protected	Percent of the Evaluation Area Impacted
Southern Appalachian Low-Elevation Pine Forest	Suitable	5	0.003
Allegheny-Cumberland Dry Oak Forest and Woodland	Suitable	17,321	10.07
Appalachian (Hemlock)-Northern Hardwood Forest	Suitable	495	0.29
South-Central Interior Mesophytic Forest	Suitable	615	0.36
<b>Total</b>		<b>18,436</b>	<b>10.72</b>

Note: Actual acreage impacted would be likely restricted to an average of 112 acres per year or approximately 3,360 acres over a 30-year period.

Overall, alternative 2 would result in short- and long-term benefits for the Indiana bat.

The northern long-eared bat, a federally threatened species, generally occurs in Scott and Campbell Counties in the central portion of the NCWMA. Alternative 2 would protect potential roosting and foraging habitat from tree clearing associated with surface coal mining operations. Overall, alternative 2 would protect approximately 18,436 acres, same as for the Indiana bat above. As with the Indiana bat, additional habitat would also be protected as a result of the inability to remine and reclaim previously mined area—approximately 9,086 acres and potentially improved if uncleared areas are allowed to mature and large snags develop over time. Of the acres protected, many would likely occur in preferred roosting habitat on upper and middle slopes.

Underground mining outside the petition area could still occur and may provide some additional benefits in terms of caves and mine shafts for use as hibernacula sites.

Overall, the protections established through alternative 2 would result in short- and long-term benefits to the northern long-eared bat.

The northern pinesnake, a state threatened species, is an upland snake found in pine and mixed pine and oak forest habitats, and known to occur in Anderson and Morgan Counties. However, there have been no documented occurrences of the northern pinesnake in the NCWMA. Alternative 2 would prohibit surface coal mining operations from preferred and suitable pinesnake habitat within the petition area totaling approximately 18,436 acres. Table 6-64 describes the northern pinesnake habitat that would be protected under alternative 2.

In addition to prohibiting new surface coal mining operations, alternative 2 would prohibit remining and associated reclamation activities. This would provide additional benefits to the pinesnake as many previously mined areas provide open habitat preferred by the snake. Alternative 2 would secure an additional 9,086 acres of potential snake habitat from being further modified through remining and reclamation. Alternative 2 would provide both short- and long-term benefits to the northern pinesnake.

**TABLE 6-64: NORTHERN PINESNAKE HABITAT POTENTIALLY PROTECTED**

Habitat Type	Preference	Area Potentially Protected (acres)	Percent of the Evaluation Area
Southern Appalachian Low-Elevation Pine Forest	Preferred	5	0.003
Allegheny-Cumberland Dry Oak Forest and Woodland	Suitable	17,321	10.07
Appalachian (Hemlock)-Northern Hardwood Forest	Suitable	495	0.29
South-Central Interior Mesophytic Forest	Suitable	615	0.36
<b>Total</b>		<b>18,436</b>	<b>10.72</b>

Note: Actual acreage impacted would be likely restricted to an average of 112 acres per year or approximately 3,360 acres over a 30-year period.

**Plant Special-Status Species:** Alternative 2 would have less potential for adverse impacts to special-status plant species and greater long-term beneficial impacts than alternative 1. Beneficial impacts would result due to the preclusion of surface coal mining operations in the future and by preventing the loss of undetected special-status plant species and their habitat during clearing activities.

There are no known occurrences of the three federally listed plant special-status species in the petition area under alternative 2. Consequently it is highly unlikely that surface coal mining operations would impact these species, therefore alternative 2 would have no impact on the Cumberland rosemary, Virginia spiraea, or the Cumberland sandwort.

Seven state-listed plant special-status species prefer forested habitat and three prefer wet areas including swamps and floodplains. Approximately 17.3 acres of palustrine artificial manmade or altered wetlands and wetlands created or modified by beaver could be protected from potential surface coal mining under alternative 2, there are no documented occurrences of these species. However, there are known occurrences of two state-listed plant special-status species and suitable habitat for five additional plant special-status species in the petition area (table 6-65). Three additional state-listed plant special-status species occur near the petition area. Under alternative 2 approximately 31,079 acres of forested habitat could potentially be protected from surface coal mining and remining operations. This accounts for

18.04% of the habitat in the evaluation area. In addition, because vegetation clearing for access road development would not occur, additional habitat would be protected. Impacts to Ozark bunchflower and pale corydalis would be unlikely in the petition areas as a result of alternative 2. Table 6-66 describes the plant special-status species habitat that could be protected under alternative 2. As described in the table, these potential acres of habitats merely reflect the habitat type that could be protected by surface coal mining.

Designation of the area as unsuitable for coal mining under alternative 2 would have long-term beneficial impacts compared to alternative 1 by preventing the loss of undetected special-status plant species and their habitat during clearing activities related to mining.

**TABLE 6-65: KNOWN OCCURRENCES OF PLANT SPECIAL-STATUS SPECIES**

Species	Proximity to Surface Coal Mining and Remining Areas*
Pale Corydalis	Within 1,900 feet
Butternut	Within 200 feet
Ozark bunchflower	Occurrence within potential mineable area
American ginseng	Occurrence within potential mineable area
Tuberclcd rein-orchid	Within 1,200 feet

\*Distances based on documented locations

**TABLE 6-66: HABITAT TYPES POTENTIALLY PROTECTED FROM SURFACE COAL MINING AND REMINING**

Habitat Type	Acres Potentially Protected from Surface Coal Mining and Remining by Alternative 2	Percent of the Evaluation Area Impacted
Deciduous Forest	30,214	17.54
Evergreen Forest	328	0.19
Mixed Forest	537	0.31
Wetland	0	0.00
<b>Total</b>	<b>31,079</b>	<b>18.04</b>

Note: Actual acreage impacted would be likely restricted to an average of 112 acres per year or approximately 3,360 acres over a 30-year period.

**Cumulative Impacts**

**Aquatic Special-Status Species:** Other actions such as timber harvest, oil and gas development, recreation development, and recreational use could degrade water conditions over time and could have detrimental impacts on aquatic habitat upstream or adjacent to the petition area. These actions would continue to impact aquatic special-status species due to sedimentation and water quality degradation, although impacts would be minimized by compliance with best management practices along with all applicable regulations and permit conditions. The impacts of alternative 2, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on aquatic special-status species. However, alternative 2 would not contribute to adverse cumulative impacts, but could help offset them by providing overall benefit.

**Terrestrial Special-Status Species:** As described under the no-action alternative, habitat loss and degradation results in some of the largest impacts to those special-status species being evaluated. Past and present cumulative actions that have impacted terrestrial habitat in the evaluation area include pre- and

post-SMCRA surface coal mining, underground mining, timber harvest, oil and gas production, electrical and gas transmission, and recreation. These actions have converted, removed, and fragmented habitat, resulting in habitat edges, mixed-aged forests, and resulted in direct disturbances, injuries, and mortality to terrestrial special-status species and populations. Many of these activities are expected to continue into the future. Timber harvest practices will likely change after 2017 when timber rights for a portion of the evaluation area transfer to TWRA, likely providing habitat improvements to multiple species. The impacts of alternative 2, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on terrestrial special-status species. However, alternative 2 would protect important habitat areas from future surface coal mining operations. This would provide benefits to special-status species and would not contribute to overall adverse cumulative impacts.

**Plant Special-Status Species:** Past and present cumulative actions that have impacted plant special-status species in the evaluation area include pre- and post-SMCRA surface coal mining, underground mining, timber harvest, oil and gas production, and development and construction. Cumulative impacts on plant special-status species in the evaluation area would be adverse, as described under alternative 1. However, the intensity of these future cumulative impacts would be less under alternative 2 than alternative 1. Alternative 2 would seek to protect plant special-status species from future surface coal mining operations. The impacts of alternative 2, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on plant special-status species. The adverse and beneficial impacts of alternative 2 overall would not significantly contribute to the cumulative impacts to plant special-status species.

## **Conclusion**

Alternative 2 would result in near- and long-term beneficial impacts to aquatic and terrestrial special-status species. The protection of lands within the petition area from future mining activities would result in long-term beneficial impacts to special-status species and habitats by limiting the potential for further injury and potentially facilitating ecosystem recovery.

Alternative 2 would have long-term direct and indirect beneficial impacts to plant special-status species. The protection of plant habitat within the petition area from future mining activities would result in increased beneficial impacts compared to alternative 1. No new or additional adverse impacts would occur compared to the no-action alternative. Alternative 2 would not result in significant adverse impacts.

## **ALTERNATIVE 3: STATE PETITION DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS**

Under alternative 3, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State's petition with a 1,200-foot ridgeline corridor, as described under alternative 2. Unlike alternative 2, alternative 3 would not prohibit remining (pursuant to 30 CFR chapter VII), but would require reclamation. Alternative 3 would also allow construction and maintenance of haul roads inside the designation area.

## **Direct and Indirect Impacts**

**Aquatic Special-Status Species:** Alternative 3 would result in near- and long-term adverse indirect impacts to aquatic special-status species due to runoff, sedimentation, and potential contamination of surface waters associated with the construction and maintenance of haul roads inside the designation area. Potential remining under alternative 3 may contribute to near-term impacts to aquatic special-status species due to increased movement of sediments or contaminants and associated degradation of water

quality. However, reclamation of lands previously mined prior to the implementation of SMCRA in 1977 and left unreclaimed could result in long-term benefits for aquatic special-status species.

Under alternative 3, five special-status species within the evaluation area could potentially be adversely impacted. These species include ashy darter, blackside dace, Cumberland arrow darter, silverjaw minnow, and Cumberland elktoe. Although not listed as threatened or endangered at the federal or state level, two species, emerald darter and rosyface shiner, are “deemed in need of management” at the state level in Tennessee, and may also occur within the buffer area used to analyze alternatives from possible mining activities and may also be impacted under alternative 3. No other special-status fish species potentially occurring within the evaluation area are known to occur within the buffer area used to analyze alternatives from possible mining activities. However, if present, impacts would be the same as those for other listed species. Potential impacts to aquatic special-status species under alternative 3 are presented in tables 6-50, 6-51 and 6-52. Best management practices and compliance with applicable regulations and permit conditions would minimize, but not eliminate impacts to this resource. Alternative 3 would have beneficial impacts to aquatic special-status species and habitats by limiting potential for further injury and potentially facilitating ecosystem recovery. Alternative 3 may result in indirect adverse impacts to known habitat for those species shown in table 6-67. However, alternative 3 still provides greater protection to all aquatic special-species and their habitats than the no-action alternative, resulting in overall beneficial impacts than under the no-action alternative. Tables 6-51 and 6-52 show impacts on listed mollusks and other aquatic species. Overall impacts would result in improved conditions in comparison to the no-action alternative.

**TABLE 6-67: AQUATIC SPECIAL-STATUS SPECIES HABITAT POTENTIALLY IMPACTED UNDER ALTERNATIVE 3**

Species	Miles of Habitat Potentially Impacted
Ashy darter	2.41
Blackside dace	1.23
Cumberland arrow darter	1.37
Silverjaw minnow	1.37
Cumberland elktoe	0.17

**Terrestrial Special-Status Species:** Bewick’s wren, a state endangered species, is typically found in rural, agricultural areas with brushy hedgerows and old buildings. As previously described, there are no known occurrences of this species in the evaluation area. Consequently, alternative 3 would have no impact on the Bewick’s wren.

The northern saw-whet owl, a state threatened species, inhabits spruce-fir forests above 5,000 feet in elevation. There are no known occurrences of this species in the evaluation area. Given the lack of suitable habitat for the northern saw-whet owl, it is expected that the alternative 3 would have no impact on the northern saw-whet owl.

The cerulean warbler would benefit from alternative 3 in both the short and long term. Under alternative 3, similar amounts of habitat would be protected, as described above for alternative 2. In addition, previously mined areas would be subject to remining and reclamation, which could help to re-establish forest conditions in the long term. Under alternative 3, approximately 9,078 acres could be remined and reclaimed over time (a portion of the estimated mining rate of approximately 112 acres per year). Many of these acres would be above 1,800 feet in elevation—preferred by cerulean warblers. However, reclaimed areas would take considerable time (over 60 years) to reach a stage where cerulean warblers may use portions of it.

Potential remining and reclamation in areas that have already experienced some level of natural revegetation would result in the creation of new edges in the short term, which could result in adverse impacts to warblers. Under alternative 3, this could impact approximately 7,317 acres within 150 feet of a previously mined area and 32,383 acres within 1,000 feet.

Overall, alternative 3 would result in both short- and long-term adverse and beneficial impacts to the cerulean warbler and other forest-dependent species. The protection of interior forest breeding habitat would help protect the species in both the short and long term. However, some edge effects and habitat fragmentation created during remining and reclamation activities could result in short- and long-term adverse impacts, although impacts would be less than under the no-action alternative, because there would be no new mining. Some marginal habitat surrounding pre-SMCRA mine sites may be disturbed during the remining process, however, it is unlikely to affect the breeding population and core habitat of the cerulean warblers in the NCWMA.

The golden-winged warbler, a state species in need of management has been documented a number of times in the evaluation area. Under alternative 3, this warbler would likely experience both adverse and beneficial impacts. As with alternative 2, alternative 3 could result in up to 27,509 acres of warbler habitat being protected. In addition, the golden-winged warbler would receive additional benefits through remining and reclamation activities. As described above, this could result in 9,086 acres of previously mined areas returning to early successional habitat, resulting in short- and long-term benefits to the warbler, depending on the goals of reclamation. However, these benefits must be weighed in light of the annual rate of surface coal mining as these benefits would occur over the very long term. Short-term adverse impacts would result from remining operations and the associated disturbance of the species and its habitat.

The gray bat, a federally and state-endangered species, is a small migratory bat that resides in caves in forested areas. This species uses only eight caves in Tennessee for hibernation and USFWS (2014c) has no records of any gray bat hibernacula within or near the evaluation area. Since the species presence is unlikely, alternative 3 would have no impact on it. In the event the species is found within the evaluation area, impacts would be similar to those described for the Indiana bat.

Under alternative 3, the Indiana bat, a federally and state-endangered species, would likely benefit from the prohibition on surface coal mining operations. As described for alternative 2 above, approximately 18,436 acres of potential Indiana bat habitat would be protected in the petition area, resulting in long-term benefits to the species in terms of roosting and foraging habitat.

Alternative 3 would also allow for the potential remining and reclamation of previously mined areas. Under alternative 3, approximately 9,086 acres could be subject to potential remining and reclamation. This could result in redisturbing areas that could provide roosting and foraging habitat for the bats. Roosting bats that are unable to leave the area prior to tree removal associated with remining could be injured or killed. However similar to the discussion of the cerulean warbler above, the loss of habitat would be limited by the annual rate of surface coal mining in the evaluation area. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions. Vegetation clearing for access road development could eliminate additional suitable roosting and foraging habitat and/or lead to additional bat injury or mortality.

Overall, alternative 3 would provide both short- and long-term benefits to the Indiana bat in terms of roosting and habitat protection. However, potential remining activities, including clearing areas and the

construction of access and haul roads, could have short-term adverse impacts. Although it is unlikely that impacts would be significant in nature, the Indiana bat could be adversely impacted if present in the petition area.

The northern long-eared bat, a federally threatened species, generally occurs in Scott and Campbell Counties in the central portion of the NCWMA. Impacts to the northern long eared bat would be similar to those described above for the Indiana bat. Northern long-eared bats may receive additional benefits given the elevation of protected habitat being in more preferred habitat. Overall, alternative three would provide beneficial impacts related to habitat protection, but could result in adverse effects similar to the Indiana bat. Although it is unlikely that impacts would be significant in nature they may adversely affect the northern long-eared bat, if present in the petition area.

The northern pinesnake is a state threatened species; however, there have been no documented occurrences of the northern pinesnake in the NCWMA. As described above for alternative 2, alternative 3 would result in long-term benefits through the protection of 18,436 acres of potential habitat from surface coal mining operations. However, alternative 3 would also allow remining and reclamation activities, including the construction of access and haul roads. This would result in short-term adverse impacts to approximately 9,086 acres of previously mined areas, as areas are cleared of vegetation and remined. Potential remining and road development could result in injury or mortality if snakes are unable to leave the area prior to disturbance. However, reclamation in the long term would provide open habitat preferred by the pinesnake, resulting in benefits over time. Overall, alternative 3 would result in both short- and long-term benefits, although some short-term adverse impacts from remining activities are likely. If present in the petition area, alternative 3 would not likely result in significant adverse effects to the northern pinesnake.

**Plant Special-Status Species:** There are no known occurrences of the three federally listed plant special-status species in the petition area under alternative 3. Cumberland rosemary and Virginia spiraea prefer floodplain habitats and/or creek edges. Direct impacts to floodplains and streams would be extremely limited and would occur only at permitted stream crossings, as mining activities in streams are otherwise prohibited under federal (30 CFR §§ 816.57 and 817.57) and state law (2009 Tenn. Pub. Acts 289). It is unlikely that any stream crossing would be permitted in an area specifically known to contain special-status species, particularly federally listed species, which receive the highest levels of protection under Endangered Species Act. Consequently it is highly unlikely that remining operations would impact these species, therefore alternative 3 would have no impact on the Cumberland rosemary, Virginia spiraea, or the Cumberland sandwort.

Alternative 3 would have less potential for adverse impacts to special-status plant species and greater long-term beneficial impacts than alternative 1. These impacts to plant special-status species are described under “General Impacts of Coal Mining in Tennessee on Special-Status Species.” Beneficial impacts would result due to the preclusion of surface coal mining operations in the future and by preventing the loss of undetected special-status plant species and their habitat during clearing activities.

Seven state-listed plant special-status species prefer forested habitat and three prefer wet areas including swamps and floodplains. Approximately 17 acres of palustrine artificial manmade or altered wetlands and wetlands created or modified by beaver could be protected from potential surface coal mining under alternative 3. However, there are no documented occurrences of these species. There are known occurrences of two state-listed plant special-status species (table 6-61) and suitable habitat for five additional plant special-status species in the petition area (table 6-68). Three additional state-listed plant special-status species occur near the petition area. Approximately 11,070 acres of vegetation could be affected by potential remining operations under alternative 3. However, previously mined areas that would be remined would also be reclaimed (though areas that were previously augered could not be

feasibly remined). In addition, vegetation clearing for access road development would eliminate additional preferred habitat. Under alternative 3 approximately 20,009 acres of forested habitat could potentially be protected from surface coal mining operations. This accounts for 11.62% of the habitat in the evaluation area. Table 6-69 describes the plant special-status species habitat that could be protected or affected under alternative 3. As described in the table, these potential acres of habitat merely reflect the habitat type that could be protected by surface coal mining.

Overall, alternative 3 would result in the protection of plant special-status species and greater long-term beneficial impacts than under alternative 1. Alternative 3 would result in direct or indirect adverse impacts, but could result in substantial benefits through the protection of special-status plant species and the reclamation of lands previously mined prior to the implementation of SMCRA in 1977 and left unreclaimed.

**TABLE 6-68: KNOWN OCCURRENCES OF PLANT SPECIAL-STATUS SPECIES**

Species	Proximity to Potential Surface Coal Mining and Remining Areas
Pale Corydalis	Within 1,900 feet
Butternut	Within 200 feet
Ozark bunchflower	Occurrence within potential mineable area
American ginseng	Occurrence within potential mineable area
Tuberclad rein-orchid	Within 1,200 feet

**TABLE 6-69: HABITAT TYPES POTENTIALLY AFFECTED BY SURFACE COAL MINING AND REMINING**

Habitat Type	Acres Potentially Protected from Surface Coal Mining	Acres Potentially Impacted by Remining	Percent of the Evaluation Area
Deciduous Forest	19,527	10,687	17.54
Evergreen Forest	189	139	0.19
Mixed Forest	293	244	0.31
Wetland	0	0	0.00
<b>Total</b>	<b>20,009</b>	<b>11,070</b>	<b>18.04</b>

### Cumulative Impacts

**Aquatic Special-Status Species:** Similar to alternative 2, other actions such as timber harvest, oil and gas development, recreation development, and recreational use could degrade water conditions over time and could have detrimental impacts on aquatic habitat. These actions upstream or adjacent to the designation area would continue to impact aquatic special-status species due to sedimentation and water quality degradation, although impacts would be minimized by compliance with best management practices along with all applicable regulations and permit conditions. The impacts of alternative 3, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on aquatic special-status species. However, alternative 3 would not contribute substantially to overall cumulative adverse impacts. Reclamation of lands previously mined prior to the implementation of SMCRA could help offset result in long-term benefits.

**Terrestrial Special-Status Species:** As described under the no-action alternative, habitat loss and degradation results in some of the largest impacts to those special-status species being evaluated. Past and present cumulative actions that have impacted terrestrial habitat in the evaluation area include pre- and post-SMCRA surface coal mining, underground mining, timber harvest, oil and gas production, electrical and gas transmission, and recreation. Many of these activities are expected to continue into the future. Timber harvest practices will likely change after 2017 when timber rights for a portion of the evaluation area transfer to TWRA, likely providing habitat improvements to multiple species.

The impacts of alternative 3, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on terrestrial special-status species. However, alternative 3 would protect important habitat areas from future surface coal mining operations. This would provide benefits to special-status species. Potential remining and reclamation would also occur under alternative 3, which would result in short-term adverse impacts to some species but would provide overall long-term benefits. Overall, alternative 3 would not contribute substantially to overall adverse cumulative impacts.

**Plant Special-Status Species:** Similar to alternative 2, past and present cumulative actions that have impacted plant special-status species in the evaluation area include pre- and post-SMCRA surface coal mining, underground mining, timber harvest, oil and gas production, and development and construction. Cumulative impacts on plant special-status species in the evaluation area would be adverse as described under alternative 1. However, the intensity of these future cumulative impacts would be less under alternative 3 than alternative 1. Alternative 3 would seek to protect plant special-status species from future surface coal mining operations. The impacts of alternative 3, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on plant special-status species. The adverse and beneficial impacts of alternative 3 overall would not significantly contribute to the cumulative impacts to plant special-status species.

## Conclusion

Alternative 3 would result in near- and long-term adverse and beneficial impacts to special-status species. Potential remining and construction, use, and maintenance of access and haul roads within the designation area and adjacent to protected ridgelines would result in near- and long-term adverse impacts to certain special-status species. These activities would cause long-term direct adverse impacts due to the loss of individual undetected plant special-status species or their habitat. However, protection of lands within the designation area from future mining activities would result in long-term beneficial impacts to special-status species and habitats by limiting the potential for further injury and potentially facilitating ecosystem recovery and by preventing the loss of undetected special-status plant species and their habitat. No new or additional adverse impacts would occur compared to the no-action alternative. Overall, adverse impacts to special-status species under alternative 3 would be reduced in comparison to the no-action alternative and would not result in significant adverse impacts.

## **ALTERNATIVE 4: EXPANDED CORRIDOR DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS (PREFERRED ALTERNATIVE)**

Under alternative 4, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State's petition, as described under alternative 2, and on additional ridgelines. Like alternative 3, alternative 4 would not prohibit remining, reclamation activities, and construction and maintenance of haul roads within the designation area and protected ridgeline boundaries.

## Direct and Indirect Impacts

**Aquatic Special-Status Species:** Like alternative 3, alternative 4 would result in near- and long-term indirect adverse impacts to aquatic special-status species due to the construction and maintenance of haul roads inside and adjacent to the designation area. Also, as described under alternative 3, potential remining would contribute to near-term adverse impacts, but reclamation of lands previously mined prior to the implementation of SMCRA in 1977 and left unreclaimed could result in long-term benefits for aquatic special-status species. Alternative 4 would have near- and long-term beneficial impacts on aquatic special-status species by protecting lands within and beyond the designation area from future surface mining activities.

Impacts to aquatic special-status species under alternative 4 would be the same as those described under alternative 3, but with increased beneficial impacts due to protection of ridgelines beyond those outlined in the State's petition. Under alternative 4, five special-status species within the evaluation area could potentially be adversely impacted. These species include ashy darter, blackside dace, Cumberland arrow darter, silverjaw minnow, and Cumberland elktoe. Although not listed as threatened or endangered at the federal or state level, two species, emerald darter and rosyface shiner, are "deemed in need of management" at the state level in Tennessee, and may also occur within the buffer area used to analyze alternatives from possible mining activities and may also be impacted under alternative 1. No other special-status fish species potentially occurring within the evaluation area are known to occur within the buffer area used to analyze alternatives from possible mining activities. However, if present, impacts would be of the same type and intensity as those for other listed species. Potential impacts to aquatic special-status species under alternative 4 are presented in tables 6-50, 6-51, and 6-52. Potential adverse impacts to aquatic special-status species would include habitat and water quality degradation. Best management practices and compliance with applicable regulations and permit conditions would minimize, but not eliminate impacts to this resource. Alternative 4 may result in indirect adverse impacts to known habitat for those species shown in table 6-70. However, alternative 4 still provides greater protection to all aquatic special-species and their habitats than the no-action alternative, resulting in overall beneficial impacts compared to the no-action alternative. Overall, alternative 4 would create conditions that are beneficial compared to the no-action alternative.

**TABLE 6-70: AQUATIC SPECIAL-STATUS SPECIES HABITAT POTENTIALLY IMPACTED UNDER ALTERNATIVE 4 (PREFERRED ALTERNATIVE)**

Species	Miles of Habitat Potentially Impacted
Ashy darter	3.11
Blackside dace	1.23
Cumberland arrow darter	1.37
Silverjaw minnow	1.37
Cumberland elktoe	0.17

**Terrestrial Special-Status Species:** Bewick's wren, a state endangered species, is typically found in rural, agricultural areas with brushy hedgerows and old buildings. As previously described, there are no known occurrences of this species in the evaluation area. Consequently, alternative 4 would have no impact on the Bewick's wren.

The northern saw-whet owl, a state threatened species, inhabits spruce-fir forests above 5,000 feet in elevation. There are no known occurrences of this species in the evaluation area. Given the lack of

suitable habitat for the northern saw-whet owl, it is expected that the alternative 4 would have no impact on the northern saw-whet owl.

The cerulean warbler would benefit from alternative 4 in both the short and long term. Under alternative 4, habitat would be protected and previously mined areas would be subject to re-mining and reclamation, which could help to re-establish forest conditions in the long term.

The Tennessee State Wildlife Action Plan identifies a number of preferred and suitable habitats for this species, some of which occur in the NCWMA. This alternative could result in up to 20,313 acres of cerulean warbler habitat being protected. Table 6-71 describes the cerulean warbler habitat that could be protected under alternative 4.

As described above, the TWRA has been developing a habitat conservation plan that establishes reserves of core breeding and foraging habitat and sets management strategies above elevations of 1,800 feet (Welton 2014). Under alternative 4, approximately 21,389 acres of potentially mineable area that occurs above 1,800 feet in elevation would be protected, roughly 12.4% of the evaluation area.

**TABLE 6-71: CERULEAN WARBLER HABITAT POTENTIALLY PROTECTED**

Habitat Type	Preference	Area Potentially Protected (acres)	Percent of the Evaluation Area
South-Central Interior Mesophytic Forest	Preferred	653	0.38
Allegheny-Cumberland Dry Oak Forest and Woodland	Suitable	19,124	11.12
Appalachian (Hemlock)-Northern Hardwood Forest	Suitable	536	0.31
<b>Total</b>		<b>20,313</b>	<b>11.81</b>

As previously discussed, edge effect and forest fragmentation limit cerulean warbler abundance and distribution. Since surface coal mining operations would not occur under alternative 4, there would be no impacts from the creation of associated new edge habitat. This would result in the protection of an additional 18,907 acres of forest habitat from being degraded within 150 feet of a potentially mineable area an additional 58,898 acres within 1,000 feet of a potentially mineable area.

Alternative 4 would allow for the potential re-mining and reclamation of previously mined areas totaling approximately 9,895 acres of potential habitat. Re-mining activities would redisturb areas, creating additional edge habitat that could degrade adjacent habitat, making degraded areas unsuitable for cerulean warblers. Under alternative 4, this could result in the degradation of 7,817 acres of forested habitat within 150 feet of potential re-mining activities and an additional 34,233 acres within 1,000 feet.

Similar to alternative 3 above, alternative 4 would result in both short- and long-term adverse and beneficial impacts to the cerulean warbler and other forest-dependent species through habitat protection. The protection of breeding habitat would help protect the species in the long term. However, some edge effects and habitat fragmentation created during re-mining and reclamation activities could result in short- and long-term adverse impacts, although impacts would be less than under the no-action alternative.

The golden-winged warbler, a state species in need of management has been documented a number of times in the evaluation area. Under alternative 4, this warbler would likely experience both adverse and beneficial impacts. Alternative 4 could result in up to 20,313 acres of warbler habitat being protected. In addition, the golden-winged warbler would receive additional benefits through potential re-mining and

reclamation activities. Alternative 4 would allow for the remining and reclamation of previously mined areas totaling approximately 9,895 acres of potential habitat. As described above, this would create new habitat by returning areas to early successional habitat, resulting in short- and long-term benefits to the warbler, depending on the goals of reclamation.

The gray bat, a federally and state-endangered species, is a small migratory bat that resides in caves in forested areas. This species uses only eight caves in Tennessee for hibernation and USFWS (2014c) has no records of any gray bat hibernacula within or near the evaluation area. Since the species presence is unlikely, alternative 4 would have no impact on it. In the event the species is found within the evaluation area, impacts would be similar to those described for the Indiana bat.

Under alternative 4, the Indiana bat, a federally and state-endangered species, would likely benefit from the prohibition on surface coal mining operations. Approximately 20,317 acres of potential Indiana bat habitat would be protected in the designation area, resulting in long-term benefits to the species in terms of roosting and foraging habitat.

Alternative 4 would also allow for the remining and reclamation of previously mined areas. Under alternative 4, approximately 9,903 acres could be subject to potential remining and reclamation. This could result in redistributing areas that could provide roosting and foraging habitat for the bats. Roosting bats that are unable to leave the area prior to tree removal associated with remining could be injured or killed. However similar to the discussion of the cerulean warbler above, the loss of habitat would be limited by the annual rate of surface coal mining in the evaluation area. Vegetation clearing for access road development could eliminate additional suitable roosting and foraging habitat and/or lead to additional bat injury or mortality.

Overall, alternative 4 would provide both short- and long-term benefits to the Indiana bat in terms of roosting and habitat protection compared to the no-action alternative. However, potential remining activities, including clearing areas and the construction of access and haul roads, could have short-term adverse impacts. Although it is unlikely that impacts would be significant in nature they may adversely affect the Indiana bat, if present in the petition area.

The northern long-eared bat, a federally threatened species, generally occurs in Scott and Campbell Counties in the central portion of the NCWMA. Impacts to the northern long eared bat would be similar to those described above for the Indiana bat. Northern long-eared bats may receive additional benefits given the elevation of protected habitat being in more preferred habitat. Overall, alternative 4 would provide beneficial impacts related to habitat protection, but could result in adverse effects similar to the Indiana bat. Although it is unlikely that impacts would be significant in nature they may adversely affect the northern long-eared bat, if present in the petition area.

The northern pinesnake is a state threatened species, however, there have been no documented occurrences of the northern pinesnake in the NCWMA. Alternative 4 would result in long-term benefits through the protection of 20,317 acres of potential habitat from surface coal mining operations. However, alternative 4 would also allow potential remining and reclamation activities, including the construction of access and haul roads. This would result in short-term adverse impacts to approximately 9,903 acres of previously mined areas, as areas are cleared of vegetation and remined. Potential remining and road development could result in injury or mortality if snakes are unable to leave the area prior to disturbance. However, reclamation in the long term would provide open habitat preferred by the pinesnake, resulting in benefits over time. Overall, alternative 4 would result in both short- and long-term benefits, although some short-term adverse impacts from remining activities are likely. If present in the petition area, alternative 4 would not likely result in significant adverse effects to the northern pinesnake.

**Plant Special-Status Species:** There are no known occurrences of the three federally listed plant special-status species in the petition area under alternative 4. Cumberland rosemary and Virginia spiraea prefer floodplain habitats and/or creek edges. Direct impacts to floodplains and streams would be extremely limited and would occur only at permitted stream crossings, as mining activities in streams are otherwise prohibited under federal (30 CFR §§ 816.57 and 817.57) and state law (2009 Tenn. Pub. Acts 289). It is unlikely that any stream crossing would be permitted in an area specifically known to contain special-status species, particularly federally listed species, which receive the highest levels of protection under Endangered Species Act. Consequently it is highly unlikely that remaining operations would impact these species, therefore alternative 4 would have no impact on the Cumberland rosemary, Virginia spiraea, or the Cumberland sandwort.

Like alternative 3, alternative 4 would have less potential for adverse impacts to special-status plant species and greater long-term beneficial impacts than alternative 1. These impacts to plant special-status species are described in detail under “General Impacts of Coal Mining in Tennessee on Special-Status Species.”

Beneficial impacts would result due to the preclusion of surface coal mining operations in the future and by preventing the loss of undetected special-status plant species and their habitat during clearing activities. These beneficial impacts would be increased under alternative 4 due to protection of ridgelines beyond those outlined in the State’s petition. However, these perceived benefits should be considered in light of the annual rate of mining in the petition area. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions. Therefore, the overall protections in the near and long term would be less.

Seven state-listed plant special-status species prefer forested habitat and three prefer wet areas including swamps and floodplains. No wetland habitat occurs under alternative 4 in potential mineable areas. There are known occurrences of two state-listed plant special-status species (table 6-72) and suitable habitat for five additional plant special-status species in the petition area (table 6-72). Three additional state-listed plant special-status species occur near the petition area. Approximately 11,988 acres of vegetation could be affected by potential remaining operations under alternative 4. However, previously mined areas that could be reclaimed would also be reclaimed (though areas that were previously augered could not be feasibly reclaimed). In addition, vegetation clearing for access road development would eliminate additional preferred habitat. Under alternative 4 approximately 22,003 acres of forested habitat could potentially be protected from surface coal mining operations. This accounts for 19.74% of the habitat in the evaluation area. Table 6-73 describes the plant special-status species habitat that could be protected or affected under alternative 4. As described in the table, these potential acres of habitat merely reflect the habitat type that could be protected by surface coal mining.

**TABLE 6-72: KNOWN OCCURRENCES OF PLANT SPECIAL-STATUS SPECIES**

Species	Proximity to Potential Surface Coal Mining and Remaining Areas
Pale Corydalis	Within 1,900 feet
Butternut	Within 200 feet
Ozark bunchflower	Occurrence within potential mineable area
American ginseng	Occurrence within potential mineable area
Tuberclad rein-orchid	Within 1,200 feet

**TABLE 6-73: HABITAT TYPES POTENTIALLY AFFECTED BY SURFACE COAL MINING AND REMINING**

Habitat Type	Acres Potentially Protected from Surface Coal Mining	Acres Potentially Impacted by Remining	Percent of the Evaluation Area
Deciduous Forest	21,481	11,586	19.20
Evergreen Forest	197	147	0.20
Mixed Forest	325	255	0.34
Wetland	0	0	0.00
<b>Total</b>	<b>22,003</b>	<b>11,988</b>	<b>19.74</b>

Alternative 4 would result in direct or indirect adverse impacts, but could result in substantial benefits through the protection of special-status plant species and the potential reclamation of lands previously mined prior to the implementation of SMCRA in 1977 and left unreclaimed. However, given the rate of surface coal mining, and the fact that impacts would not occur at a large or landscape scale it is unlikely that the impacts would be significant. Overall, alternative 4 would result in the protection of plant special-status species and greater long-term beneficial impacts than under alternative 1. While the effects of alternative 4 would be beneficial compared to alternative 1, alternative 4 would have slightly greater adverse effects compared to some of the other action alternatives due to greater adverse impacts associated with remining and access and haul road development.

### Cumulative Impacts

**Aquatic Special-Status Species:** Cumulative impacts from other actions would be the same as alternative 3. The impacts of alternative 4, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on aquatic special-status species. However, alternative 4 would not contribute substantially to overall cumulative impacts. Although there may be near-term contributions to cumulative impacts from remining, alternative 4 would designate a larger area than under alternatives 2 and 3 and would provide greater benefits in the long term.

**Terrestrial Special-Status Species:** As described under the no-action alternative, habitat loss and degradation results in some of the largest impacts to those special-status species being evaluated. Past and present cumulative actions that have impacted terrestrial habitat in the evaluation area include pre- and post-SMCRA surface coal mining, underground mining, timber harvest, oil and gas production, electrical and gas transmission, and recreation. Many of these activities are expected to continue into the future. Timber harvest practices will likely change after 2017 when timber rights for a portion of the evaluation area transfer to TWRA, likely providing habitat improvements to multiple species.

The impacts of alternative 4, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on terrestrial special-status species. Alternative 4 would protect important habitat areas from future surface coal mining operations. This would provide benefits to special-status species. Potential remining and reclamation would also occur under alternative 4, which would result in short-term and long-term adverse impacts to some special-status species but would provide long-term benefits to others. Like alternative 3, alternative 4 would not contribute substantially to overall adverse cumulative impacts.

**Plant Special-Status Species:** Cumulative impacts from other actions would be the same as alternative 3. Past and present cumulative actions that have impacted plant special-status species in the evaluation area include pre- and post-SMCRA surface coal mining, underground mining, timber harvest, oil and gas production, and development and construction. The impacts of alternative 4, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on plant special-status species.

Remining under alternative 4 would result in direct adverse impacts to plant special-status species and alternative 4 would protect plant special-status species in the designation area and their habitat from future surface coal mining operations. The adverse and beneficial impacts of alternative 4 overall would not significantly contribute to the cumulative impacts to plant special-status species.

## Conclusion

Alternative 4 would result in near- and long-term adverse and beneficial impacts to special-status species. Remining and access and haul road construction and maintenance within the designation area and adjacent to protected ridgelines would result in near- and long-term adverse impacts to certain special-status species. These same activities would cause long-term direct adverse impacts due to the loss of individual undetected plant special-status species or their habitat. However, protection of lands within the designation area from future mining activities would result in long-term beneficial impacts to special-status species and habitats by limiting further injury and potentially facilitating species and ecosystem recovery and by preventing the loss of undetected special-status plant species and their habitat. Adverse impacts under alternative 4 would be nearly identical to those described under alternative 3, but would be slightly reduced due to the protection of additional ridgelines. No new or additional adverse impacts would occur compared to the no-action alternative. Overall, alternative 4 would create conditions that are beneficial compared to the no-action alternative. Alternative 4 would not result in significant adverse impacts.

## ALTERNATIVE 5: TARGETED RESOURCE PROTECTION DESIGNATION

Under alternative 5, OSMRE would designate lands as unsuitable for surface coal mining operations based on the presence of sensitive resources. Alternative 5 would protect environmentally sensitive habitat areas including portions of Stinking Creek and Thompson Creek within the Upper Cumberland watershed.

### Direct and Indirect Impacts

**Aquatic Special-Status Species:** The prohibition of additional surface mining operations adjacent to environmentally sensitive habitat areas would offer protection to aquatic special-status species within the protected area, and could potentially help facilitate species and ecosystem recovery in portions of the Upper Cumberland and Upper Clinch River watersheds including Stinking Creek and Thompson Creek. This would result in a long-term beneficial impact to aquatic special-status species in these areas. Aquatic special-status species that may specifically benefit from protections under alternative 5 include the federally threatened blackside dace and the federally endangered Cumberland darter, and the Cumberland arrow darter, a federal candidate species for listing under the Endangered Species Act. Stinking Creek is specifically known to support populations of the Cumberland arrow darter (Carter et al. 2012) and blackside dace (USFWS 2015c). Adverse impacts to aquatic special-status species in the portions of the protected watershed would be further reduced by the prohibition of new construction of access and haul roads in the protected area. Aquatic habitats downslope of ridgelines not protected under alternative 5 would potentially be adversely impacted in the near and long term due to the development of new mines and roads in those areas due to increased runoff and sedimentation in rivers and streams due to the removal of soils and vegetation. Under alternative 5, five special-status species within the evaluation area could potentially be adversely impacted. Potentially impacted species include ashy darter, blackside dace, Cumberland arrow darter, silverjaw minnow, and Cumberland elktoe. Although not listed as threatened or endangered at the federal or state level, two species, emerald darter and rosyface shiner, are “deemed in need of management” at the state level in Tennessee, and may also occur within the buffer area used to analyze alternatives from possible mining activities and may also be impacted under alternative 1. No other special-status fish species potentially occurring within the evaluation area are known to occur within

the buffer area used to analyze alternatives from possible mining activities. However, if present, impacts would be the same as those for other listed species. Potential impacts to aquatic special-status species under alternative 5 are presented in table 6-74. Best management practices and compliance with applicable regulations and permit conditions would minimize these impacts.

Impacts to aquatic special-status species under alternative 5 would generally be of the same type and intensity as those described under alternative 2, but would occur in different locations. Portions of Stinking Creek and Thompson Creek within the Upper Cumberland watershed would receive the greatest protection under alternative 5, than under all other alternatives. Potential adverse impacts to aquatic special-status species in other areas would include habitat and water quality degradation. Impacts to aquatic special-status species would occur in portions of the Cumberland River Clinch River watersheds within the evaluation area. Alternative 5 may result in indirect adverse impacts to known habitat for those species shown in table 6-74 ashy darter, 1.23 miles of habitat for blackside dace, 1.37 miles of habitat for Cumberland arrow darter, 1.20 miles of habitat for silverjaw minnow, and 0.17 miles of habitat for Cumberland elktoe. However, alternative 5 still provides greater protection to all aquatic special-species and their habitats than the no-action alternative, resulting in overall increased beneficial impacts in comparison to the no-action alternative. Tables 6-50, 6-51 and 6-52 show impacts on listed fish, mollusks and other aquatic species.

**TABLE 6-74: AQUATIC SPECIAL-STATUS SPECIES HABITAT POTENTIALLY IMPACTED UNDER ALTERNATIVE 5**

Species	Miles of Habitat Potentially Impacted
Ashy darter	2.28
Blackside dace	1.23
Cumberland arrow darter	1.37
Silverjaw minnow	1.20
Cumberland elktoe	0.17

**Terrestrial Special-Status Species:** Bewick’s wren, a state endangered species, is typically found in rural, agricultural areas with brushy hedgerows and old buildings. There are no known occurrences of this species in the evaluation area. Consequently, alternative 5 would have no impact on the Bewick’s wren.

The northern saw-whet owl, a state threatened species, inhabits spruce-fir forests above 5,000 feet in elevation. There are no known occurrences of this species in the evaluation area. Given the lack of suitable habitat for the northern saw-whet owl, it is expected that the alternative 5 would have no impact on the northern saw-whet owl.

Under alternative 5, cerulean warblers would have considerably less habitat protected than under the other action alternatives. Alternative 5 would prohibit surface coal mining operations on 4,406 acres of potential cerulean warbler habitat. Table 6-75 describes the extent of cerulean warbler habitat potentially protected.

**TABLE 6-75: CERULEAN WARBLER HABITAT POTENTIALLY PROTECTED**

Habitat Type	Preference	Area Potentially Protected (acres)	Percent of the Evaluation Area
South-Central Interior Mesophytic Forest	Preferred	323	0.19
Allegheny-Cumberland Dry Oak Forest and Woodland	Suitable	3,846	2.24
Appalachian (Hemlock)-Northern Hardwood Forest	Suitable	237	0.14
<b>Total</b>		<b>4,406</b>	<b>2.57</b>

Under the alternative 5 alternative, approximately 4,940 acres of potentially mineable areas occur above 1,800 feet in elevation, roughly 2.9% of the evaluation area. Protection of this habitat could have added benefit to the cerulean warbler.

Since surface coal mining operations (including re-mining) would not occur under alternative 5, there would be no impacts associated with the creation of new edge habitat. This would result in the protection of an additional 4,654 acres of forest habitat from being degraded within 150 feet of a potentially mineable area. This area would increase to 15,445 acres within 1,000 feet of potentially mineable areas.

Overall, alternative 5 would result in the protection of cerulean warbler habitat in high-use areas (over 1,800 feet in elevation) than under the no-action alternative; however, alternative 5 would protect the least amount of habitat of all action alternatives, approximately 1,955 acres above 1,800 feet in elevation. In addition alternative 5 would not allow for the creation of any additional edge habitat further impacting intact habitat. Therefore alternative 5 would not result in any direct or indirect adverse impacts, but could result in some benefits through the protection of habitat for the warbler and other forest-dependent species.

The golden-winged warbler, a state species in need of management and one that is being evaluated for potential listing in the Endangered Species Act, has been documented a number of times in the evaluation area. As describe above, the Tennessee State Wildlife Action Plan identifies a number of suitable habitats for this species, some of which occur in the NCWMA. This alternative could result in up to 4,406 acres of warbler habitat being protected. Table 6-76 describes the golden-winged warbler habitat that could be protected under alternative 5.

**TABLE 6-76: GOLDEN-WINGED WARBLER HABITAT POTENTIALLY PROTECTED**

Habitat Type	Preference	Area Potentially Protected (acres)	Percent of the Evaluation Area
South-Central Interior Mesophytic Forest	Suitable	323	0.19
Allegheny-Cumberland Dry Oak Forest and Woodland	Suitable	3,846	2.24
Appalachian (Hemlock)-Northern Hardwood Forest	Suitable	237	0.14
<b>Total</b>		<b>4,406</b>	<b>2.57</b>

In addition, alternative 5 would not allow for the re-mining of previously mined areas. This would result in protecting existing edge habitat created by old surface mine benches. Unless managed for early

successional species, these areas would likely return to forested conditions in the long term. The inability to remine under this alternative would result in maintaining approximately 1,421 acres in edge-type habitat potentially benefitting the golden-winged warbler and other early successional species. Overall, this alternative would result in short- and long-term benefits to the golden-eared warbler compared to the no-action alternative; however it would provide the least amount of benefits than would the other action alternatives.

The gray bat, a federally and state-endangered species, is a small migratory bat that resides in caves in forested areas. This species uses only eight caves in Tennessee for hibernation and USFWS (2014c) has no records of any gray bat hibernacula within or near the evaluation area. Since the species presence is unlikely, alternative 5 would have no impact on it. In the event the species is found within the evaluation area, impacts would be similar to those described for the Indiana bat.

The Indiana bat, a federally and state-endangered species, is small bat that is a permanent resident in Tennessee and currently occurs in the NCWMA in portions of Campbell County. Although the USFWS (2014c) has no records of any Indiana bat hibernacula within or near the evaluation area, the species may still use the NCWMA for foraging and roosting habitat. This alternative could result in up to 4,408 acres of Indian bat habitat being protected. Table 6-77 describes the Indiana bat habitat that could be protected under alternative 5.

**TABLE 6-77: INDIANA BAT HABITAT POTENTIALLY PROTECTED**

Habitat Type	Preference	Area Potentially Protected (acres)	Percent of the Evaluation Area
Southern Appalachian Low-Elevation Pine Forest	Suitable	2	0.001
Allegheny-Cumberland Dry Oak Forest and Woodland	Suitable	3,846	2.24
Appalachian (Hemlock)-Northern Hardwood Forest	Suitable	237	0.14
South-Central Interior Mesophytic Forest	Suitable	323	0.19
<b>Total</b>		<b>4,408</b>	<b>2.57</b>

In addition to the potential roost and foraging areas protected under alternative 5, additional habitat would also be protected as a result of the inability to remine and reclaim previously mined areas. This could result in an additional 1,421 acres of roosting and foraging habitat protected from future operations.

Underground mining outside the petition area could still occur and may provide some additional benefits in terms of caves and mine shafts for use as roosting sites.

Overall, alternative 5 would result in short- and long-term benefits for the Indiana bat than under the no-action alternative. Alternative 5 would provide the least amount of protection of any of the action alternatives.

The northern long-eared bat, a federally threatened species, generally occurs in Scott and Campbell Counties in the central portion of the NCWMA. Alternative 5 would protect potential roosting and foraging habitat from tree clearing associated with surface coal mining operations. Overall, alternative 5 would protect approximately 4,408 acres, same as for the Indiana bat above. As with the Indiana bat, additional habitat would also be protected as a result of the inability to remine and reclaim previously

mined areas—approximately 1,421 acres. Of the acres protected, many would likely occur in preferred roosting habitat on upper and middle slopes.

Underground mining outside the petition area could still occur and may provide some additional benefits in terms of caves and mine shafts for use as roosting sites.

Overall, it is expected that the northern long-eared bat would benefit in the short and long term from the protections established through alternative 5 than under the no-action alternative.

The northern pinesnake, a state threatened species, is an upland snake found in pine and mixed pine and oak forest habitats, and known to occur in Anderson and Morgan Counties. However, there have been no documented occurrences of the northern pinesnake in the NCWMA. Alternative 5 would prohibit surface coal mining operations from preferred and suitable pinesnake habitat within the petition area totaling approximately 18,436 acres. Table 6-78 describes the northern pinesnake habitat that would be protected under alternative 5.

**TABLE 6-78: NORTHERN PINESNAKE HABITAT POTENTIALLY PROTECTED**

Habitat Type	Preference	Area Potentially Protected (acres)	Percent of the Evaluation Area
Southern Appalachian Low-Elevation Pine Forest	Preferred	2	0.001
Allegheny-Cumberland Dry Oak Forest and Woodland	Suitable	3,846	2.24
Appalachian (Hemlock)-Northern Hardwood Forest	Suitable	237	0.14
South-Central Interior Mesophytic Forest	Suitable	323	0.19
<b>Total</b>		<b>4,408</b>	<b>2.57</b>

In addition to prohibiting new surface coal mining operations, alternative 5 would prohibit remining and associated reclamation activities. This would provide additional benefits to the pinesnake because many previously mined areas provide open habitat preferred by the snake. Alternative 5 would secure an additional 1,421 acres of potential snake habitat from being further modified through remining and reclamation.

Alternative 5 would provide both short- and long-term benefits to the northern pinesnake than under the no-action alternative.

**Plant Special-Status Species:** In the long term, impacts to plant special-status species are expected to be direct and indirect beneficial. These impacts would generally be the same as those described under alternative 2, but would occur in different locations. Beneficial impacts would result due to the preclusion of surface coal mining operations in the future and by preventing the loss of undetected special-status plant species and their habitat during clearing activities.

There are no known occurrences of the three federally listed plant special-status species in the petition area under alternative 5. Consequently it is highly unlikely that surface coal mining operations would impact these species, therefore alternative 5 would have no impact on the Cumberland rosemary, Virginia spiraea, or the Cumberland sandwort. Impacts to Ozark bunchflower and pale corydalis would be unlikely in the designation area as a result of alternative 5, as no mining would be allowed.

Seven state-listed plant special-status species prefer forested habitat and three prefer wet areas including swamps and floodplains. There are known occurrences of two state-listed plant special-status species (table 6-79) and suitable habitat for five additional plant special-status species in the designation area (table 6-79). Three additional state-listed plant special-status species occur near the designation area. Under alternative 5, considerably less habitat would be protected than under the other action alternatives. Under alternative 5 approximately 6,742 acres of forested habitat could potentially be protected from surface coal mining and re-mining operations. This accounts for 3.91% of the habitat in the evaluation area. In addition, vegetation clearing for access road development would not occur, thus protecting additional habitat. Table 6-80 describes the plant special-status species habitat that could be protected under alternative 5. As described in the table, these potential acres of habitats merely reflect the habitat type that could be protected by surface coal mining.

**TABLE 6-79: KNOWN OCCURRENCES OF PLANT SPECIAL-STATUS SPECIES**

Species	Proximity to Potential Surface Coal Mining and Remining Areas
Pale Corydalis	Within 1,200 feet
Butternut	Within 200 feet
Ozark bunchflower	Occurrence within potential mineable area
American ginseng	Occurrence within potential mineable area
Tuberclad rein-orchid	Within 1,300 feet

**TABLE 6-80: HABITAT TYPES POTENTIALLY PROTECTED FROM SURFACE COAL MINING AND REMINING**

Habitat Type	Acres Potentially Protected from Surface Coal Mining and Remining	Percent of the Evaluation Area
Deciduous Forest	6,626	3.85
Evergreen Forest	23	0.01
Mixed Forest	93	0.05
Wetland	0	0.00
<b>Total</b>	<b>6,742</b>	<b>3.91</b>

Designation of a corridor as unsuitable for coal mining under alternative 5 would have long-term beneficial impacts by preventing the loss of undetected special-status plant species and their habitat during clearing activities related to mining. However, alternative 5 would protect the least amount of plant special-status plant species habitat of all action alternatives. Overall there would be beneficial impacts compared to alternative 1.

### Cumulative Impacts

**Aquatic Special-Status Species:** As described in alternative 2, other actions upstream or adjacent to the designation area would continue to impact aquatic special-status species due to sedimentation and water quality degradation, although impacts would be minimized by compliance with best management practices along with all applicable regulations and permit conditions. The impacts of alternative 5, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on aquatic special-status species. Alternative 5 would provide the least benefit to overall cumulative impacts

compared to the other action alternatives as it results in the lowest area designated; however, alternative 5 would specifically designate areas associated with aquatic species.

**Terrestrial Special-Status Species:** Cumulative impacts to terrestrial special-status species under alternative 5 would be the same as those described above for alternative 2. The impacts of alternative 5, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on terrestrial special-status species. However, alternative 5 would provide the least amount of habitat protection. This would allow more area to be available for surface coal mining operations. Overall, alternative 5 would provide some benefits, but would not contribute to overall adverse cumulative impacts.

**Plant Special-Status Species:** Past and present cumulative actions as described under alternative 5 would continue to impact plant special-status species and their habitat. Alternative 5 would provide the least benefit to overall cumulative impacts compared to the other action alternatives as it results in the lowest area designated. The impacts of alternative 5, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on plant special-status species. The beneficial impacts of alternative 5 would not significantly contribute to the cumulative impacts to plant special-status species.

## Conclusion

Alternative 5 would result in near- and long-term beneficial impacts to special-status species. Sensitive habitats including portions of Stinking Creek and Thompson Creek would receive the greatest protection under alternative 5. Protection of lands within the designated area from future mining activities would result in long-term beneficial impacts to aquatic resources by limiting potential for further injury and potentially facilitating species and ecosystem recovery and by preventing the loss of undetected special-status plant species and their habitat. Alternative 5 would result in the least amount of terrestrial habitat protection compared to the other action alternatives. No new or additional adverse impacts would occur compared to the no-action alternative. The sum of adverse and beneficial impacts to special-status species under alternative 5 would lead to improved conditions compared to the no-action alternative. Alternative 5 would not result in significant adverse impacts.

## ALTERNATIVE 6: REDUCED CORRIDOR DESIGNATION

Under alternative 6, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State's petition. Lands protected under alternative 6 would be the same as those protected under alternatives 2 and 3, except that the corridor width would be reduced by half (600-foot corridor instead of 1,200-foot corridor).

### Direct and Indirect Impacts

**Aquatic Special-Status Species:** Alternative 6 would result in near- and long-term indirect beneficial impacts to aquatic special-status species. The prohibition of additional surface coal mining operations would offer protection to aquatic special-status species and habitats within the designation area, and could potentially help facilitate ecosystem recovery, resulting in a long-term beneficial impact. However, construction and maintenance of haul roads outside the designation area may still result in near- and long-term adverse impacts to aquatic species due to increased runoff and sedimentation in rivers and streams due to disturbance to terrestrial habitats. Best management practices as well as compliance with applicable regulations and permit conditions would minimize these impacts. Impacts to aquatic special-status species under alternative 6 would be the same as those described under alternative 2. Potential adverse impacts to aquatic special-status species would include habitat loss and destruction due to sedimentation and water quality degradation. Impacts to aquatic special-status species may occur in

portions of the Cumberland River and Clinch River watersheds within the evaluation area. Under alternative 6, five special-status species within the evaluation area could potentially be adversely impacted. These species include ashy darter, blackside dace, Cumberland arrow darter, silverjaw minnow, and Cumberland elktoe. Although not listed as threatened or endangered at the federal or state level, two species, emerald darter and rosyface shiner, are “deemed in need of management” at the state level in Tennessee, and may also occur within the buffer area used to analyze alternatives from possible mining activities and may also be impacted under alternative 6. No other special-status fish species potentially occurring within the evaluation area are known to occur within the buffer area used to analyze alternatives from possible mining activities. However, if present, impacts would be the same as those for other listed species. Potential impacts to aquatic special-status species under alternative 6 are presented in tables 6-50, 6-51 and 6-52. Alternative 6 may result in indirect adverse impacts to known habitat for those species shown in table 6-81. However, alternative 6 still provides greater protection to all aquatic special-species and their habitats than the no-action alternative, resulting in overall increased beneficial impacts compared to the no-action alternative.

**TABLE 6-81: AQUATIC SPECIAL-STATUS SPECIES HABITAT POTENTIALLY IMPACTED UNDER ALTERNATIVE 6**

Species	Miles of Habitat Potentially Impacted
Ashy darter	2.41
Blackside dace	1.23
Cumberland arrow darter	1.37
Silverjaw minnow	1.37
Cumberland elktoe	0.17

**Terrestrial Special-Status Species:** Bewick’s wren, a state endangered species, is not known to occur in the evaluation area. Consequently, alternative 6 would have no impact on the Bewick’s wren.

The Northern saw-whet owl, a state threatened species, inhabits spruce-fir forests above 5,000 feet in elevation. There are no known occurrences of this species in the evaluation area. Given the lack of suitable habitat for the northern saw-whet owl, it is expected that the alternative 6 would have no impact on the northern saw-whet owl.

Under alternative 6, impacts to the Cerulean warbler, would be similar to those described for alternative 2 above, although less area would be impacted given the smaller potential designation area. Approximately 10,064 acres of potential habitat would be protected from future surface coal mining operations. Table 6-82 describes potential cerulean warbler habitat that would be protected under alternative 6.

**TABLE 6-82: CERULEAN WARBLER HABITAT POTENTIALLY PROTECTED**

Habitat Type	Preference	Area Potentially Protected (acres)	Percent of the Evaluation Area
South-Central Interior Mesophytic Forest	Preferred	288	0.17
Allegheny-Cumberland Dry Oak Forest and Woodland	Suitable	9,570	5.56
Appalachian (Hemlock)-Northern Hardwood Forest	Suitable	206	0.12
<b>Total</b>		<b>10,064</b>	<b>5.85</b>

Under alternative 6, approximately 11,009 acres of potentially mineable areas occur above 1,800 feet in elevation, roughly 6.4% of the evaluation area. Therefore, habitat protection would likely be in cerulean warbler preferred areas. No remining could occur under alternative 6, therefore there would be no impacts associated with remining.

Since surface coal mining operations (including remining) would not occur under alternative 6, there would be no impacts associated with the creation of new edge habitat. This would result in the protection of an additional 12,224 acres of forest habitat from being degraded within 150 feet of a potentially mineable area. This area would increase to 55,275 acres within 1,000 feet of potentially mineable areas.

Overall, alternative 6 would result in the protection of cerulean warbler habitat in high-use areas (over 1,800 feet in elevation) compared to the no-action alternative. In addition alternative 6 would not allow for the creation of any additional edge habitat further impacting intact habitat. Therefore alternative 6 would not result in any direct or indirect adverse impacts, but could result in some benefits through the protection of habitat for the warbler and other forest-dependent species.

The golden-winged warbler, a state species in need of management and one that is being evaluated for potential listing in the Endangered Species Act, has been documented a number of times in the evaluation area. Impacts would be similar to alternative 2, although less area would be designated. As describe above, the Tennessee State Wildlife Action Plan identifies a number of suitable habitats for this species, some of which occur in the NCWMA. This alternative could result in up to 10,064 acres of warbler habitat being protected. Table 6-83 describes the golden-winged warbler habitat that could be protected under alternative 6.

**TABLE 6-83: GOLDEN-WINGED WARBLER HABITAT POTENTIALLY PROTECTED**

Habitat Type	Preference	Area Potentially Protected (acres)	Percent of the Evaluation Area
South-Central Interior Mesophytic Forest	Suitable	288	0.17
Allegheny-Cumberland Dry Oak Forest and Woodland	Suitable	9,570	5.56
Appalachian (Hemlock)-Northern Hardwood Forest	Suitable	206	0.12
<b>Total</b>		<b>10,064</b>	<b>5.85</b>

In addition, alternative 6 would not allow for the remining of previously mined areas. This would result in protecting existing edge habitat created by old surface mine benches. Unless managed for early successional species, these areas would likely return to forested conditions in the long term. The inability to remine under this alternative would result in maintaining approximately 4,905 acres in edge-type habitat potentially benefitting the golden-winged warbler and other early successional species. Overall, this alternative would result in short- and long-term benefits to the golden-eared warbler compared to the no-action alternative.

The gray bat, a federally and state-endangered species has not been documented within or near the evaluation area. Since the species presence is unlikely, alternative 6 would have no impact on it. In the event the species is found within the area, impacts would be similar to those described for the Indiana bat.

The Indiana bat, a federally and state-endangered species, is a small bat that is a permanent resident in Tennessee and currently occurs in the NCWMA in portions of Campbell County. Although the USFWS (2014c) has no records of any Indiana bat hibernacula within or near the evaluation area, the species may still use the NCWMA for foraging and roosting habitat. An Indiana bat hibernacula, New Mammoth Cave, a priority 1 / 2 category cave, is less than 2 miles from the evaluation area. This alternative could result in up to 10,066 acres of Indiana bat habitat being protected. Table 6-84 describes the Indiana bat habitat that could be protected under alternative 6.

**TABLE 6-84: INDIANA BAT HABITAT POTENTIALLY PROTECTED**

Habitat Type	Preference	Area Potentially Protected (acres)	Percent of the Evaluation Area
Southern Appalachian Low-Elevation Pine Forest	Suitable	2	0.001
Allegheny-Cumberland Dry Oak Forest and Woodland	Suitable	9,570	5.56
Appalachian (Hemlock)-Northern Hardwood Forest	Suitable	206	0.12
South-Central Interior Mesophytic Forest	Suitable	288	0.17
<b>Total</b>		<b>10,066</b>	<b>5.85</b>

In addition to the potential roost and foraging areas protected under alternative 6, additional habitat would also be protected as a result of the inability to remine and reclaim previously mined area. This could result in an additional 4,910 acres of roosting and foraging habitat protected from future operations.

Underground mining outside the petition area could still occur and may provide some additional benefits in terms of caves and mine shafts for use as roosting sites.

Overall, alternative 6 would result in short- and long-term benefits for the Indiana bat when compared to the no-action alternative.

The northern long-eared bat, a federally threatened species, generally occurs in Scott and Campbell Counties in the central portion of the NCWMA. Alternative 6 would protect potential roosting and foraging habitat from tree clearing associated with surface coal mining operations. Overall, alternative 6 would protect approximately 10,066 acres, the same as for the Indiana bat. As with the Indiana bat, additional habitat would also be protected as a result of the inability to remine and reclaim previously mined areas—approximately 4,910 acres. Most of the acres protected would likely occur in preferred roosting habitat on upper and middle slopes.

Underground mining outside the petition area could still occur and may provide some additional benefits in terms of caves and mine shafts for use as roosting sites.

Overall, it is expected that the northern long-eared bat would benefit in the short and long term from the protections established through alternative 6 when compared to the no-action alternative. However, as noted above, actual benefits would be based on the rate of surface coal mining and other forest management activities in the petition area.

The northern pinesnake, a state threatened species, is an upland snake found in pine and mixed pine and oak forest habitats, and known to occur in Anderson and Morgan Counties. However, there have been no documented occurrences of the northern pinesnake in the NCWMA. Alternative 6 would prohibit surface

coal mining operations from preferred and suitable pinesnake habitat within the petition area totaling approximately 10,066 acres. Table 6-85 describes the northern pinesnake habitat that would be protected under alternative 6.

**TABLE 6-85: NORTHERN PINESNAKE HABITAT POTENTIALLY PROTECTED**

Habitat Type	Preference	Area Potentially Protected (acres)	Percent of the Evaluation Area
Southern Appalachian Low-Elevation Pine Forest	Preferred	2	0.001
Allegheny-Cumberland Dry Oak Forest and Woodland	Suitable	9,570	5.56
Appalachian (Hemlock)-Northern Hardwood Forest	Suitable	206	0.12
South-Central Interior Mesophytic Forest	Suitable	288	0.17
<b>Total</b>		<b>10,066</b>	<b>5.85</b>

In addition to prohibiting new surface coal mining operations, alternative 6 would also prohibit remining and associated reclamation activities. This would provide additional benefits to the pinesnake as many previously mined areas provide open habitat preferred by the snake. Alternative 6 would secure an additional 4,910 acres of potential snake habitat from being further modified through remining and reclamation.

Alternative 6 would provide both short- and long-term benefits to the northern pinesnake when compared to the no-action alternative.

**Plant Special-Status Species:** In the long term, impacts to plant special-status species are expected to be direct and indirect beneficial. These impacts would generally be the same as those described under alternative 2, although less area would be protected given the smaller potential designation area. The prohibition of additional mining activities would protect plant special-status species within the petition area and prevent associated adverse impacts, resulting in a long-term beneficial impact.

There are no known occurrences of the three federally listed plant special-status species in the petition area under alternative 6. Consequently it is highly unlikely that surface coal mining operations would impact these species, therefore alternative 6 would have no impact on the Cumberland rosemary, Virginia spiraea, or the Cumberland sandwort. Impacts to Ozark bunchflower and pale corydalis would be unlikely in the designation area as a result of alternative 6, as no mining would be allowed.

Seven state-listed plant special-status species prefer forested habitat and three prefer wet areas including swamps and floodplains. There are known occurrences of one state-listed plant special-status species (table 6-86) and suitable habitat for six additional plant special-status species in the designation area (table 6-86). Four additional state-listed plant special-status species occur near the designation area. Under alternative 6 approximately 17,884 acres of forested habitat could potentially be protected from surface coal mining and remining operations. This accounts for 10.38% of the habitat in the evaluation area. In addition, vegetation clearing for access road development would not occur, thus protecting additional habitat. Table 6-87 describes the plant special-status species habitat that could be protected under alternative 6. As described in the table, these potential acres of habitats merely reflect the habitat type that could be protected by surface coal mining.

Overall, alternative 6 would result in protection of plant special-status species and habitat, and greater long-term beneficial impacts than under alternative 1. However, alternative 6 would protect less habitat than some of the other action alternatives. Overall alternative 6 would have beneficial impacts compared to alternative 1.

**TABLE 6-86: KNOWN OCCURRENCES OF PLANT SPECIAL-STATUS SPECIES**

Species	Proximity to Potential Surface Coal Mining and Remining Areas
Pale Corydalis	Within 1,900 feet
Butternut	Within 210 feet
Ozark bunchflower	Occurrence within potential mineable area
American ginseng	Within 250 feet
Tuberclad rein-orchid	Within 1,500 feet

**TABLE 6-87: HABITAT TYPES POTENTIALLY PROTECTED FROM SURFACE COAL MINING AND REMINING**

Habitat Type	Acres Potentially Protected from Surface Coal Mining and Remining (acres)	Percent of the Evaluation Area
Deciduous Forest	16,403	9.52
Evergreen Forest	358	0.21
Mixed Forest	1,123	0.65
Wetland	0	0.00
<b>Total</b>	<b>17,884</b>	<b>10.38</b>

### Cumulative Impacts

**Aquatic Special-Status Species:** Under alternative 6, other actions such as timber harvest, oil and gas development, recreation development, and recreational use could degrade water conditions over time and could have detrimental impacts on aquatic habitat upstream or adjacent to the petition area. Impacts would be minimized by compliance with best management practices along with all applicable regulations and permit conditions. The impacts of alternative 6, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on aquatic special-status species. Alternative 6 would have similar impacts as alternatives 2 and 3 and would not contribute substantially to overall cumulative impacts, although it would provide long-term benefits that could help offset some adverse impacts.

**Terrestrial Special-Status Species:** Cumulative impacts to terrestrial special-status species under alternative 6 would be the same as those described above for alternative 2. The impacts of alternative 6, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on terrestrial special-status species. However, alternative 6 would provide about 50% the amount of habitat protection. This would allow more area to be available for surface coal mining operations. Overall, alternative 6 would provide long-term benefits, but would not contribute to overall adverse cumulative impacts.

**Plant Special-Status Species:** Past and present cumulative actions, as described under alternative 6, would be similar in type and duration as those described under alternative 2. The impacts of alternative 6, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on

plant special-status species. However, alternative 6 would provide 50% of the amount of protection to plant special-status species and their habitat than alternatives 2 and 3. This would allow more area to be available for surface coal mining operations. The beneficial impacts of alternative 6 would not significantly contribute to the cumulative impacts to plant special-status species.

## **Conclusion**

Alternative 6 would result in near- and long-term beneficial impacts to special-status species. Similar to alternative 2, the protection of lands within the designation area from future mining activities would result in long-term beneficial impacts to special-status species and habitats by limiting further loss, degradation or injury and potentially facilitating ecosystem and species recovery and by preventing the loss of undetected special-status plant species and their habitat. No new or additional adverse impacts would occur compared to the no-action alternative. Compared to the no-action alternative, alternative 6 would result in increased beneficial impacts to special-status species and would not result in significant adverse impacts.

# **IMPACTS OF THE ALTERNATIVES ON LAND USE AND RECREATION**

## **METHODS FOR ANALYSIS**

### **Applicable Statutes, Regulations, and Policies**

#### **Land Use**

In general, the intent of SMCRA is to return mined lands to their premining condition, to the extent possible. However, coal mining results in short-term changes to land use by converting the land from a premining land use to mining during the actual operation and, in certain situations, long-term changes by allowing conversion to alternate postmining land uses. Land use effects from coal mining under the no-action alternative are dictated by SMCRA and certain provisions of the existing implementing regulations. These are summarized below, followed by a description of the specific effects these provisions have on the environment particularly if they are proposed to change under action alternatives.

#### **Postmining Land Use**

Following mining and termination of SMCRA jurisdiction, the landowner is free to develop the land without regard to SMCRA requirements that were previously in effect. SMCRA allows for approval of final grading plans that facilitate specific postmining land uses that differ from premining land uses. This has the dual effect of limiting postmining land uses to specific categories that have been determined to be higher and better uses of the land, relative to premining uses, with the incentive of saving the landowner earth-moving costs when these postmining uses are selected. This practice is allowable under current regulations within certain guidelines.

Paragraphs (a)(2) through (a)(4) of section 508 of SMCRA provide that each reclamation plan submitted as part of a permit application must include a statement of the condition of the land prior to any mining. That statement must describe

- The land uses existing at the time of application and, if the land has a history of previous mining, the uses that preceded any mining;

- The capability of the land prior to any mining to support a variety of uses, giving consideration to soil and foundation characteristics, topography, and vegetative cover, and, if applicable, a soil survey;
- The productivity of the land prior to mining, as well as the average yield of food, fiber, forage, or wood products that would be obtained from the land under high levels of management;
- The proposed postmining land use, including a discussion of the utility and capacity of the reclaimed land to support a variety of alternative uses and the relationship of the proposed postmining land use to existing land use policies and plans;
- The comments of the surface landowner and any state or local governments or agencies that would have to initiate, implement, approve, or authorize the proposed postmining land use; and
- How the proposed postmining land use is to be achieved and the support activities that may be needed to do so.

Section 508(a)(8) of SMCRA also requires a statement of the consideration that has been given to making the surface coal mining and reclamation operations consistent with surface owner plans and applicable state and local land use plans and programs.

The regulations implementing these provisions of SMCRA are found at 30 CFR § 780.23 (surface mining) and 30 CFR § 784.15 (underground mining). The regulations basically restate the statutory provisions and add a requirement for a description of the historic use of the land if the premining land use changed within 5 years before the anticipated date of beginning operations. They also specify that whenever the proposed postmining land use differs from the premining use, the proposed postmining land use must comply with the alternative postmining land use requirements of 30 CFR § 816.133(c), as discussed below.

Section 515(b)(2) of SMCRA requires that all surface coal mining and reclamation operations:

restore the land affected to a condition capable of supporting the uses which it was capable of supporting prior to any mining, or higher or better uses of which there is reasonable likelihood, so long as such use or uses do not present any actual or probable hazard to public health or safety or pose any actual or probable threat of water diminution or pollution, and the permit applicants' declared proposed land use following reclamation is not deemed to be impractical or unreasonable, inconsistent with applicable land use policies and plans, involves unreasonable delay in implementation, or violates federal, state, or local law.

The regulations implementing this paragraph of SMCRA are found at 30 CFR § 816.133 (surface mining) and 30 CFR § 817.133 (underground mining). The regulations essentially restate the statutory provisions and define how the premining land uses must be determined (i.e., the premining land uses to which the postmining land use is compared must be those uses that the land previously supported if the land has not been previously mined and has been properly managed). For previously mined land that has not been reclaimed, the premining land use must be the land use that existed before any mining. If the previously mined land cannot be reclaimed to the land use that existed before any mining, the postmining land use must be the highest and best use that can be achieved, that is compatible with surrounding areas, and that does not require the disturbance of areas previously unaffected by mining.

In addition, the regulations at 30 CFR § 701.5 define land uses as "...specific uses or management-related activities, rather than the vegetation or cover of the land. Land uses may be identified in combination when joint or seasonal uses occur; and may include land used for support facilities that are an integral part

of the use, and “higher or better uses” as “postmining land uses that have a higher economic value or nonmonetary benefit to the landowner or the community than the premining land uses.”

In order to meet these SMCRA objectives, current regulations require that all permits be issued in a manner designed to ensure that disturbed areas are restored to conditions capable of supporting the uses they were capable of supporting before mining or higher or better uses (30 CFR §§ 816 and 817.133(a)). A SMCRA permit application must state the intended use of the land after mining has ceased and reclamation is complete. Under 30 CFR § 780.23, surface coal mining permit applicants are required to submit certain information to the regulatory authority, including but not limited to:

- A map and narrative of the existing land uses within the proposed permit area. If the premining use has changed within five years prior to the anticipated date of the proposed operation, a description of the historic use of the land;
- A statement of the land’s ability, before any mining, to support a variety of uses while taking into consideration factors such as hydrology, soils, topography and vegetation;
- A statement of the premining productivity of the land determined by average yields of food, fiber forage or wood products under high levels of management;
- A detailed description of the proposed use including a discussion of the land’s capacity to support a variety of alternative uses and the relationship of the proposed use to land zoning and planning regulations;
- A description of the consideration given to making all proposed surface mining activities consistent with the surface owner’s plans and applicable state and local land use plans and programs;
- Comments from the surface owner and other state and local government entities that would initiate, implement, approve or authorize the proposed land use; and
- A description of how the proposed use will be accomplished including the necessary support facilities needed to achieve that use.

Similar information requirements apply to underground coal mining permit applications (30 CFR § 784.15).

If an alternative postmining land use is proposed, then the application must also contain the information required for approval of that use pursuant to 30 CFR § 816.133, including demonstrations that:

- There is a reasonable likelihood of achieving the proposed use, without unreasonable delay, and the use will not be impractical or unreasonable;
- The proposed use will not present any actual or probable hazard to public health or safety, or threat of water diminution or pollution;
- The proposed use will not be inconsistent with applicable land use policies or plans; and
- The proposed use will not cause or contribute to violation of federal, state or local law (30 CFR §§ 816 and 817.133).

**Postmining Land Use for Special Categories of Mining:** Under SMCRA, postmining land uses are limited to the premining land use and, in certain cases, specific other uses, based on the category of mining. If the land use is to be changed, and the land is not to be returned to its approximate original

contour, the operator must apply for, and receive a variance from approximate original contour requirements. Two types of variances are available: mountain top removal and steep-slope variances.

**Mountain Top Removal Land Use Variance:** Current federal regulations define the term “mountaintop removal mining” as:

[S]urface mining activities, where the mining operation removes an entire coal seam or seams running through the upper fraction of a mountain, ridge, or hill, except as provided for in 30 CFR 824.11(a)(6), by removing substantially all of the overburden off the bench and creating a level plateau or a gently rolling contour, with no highwalls remaining, and capable of supporting postmining land uses in accordance with the requirements of this section (30 CFR 785.14(b)).

Under 30 CFR § 785.14(c) there must be “an industrial, commercial, agricultural, residential, or public facility (including recreational facilities) postmining land use,” to justify a mountain top removal approximate original contour variance. Additional performance standards exist related to slope stability, excess spoil generation and control, and drainage requirements (30 CFR § 824.11).

In addition to proposing the appropriate postmining land use, an approximate original contour variance for the mountaintop removal operation may only be granted where the specific land use is deemed to constitute an equal or better economic or public use of the affected land. As compared with the premining use, and the applicant must present specific plans for the proposed postmining land use and appropriate assurances that such use will be

- (A) Compatible with adjacent land uses;
- (B) Obtainable according to data regarding expected need and market;
- (C) Assured of investment in necessary public facilities;
- (D) Supported by commitments from public agencies where appropriate;
- (E) Practicable with respect to private financial capability for completion of the proposed use;
- (F) Planned pursuant to a schedule attached to the reclamation plan so as to integrate the mining operation and reclamation with the [postmining land use]; and
- (G) Designed by a registered engineer in conformance with professional standards established to assure the stability, drainage, and configuration necessary for the intended use of the site (30 CFR §§ 785.14(c)(1)(iii)(A)-(G)).

In addition, the proposed postmining land use must be consistent with existing state and local land use plans and programs. Surface mining operations conducted under an approximate original contour variance for mountaintop removal cannot result in damage to natural watercourses below the lowest coal seam mined. See 30 USC § 1265(c)(3)(4); 30 CFR § 785.14 and 30 CFR part 824.

**Steep Slope Variance:** An approximate original contour variance may also be allowed for non-mountain top removal mine sites operating in “steep slope terrain.” Steep slope terrain is defined as any slope of more than 20 degrees or lesser as determined by the regulatory authority. In these cases the entire coal seam and overburden are not removed, leaving a highwall. Under 30 CFR § 785.16, the regulatory authority “may issue a permit [that contains an approximate original contour variance] for non-mountaintop removal, steep slope, surface coal mining and reclamation operations,” where it finds that following reclamation the lands “will be suitable for either industrial, commercial, residential, or public (including recreational facilities)” uses, provided that the surface landowner has knowingly requested (in

writing) such a variance in order to support the proposed postmining land use (30 CFR § 785.16(a)(1)). Unlike the mountaintop removal approximate original contour variance, an agricultural postmining land use is not permissible for the purpose of granting a steep slope mining approximate original contour variance. In addition, the watershed within the proposed permit and adjacent areas must be improved “when compared with the condition of the watershed before mining or with its condition if the AOC [approximate original contour] were to be restored” (30 CFR § 785.16(a)(3)).

Requirements for both steep slope and mountaintop removal variances from approximate original contour requirements allow such variances only where the proposed postmining land use will result in an equal or better economic or public use (OSMRE 2000).

As noted, on private lands the authority of SMCRA to influence postmining land use is time-limited; once the bond is released the landowner of private property is free to pursue land uses at their discretion.

### **Lands Considered to be Incompatible with Mining**

SMCRA recognizes that mining may be incompatible with the existing land uses of surrounding areas in certain situations. Except for operations in existence on August 3, 1977, section 522(e) of SMCRA prohibits surface coal mining operations on the lands listed in paragraphs (e)(1) through (e)(5), subject to valid existing rights (30 USC § 1272(e)). Under OSMRE regulations (paragraph (b) of the definition of valid existing rights in 30 CFR § 761.5), a person may have valid existing rights if prior to the date the land came under the protection of section 522(e), the person or predecessor of interest obtained, or made a good faith effort to obtain, all necessary permits and other authorizations required to conduct surface coal mining operations. A person may also have valid existing rights if the land is needed for and immediately adjacent to a surface coal mining operation for which all permits and other authorizations for conducting a surface coal mining operation had been obtained, or a good faith attempt to attain them had been made, before the land came under the protection of section 522(e).

Section 522(e)(1) protects all lands within the boundaries of the National Park System, National Wildlife Refuge System, the National System of Trails, the National Wilderness Preservation System, the Wild and Scenic Rivers System, including study rivers designated under section 5(a) of the Wild and Scenic Rivers Act, and National Recreation Areas designated by Congress (30 USC § 1272(e)(1)).

Section 522(e)(2) protects federal lands within the boundaries of any national forest, but it allows surface coal mining operations to be conducted on those lands if the Secretary of the Interior finds that there are no significant recreational, timber, economic, or other values that may be incompatible with the proposed mining operations. The Secretary may make this finding only for (1) surface operations and impacts incident to an underground coal mine or (2) surface coal mining operations on lands without significant forest cover within those national forests west of the 100th meridian for which the Secretary of Agriculture determines that surface mining is in compliance with the Multiple-Use Sustained-Yield Act of 1960, the Federal Coal Leasing Amendments Act of 1975, the National Forest Management Act of 1976, and SMCRA. No surface coal mining operations are allowed on any federal lands within the Custer National Forest.

Section 522(e)(3) protects lands where mining would adversely affect publicly owned parks and properties listed on the National Register of Historic Places, although it allows surface coal mining operations when those operations are approved jointly by the regulatory authority and other federal and state authorities with jurisdiction over the park or historic place.

Section 522(e)(4) protects lands within 100 feet of the outside right-of-way line of a public road. The law allows mining within the protected area if the regulatory authority, after public notice and opportunity for a public hearing, finds that the interests of the public and the affected landowners will be protected.

Section 522(e)(5) prohibits surface coal mining operations on lands within 300 feet of an occupied dwelling unless the owner of the dwelling waives that protection. It also prohibits surface coal mining operations on lands within 300 feet of any public building, school, church, community or institutional building, or public park. It further prohibits surface coal mining operations on lands within 100 feet of a cemetery.

### **Petition Process for Designating Lands Unsuitable for Mining**

Section 522(c) of SMCRA allows any person having an interest that is or may be adversely affected to petition the regulatory authority to designate an area as unsuitable for surface coal mining operations, or to terminate an existing designation. Paragraphs (a)(2) and (a)(3) of section 522 establish the criteria for evaluating the petition. Under paragraph (a)(2), the regulatory authority must make a designation of unsuitability if it determines that reclamation as required by the SMCRA regulatory program is not technologically and economically feasible. Under paragraph (a)(3), the regulatory authority has the discretionary authority to designate the area as unsuitable for all or certain types of surface coal mining operations if it determines that those operations would

- Be incompatible with existing state or local land use plans or programs;
- Affect fragile or historic lands in which the operations could result in significant damage to important historic, cultural, scientific, and aesthetic values and natural systems;
- Affect renewable resource lands (including aquifers and aquifer recharge areas) where the operations could result in substantial loss or reduction of long-range productivity of water supply or of food or fiber products; or
- Affect natural hazard lands (including areas subject to frequent flooding and areas of unstable geology) in which the operations could substantially endanger life and property.

Implementing regulations describing the areas designated by Congress are in 30 CFR part 761. Implementing regulations for the designation process are set forth in 30 CFR parts 762, 764, and 769. With these regulations in place, the no-action alternative prevents, and would continue to prevent, surface mining where it would be incompatible with existing land uses.

### **Assumptions and Methodology**

Land use and recreation within the evaluation area are potentially affected by land use changes and other impacts associated with surface coal mining operations. These may include visible physical modifications to the landscape such as vegetation removal and changes in topography; physical displacement of existing land uses at mine sites; impacts to surrounding land uses resulting from access restrictions in areas surrounding mine sites; impacts due to noise, dust, and emissions from mining operations and related traffic; and impacts related to conflicts with existing land management plans or interference with the ability of management agencies to implement those plans.

Impacts were evaluated by considering the effects of alternative 1 and the various action alternatives on land use, including recreational uses and facilities. Field investigations are not proposed as part of this methodology but rather existing data sources were used to examine land use conditions and recreational opportunities throughout the project study area.

Information on land use and recreation was collected from various sources including relevant available literature, GIS data layers and maps, the existing conditions described in “Chapter 4: Affected Environment,” information on potential mineable coal resources described in “Chapter 5: Evaluation of Coal Resources,” information on existing land use management plans described in “Chapter 2: Petition Evaluation” and professional judgment. The limits of the inventory vary depending on the application of each data set.

GIS data depicting the petition or designation area of each alternative, the evaluation area, existing land uses and recreational resources, and potential coal resources within the evaluation and designation area was used to analyze impacts. Coal resource data layers include unmined areas and previously mined areas and the commercially viable coal seam in which each is located.

Potential overall impacts to land use are qualitatively analyzed based on the potential impacts resulting from physical displacement of existing land uses at mine sites; impacts to surrounding land uses resulting from access restrictions in areas surrounding mine sites; impacts due to noise, dust, and emissions from mining operations and related traffic; and impacts related to conflicts with existing land management plans or interference with the ability of management agencies to implement those plans. Overall impacts to recreation are analyzed based on the potential impacts to recreational use resulting from access restrictions in areas surrounding mine sites; noise, dust, emissions, and visual impacts from mining operations and related traffic; and impacts to recreational opportunities such as hunting, wildlife viewing, or fishing resulting from habitat and water quality impacts. Additionally, the analysis of impacts to recreation considers the potential for adverse effects to specific, unique recreational facilities or resources.

A more site-specific analysis was completed using GIS tools and associated data, where feasible. These data quantitatively describe the area where potential impacts to land use and recreation could occur. For each alternative, these analyses looked at one or more of the following indicators:

- Proximity of mineable coal to existing oil and gas wells
- Proximity of mineable coal to campgrounds
- Proximity of mineable coal to fish-bearing streams
- Proximity of mineable coal to State Parks and Natural Areas
- Proximity of mineable coal to Nationwide Rivers Inventory stream segments, Obed Wild and Scenic River system, and the Big South Fork National Recreation River
- Proximity of mineable coal to the Cumberland Trail
- Proximity of mineable coal to the Hatfield Knob elk viewing tower

Using the data sources and analyses, the existing land use conditions and recreational resources and opportunities within the area of analysis were investigated. The resulting assessment served as a baseline against which the impacts of each alternative were compared. It is expected that, under the six alternatives, impacts from mining operations would vary with possible implications for land use and recreation. Conclusions were based on overall impacts to land use and recreation occurring within the area of analysis and determination of impact type, potential area, duration, and relative intensity for each alternative. Greater impacts would be expected to occur closer to active or unreclaimed mining areas.

Specific assumptions used in the analysis of impacts to land use and recreation include the following:

- The initial basis of the analysis will be the proximity of known coal resources and existing highwalls to potentially conflicting land uses or recreational resources.

- Impacts to land use would occur, but adherence to performance standards and implementation of reclamation requirements would mitigate most long-term impacts.
- Impacts to water resources, and therefore associated recreational opportunities, could occur, but adherence to performance standards and implementation of mitigation measures would prevent exceedances of applicable water quality criteria.
- To better understand the context and intensity of potential impacts, it is assumed that mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions. Reclamation and best management practices would be required in order to restore the premining landscape, protect soil, water and air quality, restore vegetated habitat, and protect fish and wildlife species.
- It is expected that no valley fills would be approved to allow for storage of excess spoil under any of the alternatives. As set forth in Tennessee code section 69-3-108, as amended, no mining can occur within 100 feet of the ordinary high water mark of any stream, nor may overburden or waste materials from surface mining of coal be disposed of within 100 feet of the ordinary high water mark of a stream (except in certain circumstances to restore impaired streams).
- It is assumed that no surface coal mining would take place in the ERTCE portion of the evaluation area.
- It is assumed, based on the discussion above concerning the implementing regulations at 30 CFR § 761.11 establishing areas where surface coal mining operations are prohibited or limited, that mining would be prohibited within 300 linear feet to either side of the 300-foot wide Cumberland Trail State Park right of way. Therefore, it is assumed that no mining would take place within a 900-foot wide corridor centered on the Cumberland Trail State Park. The Cumberland Trail State Park extends for 42 miles through the evaluation area, thus the corridor where no mining would take place would encompass approximately 4,582 acres.

## **Area of Analysis**

The limits of the potential area affected for land use and recreation include the petition area or designation area of each alternative proposed, the evaluation area, and lands within a certain distance of an active mine as may be applicable to each specific land use or recreational resource analyzed. Impacts to water-based recreation may extend outside of the evaluation area based on potential downstream impacts to water resources from surface mining activities.

## **GENERAL IMPACT OF COAL MINING IN TENNESSEE ON LAND USE AND RECREATION**

### **Surface Mining and Remining**

Construction of mines and support facilities can cause environmental impacts in the near term that are related to site preparation, such as grading and drainage diversion, and to the actual construction of the facilities. In the long term, the operation of mine and support facilities, along with the subsequent reclamation of mined areas, constitute a period of mineral extraction-related land use that may last from a few years to decades and differs substantially from the premining land use (OSMRE 1979).

Typical activities during the construction and mining phase include ground clearing (removal of vegetative cover and topsoil), drilling, blasting, trenching, excavation, and vehicular and pedestrian traffic. Activities conducted in locations other than the facility site include transport of coal. Impacts to

land use could occur during mine construction and operation if mining activities conflict with existing land use plans and community goals; conflict with or impair existing recreational, educational, religious, scientific, or other uses; or result in conversion of an existing commercial land use for the area. Indirect impacts to agricultural land uses and certain types of recreation could also occur if water quality is affected by acid mine drainage, sedimentation, or other contaminant runoff resulting from mining operations (TEEIC 2015).

During construction and mining activities, most land use impacts would be expected to be temporary, such as the closure of surrounding areas to certain uses during blasting or heavy equipment operations, impediments to access related to increased vehicle and equipment traffic, or temporary effects on the character of a recreation area due to noise, dust, and visual intrusions. Long-term land use impacts would occur if existing land uses would be substantially incompatible with coal mining over the duration of a mining operation, such as residential use or remote recreational experiences; however, those uses could be resumed if the land is properly reclaimed to pre-development conditions.

Primary sources of noise during construction and mining would include mining equipment (draglines, augers, rollers, bulldozers, pile drivers, and diesel engines) coal trucks, and blasting. Blasting would be clearly audible in the general vicinity of surface and coal mining activities, but noise levels could vary depending on the weight of the explosives and the type of blast design used. Per the OSMRE study, "Acoustic Measurement and Assessment of Impacts of Surface Coal Mining in the NCWMA and Emory River Tracts Conservation Easement Area," blasting is estimated to have an acoustic level ranging from 105 dBA (A-weighted decibels) to 110 dBA at 50 feet (Nabelek 1985). However, because of the infrequency of blasting, and requirements to notify residents within 1,000 feet and limit blasting to daylight hours Monday through Saturday (Rules of Tennessee Department of Environment and Conservation 0400-42-06-.02 Blasting Regulations), expected impacts from blasting would be minor to moderate and limited in time and effect.

In areas where mining occurs near residential uses, a future surface mine site could be perceptible to residents, thus resulting in adverse impacts to residential land use. Under these conditions, federal regulations require specific details in the permit application regarding blasting plans and implementing specific distance limitations (30 CFR § 816.67). These special limitations are also applied to mining within the buffer zone for churches, communities, and cemeteries, all of which would be protected if mining is approved to occur within the petition evaluation area. Under these scenarios, blasting could be perceptible at residences and it could impact other noise-sensitive land uses but should not result in actual physical damage to reasonably sound structures if the mine operator follows the approved mining operations plan.

In addition, at least one study has demonstrated a statistically significant negative relationship on a county-by-county level between proximity to surface coal mines and residential property values. The study also indicates that the negative impact of a surface coal mine on residential property values would be expected to be much more pronounced if an individual property is located within one mile of a mine and less pronounced if a property is located at a far greater distance away from a mine (Williams 2011).

Surface coal mining operations could have potential long-term adverse impacts on forestry uses, particularly if surface mining results in the permanent conversion of forested areas to non-forested areas. Areas cleared of timber to facilitate mining operations and construct access and haul roads would require a substantial amount of time to return to a forested condition. For example, the forest rotation (time required to grow a timber crop to economic or natural maturity) for oak may be 30 to 150 years depending on the site, desired product and landowner objectives (University of Tennessee 1995).

Surface coal mining operations could also affect other mineral resource extraction activities, such as oil and gas production, if these uses occur in close proximity to a mine site. The production of oil and gas might be temporarily delayed by the approval of a mining permit. However, oil and gas could still be developed after coal mining has been completed (OSMRE 1984). Temporary area and road closures associated with surface coal mining activities could temporarily affect the ability of well permit owners to access well sites. Therefore, the potential for near-term adverse impacts to oil and gas production exists.

The presence of mining personnel, vehicles and equipment, noise, and dust could cause near-term adverse impacts for recreational visitors who are seeking a remote, backcountry experience. Displacement of wildlife due to noise, lights, and habitat disturbance from mining activities could diminish wildlife viewing and hunting opportunities, resulting in near-term adverse impacts. Mining-related water quality impacts could diminish fishing, canoeing, and kayaking opportunities, also resulting in near-term adverse impacts. Future opportunities for the creation of recreational trails or other recreational amenities may be affected, resulting in long-term adverse impacts. In the long term, visitors could choose to visit other recreational areas due to mining disturbance and/or recreational use restrictions that may occur.

The type and intensity of impacts to land use and recreation would vary according to the location of mining operations relative to specific land uses or recreational resources, the size and type of mining, and the duration of mining activities. The adverse impacts from surface mining and re-mining operations and activities and the development and use of access and haul roads would be minimized through the implementation of best management practices; stormwater management, sediment and erosion control, and reclamation plans; and performance standards, as described under “Applicable Statutes, Regulations, and Policies” above. Mitigation and minimization measures are implemented before, during, and after mining operations. Prior to the commencement of mining operations, steps are taken to avoid or minimize the impacts of mining on land use and recreation. Under SMCRA (30 CFR parts 780 and 784), mining permit applicants must research the baseline conditions of the area to be mined and develop both a mining plan and a reclamation plan. Under SMCRA (816.100, 816.101, 942.816(e)), Tennessee requires concurrent reclamation practices such that after surface mining operations are completed on a site, the reclamation operations must begin within 60 days of coal removal, thereby resulting in a shorter timeframe for adverse impacts to land use and recreation.

The continued existence of pre-SMCRA unreclaimed abandoned mined lands could result in long-term adverse impacts. In addition to acid mine and other polluted drainage that can still occur at pre-SMCRA unreclaimed mines (TNWF 2005; EPA 2004), the presence of unreclaimed mine areas and any related mine workings or equipment that may have been abandoned on site could create safety hazards for recreational users.

## **Roads**

Haul road and access road construction could result in adverse impacts to land use and recreation related to the removal of vegetation, soil disturbance, increased potential for erosion and runoff to adjacent surface waterbodies, disturbance of wildlife, and noise and visual disturbances (OSMRE 1979). Operation of roads could also result in noise, dust, and emissions from vehicle traffic to and from mine sites. Long-term beneficial impacts to recreation can also result from the presence of access and haul roads, since these roads can enhance access into the area for recreational purposes. For example, off-road vehicle and all-terrain vehicle enthusiasts, hunters, and wildlife watchers use these roads to access their favorite areas for pursuing their respective interests. Implementation of best management practices and compliance with applicable SMCRA and other regulations would minimize adverse impacts from construction and operation of roads, resulting in long-term minor adverse impacts on land use and recreation.

## ALTERNATIVE 1: NO-ACTION ALTERNATIVE

Under the no-action alternative, the OSMRE would deny the State's petition to designate the subject lands as "unsuitable for surface coal mining operations" (30 CFR § 764.13). Therefore, the no-action alternative would have the same effect as deciding not to designate any of the petition area, as described by alternative 2, as unsuitable for surface coal mining operations. Current management of coal resources would continue, and all types of mining operations and activities would continue to be allowed throughout the petition and evaluation areas, including surface, underground, augering, remining, and associated reclamation activities. Access and haul roads would be constructed to support mining operations as well as remining and reclamation efforts. Reclamation associated with remining would restore damage in areas mined prior to the passage of SMCRA in 1977. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions. Mitigation and best management practices would be required in order to restore the premining landscape, protect soil, water and air quality, restore vegetated habitat, and protect fish and wildlife species.

The selection of the no-action alternative would not by itself result in the approval of any specific surface coal mining operations within the petition evaluation area. Approval or denial of a specific surface coal mining operation can be issued only after an applicant has submitted a permit application to the OSMRE with site-specific data that meet all the requirements of SMCRA and the implementing regulatory program. The no-action alternative would generally be expected to result in a level of future disturbance associated with surface coal mining operations that is consistent with historical levels of approximately 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). Disturbance associated with surface coal mining and access and haul road construction under the no-action alternative could potentially have impacts on forestry, oil and gas, and recreational uses within the NCWMA, in addition to potentially conflicting with the management goals and policies of existing land use management plans.

Under the no-action alternative, a maximum of approximately 65,830 acres of unmined areas and 16,925 acres of previously surface mined areas would be available for surface mining and remining, respectively (see table 6-88). The no-action alternative is therefore considered to have the largest impact of all of the alternatives considered.

**TABLE 6-88: MAXIMUM POTENTIAL ACREAGE AVAILABLE FOR SURFACE MINING AND REMINING WITHIN THE EVALUATION AREA BY ALTERNATIVE**

Alternative	Potential Surface Mineable Acreage	Previously Surface Mined (Remining) Acreage
Alternative 1 (No Action)	65,830.3	16,924.9
Alternative 2	31,736.5	8,146.6
Alternative 3	31,736.5	16,924.9
Alternative 4 (Preferred Alternative)	28,463.4	16,924.9
Alternative 5	56,954.5	15,399.9
Alternative 6	46,664.2	12,075.2

## Direct and Indirect Impacts to Existing Land Uses

Existing land uses that could be affected by development of these areas for surface coal mining and associated haul road construction and use under the no-action alternative would consist of residential land uses surrounding the evaluation area, forestry uses within the evaluation area, oil and gas extraction within the evaluation area, dispersed recreational uses within the evaluation area, and designated recreational areas and facilities within the evaluation area.

**Residential Use:** Residential land use surrounding the evaluation area, and on private inholdings interspersed within the evaluation area, is minimal. As described above, distance requirements established under 30 CFR § 761.11 and blasting timing and notification requirements established under TDEC Rules 0400-42-06-.02 would be expected to minimize the impacts of surface mining on residential land use. Furthermore, any potential impacts on residential land uses, including disturbance to residents related to active mining operations in the near term and impacts to property values in the long term, would be variable and highly dependent on the location of individual surface mining operations. It is therefore not possible to predict the potential impacts of mining operations on specific residential land uses. In general, the no-action alternative could have near- and long-term adverse impacts on residential land uses; however, due to the limited amount of residential land use in close proximity to the evaluation area, these impacts are expected to be minimal. Best management practices and compliance with applicable regulations and permit conditions would further minimize, but not eliminate impacts to this land use.

**Forestry Use:** As described above, surface coal mining could have potential long-term adverse impacts on forestry uses. Surface mining requires the clearing of large areas of vegetation, resulting in the conversion of forested areas to non-forested areas for a substantial length of time, ranging from a few decades to over 100 years depending on the site, desired product (e.g., pulpwood or sawtimber), and landowner objectives (University of Tennessee 1995). Similar to the impacts described above for residential land use, the impacts of surface mining would be highly variable and dependent on the location of individual surface mining operations as well as the location of planned future timber harvest operations. Although long-term adverse impacts to forestry-related uses would result from the length of time necessary for a site to return to a forested condition, the extent of forested land on the NCWMA combined with the relatively limited 3,360-acre area of surface mining disturbance predicted over the 30-year analysis period suggest that adverse impacts would be minimal. Adherence to the SMCRA General Performance Standards governing Postmining Use of Land (30 CFR § 715.13) and the permit application requirements contained in TDEC Rules Chapter 0400-42-05, Revegetation Plan, would be expected to further minimize, but not eliminate impacts to this land use.

**Oil and Gas Production:** Surface coal mining can directly interfere with oil and gas production, which might be temporarily delayed by the approval of a mining permit (OSMRE 1984). Oil and gas could still be developed after coal mining has been completed; however, coal mining operations can last anywhere from a few years to decades (OSMRE 1979). Oil and gas operations in Tennessee typically require a well pad up to approximately 3.5 acres in area, along with additional acreage for development of roads and power lines as necessary (BLM 2008). It is therefore assumed, based on calculating a radius of approximately 220 feet for a circular area of 3.5 acres, that surface coal mining operations within approximately 250 feet or less of a permitted oil or gas well could directly interfere with oil and gas production. Additionally, it is assumed based on professional judgment that surface coal mining operations within 1,000 feet of an oil and gas well could intermittently interfere with the well permit owner's ability to access their well sites due to mining vehicle and equipment traffic or temporary road or area closures.

From data of oil and gas well locations provided by the OSMRE, 322 oil and gas wells were identified within the boundaries of the evaluation area (TDOG 2011). Under the no-action alternative, a total of 196

permitted oil and gas wells lie within 250 feet of mineable coal seams and/or previously mined areas. Of this total, 108 well permits lie directly atop mineable coal resources. An additional 81 permitted oil and gas wells lie within 250 to 1,000 feet of mineable coal seams and/or previously mined areas. The majority of oil and gas permits within the evaluation area therefore have the potential to be adversely impacted by surface coal mining operations under the no-action alternative, although impacts will vary based upon the specific locations of future surface coal mining operations. Adverse impacts to existing, operating oil and gas wells are expected to be intermittent and largely related to the interference of coal mining operations with well site access. Impacts to undeveloped oil and gas permits could be longer-term in nature if the development of a surface coal mine delays the drilling of an oil or gas well. The potential for long-term impacts on currently permitted but undeveloped oil and gas production would be limited by the projected annual rate of surface coal mining in the evaluation area.

### **Direct and Indirect Impacts to Existing Recreational Uses**

**Dispersed Recreational Uses:** Many of the common recreational uses of the evaluation area, including but not limited to hiking, all-terrain vehicle use, hunting, and fishing, are dispersed throughout the NCWMA, and areas specifically designated for such uses are few. Therefore, the impacts on recreational uses will largely be dependent on the specific details of individual mine operations and must be evaluated within the context of individual permit applications. In general, impacts to these uses on the NCWMA under the no-action alternative would be similar to those described above under General Impacts of Surface Coal Mining and would consist of impacts related to noise from surface mine construction and operation, including blasting; noise, fugitive dust and emissions from mining vehicle traffic and mining equipment; visual disturbances related to the presence of surface mining operations; and indirect impacts to water-based recreation related to water quality impacts from mine runoff. Impacts to dispersed recreational uses would require more detailed analysis within the context of individual surface mining permit applications that define a specific geographical extent of proposed mining activities. Therefore, the analysis of impacts to recreation under the no-action alternative focuses on potential impacts to designated recreational resources within and surrounding the evaluation area.

**Impacts to Designated Recreational Resources:** Recreational resources lying within the evaluation area boundary that have received specific designations and have the potential to be impacted under the no-action alternative include the Cumberland Trail State Park, the Hatfield Knob elk viewing tower, and the Stinking Creek Nationwide Rivers Inventory river. Designated recreational resources lying outside the evaluation area that have the potential to be impacted under the no-action alternative include the Big South Fork National River and Recreation Area, Obed Wild and Scenic River, and Rock Creek Nationwide Rivers Inventory Stream.

**Cumberland Trail State Park:** The Cumberland Trail is a designated State Scenic Trail, a 42-mile segment of which traverses the evaluation area from northeast to southwest. It is also designated as Cumberland Trail State Park, which comprises a 300-foot wide corridor centered on the trail, including designated campgrounds. SMCRA standards establishing areas where surface coal mining operations are prohibited or limited (30 CFR § 761.11) include areas within 300 feet, measured horizontally, of any public park. Therefore, under the no-action alternative, surface coal mining and related operations would be prohibited within an additional 300-foot wide corridor on either side of the 300-foot wide Cumberland Trail State Park right-of-way, for a total corridor width of 900 feet.

Based on the 900-foot corridor width, it is unlikely that recreational users of the Cumberland Trail would experience any impacts related to area closures or access restrictions associated with surface coal mining. Impacts related to noise, dust, or emissions from mining vehicle traffic would only occur in close proximity to roadway crossings of the trail, and would be highly intermittent and minimal. Adverse impacts from visual disturbance would be highly dependent on the user's position on the trail; it is likely

that, given the width of the corridor within which mining is effectively excluded, any line of sight to a surface mining operation would be obscured by vegetation and/or topography. Impacts to recreational use of the Cumberland Trail and its associated designated campgrounds under the no-action alternative are therefore assumed to be limited to noise impacts from mine construction and operation, including blasting.

SMCRA does not contain requirements specific to soundscapes or noise limitations on surface coal mining. OSMRE regulations provide specific standards for airblasts (129 decibels (dB) peak, flat response) at 30 CFR § 816.67. These limits apply to the location of any dwelling, public building, school, church, community, or institutional building in connection with blasting under the jurisdiction of the OSMRE. Soundscapes are also within the general purview of environmental issues considered under NEPA, and are analyzed in greater detail in this EIS document under the “Impacts of the Alternatives on Natural Soundscapes” and “Impacts of the Alternatives on Visual Resources.”

The EPA recommends using day-night average sound level and hourly equivalent sound level ( $L_{eq}$ ) as the best descriptors when assessing environmental noise impacts. Day-night average sound level and  $L_{eq}$  are defined in detail under the discussion on Soundscapes in this document. Basically, these descriptors represent different measures of average noise levels, which take into account increased sensitivity to noise during the nighttime hours as well as variation in sound over time. The EPA recommends that areas of outdoor activity where quiet is a basis of use,  $L_{eq}$  should not exceed 55 dBA (average over 24-hour period). Sound levels above this can result in human interference and annoyance (EPA 1974). Based on the analysis of soundscapes in this document, a criteria sound level of greater than 55 dBA was chosen as the level above which annoyance and interference with recreational activities occurs. A criteria sound level of greater than 45 dBA was chosen as the level above which wildlife disturbance occurs.

Sounds generated by contour surface mining operations are high compared to ambient baseline levels, but vary based on the size of the mining operation. The analysis of soundscapes within this document estimates the sound level from a hypothetical large coal mine at 70 dBA at a distance of 1,312 feet, which is equivalent to the sound produced by interstate highway traffic at 70 miles per hour. Based on the assumption that sound levels from point sources such as mines have an attenuation rate of 6 dBA per doubling in distance, a 2-mile buffer outside of the 900-foot corridor was chosen for analysis of potential noise impacts to recreational users on the Cumberland Trail. Using a noise attenuation calculator at, it was determined that for a hypothetical mine with a reference level of 70 dBA at a distance of 1,312 feet, lying a distance of 2 miles outside the 900-foot corridor, recreational users on the Cumberland trail would experience an ambient sound level of 51.5 dBA. While this is below the annoyance threshold, it is substantially above normal ambient sound conditions. Blasting generates far greater noise impacts than mining operations, but at far shorter intervals. Blasting is estimated to have an acoustic level ranging from 105 dBA to 110 dBA at 50 feet (Nabelek 1985), which translates to an ambient sound level on the Cumberland Trail of between 58 and 63 dBA for a hypothetical mine with a reference level of 70 dBA at a distance of 1,312 feet, lying a distance of 2 miles outside the 900-foot corridor.

It must be noted that, although hikers on the Cumberland Trail would gradually move away from sources of mining-related noise, a hypothetical mining operation (as described above), which lies closer than two miles outside the 900-foot corridor would be audible at higher levels, for longer periods of time and for greater distances along the trail. Any mining within 1.4 miles or less of the trail would be audible at levels above the 55 dBA human annoyance threshold.

Unlike hikers, users of the designated campgrounds along the trail would remain stationary for sustained lengths of time and therefore would be subject to high levels of mining noise for longer periods of time. Six campgrounds along the Cumberland Trail lie within two miles or less of a potentially mineable coal seam. The potential adverse noise impacts to campground users would be longer in duration, and

therefore greater than the adverse impacts to hikers if mining operations were initiated along these coal seams. These impacts would only occur, however, if coal resources within two miles of the campgrounds were developed, and impacts would be less likely at greater distances.

Over 30,197 acres of potentially mineable unmined coal resources and 11,554 acres of unreclaimed previously mined areas lie within two miles of the 900-foot corridor surrounding the Cumberland Trail along its 42-mile length through the evaluation area (see table 6-89). The potential under the no-action alternative for mining-related noise disturbance to adversely impact recreational trail users of the Cumberland Trail is therefore widespread. In spite of the limited annual surface mining disturbance projected over the period of analysis, there is high potential for these adverse impacts to occur locally at some point along the trail.

**TABLE 6-89: MAXIMUM POTENTIAL ACREAGE OF SURFACE MINING AND REMINING WITH POTENTIAL TO AFFECT CUMBERLAND TRAIL AND HATFIELD KNOB ELK VIEWING TOWER, BY ALTERNATIVE**

Alternative	Potentially Mineable Coal Seams <sup>a</sup>	Potentially Remineable Highwalls <sup>a</sup>	Potentially Mineable Coal Seams <sup>b</sup>	Potentially Remineable Highwalls <sup>b</sup>
Alternative 1 (No Action)	3,484	4,664	30,197	11,554
Alternative 2	1,761	2,021	15,332	5,945
Alternative 3	1,761	4,664	15,332	11,554
Alternative 4 (Preferred Alternative)	1,606	4,664	13,824	11,554
Alternative 5	3,118	4,402	27,000	10,700
Alternative 6	2,562	3,206	19,166	7,429

<sup>a</sup> Coal resources within 4.5 miles of the Hatfield Knob Elk Tower (acres).

<sup>b</sup> Coal resources within 2 miles of the 900-foot Cumberland Trail Corridor (acres).

**Hatfield Knob Elk Viewing Tower:** The potential for negative impacts to animals due to human-caused sounds is high because many animals rely on auditory clues for predator avoidance, mate attraction, obtaining nesting territories, and finding prey. Noise impact criteria for wildlife are discussed in greater detail in this document in the section “Impacts of the Alternatives on the Natural Soundscape.” The analysis of impacts to recreational use at the Hatfield Knob elk viewing tower is based on a criteria sound level of greater than 45 dBA for wildlife disturbance in addition to potential visual disturbance impacts and direct displacement of elk habitat.

The Hatfield Knob elk viewing tower is a noteworthy recreational resource within the evaluation area because of the unique wildlife viewing opportunities it offers. According to information provided by OSMRE and TWRA, visitation at the elk tower has increased from 468 people in 2006 to 14,370 in 2013 (Elkins pers. comm. 2015). Mining impacts that diminish elk viewing opportunities would therefore have a high potential for adverse impacts to recreational use.

Unlike the Cumberland Trail, the Hatfield Knob elk viewing tower is situated in a relatively unforested portion of the evaluation area on a reclaimed surface mine. While this increases elk viewing opportunities, it also increases the potential for adverse impacts to recreation resulting from changes to the visual landscape if mining activities are visible from the tower. The Hatfield Knob elk viewing tower is situated directly atop a potentially mineable coal seam. Approximately 350 acres of potentially mineable coal and approximately 260 acres of remineable coal resources are located within approximately one mile of the tower. Therefore, the potential for adverse visual impacts to recreational use at the

Hatfield Knob elk viewing tower exists, although visibility may be constrained by distance and topography unless surface mining takes place within visible proximity to the elk viewing tower. Given the limited amount of mining projected over the 30-year period of analysis it is considered unlikely but not impossible that mining operations would be visible from the elk tower.

Mining operations close enough to be visible from the elk viewing tower would likely have much greater potential for adverse recreation impacts resulting from direct displacement of elk and elk habitat. The General Performance Standards governing Postmining Use of Land in the SMCRA implementing regulations (30 CFR § 715.13) require the timely restoration of disturbed areas to conditions that are capable of supporting the uses they were capable of supporting before any mining occurred. However, it is likely that any mining operations permitted within close enough proximity to the elk viewing tower to displace elk habitat would have near-term to potentially long-term adverse impacts on recreation, depending on the amount of time required for restoration. Given the available potentially mineable coal resource under the no-action alternative, the overall area of the NCWMA, and the limited amount of mining projected over the 30-year period of analysis, adverse impacts to recreation at the Hatfield Knob elk viewing tower due to direct displacement of elk habitat are considered unlikely.

Similar to the impacts described for recreation on the Cumberland Trail, the greatest potential for adverse impacts to recreation at the Hatfield Knob elk viewing tower under the no-action alternative results from potential displacement of elk due to noise impacts related to mining operations. Using the hypothetical mine scenario described above, a mine with a reference sound level of 70 dBA at 1,312 feet would require a distance of over 26,000 feet, or roughly 4.5 miles, to attenuate to levels below the 45 dBA threshold for wildlife disturbance. Under the no-action alternative, approximately 3,484 acres of potentially mineable coal and 4,664 acres of potentially remineable coal resources exist within a 4.5-mile radius of the elk viewing tower (see table 6-89). The distance at which noise levels would be above the 45 dBA threshold for wildlife disturbance implies that elk could react to surface mining operations near the viewing tower area by moving an extended distance away from the viewing tower area, limiting elk viewing opportunities for visitors and resulting in adverse impacts to recreation. Despite the limited amount of annual mining projected over the 30-year period of analysis, there is a likelihood that adverse recreational impacts related to noise disturbance at the Hatfield Knob elk viewing tower could occur at some interval under the no-action alternative.

**Stinking Creek and Rock Creek Nationwide Rivers Inventory Streams, Big South Fork National River and Recreation Area, and Obed Wild and Scenic River:** The headwaters of the Stinking Creek Nationwide Rivers Inventory stream are located within the northern portion of the evaluation area, while the majority of the stream reach that is listed on the Nationwide Rivers Inventory is located outside of the evaluation area. The Rock Creek Nationwide Rivers Inventory stream is located 0.7 miles outside of the evaluation area boundary at its closest point. The Wild and Scenic Obed River system is located slightly more than 10 miles from the evaluation area at its closest point; however, water draining from the southern portion of the evaluation area eventually reaches the Obed River system via the Emory River. The Big South Fork National River and Recreation area is located over 7 miles outside the boundary of the evaluation area at its closest point.

No surface mining would occur within the ERTCE under the no-action alternative; therefore, there is no potential for impacts to the Wild and Scenic Obed River system under the no-action alternative. Any recreation-related impacts to the remaining rivers and streams under the no-action alternative are expected to be indirect impacts resulting from runoff of sediment and mining-related contamination. As noted in this EIS under Impacts to Water Resources, the South Fork Cumberland watershed has a high potential for adverse effects from mining operations due to the large number of miles and acreages of sensitive surface water resources in close proximity to potential mineable areas. Several sources have observed that mining impacts on surface waters diminish within the buffer area used to analyze alternatives from a

mining operation (Lindberg et al. 2011); therefore, downstream impacts on the Big South Fork National River and Recreation Area are unlikely. Based on this, coupled with the provisions of the Clean Water Act and SMCRA implementing regulations that provide for protecting surface water resources and are discussed in detail in the “Impacts of the Alternatives on Surface Water” section. Adverse downstream recreation-related impacts on designated streams are expected to be minimal.

### **Cumulative Impacts**

Coal mining and haul road construction and maintenance activities upstream or adjacent to the evaluation area would cause noise, traffic, and water quality degradation that could cause similar impacts to those described for surface coal mining under the no-action alternative above, although impacts would be minimized by compliance with best management practices along with all applicable regulations and permit conditions. Other actions such as timber harvest and oil and gas development would result in noise, fugitive dust, vehicle traffic, area closures, and vegetation removal, in addition to ground disturbance that could temporarily increase runoff and degrade water conditions. These actions would have detrimental impacts on land use and recreation. The impacts of the no-action alternative, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on land use and recreation. Depending on the location of surface coal mining operations relative to existing land uses and designated recreational resources, the no-action alternative could contribute substantially to the overall adverse cumulative impacts to land use and recreation.

### **Conclusion**

Alternative 1 (no action) would have near- and long-term adverse impacts to land use and recreation. Surface mining and related activities would result in potential conflicts with existing forestry and oil and gas production uses, potential impacts to dispersed recreation related to noise, traffic, fugitive dust and emissions, area closures and access restrictions, and potential impacts to designated recreational resources that result primarily from noise impacts. Depending on where surface coal mining operations occurred, these impacts would occur to greater or lesser degrees. Best management practices and compliance with applicable regulations and permit conditions would minimize, but not eliminate impacts to land use and recreation.

## **ALTERNATIVE 2: STATE PETITION DESIGNATION**

Under alternative 2, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State’s petition. Under this alternative, 505 miles of ridgelines with a 1,200-foot corridor (600 feet on both sides of the ridgeline) would be designated as unsuitable for surface coal mining.

### **Direct and Indirect Impacts to Existing Land Uses**

**Residential Use:** Alternative 2 would result in impacts to residential land use similar to those described for the no-action alternative above. To the extent that prohibition of surface coal mining within the petition area would prevent mining of coal resources lying near residential uses, impacts would be beneficial. Overall impacts would be beneficial compared to the no-action alternative.

**Forestry Use:** Under alternative 2, approximately 34,094 acres of potentially surface mineable area and 8,778 acres of potentially remineable area would be included within the total area designated unsuitable for mining. Since 91% of the evaluation area is forested, the likelihood is high that these acreages represent largely forested lands. Long-term conversion to non-forested conditions from surface mining

conditions would not have the potential to occur on these lands, resulting in beneficial impacts. Overall, impacts to forestry uses would be more beneficial under alternative 2 relative to the no-action alternative.

**Oil and Gas Production:** Under alternative 2, 97 permitted oil and gas wells would be located within the petition area, with the result that these oil and gas wells would be unaffected by surface coal mining. Overall, alternative 2 would have fewer adverse impacts to oil and gas production than the no-action alternative.

### **Direct and Indirect Impacts to Existing Recreational Uses**

**Dispersed Recreational Uses:** Under alternative 2, impacts to dispersed recreation related to access restrictions and area closures as well as noise, fugitive dust and emissions from mining vehicle traffic and mining equipment would not occur on approximately 73,000 acres of the evaluation area, resulting in beneficial impacts to recreation. The potential for adverse impacts related to the continued presence of unreclaimed previously mined areas, as described above in the “General Impact of Coal Mining in Tennessee” section, would continue. Adverse impacts related to visual impacts outside the petition area may occur depending on the user’s line of sight and location. Adverse impacts related to noise originating outside the petition area may still occur. Overall impacts to dispersed recreation would be more beneficial under alternative 2 than under the no-action alternative.

### **Impacts to Designated Recreational Resources**

Recreational resources lying both within and outside the evaluation area boundary that have received specific designations and have the potential to be impacted under alternative 2 are the same as those described under the no-action alternative.

**Cumberland Trail State Park:** Under alternative 2, the types of potential impacts to recreation on the Cumberland Trail and at associated campgrounds would remain the same as described under the no-action alternative. Approximately 15,332 acres of potentially surface mineable coal and 5,945 acres of potentially remineable areas would remain available for mining within two mile distance outside of the 900-foot corridor surrounding the Cumberland Trail State Park. There would be continued potential for adverse impacts to recreation on the trail and at designated campgrounds within the park resulting from noise related to surface mining operations outside the park corridor, due to the distance at which mining operations are typically audible. Since the acreage available for potential surface coal mining and remining would be substantially lower than under the no-action alternative, the potential for adverse impacts would be less widespread. Overall impacts to users of the Cumberland Trail State Park would be less adverse than under the no-action alternative.

**Hatfield Knob Elk Viewing Tower:** Under alternative 2, the designation of the petition area would result in 4,366 fewer acres of potentially surface mineable and remineable acreage within 4.5 miles of the elk viewing tower than under the no-action alternative. The potential for adverse impacts to recreation from noise would remain, due to the distance at which mining operations are typically audible; however, the potential for noise impacts would be less widespread and therefore diminished. Overall impacts of alternative 2 would be less adverse than under the no-action alternative.

**Stinking Creek and Rock Creek Nationwide Rivers Inventory Streams, Big South Fork National River and Recreation Area, and Obed Wild and Scenic River:** Under alternative 2, the designation of the petition area as unsuitable for mining would have beneficial impacts on surface water resources through the permanent prevention of surface coal mining-related impacts on water quality within the petition area. Adverse impacts could still occur in certain areas due to acid drainage or other contamination originating from unreclaimed areas. It is expected that alternative 2 would nonetheless

have overall beneficial indirect impacts on water-based recreation on designated streams and rivers. Overall impacts would be less adverse than under the no-action alternative.

### **Cumulative Impacts**

Cumulative actions under alternative 2 are the same as those described above for the no-action alternative. These actions would have detrimental impacts on land use and recreation. The impacts of alternative 2, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on land use and recreation. Depending on the location of surface coal mining operations relative to existing land uses and designated recreational resources, alternative 2 could, but is not likely to, contribute substantially to the overall adverse cumulative impacts to land use and recreation.

### **Conclusion**

Under alternative 2, some potential for near- and long-term adverse impacts to land use and recreation within portions of the evaluation area would remain due to ongoing surface mining activities outside of the petition area. These would be similar to those described under the no-action alternative, but reduced. However, no new or additional adverse impacts would occur compared to the no-action alternative. Beneficial impacts would occur from increased potential for implementation of existing surface management plans, reduced impacts to dispersed recreation, and reduced impacts to designated recreational resources. Long-term adverse impacts would result from the continued presence of unreclaimed mine sites. Best management practices and compliance with applicable regulations and permit conditions would minimize, but would not eliminate impacts to land use and recreation. Overall, greater beneficial impacts and fewer adverse impacts would be expected relative to the no-action alternative, with no significant adverse impacts expected.

### **ALTERNATIVE 3: STATE PETITION DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS**

Under alternative 3, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State's petition with a 1,200-foot ridgeline corridor, as described under alternative 2. Unlike alternative 2, alternative 3 would not prohibit re-mining (pursuant to 30 CFR chapter VII), but would require reclamation. Alternative 3 could also allow potential construction and maintenance of haul roads inside the designation area.

#### **Direct and Indirect Impacts to Existing Land Uses**

**Residential Use:** Alternative 3 would result in impacts to residential land use similar to those described for alternative 2 above. To the extent that potential re-mining and the construction of access and haul roads within the designation area would create noise impacts to nearby residential uses, near-term adverse impacts could occur. Long-term adverse impacts would be similar to those described for alternative 2. Overall impacts would be less adverse than under the no-action alternative.

**Forestry Use:** Alternative 3 would result in impacts to forestry-related uses similar to those described for alternative 2; however, near-term adverse impacts would result from the potential clearing of forested area for access and haul road construction and the re-mining of unreclaimed, previously mined areas. In the long term, beneficial impacts to forestry-related uses would result from the reclamation and permanent reforestation of remined areas. Overall impacts would be more beneficial than under the no-action alternative.

**Oil and Gas Production:** Alternative 3 would result in impacts to oil and gas production similar to those described for alternative 2. Near-term adverse impacts could result from conflicts between potential remining and permitted oil and gas uses, since 33 of the 97 oil and gas wells within the alternative 3 designation area lie within 250 feet of unreclaimed previously mined areas. In the long term, beneficial impacts would result from the permanent exclusion of surface coal mining as a competing land use within the designation area. Overall impacts would be less adverse than under the no-action alternative.

### **Direct and Indirect Impacts to Existing Recreational Uses**

**Dispersed Recreational Uses:** Under alternative 3, near-term adverse impacts would occur due to the construction and use of access and haul roads and the remining of unreclaimed previously mined areas. These impacts would be related to access restrictions and area closures as well as noise, fugitive dust and emissions from mining vehicle traffic and mining equipment. In the long term, alternative 3 would result in beneficial impacts to dispersed recreation similar to those described for alternative 2, with added beneficial impacts resulting from enhanced recreational access on access and haul roads, as described under “General Impact of Coal Mining in Tennessee on Land Use and Recreation.” Additional long-term beneficial impacts would result from the reclamation of remined areas. Adverse impacts related to visual impacts outside the petition area may occur depending on the user’s line of sight and location. Adverse impacts related to noise originating outside the petition area may still occur. Overall impacts would be beneficial compared to the no-action alternative.

**Impacts to Designated Recreational Resources:** Recreational resources lying both within and outside the evaluation area boundary that have received specific designations and have the potential to be impacted under alternative 3 are the same as those described under the no-action alternative.

**Cumberland Trail State Park:** Under alternative 3, the types of potential impacts to recreation on the Cumberland Trail and at associated campgrounds would remain the same as described for the no-action alternative. Near-term adverse impacts could result from noise related to access and haul road construction and remining of unreclaimed, previously mined areas. In the long term, impacts would be the same as those described for alternative 2. 15,332 acres of potentially surface mineable area and 11,554 acres of remineable area would remain available for mining within two miles of the 900-foot corridor surrounding the Cumberland Trail State Park. Approximately 14,865 acres of unmined, potentially surface mineable acreage would be protected. There would be continued potential for adverse impacts to recreation on the trail and at designated campgrounds within the park resulting from noise related to surface mining operations outside the park corridor, due to the distance at which mining operations are typically audible. Since substantially fewer acres would be available for potential surface coal mining than under the no-action alternative, the potential for adverse impacts would be less widespread. Overall impacts would be less adverse than under the no-action alternative.

**Hatfield Knob Elk Viewing Tower:** Under alternative 3, the designation of the petition area would result in 1,723 fewer acres of potentially surface mineable and remineable acreage within 4.5 miles of the elk viewing tower than under the no-action alternative. Near-term adverse impacts could result from noise related to potential access and haul road construction and remining of unreclaimed, previously mined areas. In the long term, reclamation of remined areas could have beneficial impacts if it contributes to elk habitat enhancement. The long-term potential for adverse impacts to recreation from noise would remain, due to the distance at which mining operations are typically audible; however, the potential for noise impacts would be less widespread and therefore diminished. Overall impacts of alternative 3 would be less adverse than under the no-action alternative.

**Stinking Creek and Rock Creek Nationwide Rivers Inventory Streams, Big South Fork National River and Recreation Area, and Obed Wild and Scenic River:** Under alternative 3, the potential

construction and use of access and haul roads and the re-mining of unreclaimed, previously mined areas would have potential adverse impacts on surface water quality due to increased potential for runoff. In the long term, reclamation of re-mined areas would mitigate impacts related to acid drainage or other contamination that may be originating from unreclaimed mine sites. Alternative 3 would therefore have long-term beneficial impacts on surface water resources, and thus would have beneficial indirect impacts on water-based recreation on designated streams and rivers. Overall impacts would be less adverse relative to the no-action alternative.

### **Cumulative Impacts**

Cumulative actions under alternative 3 are the same as those described above for the no-action alternative. These actions would have detrimental impacts on land use and recreation. The impacts of alternative 3, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on land use and recreation. Depending on the location of surface coal mining operations relative to existing land uses and designated recreational resources, alternative 3 could, but is not expected to, contribute substantially to the overall adverse cumulative impacts to land use and recreation.

### **Conclusion**

Under alternative 3, some potential for near- and long-term adverse impacts to land use and recreation within portions of the evaluation area would remain. These would be similar to those described under the no-action alternative, but reduced. Near-term adverse impacts would result from the potential re-mining of unreclaimed, previously mined areas and associated access and haul road construction. Long-term beneficial impacts would result from the reclamation of previously unreclaimed mine sites. Beneficial impacts would occur from reduced potential for land use conflicts, increased potential for implementation of existing surface management plans, reduced impacts to dispersed recreation, and reduced impacts to designated recreational resources. No new or additional adverse impacts would occur compared to the no-action alternative. Best management practices and compliance with applicable regulations and permit conditions would minimize, but would not eliminate impacts to land use and recreation. Overall impacts would be less adverse relative to the no-action alternative.

### **ALTERNATIVE 4: EXPANDED CORRIDOR DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS (PREFERRED ALTERNATIVE)**

Under alternative 4, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State's petition, as described under alternative 2, and on additional ridgelines. Like alternative 3, alternative 4 would not prohibit re-mining, reclamation activities, and construction and maintenance of haul roads within the designation area and protected ridgeline boundaries.

### **Direct and Indirect Impacts to Existing Land Uses**

**Residential Use:** Alternative 4 would result in impacts to residential land use similar to those described for alternative 3 above. To the extent that potential re-mining and the construction of access and haul roads within the designation area would create noise impacts to nearby residential uses, near-term adverse impacts could occur. Long-term impacts would be similar to those described for alternative 3 but would extend over a greater area. Overall impacts would be beneficial compared to the no-action alternative.

**Forestry Use:** Alternative 4 would result in impacts to forestry-related uses similar to those described for alternative 3, but these would occur over a larger geographic area. Overall impacts to forestry uses would be more beneficial relative to the no-action alternative.

**Oil and Gas Production:** Alternative 4 would result in impacts to oil and gas production similar to those described for alternative 3. Near-term adverse impacts could result from conflicts between potential remining and permitted oil and gas uses, since 33 of the 104 permitted oil and gas wells within the alternative 4 designation area lie within 250 feet of unreclaimed previously mined areas. In the long term, beneficial impacts would result from the permanent exclusion of surface coal mining as a competing land use within the designation area. Overall impacts to oil and gas production would be less adverse than under the no-action alternative.

### **Direct and Indirect Impacts to Existing Recreational Uses**

**Dispersed Recreational Uses:** Under alternative 4, near-term adverse impacts and long-term beneficial impacts to dispersed recreation would result, similar to those described for alternative 3 but over a larger geographic area (approximately 75,213 acres as opposed to approximately 67,326 acres). Adverse impacts related to visual impacts outside the petition area may occur depending on the user's line of sight and location. Adverse impacts related to noise originating outside the petition area may still occur. Overall impacts would be more beneficial than under the no-action alternative.

**Impacts to Designated Recreational Resources:** Recreational resources lying both within and outside the evaluation area boundary that have received specific designations and have the potential to be impacted under alternative 4 are the same as those described under the no-action alternative.

**Cumberland Trail State Park:** Under alternative 4, the types of potential impacts to recreation on the Cumberland Trail and at associated campgrounds would remain the same as described for the no-action alternative. Impacts related to the potential remining of unreclaimed, previously mined areas would be similar to those described for alternative 3. Approximately 13,824 acres of potentially surface mineable areas and 11,554 acres of remineable areas would remain available for mining within two miles of the 900-foot corridor surrounding the Cumberland Trail State Park, while 16,373 acres of potentially surface mineable areas would be protected. This represents the smallest available acreage under any of the alternatives. There would be continued potential for adverse impacts to recreation on the trail and at designated campgrounds within the park resulting from noise related to surface mining operations outside the park corridor, due to the distance at which mining operations are typically audible. Since substantially fewer acres would be available for potential surface coal mining than under the no-action alternative, the potential for adverse impacts would be less widespread. Overall impacts would be less than under the no-action alternative.

**Hatfield Knob Elk Viewing Tower:** Under alternative 4, the designation of the petition area would result in 1,878 fewer acres of potentially surface mineable acreage within 4.5 miles of the elk viewing tower than under the no-action alternative. Near-term and long-term impacts related to the remining of unreclaimed, previously mined areas would be similar to those described for alternative 3. The long-term potential for adverse impacts to recreation from noise would remain, due to the distance at which mining operations are typically audible; however, the potential for noise impacts would be less widespread and therefore diminished. Overall impacts of alternative 4 would be less than under the no-action alternative.

**Stinking Creek and Rock Creek Nationwide Rivers Inventory Streams, Big South Fork National River and Recreation Area, and Obed Wild and Scenic River:** Under alternative 4, the potential construction and use of access and haul roads and the remining of unreclaimed, previously mined areas would have potential adverse impacts on surface water quality due to increased potential for runoff. In the long term, reclamation of remined areas would mitigate impacts related to acid drainage or other contamination that may be originating from unreclaimed mine sites. Alternative 4 would therefore have long-term beneficial impacts on surface water resources, and thus would have beneficial indirect impacts

on water-based recreation on designated streams and rivers. Overall impacts would be beneficial compared to the no-action alternative.

### **Cumulative Impacts**

Cumulative actions under alternative 4 are the same as those described above for the no-action alternative. These actions would have detrimental impacts on land use and recreation. The impacts of alternative 4, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on land use and recreation. Depending on the location of surface coal mining operations relative to existing land uses and designated recreational resources, alternative 4 could, but is not considered likely to, contribute substantially to the overall adverse cumulative impacts to land use and recreation.

### **Conclusion**

Under alternative 4, some potential for near- and long-term adverse impacts to land use and recreation within portions of the evaluation area would remain. These would be similar to those described under the no-action alternative, but reduced. Near-term adverse impacts would result from the potential remining of unreclaimed, previously mined areas and associated access and haul road construction. Long-term beneficial impacts would result from the reclamation of previously unreclaimed mine sites. Beneficial impacts would occur from reduced potential for land use conflicts, increased potential for implementation of existing surface management plans, reduced impacts to dispersed recreation, and reduced impacts to designated recreational resources. No new or additional adverse impacts would occur compared to the no-action alternative. Best management practices and compliance with applicable regulations and permit conditions would minimize, but would not eliminate impacts to land use and recreation. Overall impacts would be beneficial compared to the no-action alternative.

## **ALTERNATIVE 5: TARGETED RESOURCE PROTECTION DESIGNATION**

Under alternative 5, OSMRE would designate lands as unsuitable for surface coal mining operations based on the presence of sensitive resources. Alternative 5 would protect environmentally sensitive habitat areas, including portions of Stinking Creek and Thompson Creek within the Upper Cumberland watershed, a 1,327-acre (roughly 4,290-foot radius) buffer zone surrounding the Hatfield Knob elk viewing tower. In addition, it would protect a 1,500-foot buffer zone centered on the Cumberland Trail, extending for the full length of the segment of the trail that traverses the evaluation area, and including all campgrounds associated with Cumberland Trail State Park. The 1,500-foot corridor includes the 900-foot corridor described in the other alternatives, but expands the corridor width by an additional 600 feet.

### **Direct and Indirect Impacts to Existing Land Uses**

**Residential Use:** Alternative 5 would result in impacts to residential land use similar to those described for the no-action alternative above. To the extent that prohibition of surface coal mining within the petition area would prevent mining of coal resources lying near residential uses, impacts would be beneficial; however, alternative 5 would result in the effective exclusion of surface coal mining on the smallest aggregate land area of any alternative aside from the no-action alternative. Overall impacts would be slightly beneficial compared to the no-action alternative.

**Forestry Use:** Under alternative 5, approximately 8,876 acres of potentially surface mineable area and 2,212 acres of potentially remineable area would be included within the total area designated unsuitable for mining. Since 91% of the evaluation area is forested, the likelihood is high that these acreages represent largely forested lands. Long-term conversion to non-forested conditions would not have the potential to occur on these lands, resulting in beneficial impacts. Overall impacts would be beneficial

compared to the no-action alternative, but would occur over the smallest geographical area of any of the alternatives aside from the no-action alternative.

**Oil and Gas Production:** Under alternative 5, 13 permitted oil and gas wells would be located within the petition area, with the result that these oil and gas wells would be unaffected by surface coal mining. Overall impacts to oil and gas production would be slightly beneficial compared to the no-action alternative, but would afford the least amount of protection to oil and gas permit owners from competing land use out of any of the alternatives aside from the no-action alternative.

### **Direct and Indirect Impacts to Existing Recreational Uses**

**Dispersed Recreational Uses:** Under alternative 5, impacts to dispersed recreation related to access restrictions and area closures as well as noise, fugitive dust and emissions from mining vehicle traffic and mining equipment would not occur on approximately 12,331 acres of the evaluation area, resulting in beneficial impacts to recreation. However, this represents the smallest geographical extent of beneficial impacts to dispersed recreation of any of the alternatives. The potential for adverse impacts related to the continued presence of unreclaimed previously mined areas as described under “General Impact of Coal Mining in Tennessee on Land Use and Recreation” would remain. Adverse impacts related to visual impacts outside the petition area may occur depending on the user’s line of sight and location. Adverse impacts related to noise originating outside the petition area may still occur. Overall impacts would be slightly beneficial compared to the no-action alternative.

### **Impacts to Designated Recreational Resources**

Recreational resources lying both within and outside the evaluation area boundary that have received specific designations and have the potential to be impacted under alternative 5 are the same as those described under the no-action alternative.

**Cumberland Trail State Park:** Under alternative 5, the types of potential impacts to recreation on the Cumberland Trail and at associated campgrounds would remain the same as described under the no-action alternative. The 1,500-foot buffer designated for the Cumberland Trail under alternative 5 represents the largest protected corridor under any of the alternatives (approximately 7,636 acres). The 1,500-foot buffer would eliminate the most substantial adverse noise-related impacts from surface mining that might otherwise occur close to the boundary of the 900-foot corridor under the other alternatives. Nonetheless, approximately 27,000 acres of potentially surface mineable areas and approximately 10,700 acres of potentially remineable areas would remain available for mining within the remainder of the two-mile distance used to evaluate potential noise impacts under the other alternatives. There would be continued potential for adverse impacts to recreation on the trail and at designated campgrounds within the park resulting from noise related to surface mining operations outside the park corridor, due to the distance at which mining operations are typically audible. Since fewer acres would be available for potential surface coal mining and remining than under the no-action alternative, the potential for adverse impacts would be less widespread; however, out of all action alternatives, alternative 5 would have the least potential to minimize adverse noise-related impacts to recreational users of the trail. Overall impacts would be slightly beneficial compared to the no-action alternative.

**Hatfield Knob Elk Viewing Tower:** Under alternative 5, the potential impacts to recreation on the designation of the petition area would result in 366 fewer acres of potentially surface mineable area and 262 fewer acres of potentially remineable area within 4.5 miles of the elk viewing tower than under the no-action alternative. This represents the smallest reduction in potentially surface mineable acreage of any of the action alternatives. The establishment of a 1,327-acre buffer surrounding the elk viewing tower would eliminate the most substantial adverse effects occurring within close proximity to the tower;

however, the potential for adverse impacts to recreation from noise would remain, due to the distance at which mining operations are typically audible. Overall, impacts of alternative 5 would be slightly reduced than under the no-action alternative.

**Stinking Creek and Rock Creek Nationwide Rivers Inventory Streams, Big South Fork National River and Recreation Area, and Obed Wild and Scenic River:** Under alternative 5, the direct protection of portions of Stinking Creek and Thompson Creek within the designation area would translate into a slight decrease in adverse impacts to downstream water quality in the thereby resulting in some beneficial impacts for water-based recreational activities such as fishing and boating. However, the area designated unsuitable for surface coal mining under alternative 5 is the smallest among all of the action alternatives. In addition, adverse impacts could still occur in certain areas due to acid drainage or other contamination originating from unreclaimed, previously mined areas. However, no new or additional adverse impacts would occur compared to the no-action alternative. The overall indirect impacts to recreation resulting from water quality impacts to the Stinking Creek and Rock Creek Nationwide Rivers Inventory Streams, Big South Fork National River and Recreation Area, and Obed Wild and Scenic River under alternative 5 would be slightly reduced compared to the no-action alternative.

### **Cumulative Impacts**

Cumulative actions under alternative 5 are the same as those described above for the no-action alternative. These actions would have detrimental impacts on land use and recreation. The impacts of alternative 5, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on land use and recreation. Depending on the location of surface coal mining operations relative to existing land uses and designated recreational resources, alternative 5 could contribute substantially to the overall adverse cumulative impacts to land use and recreation.

### **Conclusion**

Under alternative 5, potential for near- and long-term adverse impacts to land use and recreation within portions of the evaluation area would remain. These would be similar to those described under the no-action alternative, but slightly reduced. Limited beneficial impacts would occur from reduced potential for land use conflicts, increased potential for implementation of existing surface management plans, reduced impacts to dispersed recreation, and reduced impacts to designated recreational resources. Long-term adverse impacts would result from the continued presence of unreclaimed mine sites. However, no new or additional adverse impacts would occur compared to the no-action alternative. Best management practices and compliance with applicable regulations and permit conditions would minimize, but would not eliminate impacts to land use and recreation. Overall impacts would be slightly beneficial compared to the no-action alternative.

## **ALTERNATIVE 6: REDUCED CORRIDOR DESIGNATION**

### **Direct and Indirect Impacts to Existing Land Uses**

**Residential Use:** Alternative 6 would result in impacts to residential land use similar to those described for alternative 2 above, but over a more limited geographical area. To the extent that prohibition of surface coal mining within the alternative 6 designation area would prevent mining of coal resources lying near residential uses, impacts would be beneficial. Overall impacts would be beneficial compared to the no-action alternative.

**Forestry Use:** Under alternative 6, approximately 19,166 acres of potentially surface mineable area and 7,429 acres of potentially remineable area would be included within the total area designated unsuitable

for mining. Since 91% of the evaluation area is forested, the likelihood is high that these acreages represent largely forested lands. Long-term conversion to non-forested conditions would not have the potential to occur on these lands, resulting in beneficial impacts. Overall impacts would be beneficial compared to the no-action alternative.

**Oil and Gas Production:** Under alternative 6, 65 permitted oil and gas wells would be located within the designation area, with the result that these oil and gas wells would be unaffected by surface coal mining. Overall impacts to oil and gas production would be beneficial compared to the no-action alternative.

### **Direct and Indirect Impacts to Existing Recreational Uses**

**Dispersed Recreational Uses:** Under alternative 6, impacts to dispersed recreation related to access restrictions and area closures as well as noise, fugitive dust and emissions from mining vehicle traffic and mining equipment would not occur on approximately 36,500 acres of the evaluation area, resulting in beneficial impacts to recreation. The potential for adverse impacts related to the continued presence of unreclaimed previously mined areas, as described under “General Impact of Coal Mining in Tennessee on Land Use and Recreation” would continue. Adverse impacts related to visual resources outside the designation area may occur depending on the user’s line of sight and location. Adverse impacts related to noise originating outside the petition area may still occur. Overall impacts would be beneficial compared to the no-action alternative.

**Impacts to Designated Recreational Resources:** Recreational resources lying both within and outside the evaluation area boundary that have received specific designations and have the potential to be impacted under alternative 6 are the same as those described under the no-action alternative.

**Cumberland Trail State Park:** Under alternative 6, the types of potential impacts to recreation on the Cumberland Trail and at associated campgrounds would remain the same as described under the no-action alternative. Approximately 22,219 acres of potentially surface mineable areas and 8,542 acres of remineable areas would remain available for mining within two miles of the 900-foot corridor surrounding the Cumberland Trail State Park, while approximately 7,978 acres of potentially surface mineable areas and 3,012 acres of remineable areas would be protected. There would be continued potential for adverse impacts to recreation on the trail and at designated campgrounds within the park resulting from noise related to surface mining operations outside the park corridor, due to the distance at which mining operations are typically audible. Since fewer acres would be available for potential surface coal mining and remining than under the no-action alternative, the potential for adverse impacts would be less widespread. Overall impacts would be beneficial compared to the no-action alternative.

**Hatfield Knob Elk Viewing Tower:** Under alternative 6, the designation of the petition area would result in 2,380 fewer acres of potentially surface mineable and remineable acreage within 4.5 miles of the elk viewing tower than under the no-action alternative. The potential for adverse impacts to recreation from noise would remain, due to the distance at which mining operations are typically audible; however, the potential for noise impacts would be less widespread and therefore diminished. Overall impacts of alternative 6 would be less adverse than under the no-action alternative.

**Stinking Creek and Rock Creek Nationwide Rivers Inventory Streams, Big South Fork National River and Recreation Area, and Obed Wild and Scenic River:** Under alternative 6, the designation of the petition area as unsuitable for mining would have beneficial impacts on surface water resources through the permanent prevention of surface coal mining-related impacts on water quality within the petition area. Adverse impacts could still occur in certain areas due to acid drainage or other contamination originating from unreclaimed areas. It is expected that alternative 6 would nonetheless

have overall beneficial indirect impacts on water-based recreation on designated streams and rivers. Overall impacts would be less adverse than under the no-action alternative.

### **Cumulative Impacts**

Cumulative actions under alternative 6 are the same as those described for the no-action alternative. These actions would have detrimental impacts on land use and recreation. The impacts of alternative 6, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on land use and recreation. Depending on the location of surface coal mining operations relative to existing land uses and designated recreational resources, alternative 6 could, but is not likely to, contribute substantially to the overall adverse cumulative impacts to land use and recreation.

### **Conclusion**

Under alternative 6, some potential for near- and long-term adverse impacts to land use and recreation within portions of the evaluation area would remain. These would be similar to those described under the no-action alternative, but reduced. Beneficial impacts would occur from reduced potential for land use conflicts, reduced impacts to dispersed recreation, and reduced impacts to designated recreational resources. Long-term adverse impacts would result from the continued presence of unreclaimed mine sites. However, no new or additional adverse impacts would occur compared to the no-action alternative. Best management practices and compliance with applicable regulations and permit conditions would minimize, but would not eliminate impacts to land use and recreation. Overall impacts would be less adverse than under the no-action alternative.

## **IMPACTS OF THE ALTERNATIVES ON VISUAL RESOURCES**

### **METHODS FOR ANALYSIS**

#### **Applicable Statutes, Regulations, and Policies**

The visual quality of areas surrounding coal mining is considered as a resource in this discussion because the visual appeal of surroundings affects the quality of life of the public and how people feel about the area in which they live and work, and where they choose to recreate. The analysis described in the following sections assumes that the public would prefer that natural premining conditions be reproduced during reclamation. The analysis takes into account the extent to which reclamation using landforming principles can create greater opportunities to restore the site to its approximate premining condition and decrease adverse impacts on visual resources. Neither SMCRA nor the implementing regulations for SMCRA, specifically require the permit applicant to address the visual impacts of proposed operations.

During the active mining process, alterations to the existing vegetation and topography are often visually dramatic. Earthen materials overlying the coal are excavated and moved to various locations around the mine site. Vegetation is removed and portions of the mine site may remain without vegetation for long periods of time.

Once mining is completed, surface mine companies are, with limited exceptions, required to restore the mine site to its approximate original contour via backfilling and regrading. However, in some (steep-slope) terrain, the increase in volume of spoil relative to solid rock results in excess spoil fills outside the mined area, even when the mined area is returned to approximate original contour. In addition, approximate original contour variances are available that can result in altered postmining topography on the mined areas, as well as excess spoil fills outside the mined areas. Access roads and drainage control ponds may be approved as permanent features, altering the visual resources of an area. With the exception

of mined areas returned to approximate original contour, all of these features, if present, change the landscape in ways not consistent with the natural topography. Re-establishment of vegetation similar to that which existed prior to mining is typically required, although current regulations do not require the use of native species. The existing sections have been interpreted as allowing revegetation of sites with nonnative species even if those species are not necessary to achieve the postmining land use. As a result, successful revegetation may not completely obscure the visible change after mining.

The spread of nonnative species is virtually always a consequence of conversion of land to new postmining land uses; for example the conversion of forest to agricultural land and forested areas to grassland grazing areas. The converted site looks visually different and is different in terms of recreational opportunities, land use and wildlife habitat value.

Visual resource impacts are also considered during preparation of the NEPA analysis for mining on federal lands or for mining of coal for which the United States holds the mineral rights. The Secretary of the Department of Interior is responsible for authorizing the surface mining of federal coal leased by the US Bureau of Land Management, see 30 CFR § 740.4(a)(1). This authorization is provided by the issuance of a Mining Plan. The authority to issue a Mining Plan is primarily set forth under the federal Mineral Leasing Act, which states that before any entity can take action on a federal leasehold that “might cause a significant disturbance to the environment,” an operation and reclamation plan must be submitted to the Secretary of Interior for approval (30 USC § 207(c)). OSMRE is charged to “prepare and submit to the Secretary a decision document recommending approval, disapproval, or conditional approval of the mining plan” (30 CFR § 746.13).

Surface mining results in greatly disturbed landscapes. Reclamation of these landscapes is achieved with varying degrees of success with regard to previous visual character. Regional variations in rainfall and topography require different approaches to reclamation, and affect the amount of effort required to achieve successful reclamation and restoration of the premining appearance of the site. How well the land is returned to the premining condition depends on the regulatory authority’s approximate original contour requirements, as well as regional and site specific conditions.

Impacts to visual resources do occur under the no-action alternative; they are not completely avoidable unless mining is precluded altogether.

### **Assumptions and Methodology**

Potential impacts on scenic views and from light pollution are assessed based on the alternatives being proposed and the various visual resources available within the evaluation area, with attention to nighttime lighting, visual sensitivities, and the natural lightscape. Topic-specific context for assessing impacts of the alternatives to scenic qualities includes:

- The type of scenic qualities available (as noted in “Chapter 3: Alternatives”) in the evaluation area includes a number of sections that possess a high degree of scenic quality and visual sensitivity, although scenic viewpoints/key observation points are limited.
- The level of scenic integrity. Scenic integrity is the degree from which the landscape character deviates from a natural, natural-appearing landscape in line, form, color, and texture of the landscape. In general, natural and natural-appearing landscapes have the greatest scenic integrity. As manmade incongruities are added to the landscape, the scenic integrity diminishes.
- The ability of a landscape to absorb or incorporate alterations with limited reduction in scenic integrity. This depends on the character and complexity of the landscape, and other environmental factors. A new surface coal mining operation next to an existing one provides less

contrast, and therefore can be absorbed into that landscape better than introducing a new operation as a new feature in an undeveloped area.

- **Landscape character**—this factor encompasses the patterns of landform (topography), vegetation, land use, and aquatic resources (i.e., lakes, streams, and wetlands). The visual character is influenced by natural systems as well as by human interactions and use of land. In natural settings, visual character attributes are natural elements, whereas in rural or pastoral/agricultural settings they may include manmade elements such as fences, walls, barns and outbuildings, and occasional residences. In a more developed setting, the visual character may include buildings, lawn areas and landscaping, pavement, and utility infrastructure.
- The proximity of the areas with scenic qualities and areas with no artificial light sources to mining operations.
- The potential for light pollution in the form of sky glow or light trespass/glare to travel to receptors and impact natural lightscapes.

Receptors considered in the analysis included the following:

- **Local residents:** people who live in the area and who may view the evaluation area from their yards or homes, while driving on local roads, or during other activities in their daily lives. Local residents can be highly sensitive to changes in the landscape that can be viewed from their homes and neighborhoods. The sensitivity of local residents to the visual impact may be mitigated by exposure to other existing surface coal mining operations and other dissonant features such as wind farms or transmission lines already within the viewshed.
- **Commuters and travelers:** people who travel near the evaluation area on their way to other destinations. They may view the evaluation area on a regular basis or only once. Typically, drivers would have limited views of the areas where vegetation or structures provide screening. The visual perception of the evaluation area for commuters and travelers is anticipated to be relatively low because they are typically moving and have a relatively short duration of visual exposure. Drivers tend to be occupied with traffic and navigation and are concerned with off-road views to a much lesser degree. Passengers would have a greater occasion to perceive off-road views. The exception to this assessment is scenic roads and byways, which are considered to provide scenic value as part of the driving experience for drivers as well as passengers.
- **Recreational users:** local residents and tourists involved in recreational activities in the evaluation area or state and local parks, and natural areas. Scenery and visual quality may or may not be an important recreational experience for these viewers. For some recreational users, scenery may be an important part of their experience as their activities may include attentiveness to views of the landscape for long periods. Such viewers also may have a high appreciation for visual quality and high sensitivity to visual change, as many of these users may be present in the area because of the pristine natural character of the landscape and scenic views.

Impacts concluded below are based on an assumption that receptors identified above would present in the area, either near a mining operation or at a point where mining operations would be viewable. While, there is potential this could occur, the area is predominately rural, with minimal visitation and a lack of quality viewsheds and as such impacts would be uncommon and extremely localized in the event that they would occur, primarily to those individuals in a close enough proximity to mining sites and operations.

It is also important to note that the extent of impacts is highly dependent on the seasons as a result of vegetative cover. For example, surface coal mining operations would likely contrast more during summer as areas clear of vegetation are compared to those with well-developed canopies. Disturbance areas may

be visible for a greater distance, albeit still localized, in late-fall, winter, and early spring during leaf off. However, the lack of a canopy given leaf-off conditions may result in less contrast with surface coal mining disturbance, which would be more easily absorbed by the landscape. Impacts would also be more pronounced in areas that are frequented by visitors including the Cumberland Trail and scenic viewsheds/key observation points. To gauge the magnitude of impacts to those present at scenic viewsheds/key observation points, a visual analysis was conducted to demonstrate the likely intrusion that a mining operation would have at these viewpoints. Viewpoints were selected based on a “Viewshed Effects on the Experience of Recreationists in the North Cumberland Wildlife Management Area and Emory River Tracts Conservation Easement” by the University of Tennessee. Viewsheds analyzed in this report for analysis were chosen because they represent the different levels of natural, disturbed, and restored/recovery landscape scenes in the study area, with 4 viewpoints being selected overall. Impacts based on this survey were determined based on the amount and prevalence of the disturbance to the landscape cause from both the development of sites as well as ongoing operations.

### **Area of Analysis**

The area of analysis for visual resources includes the evaluation area, which encompasses the entire NCWMA and ERTCE viewshed. This landscape is dominated by mountains and valleys and is largely rural or undeveloped. Forests, agriculture, and undeveloped lands comprise nearly 98% of the land area within the evaluation area, with forest alone comprising more than 91% of the land cover. As such, aesthetics and viewsheds in the evaluation area reflect these land uses. In addition, nighttime lighting, which is infrequently present in the evaluation area, is potentially visible from further distances. Therefore, although activities that would occur under the various alternatives may have limited visibility from outside the evaluation area, light pollution in the form of sky glow is visible from further distances.

### **GENERAL IMPACT OF COAL MINING IN TENNESSEE ON VISUAL RESOURCES**

In general, mining operations have the potential to modify visual resources through alterations to the natural landscape that diminish the aesthetic quality of the area. Surface, underground, and auger mining and re-mining all disturb the natural environment to various extents. These disturbances result from the removal of forest vegetation and the excavation of soil for both the mine sites and necessary access roads, as well as through the intrusion of mining equipment and operational staff, all of which create a line-of-sight that is not natural and subsequently reduce the scenic integrity of the area.

During the active mining process, alterations to the existing vegetation and topography are often visually dramatic. Earthen materials overlying the coal are excavated and moved to various locations around the mine site. Vegetation is removed and portions of the mine site may remain without vegetation for long periods of time. The removal of vegetation causes textural contrast to the view as compared to the surrounding undisturbed forestland. The impact of these contrasts to visual resources varies greatly from site-to-site and is dependent on surrounding topography and forestland as well as the accessibility of the site to viewers. The excavation of soils and overburden may result in highwalls that intrude into the topography and similarly degrade the natural line of sight. The visibility of these highwalls is likewise dependent on the adjacent land area, nearby forestland coverage, and site accessibility. In the event that sites are viewable, the nature of highwalls allows them to be visible during active mining until backfilled (although the location of the exposed highwall would vary through time as mining and reclamation progressed).

Performance standards at 30 CFR part 816 and § 817.100 require the applicant to reclaim the mine site as contemporaneously as practicable with the ongoing mining operation. Also, once mining is completed, surface mine operators are, with limited exceptions, required to restore the mine site to its approximate original contour via backfilling and regrading. By regulation, this necessitates that disturbed areas be

planted during the first normal period for favorable planting conditions after replacement of the plant-growth medium, so that the length of time that any one area is exposed is reduced. Vegetation similar to that which existed prior to mining is typically required to be re-established following mining. However, there are often permanent impacts to these visual resources as well. Access roads and drainage control ponds may be approved as permanent features, altering the visual resources of an area. Excess spoil fills are permanent features. If placed in adjacent valleys, they change the landscape in ways not consistent with the natural topography, however, fill of headwater stream valleys would not be allowed, because the Tennessee Responsible Mining Act (Tennessee Code Annotated, section 69-3-108) does not allow coal mining or disposal of spoil or coal waste materials within 100 feet of the ordinary high water mark of a stream. In limited circumstances, variances to the requirement for approximate original contour may be approved, in which case the existing topography is permanently altered. Current reclamation requirements for revegetation and approximate original contour restoration do not always result in returning a site to its original visual character, and can result in noticeable changes to the landscape.

As mines are developed, the presence of mining personnel and their vehicles and equipment could cause disruptions to the natural environment, deteriorating viewsheds. The intrusions of equipment and personnel would vary dependent on the nearby landscape and accessibility of the site, but for those areas where operations are visible, viewsheds would be diminished. Given the ability of the landscape to absorb these disturbances due to topography and vegetative cover, these impacts to viewsheds generally only impact those in the close presence/proximity of a particular mine or equipment. Intrusions are equally dependent on the type of equipment and amount of personnel and the size and location of the mine.

Lighting of mining operations, which is typically provided by fluorescent high-pressure lamps, can interfere with nighttime visual resources. Depending on where the operations are sited, the design and installation of lighting, and the amount of activity and type of equipment used during the night, impacts could include disturbance of night-sky views and increases in overall sky glow and anthropogenic light ratios, which are used to measure total sky brightness compared to natural nighttime levels. Typically, only large mining operations are operated at night, and during these operations noticeable adverse impacts to the night-sky could occur, with the extent of impacts being dependent on the duration of nighttime activities. In the more likely event of a select few sites operating at night, impacts would be relatively unnoticeable.

Although impacts primarily only occur to those in the nearby vicinity of the mining operations, commuters and travelers may be subject to views of surface coal mining operations from several major routes. Given the topography of the area, these views would likely be brief as travelers pass through the area. Recreational users using the Cumberland or other local trails or parks would likely be the most impacted when it comes to visual resources. 30 CFR § 761.11(c) specifies that if a proposed surface coal mining operation would have an adverse impact on a publicly owned park or place in the National Register of Historic Places, the proposed operation cannot be authorized unless both the SMCRA regulatory authority and the agency with jurisdiction over the park or place jointly approve the operation. In essence, if adverse impacts are identified, under 30 CFR § 780.31(a) or § 84.17(a) the applicant must prepare a plan to prevent adverse impacts, or (if approved by both agencies) to minimize adverse impacts, which would include aesthetic impacts.

### **ALTERNATIVE 1: NO-ACTION ALTERNATIVE**

Under the no-action alternative, no areas would be designated as unsuitable for surface coal mining, and surface coal mining operations would continue to be authorized within the approximately 172,000-acre evaluation area. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate

could fluctuate over time depending on engineering and economic factors and/or other free market conditions. Surface, underground, and auger mining and re-mining operations would be permitted on all land including ridgelines except within 100 feet of streams and other areas, as described under “Applicable Statutes, Regulations, and Policies.”

### **Direct and Indirect Impacts**

Under the no-action alternative, approximately 44,856 acres (26%) within the evaluation area is considered potential mineable area that could be affected by future surface coal mining while re-mining and associated reclamation operations would be permitted within a portion of the approximately 23,492 acres (14%) of previously mined land, similarly located within the evaluation area. Disturbance associated with surface coal mining operations and re-mining under the no-action alternative could potentially have impacts to visual resources within the evaluation area through the alterations to the natural landscape that diminish the aesthetic quality of the area. Other potential impacts to visual resources could occur as a result of the development of roads supporting surface coal mining operations as well as from the use of lighting in the event of nighttime operations.

Impacts to visual resources would occur as a result of surface coal mining operations and associated activities affecting landscape character and scenic integrity. The development and operation of mines would require the removal of forest vegetation on mountain slopes and the excavation of soil for the mine site and access roads, the size and scale of which would vary depending on the location and number of surface mines. All of these activities would create a line-of-sight that is not natural, reducing the scenic integrity of the area in the near term. While exact locations of mining operations are not identified, the extent of impacts is highly dependent on the likelihood of mine sites being viewed by the public. In general, however, based on the steep rugged terrain and heavy forest canopy of the area, intrusions into the viewshed would be extremely localized and only maximally visible from a limited number of locations. In addition, considerable mining and logging activity has previously occurred in the evaluation area and as such, much of the area is already visually compromised. For example, residents who have experienced surface coal mining operations in the past may be less sensitive and therefore less visually affected by new surface coal mining operations. Commuters and travelers may be subject to views of surface coal mining operations from several major routes such as State Highway 63 and Interstate 75. Impacts to commuters would likely be similar to those affecting local residents because surface coal mining operations have historically occurred in this area. Travelers through the area may be subject to ridgeline views of mining; however, due to the dense vegetation and topography of the area these views would likely be brief as travelers pass through the area. Recreational users using the Cumberland Trail or other local trails or parks would likely be the most impacted when it comes to visual resources. However, as described above, the lack of viewpoints and local topography would limit near and long-term adverse effects.

The removal of vegetation causes textural contrast to the view as compared to the surrounding undisturbed forestland. Highwalls, which intrude into the topography, would be visible during active mining until backfilled (although the location of the exposed highwall would vary through time as mining and reclamation progressed). Views of exposed highwalls would be limited at any one time. However, highwalls may not be left unreclaimed. After backfilling, grading, and revegetation, the reclaimed mine bench would continue to be a visible contrast to the surrounding area. This textural contrast would last for approximately 20 years after mining has ceased depending on the growth rate and survival rate of the replacement tree species (BLM 1983).

In addition, long-term impacts from physical scars to mountainsides and the landscape from surface mining would persist as reclamation is initiated and takes place. While reclamation efforts would work to eliminate the appearance of past mining, scarring of the landscape could potentially be visible in the long-

term, dependent on the extent of previous site-specific surface mining and subsequent scars as well as length of time in which reclamation efforts have been occurring. Although it is anticipated that each mine site will be able to support pre-mining activities, scars could still be observed by individuals in close proximity to the site, even long after reclamation efforts have taken place and would result in long-term adverse impacts, albeit only occurring to those in close proximity of sites.

As mines develop, the presence of mining personnel and their vehicles and equipment could cause near-term adverse visual impacts for recreational users who seek a park-like or natural experience. However, given the ability of the landscape to absorb these disturbances due to topography and vegetative cover, these impacts would be localized, affecting only those individuals in the presence/proximity of a particular mine or equipment. The extent of the intrusion would be highly dependent on the type of equipment and amount of personnel and the size and location of the mine. During mine development and as reclamation is initiated, there would be near-term impacts.

Long-term impacts would result as sites revegetate and display a forest pattern that is different from the surrounding area, although it is unlikely that recreational users would be adversely affected during this period given other landscape characteristics associated with trails and powerlines in the area. These reclaimed areas would also provide recreational users with views of surrounding ridgelines given the lower vegetation, which could improve their experience.

Lighting of mining operations, which is typically provided by fluorescent high-pressure lamps, could interfere with nighttime visual resources. Depending on where the operations are sited, the design and installation of lighting, and the amount of activity and type of equipment used during the night, impacts could include disturbance of night-sky views and increases in overall sky glow and anthropogenic light ratios, which are used to measure total sky brightness compared to natural nighttime levels. Typically, only large mining operations are operated at night, and during these operations noticeable adverse impacts to the night-sky could occur. These near-term impacts would be dependent on the duration of nighttime operations. In the more likely event in which only a select few sites operate at night, impacts would be relatively unnoticeable.

## **Cumulative Impacts**

All past, present, and reasonably foreseeable future actions identified in the cumulative impacts common to all alternatives have the potential to impact visual resources. Impacts could occur as a result of the intrusion of personnel, equipment, structure construction and the removal of existing vegetation into the existing landscape, resulting in both near- and long-term adverse direct impacts with the potential to be significant depending on the nature and intensity of intrusions into the visual landscape. Impacts particularly stemming from timber harvesting and the development of oil wells including pads and pipelines have a greater potential to result in significant impacts as a result of the larger potential disturbance area associated with these activities. Pre-SMCRA mine sites have developed benches and highwalls that both create a visual intrusion but also provide vistas. Surface coal mining operations and oil and gas operations, as well as construction and development, have the potential to impact night-sky resources through the creation of light pollution. The extent of potential impacts depends on the type, intensity and duration of activities as well as the type of topography and vegetative condition and the amount of receptors in the area. Receptors located in near the action would result in higher impacts. Both near- and long-term adverse impacts are anticipated, with the potential to be significant dependent on available viewsheds, the frequency of site use, and the type of activity. The impacts of alternative 1, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on visual resources. The contribution of the no-action alternative to the overall cumulative impacts to visual resources would be substantial based on the potential sizeable extent and type of operations.

## **Conclusion**

Alternative 1 could have substantial near-term adverse impacts to visual resources. Future construction of surface coal mining operations would continue to intrude into viewsheds in the evaluation area and would result in near-and long-term adverse impacts to visual resources. However, given the topography, dense vegetative cover, and the rural nature of the evaluation area impacts are anticipated to be localized and not significant. Impacts to nighttime visual resources as a result of lighting of mining operations are anticipated. Near-term adverse impacts stemming from light pollution are expected, with the potential for substantial impacts from larger mines with receptors nearby. Overall, adverse impacts stemming from the implementation of alternative 1 would not likely result in significant impacts.

## **ALTERNATIVE 2: STATE PETITION DESIGNATION**

Alternative 2 includes the designation of a 1,200-foot corridor centered on 505 miles of ridgelines as unsuitable for surface coal mining would prevent surface coal mining operations, as well as any surface activities or surface impacts incident to underground coal mines on 67,326 acres. Under alternative 2, the petition area including approximately 22,122 acres of potential mineable area (13% of the evaluation area) would be protected from future surface coal mining operations.

## **Direct and Indirect Impacts**

In the long term, as a result of designating land as unsuitable for surface mining, alternative 2 would have beneficial impacts to visual resources when compared to alternative 1 as a result in a reduction in the amount of mineable area and through the prohibition of mining activities allowing lands to remain in their natural condition. Similarly, beneficial impacts would remain predominantly localized based on the lack of quality viewsheds in the area as a result of the dense vegetation and mountainous topography within the petition area, limiting and prohibiting views as evident in a viewshed analysis, as described below.

Adverse impacts to visual resources occurring as a result of underground mines located in the petition area would be relatively minimal based on the relatively small area impacted and the fact that underground mines are typically not easily visible due to steep, mountainous topography and heavy forest cover. From within the petition area a GIS quantitative analysis was conducted to estimate the visual impacts in terms of how many acres would be visible (viewsheds are available and apparent year round) or potentially visible (viewsheds are highly dependent on foliage and the amount of tree cover) within a 1.0-mile radius were calculated at specific areas with the petition area. These areas include several high elevation points along the Cumberland Trail that hold more pronounced viewsheds than other areas along the trail. Other analyzed areas include several points along Interstate 75 as well as multiple campgrounds and an elk viewing tower. The viewshed model was run under the assumption that surface mining would only occur within the boundaries of the respective alternatives. Forest cover was then removed within each alternative, with the exception of areas crossed by the Cumberland Trail as no mining is allowed within 450 feet (900 feet corridor) on either side of the Cumberland Trail. Tree cover along the trail was retained within each alternative representing the trail crossing. Trees removed within the respective alternatives were then integrated with the elevation data to calculate the visual area an observer could see from a distinct point.

Since each point is viewed at variable heights and elevations by visitors, additional criteria accounting for visitor's visible perspective were included in the viewshed analysis. For example, visual impacts were calculated to determine how much of the surface mining would be visible within a 1-mile radius for a person standing 6.0 feet tall at the Cumberland Trail and at the different campsite points. Heights were then increased to 18 feet for visitors at the elk viewing tower and 15 feet for individuals driving along Interstate 75.

Calculated results presented for alternative 2 and other action alternatives represent how many acres would be visible or potentially visible, depending on density of trees and tree foliage from each Point. Since mining would only occur within the alternative boundaries and the elevation is variable throughout the evaluation area, visual impacts may be limited or extended depending on the location, or elevation of the point and height of the observer.

Maps detailing these different viewsheds and estimated visible acreages are figures 6-48, 6-49, 6-50, and 6-51. As a result of this analysis it was determined that for points along the Cumberland trail approximately 364 acres within the petition area would be visible for mining, while another 5 acres would be potentially visible. Potentially visible areas, are those where views are highly dependent on foliage and the amount of tree cover. The extent of the intrusions range but viewers could expect to notice the intrusion of mining operations from these viewpoints. Similarly for areas along Highway 75, 7 acres would be visible with no potentially visible areas. For existing campsites, mining would be visible on 192 acres under full foliage cover, with 2 acres being potentially visible. Finally, from the elk tower approximately 123 would be visible while no mining would be potentially visible.

Based on these simulations, impacts are not anticipated to be substantial as the overall amount of mining both visible and potentially visible is noticeably small when compared to the entire petition area. However, impacts would be adverse for those individuals who are in these viewsheds and who view mining activities occurring outside the petition area. There could similarly be some impact as a result of increased vehicular traffic on access and haul roads outside the petition area, however, impacts to aesthetics are not anticipated to be adverse.

Since alternative 2 would prohibit surface coal mining in the petition area, salvage harvest associated with surface mining operations would not take place; however, any resulting decrease in availability of timber relative to the no-action alternative would be small. Any change in timber harvest would not be expected to generate noticeable impacts to visual resources as a result of alterations to the existing landscape.

In the long term, impacts under alternative 2 would be beneficial as a result of prohibiting surface coal mining activities allowing lands to remain in their natural condition. Similarly, beneficial impacts would remain predominantly localized based on the topography and dense vegetation within the petition area. Adverse impacts could occur to individuals whom directly view mining operations and long-term scars on the landscapes from pre-SMCRA mine sites, however, based on the relatively small scale of these operations adverse impacts are anticipated to be infrequent.

### **Cumulative Impacts**

All past, present, and reasonably foreseeable future actions identified in the cumulative impacts common to all alternatives have the potential to impact visual resources as a result of the intrusion of personnel, equipment, structure construction and the removal of existing vegetation into the existing landscape. Impacts from these actions would be similar to those described for the no-action alternative but would differ in scale. The impacts of alternative 2, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on visual resources. Because alternative 2 would reduce the amount of potential surface mining opportunities but would not allow for reclamation of past mine sites, alternative 2 would not contribute substantially to the overall cumulative adverse impact.

### **Conclusion**

Alternative 2 would have long-term beneficial impacts as a result of prohibiting surface coal mining activities allowing lands to remain in their natural condition. Similarly, beneficial impacts would remain predominantly localized based on the topography and dense vegetation within the petition area.

Individuals who directly view mining operations and scars from mining on the landscape could experience adverse impacts; however, based on the relatively small scale of these operations and required close proximity to view previous mining operations scars, adverse impacts are anticipated to be infrequent. Overall adverse impacts are anticipated to be reduced from those described under the no-action alternative due to the reduced nature and extent of activities permitted. When considering impacts to aesthetics, alternative 2 would not be significant.

### **ALTERNATIVE 3: STATE PETITION DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS**

Under alternative 3, areas designated as unsuitable for surface coal mining would be the same as those described for alternative 2, resulting in the prevention of surface coal mining operations, as well as any surface activities or surface impacts incident to underground coal mines. Similarly, a visual analysis was conducted to determine potential viewable areas as a result of alternative 3 with results being identical to those presented above for alternative 2 as seen in figures 6-48, 6-49, 6-50, and 6-51.

#### **Direct and Indirect Impacts**

In the long term, potentially remined areas would be reclaimed according to SMCRA reclamation plan requirements and environmental performance standards. Resulting impacts to aesthetics would be beneficial as a result of the natural environment being allowed to recover for areas in which reclamation is needed. Beneficial impacts would be localized in the direct footprint of previously mined areas. Impacts would be limited based on the noticeable extent of previously disturbed areas, already reducing the visual quality of the area and needing to be regenerated as well as on limitations to existing viewsheds of these areas including dense vegetation and mountainous topography. Beneficial impacts would be greatest in areas on higher elevations or near clearings because of the availability of more viewsheds. In the event that nighttime mining occurs, near-term adverse impacts would result from intrusions into the night sky. Impacts would be dependent on the location of viewers and the availability of viewsheds as well as the duration of nighttime operations as well as the distance of the receptor.

Although potential remining and reclamation efforts could occur, long-term adverse impacts would persist from physical scars on mountainsides and the landscape from surface mining. As noted, under alternative 1 while reclamation efforts would work to eliminate the appearance of past mining, scarring of the landscape could potentially be visible in the long-term, dependent on the extent of previous site-specific surface mining and subsequent scars, as well as length of time in which reclamation efforts have been occurring. Although it is anticipated that each mine site will be able to support pre-mining activities, scars could still be observed by individuals in close proximity to the site, even long after reclamation efforts have taken place, and would result in long-term adverse impacts, albeit only occurring to those in close proximity of sites.

Alternative 3 would have long-term beneficial impacts as a result of prohibiting mining activities and allowing lands to remain in their natural condition. Similarly, beneficial impacts would remain predominantly localized based on the receptors and mountainous topography and dense vegetation within the designation area, however would still be beneficial compared to the no-action alternative.

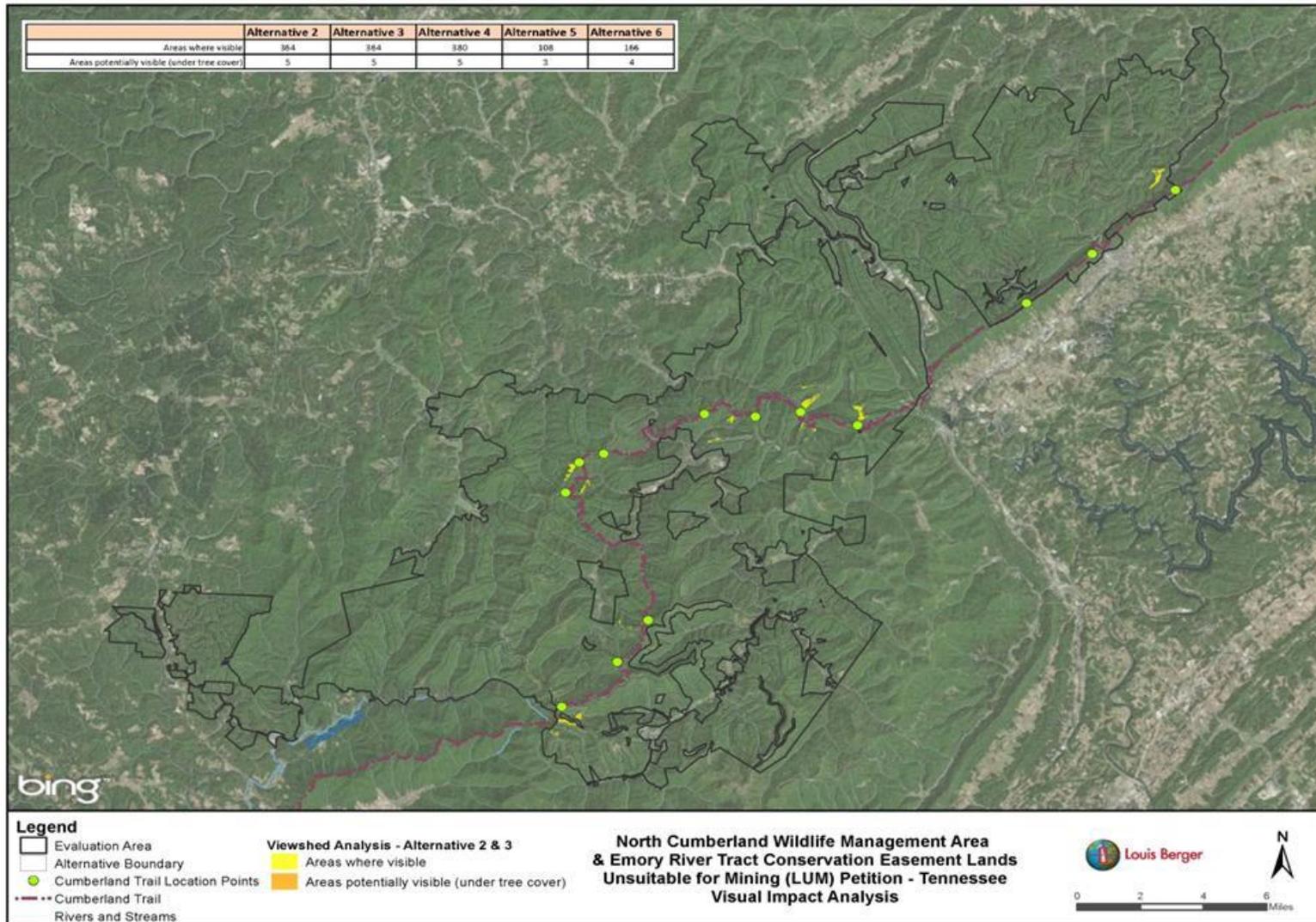


FIGURE 6-48: VISUAL IMPACT ANALYSIS – CUMBERLAND TRAIL (ALTERNATIVES 2 AND 3)

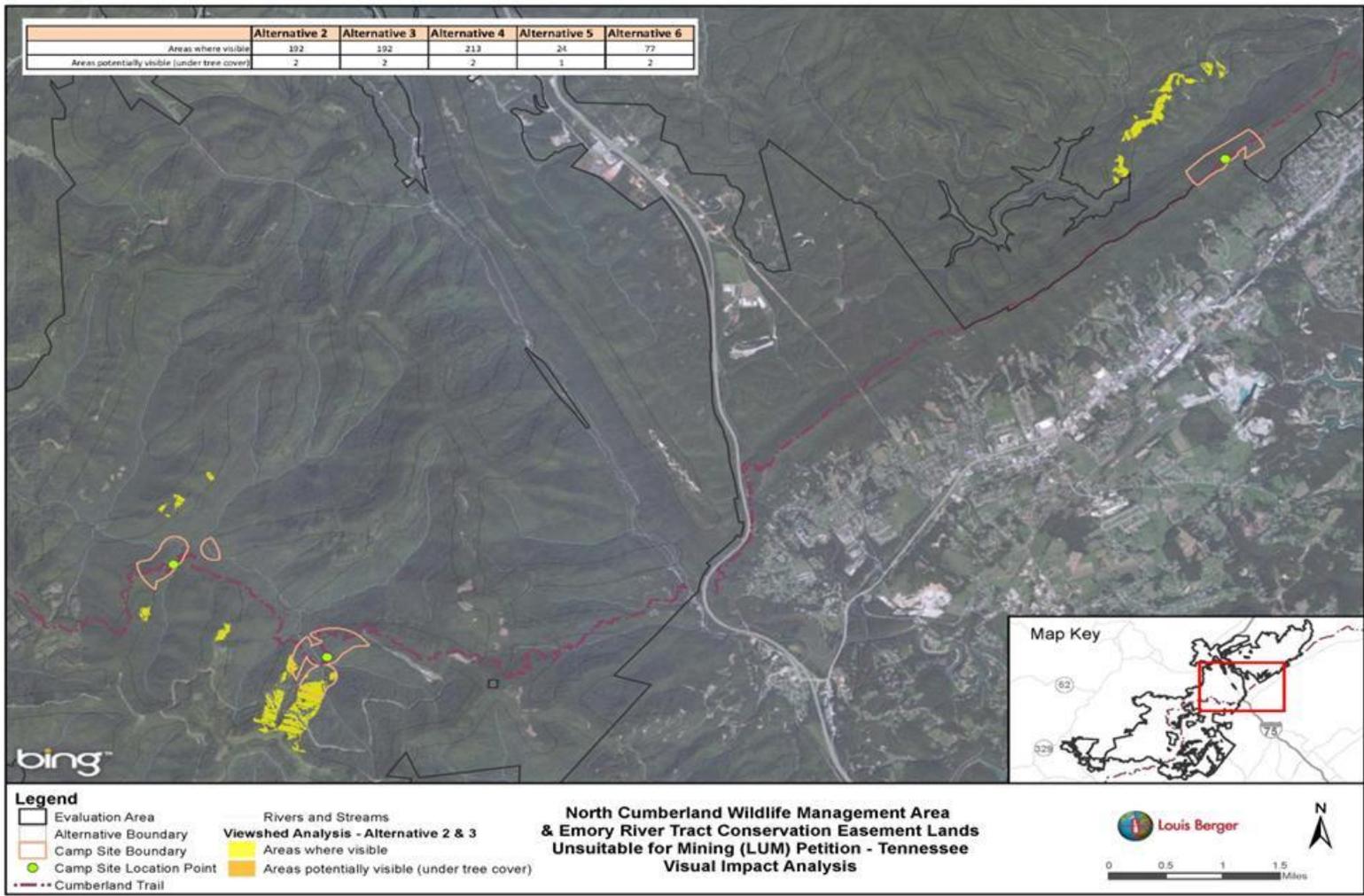


FIGURE 6-49: VISUAL IMPACT ANALYSIS – CAMPSITES (ALTERNATIVES 2 AND 3)

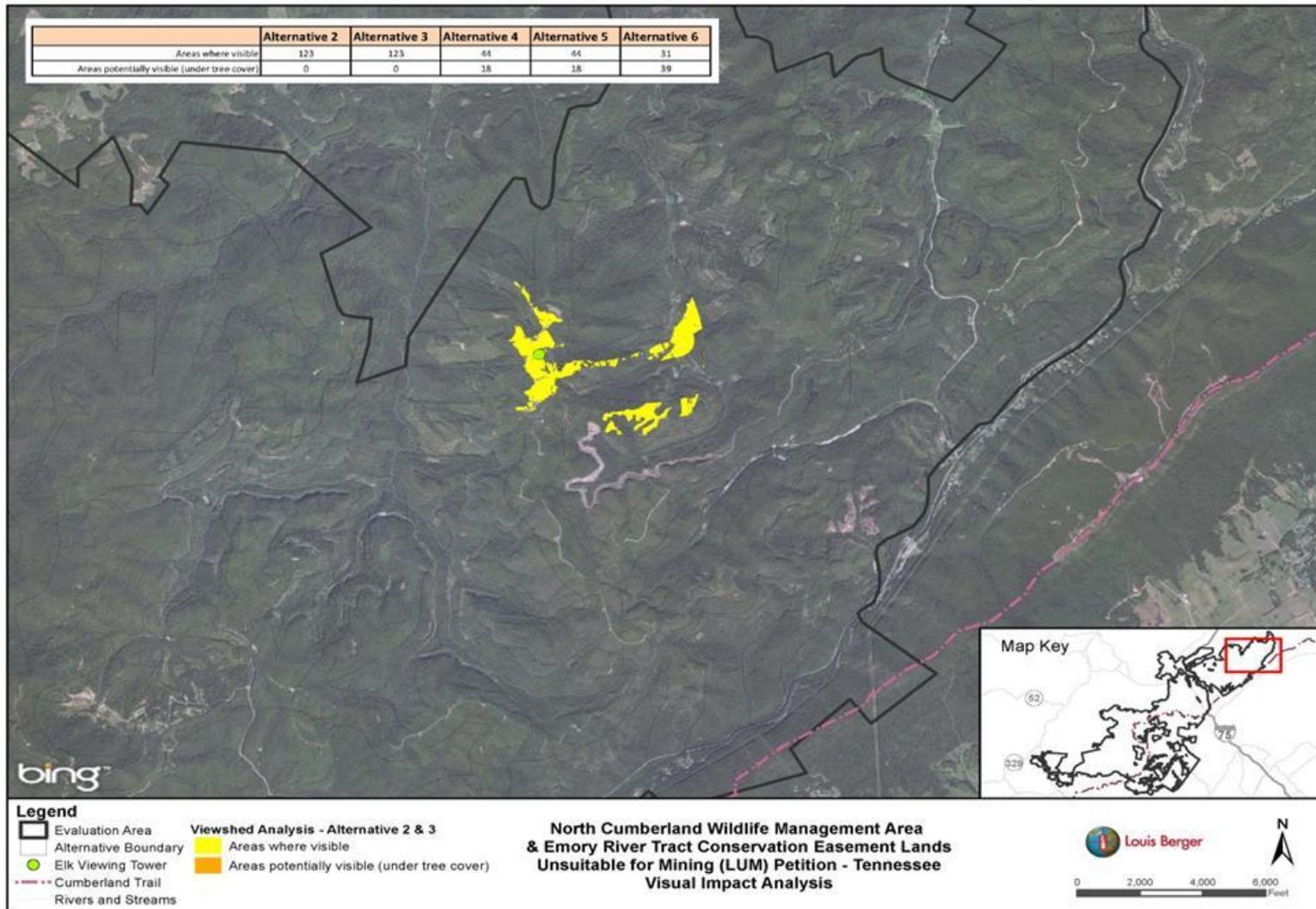


FIGURE 6-50: VISUAL IMPACT ANALYSIS – ELK VIEWING TOWER (ALTERNATIVES 2 AND 3)

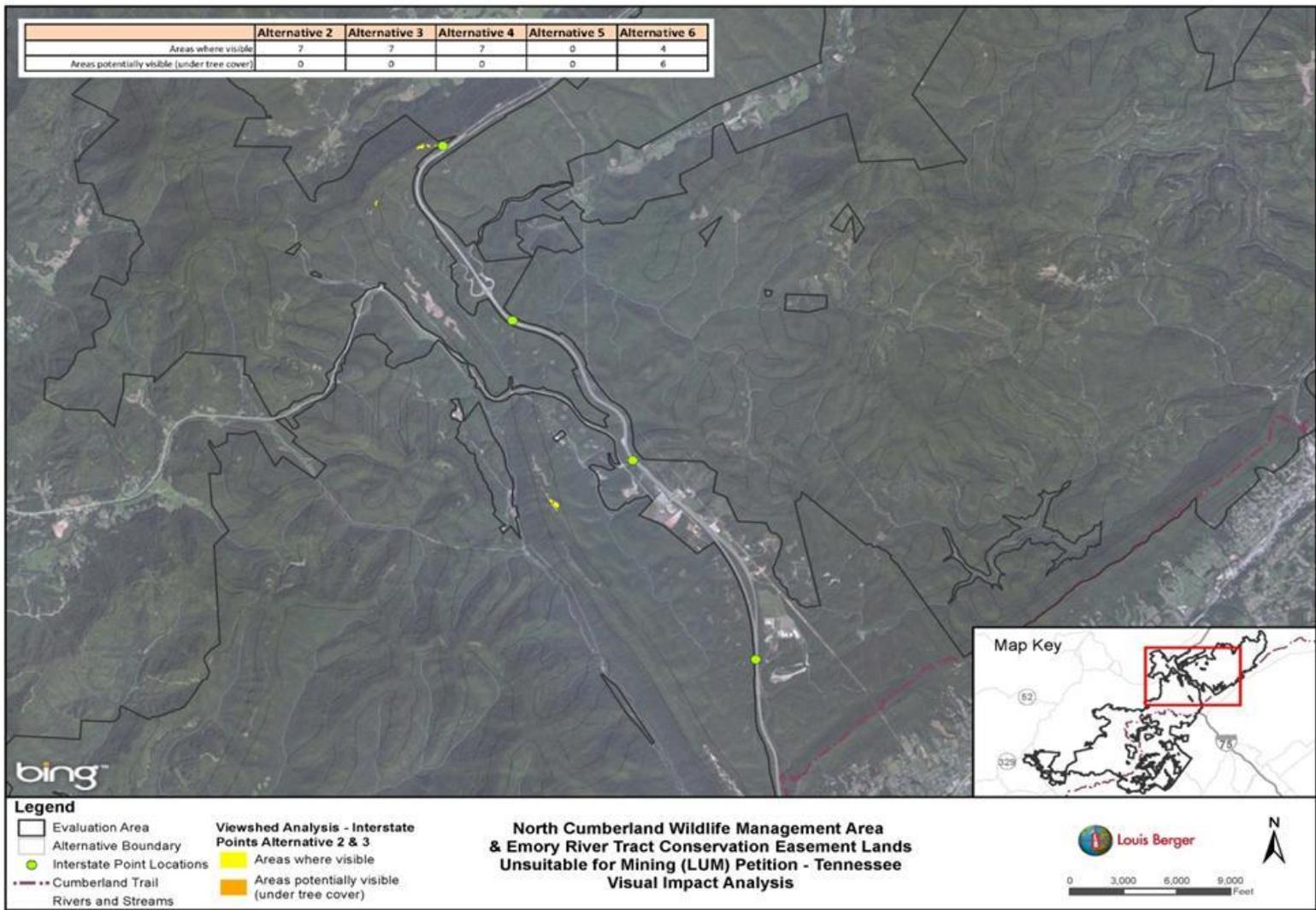


FIGURE 6-51: VISUAL IMPACT ANALYSIS – INTERSTATE 75 (ALTERNATIVES 2, 3, AND 4)

## **Cumulative Impacts**

All past, present, and reasonably foreseeable future actions identified in the cumulative impacts common to all alternatives have the potential to impact visual resources as a result of the intrusion of personnel, equipment, structure construction, and the removal of vegetation from the existing landscape. Impacts from these actions would be the same as described for the no-action alternative. However, alternative 3 would potentially allow for the reclamation of past surface coal mining sites, thus reducing adverse effects to visual resources in the long term. The impacts of alternative 3, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on visual resources. Overall, adverse cumulative impacts would occur; however, alternative 3 would offset them to some extent through the reclamation of pre-SMCRA mine sites.

## **Conclusion**

Alternative 3 would have near- and long-term adverse impacts to visual resources as a result of potential remining operations. However, no new or additional adverse impacts would occur compared to the no-action alternative. Adverse impacts to nighttime visual resources as a result of lighting of large mining operations are anticipated with impacts stemming from light pollution. Overall, adverse impacts under alternative 3 would offset past impacts and could provide beneficially significant impacts.

## **ALTERNATIVE 4: EXPANDED CORRIDOR DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS (PREFERRED ALTERNATIVE)**

### **Direct and Indirect Impacts**

As described under alternative 2, a viewshed analysis was conducted for alternative 4 using the same method and assumptions.

Maps detailing these different viewsheds and estimated visible acreages for alternative 4 are figures 6-51 (presented above under alternative 2), 6-52, 6-53, and 6-54. As a result of this analysis it was determined that for points along the Cumberland trail approximately 380 acres within the petition area would be visible (year-round) for mining, while another 5 acres would be potentially visible (when leaves are off trees). Similarly for areas along Highway 74, 7 acres would be visible with no potentially visible areas. For existing campsites, mining would be visible on 213 acres under full foliage cover, with 2 acres being potentially visible. Finally, from the elk tower approximately 44 would be visible, with 18 acres being potentially visible.

In the long term, the designation of these lands as unsuitable for surface coal mining would prevent impacts to the natural landscape from potential new mining operations in the future, resulting in beneficial impacts. Beneficial impacts would remain predominantly localized based on the lack of quality viewsheds in the area based on dense vegetation and mountainous topography within the designation area.

Impacts as a result of potential remining, reclamation and the development of access and haul roads would be similar to those described under alternative 3, resulting in highly localized near-term adverse impacts to visual resources as a result of intrusions into the natural environment during remining and construction activities. In the long term, reclamation of remined areas would mitigate existing damage and would restore the natural landscape, resulting in beneficial impacts compared to existing conditions. It is anticipated that long-term adverse impacts as a result of scars to the landscape would persist and could still be observed by individuals in close proximity to the site, even long after reclamation efforts have taken place, albeit only occurring to those in close proximity of sites. Adverse impacts to nighttime

visual resources as a result of lighting of large mining operations are anticipated with impacts stemming from light pollution.

### **Cumulative Impacts**

All past, present, and reasonably foreseeable future actions identified in the section on cumulative impacts common to all alternatives have the potential to impact visual resources. Impacts would stem from the intrusion of personnel, equipment, structure construction and the removal of existing vegetation into the existing landscape, resulting in both near- and long-term adverse direct impacts with the potential to be significant depending on the nature and intensity of intrusions into the visual landscape. Coal mining and oil and gas operations as well as construction and development all have the potential to impact night-sky resources through the creation of light pollution. The impacts of alternative 4, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on visual resources. Since alternative 4 reduces the amount of potential surface mining opportunities, and allows for the reclamation of past mining disturbance, alternative 4 would offset some adverse cumulative impacts.

### **Conclusion**

Alternative 4 would have near and long-term adverse impacts to visual resources as a result of potential remaining operations and associated road development, as described under alternative 2. Adverse impacts to nighttime visual resources as a result of lighting of large mining operations are anticipated with impacts stemming from light pollution. No new or additional overall adverse impacts would occur compared to the no-action alternative. Given the reclamation of past mine sites, alternative 4 would not result in significant adverse impacts.

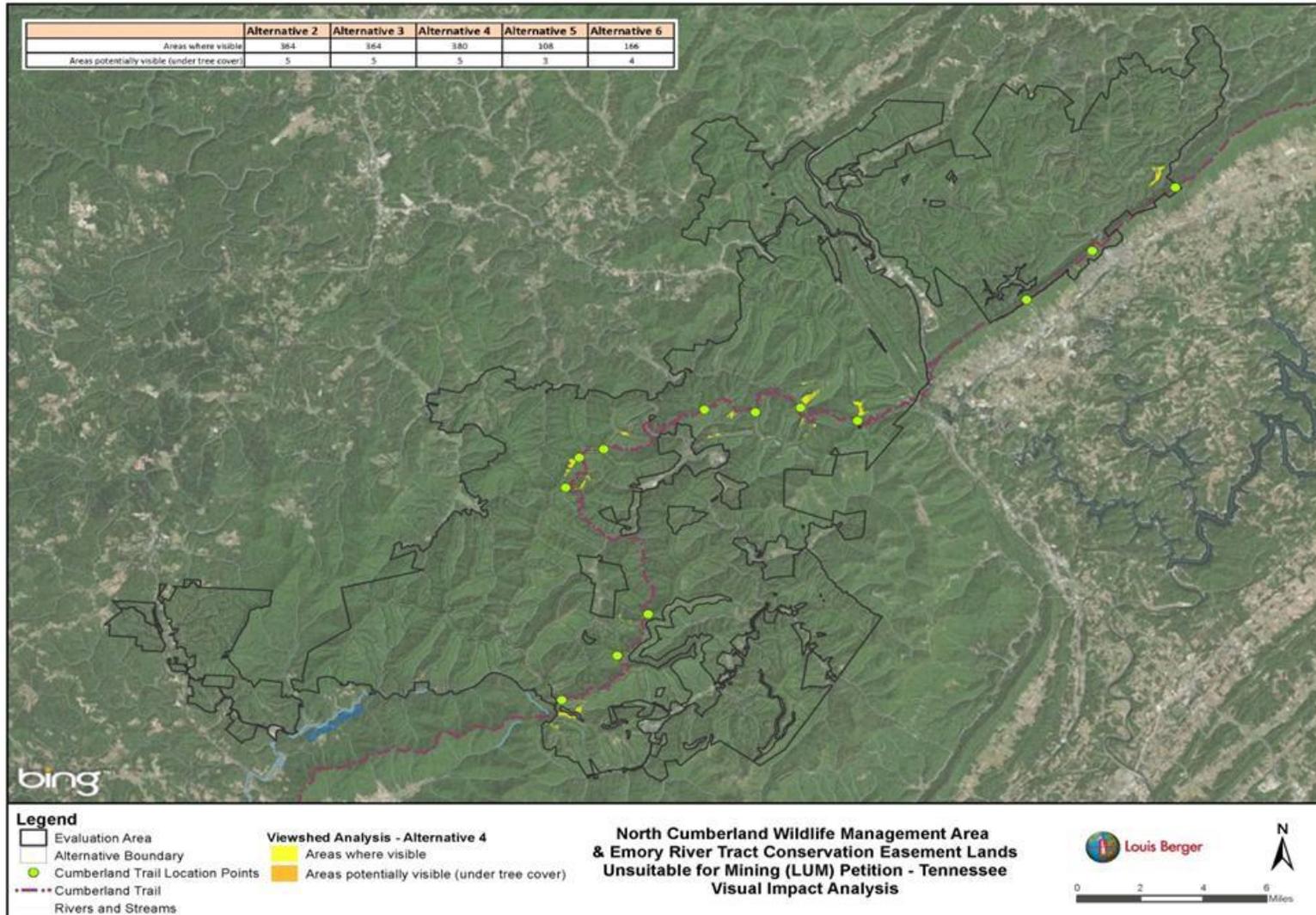


FIGURE 6-52: VISUAL IMPACT ANALYSIS – CUMBERLAND TRAIL (ALTERNATIVE 4)

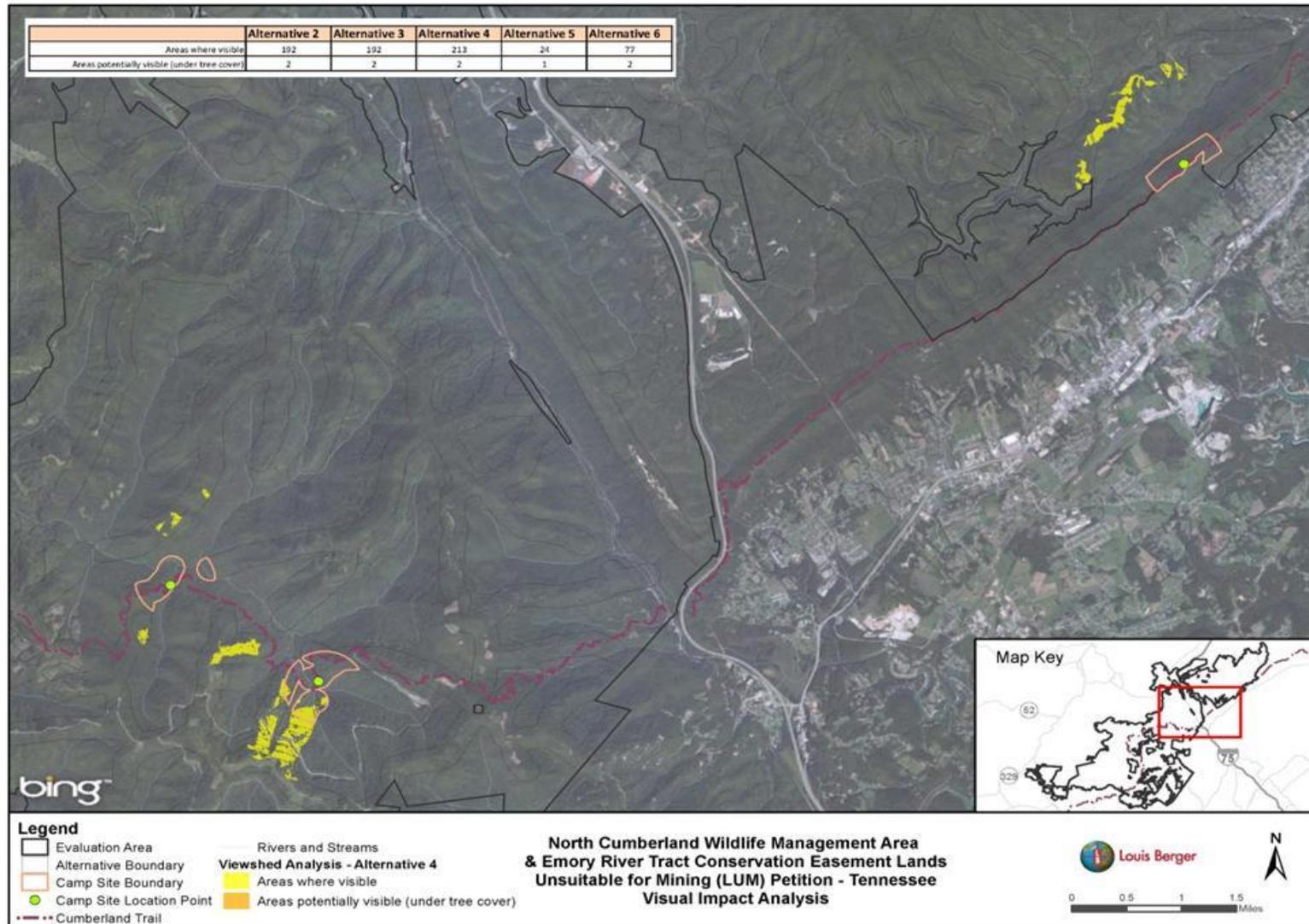


FIGURE 6-53: VISUAL IMPACT ANALYSIS – CAMPSITES (ALTERNATIVE 4)

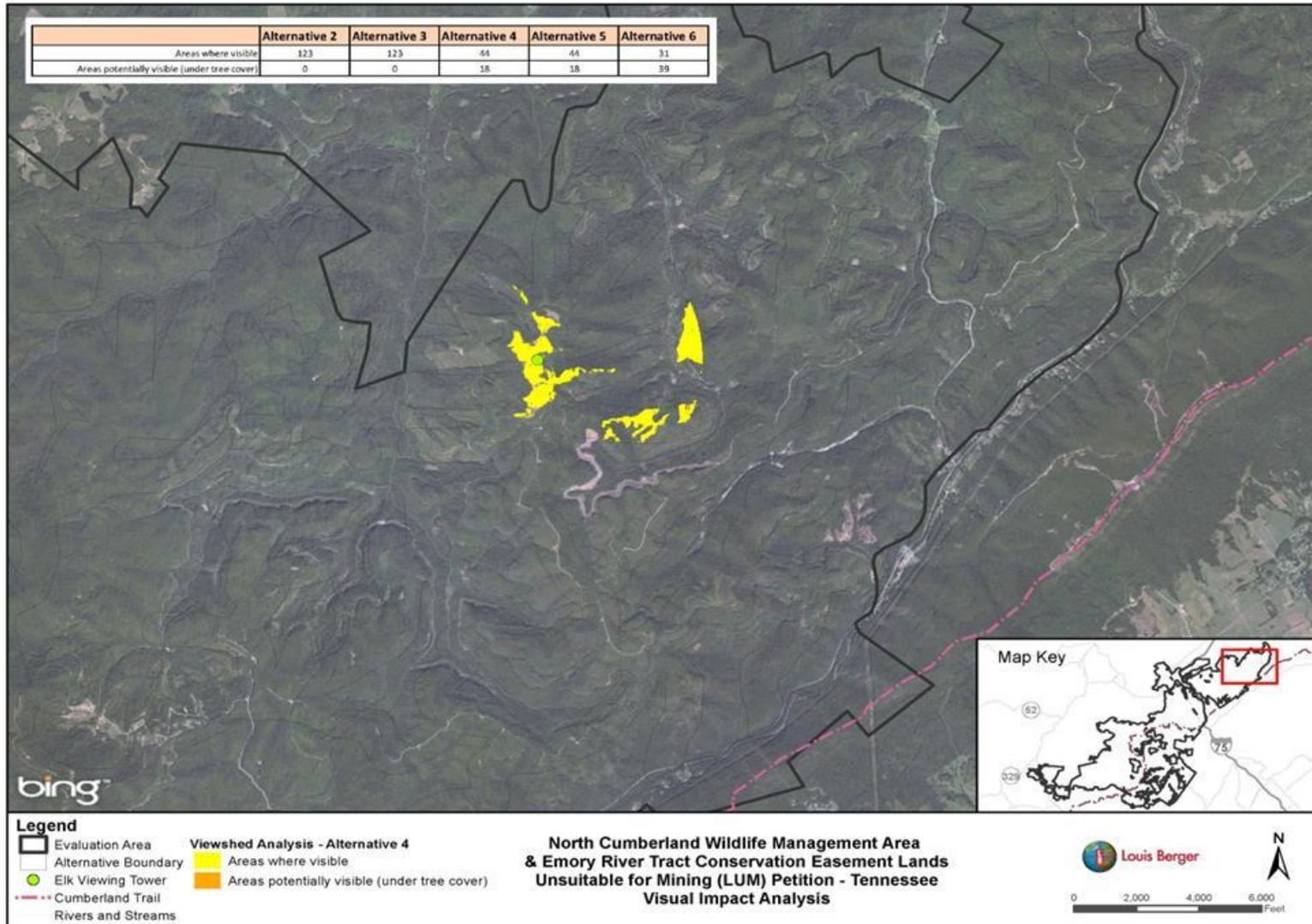


FIGURE 6-54: VISUAL IMPACT ANALYSIS – ELK VIEWING TOWER (ALTERNATIVES 4 AND 5)

## **ALTERNATIVE 5: TARGETED RESOURCE PROTECTION DESIGNATION**

### **Direct and Indirect Impacts**

Under alternative 5, OSMRE would designate an area encompassing 12,331 acres of public access lands within the NCWMA as unsuitable for surface coal mining operations. This alternative prioritizes the protection of sensitive biological or recreational resources. No remining or associated access or haul roads would be allowed under alternative 5. Similarly, a visual analysis was conducted to determine potential viewable areas as a result of alternative 5, using the same method and assumptions to those presented above for alternative 2.

Maps detailing these different viewsheds and estimated visible acreages for alternative 5 are figures 6-54 (presented above under alternative 4), 6-55, 6-56, and 6-57. As a result of this analysis it was determined that for points along the Cumberland trail approximately 108 acres within the petition area would be visible (year-round) for mining, while another 3 acres would be potentially visible (when leaves are off trees). Mining would not be visible along Interstate 75, under alternative 5. For existing campsites, mining would be visible on 24 acres under full foliage cover, with 1 acre being potentially visible. Finally, from the elk tower approximately 44 would be visible, with 18 acres being potentially visible. Long-term adverse impacts as a result of scars to the landscape from previous surface mining operations would occur and would be more pronounced because remining and reclamation would not occur. Impacts would be expected to occur only to those individuals in close proximity to the mine sites and, as such, impacts would be localized.

Beneficial impacts as a result of designation would be similar to those presented under alternatives 2, 3, and 4. In addition improved protections for plant and wildlife habitat, trails, recreational facilities, and other sensitive resources would have beneficial impacts on visual resources in areas that are more frequented by recreational users, magnifying the overall beneficial impacts for these small areas. It is still anticipated however, that these impacts would be localized and only apparent to those in the vicinity of the sites. Alternative 5 would not allow for remining and reclamation and therefore would not reduce existing negative visual impacts.

### **Cumulative Impacts**

Cumulative impacts would be the same as those described for alternative 2; however, impacts would be over a much smaller area. The impacts of alternative 5, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on visual resources. Because alternative 5 reduces the amount of potential surface mining opportunities but does not allow for reclamation of past mine sites, alternative 5 would not contribute substantially to the overall cumulative impact.

### **Conclusion**

Alternative 5 would have impacts similar to alternative 2, but those impacts would occur in areas with high recreational use providing localized benefits. Alternative 5 would not allow for remining and reclamation and therefore would not reduce existing negative visual impacts. No new or additional overall adverse impacts would occur compared to the no-action alternative. Beneficial impacts from alternative 5 could potentially be significant as the areas identified under alternative 5 are sensitive and more frequently visited.

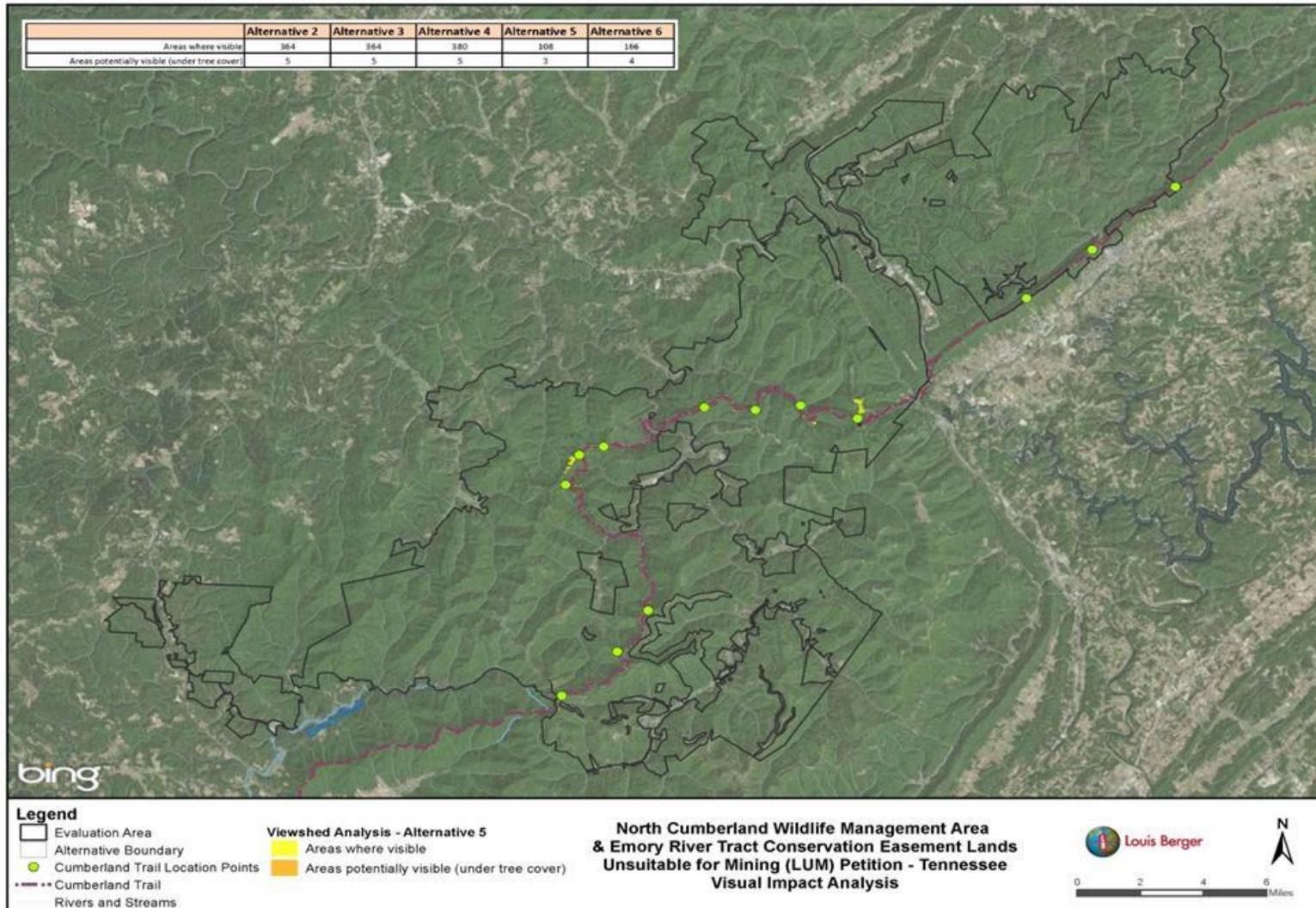


FIGURE 6-55: VISUAL IMPACT ANALYSIS – CUMBERLAND TRAIL (ALTERNATIVE 5)

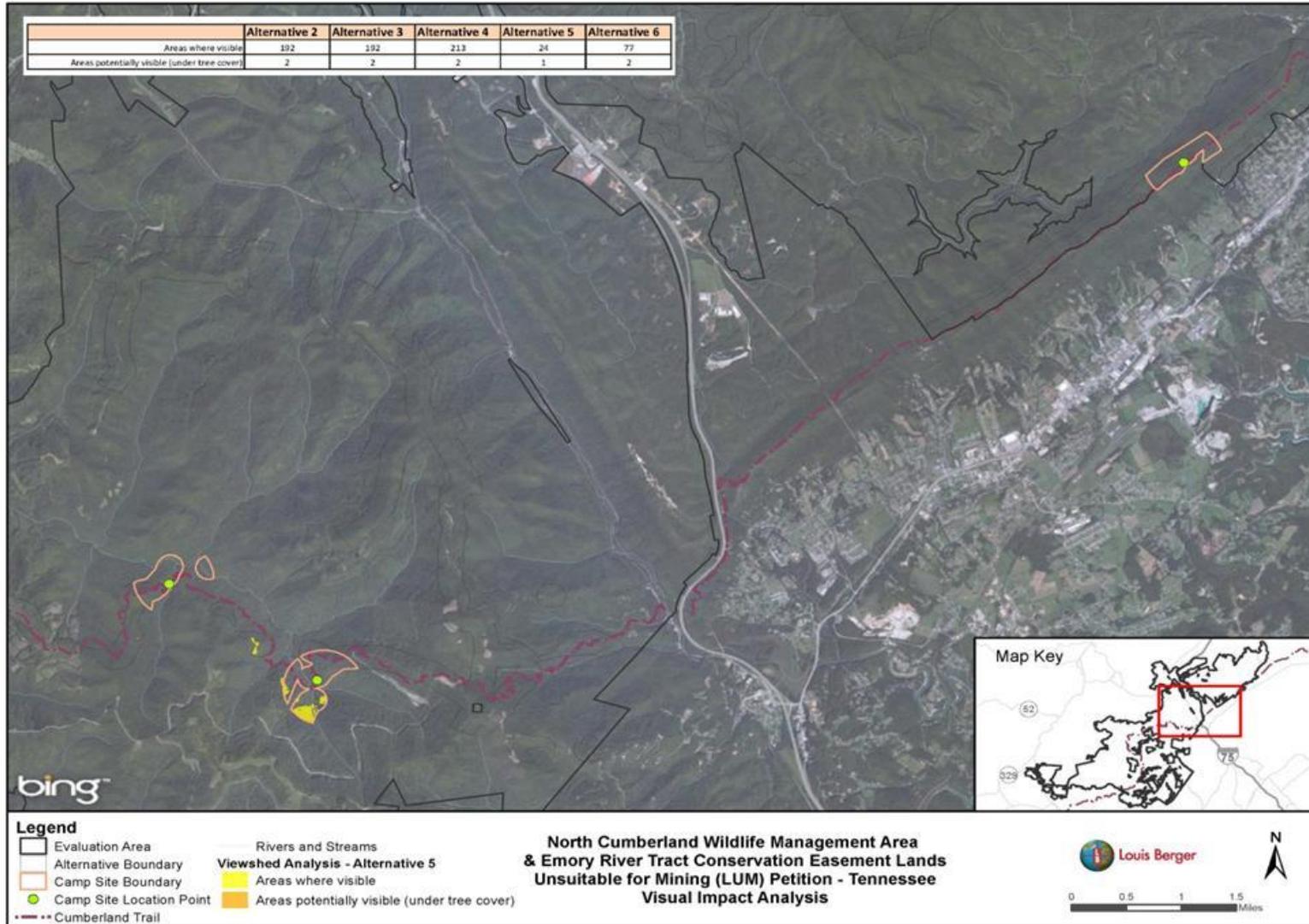


FIGURE 6-56: VISUAL IMPACT ANALYSIS – CAMPSITES (ALTERNATIVE 5)

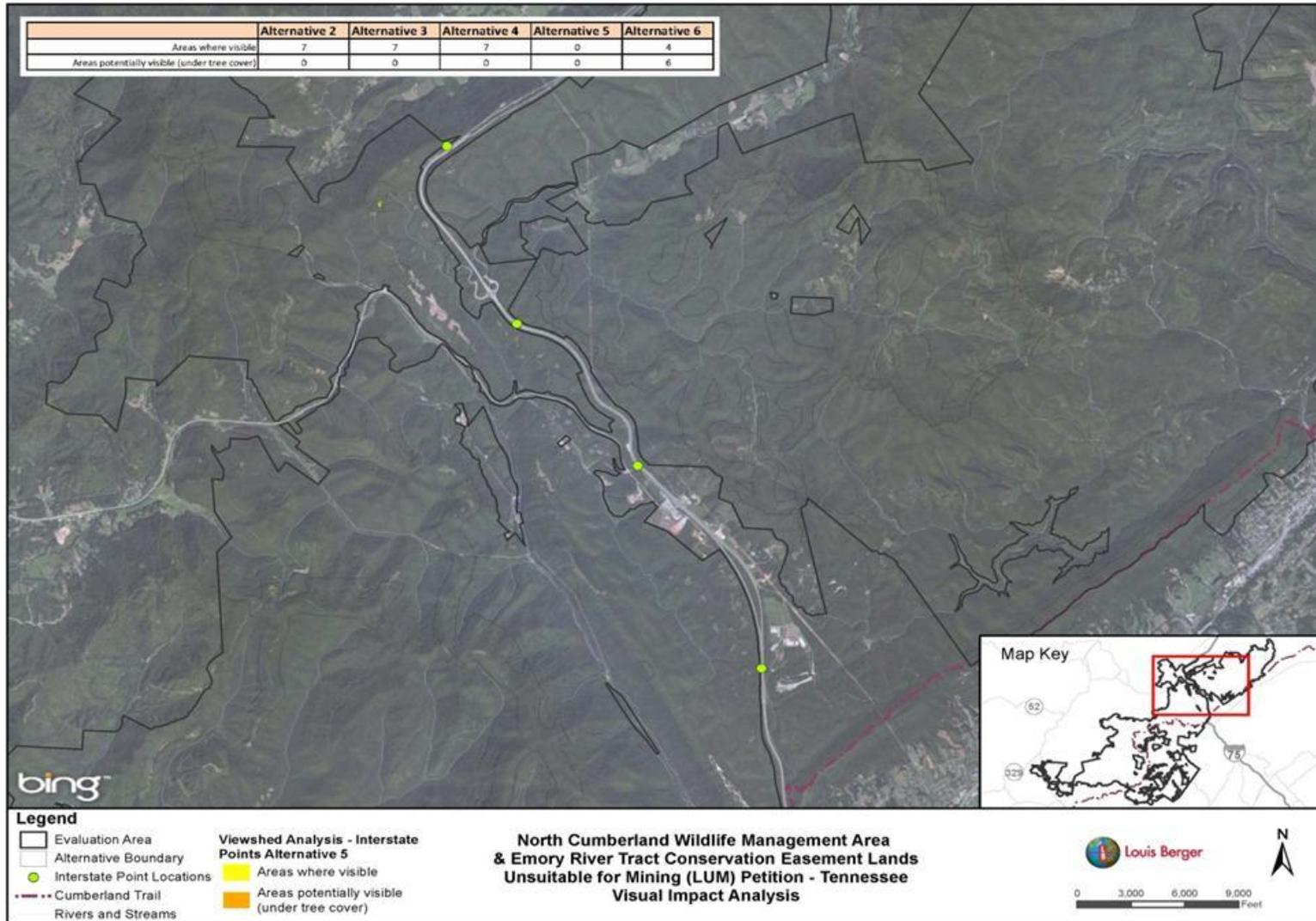


FIGURE 6-57: VISUAL IMPACT ANALYSIS – INTERSTATE 75 (ALTERNATIVE 5)

## **ALTERNATIVE 6: REDUCED CORRIDOR DESIGNATION**

### **Direct and Indirect Impacts**

Beneficial impacts to visual resources under alternative 6 would be less pronounced than under alternative 2 because of the much smaller land area designated. Similar to alternative 2, remining and reclamation would not be allowed under alternative 6. There would be no short-term adverse impacts associated with disruption of the existing natural landscape by remining and reclamation activities; however, long-term adverse impacts similar to those described for alternative 2 would result from the continued presence of unreclaimed surface mining disturbance within the designation area.

Similarly, a visual analysis was conducted to determine potential viewable areas as a result of alternative 6, using the same method and assumptions to those presented above for alternative 2.

Maps detailing these different viewsheds and estimated visible acreages for alternative 6 are figures 6-58, 6-59, 6-60, and 6-61. As a result of this analysis it was determined that for points along the Cumberland trail approximately 186 acres within the petition area would be visible (year-round) for mining, while another 4 acres would be potentially visible (when leaves are off the trees). Mining would be visible on 4 acres and potentially visible on 6 acres along Interstate 75, under alternative 5. For existing campsites, mining would be visible on 77 acres under full foliage cover, with 2 acres being potentially visible. Finally, from the elk tower approximately 31 would be visible, with 39 acres being potentially visible. Long-term adverse impacts as a result of scars to the landscape from previous surface mining operations would occur and would be more pronounced because remining and reclamation would not occur. Impacts would be expected to occur only to those individuals in close proximity to the mine sites and, as such, impacts would be localized.

Since alternative 6 would prohibit surface coal mining in the designation area and salvage harvest associated with surface mining operations would not take place. Any resulting decrease in availability of timber relative to the no-action alternative would be small. Any change in timber harvest would not be expected to generate noticeable impacts to visual resources as a result of alterations to the existing landscape based on the dense vegetation and mountainous terrain.

As a result of designating land as unsuitable for surface coal mining operations, lands would remain in their natural conditions resulting in beneficial impacts to visual resources. Similarly, beneficial impacts would remain predominantly localized based on the topography, and dense vegetation within the designation area.

### **Cumulative Impacts**

Cumulative impacts would be the same type as those described for alternative 2; however, its protections would extend over a much smaller area. The impacts of alternative 6, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on visual resources. Because alternative 6 would reduce the amount of potential surface mining opportunities but would not allow reclamation of past mine sites, alternative 6 would not contribute substantially to the overall cumulative impact.

### **Conclusion**

Alternative 6 would have impacts similar to alternative 2, but those impacts would occur over a smaller area. No new or additional overall adverse impacts would occur compared to the no-action alternative. Impacts from alternative 6 would not be significant.

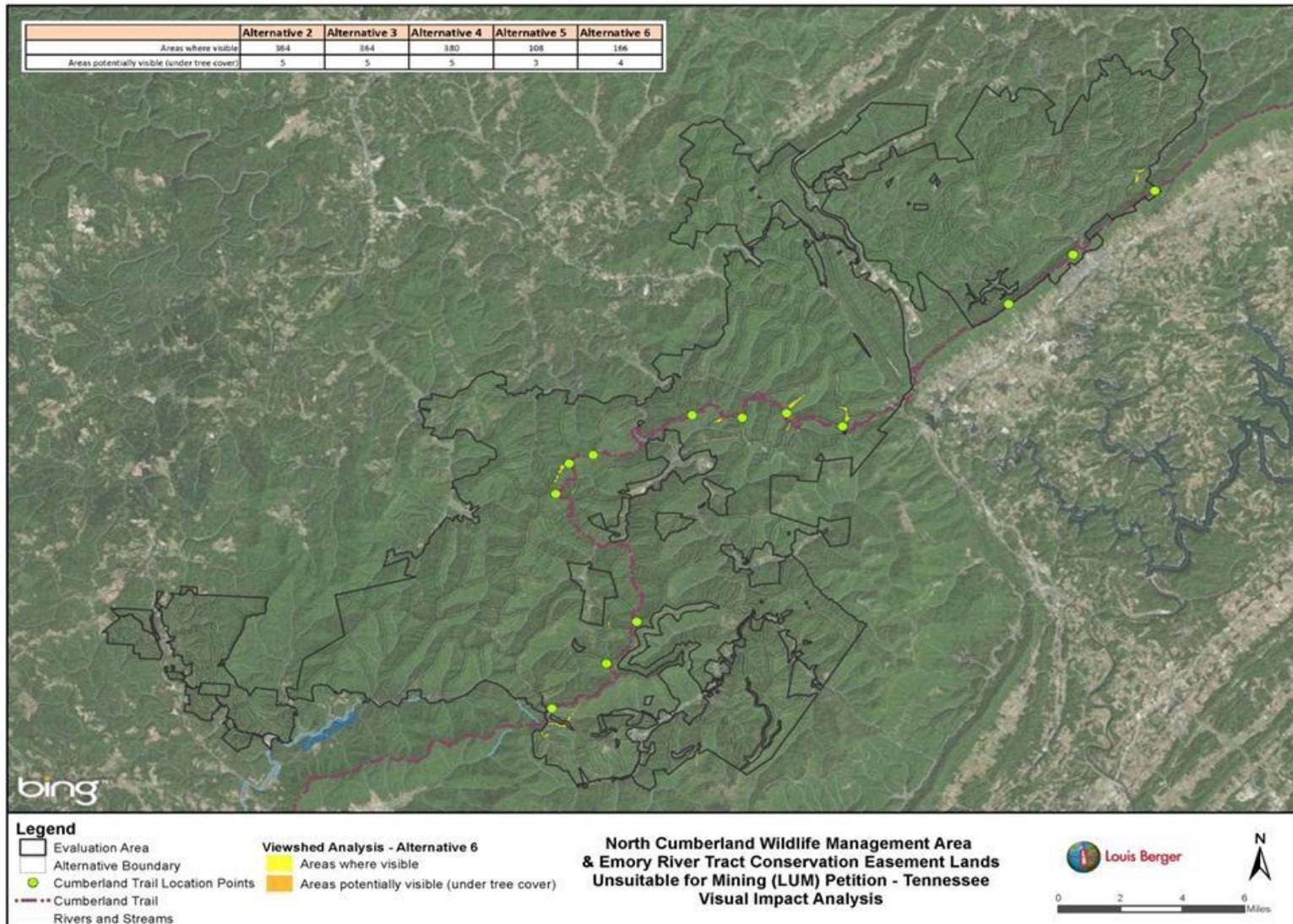


FIGURE 6-58: VISUAL IMPACT ANALYSIS – CUMBERLAND TRAIL (ALTERNATIVE 6)

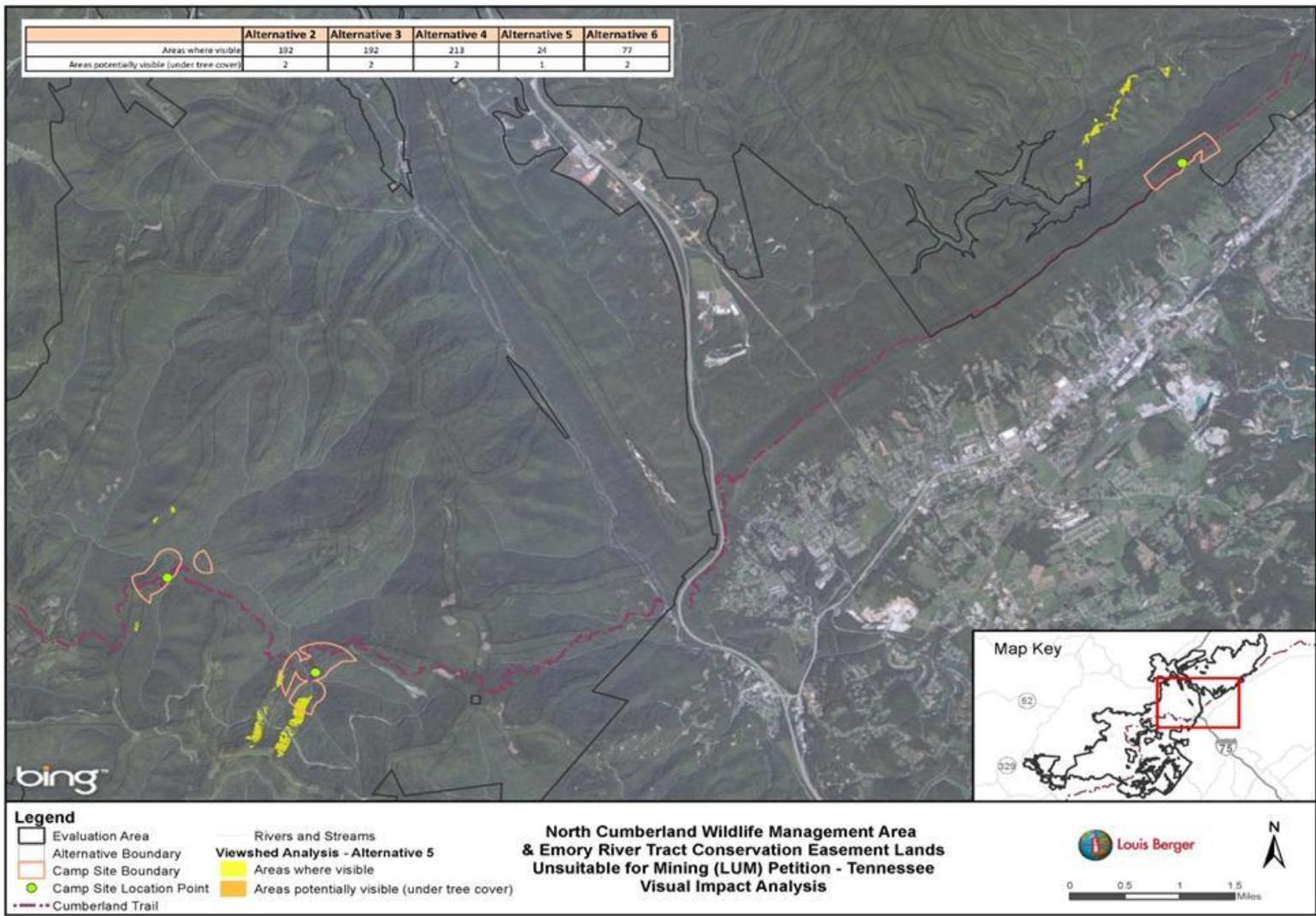


FIGURE 6-59: VISUAL IMPACT ANALYSIS – CAMPSITES (ALTERNATIVE 6)

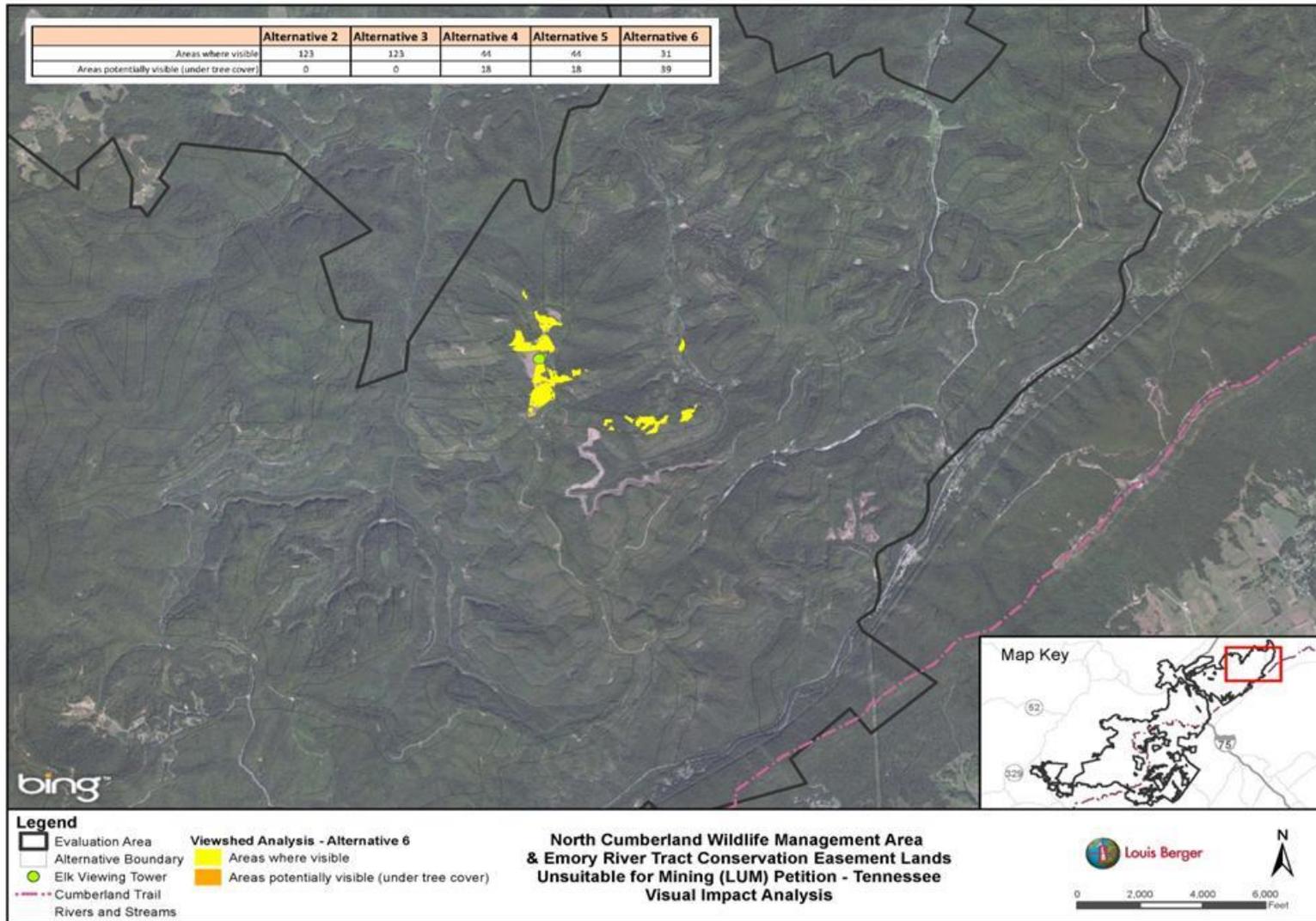


FIGURE 6-60: VISUAL IMPACT ANALYSIS – ELK VIEWING TOWER (ALTERNATIVE 6)

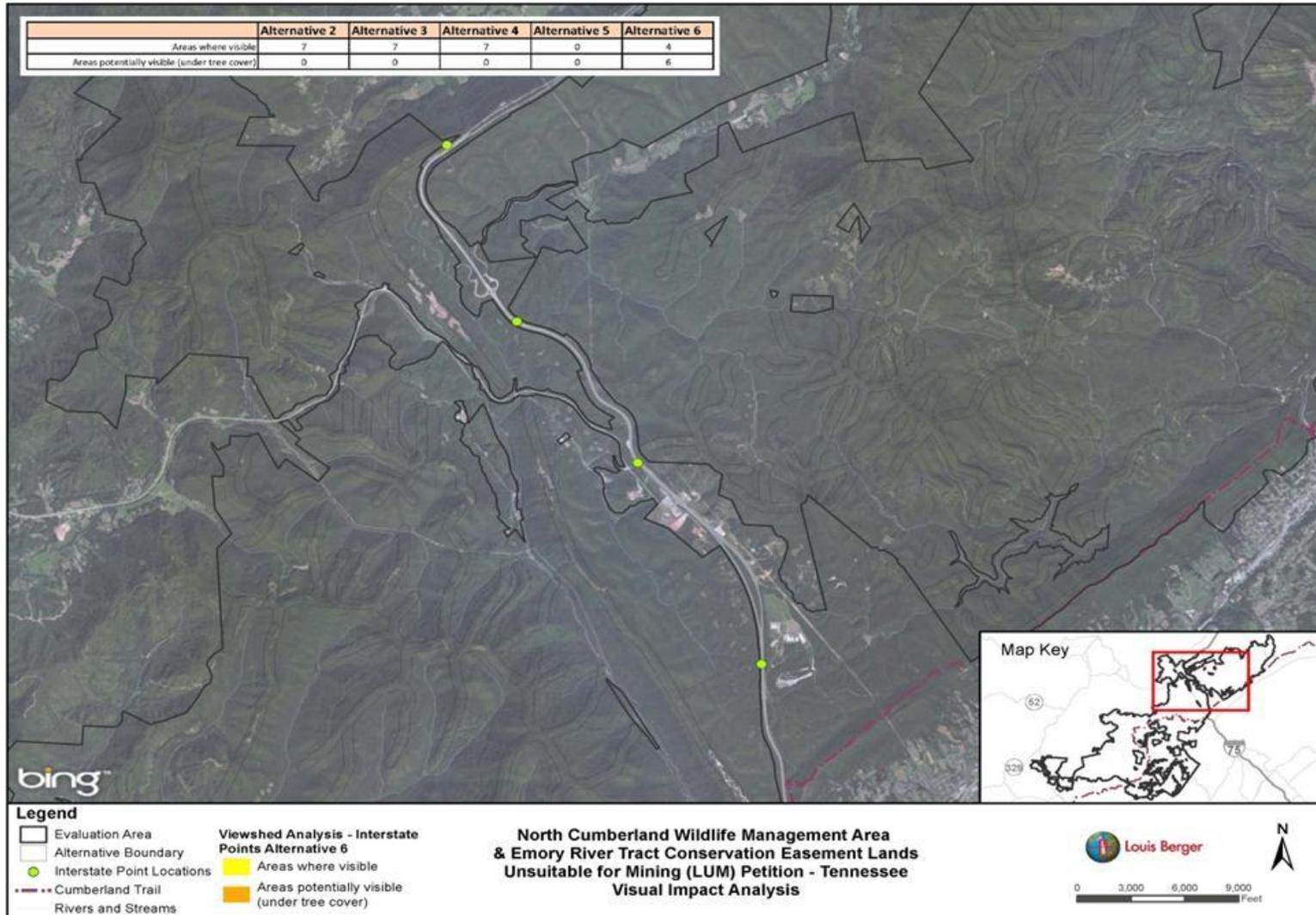


FIGURE 6-61: VISUAL IMPACT ANALYSIS – INTERSTATE 75 (ALTERNATIVE 6)

# IMPACTS OF THE ALTERNATIVES ON THE NATURAL SOUNDSCAPE

## METHODS FOR ANALYSIS

### Applicable Statutes, Regulations, and Policies

#### Noise

Mining activities cause noise in and around the mine site. Surface coal mining operations often employ large earth-moving vehicles and other machinery that can produce noise during the mine operation. Surface mining, which relies on blasting to remove overburden, generally creates more noise than underground mining although underground mining operations often have large ventilation systems that produce noise during mine operation. Depending on the location of the mining activity and its proximity to noise sensitive areas, mining-related noise can interfere with human enjoyment of areas immediately surrounding the mining activity.

Blasting operations are sporadic events, but are of particular concern because of potentially damaging low-frequency noise and pressure waves (which if done improperly would pose an obvious safety risk) but could also result in damage to nearby structures. Therefore, SMCRA and the implementing regulations require careful planning, control, and monitoring of blasting events to ensure that blasting occurs under safe conditions. Setback requirements from dwellings, public buildings, schools, and churches reduce noise impacts to sensitive receptors under the no-action alternative, as do existing requirements to conduct blasting between sunrise and sunset unless nighttime blasting is approved by the regulatory authority upon a determination that the public will be protected from adverse noise and other impacts (30 CFR §§ 816.61–64).

As noted above, underground mines involve a number of noise making processes and equipment, most of which produce noise underground. However, surface noise from underground mining does result from the use of large intake and exhaust fans that vent methane from underground mine operations, and from conveyor belts or trains, trucks and dozers used to transport coal and coal mine waste.

The primary responsibility for addressing construction noise, noise from power equipment operated by individuals, and unmuffled industrial noise penetrating residential areas, rests with states and local governments. Thousands of United States cities have implemented noise ordinances that give noise control officers and police the power to investigate noise complaints and enforcement power to abate the offending noise source through shutdowns and fines. A typical noise ordinance sets forth clear definitions of acoustic nomenclature and defines categories of noise generation; then numerical standards are established so that enforcement personnel can take the necessary steps of warnings, fines, or other municipal police action to rectify unacceptable noise generation. Under the no-action alternative, coal mining would continue to produce noise, as described above. Noise from coal mining may then affect surrounding communities and wildlife.

### Assumptions and Methodology

This section provides the rationale for the criteria used to assess soundscape impacts to humans and wildlife.

#### Noise Impact Criteria for Human Annoyance

Several organizations and agencies, including the American National Standards Institute, the National Research Council, the World Health Organization, EPA, have studied the impacts of noise to humans.

The American National Standards Institute, World Health Organization, and EPA recommend a criterion of greater than 55 dBA day-night average sound level as a level of significance when assessing impacts to humans (Berglund and Lindvall 1995). “Day-night average sound level” is the average noise level over a 24-hour period, with sound levels of human-caused sounds between the hours of 2200 and 0700 increased by 10 dB to take into account the increased sensitivity to noise during the nighttime hours.

The EPA recommends using day-night average sound level and equivalent sound level ( $L_{eq}$ ) as the best descriptors when assessing environmental noise impacts. The  $L_{eq}$  is the equivalent continuous sound which would contain the same sound energy as a time varying sound over a specified period of time (FHWA 2011). The EPA recommends that areas of outdoor activity where quiet is a basis of use,  $L_{eq}$  should not exceed 55 dBA (average over 24-hour period). Sound levels above this can result in human interference and annoyance (EPA 1974).

Based on a review of available literature and recommendations by various agencies and organizations, a criteria sound level of greater than 55 dBA was chosen as the level above which annoyance and interference with outdoor activities occurs.

### **Noise Impact Criteria for Wildlife**

Barber and others (Barber et al. 2009; Barber, Crooks, and Fristrup 2010) provide a summary of issues relative to human-caused sounds and animals. The potential for negative impacts to animals due to human-caused sounds is high because many animals rely on auditory clues for predator avoidance, mate attraction, obtaining nesting territories, and finding prey. Such sources include aircraft, motor boating, vehicles, machinery, and heavy equipment, including mining equipment. The study of animal response to noise is a function of many variables including characteristics of the noise and duration, life history characteristics of the species, habitat type, season and current activity of the animal, sex and age, previous exposure and whether other physical stressors are present (Manci et al. 1988).

Wildlife reaction to human-caused sounds can range from mild, such as an increase in heart rate to more damaging effects on metabolism and hormone balance. Long-term exposure to noise can cause excessive stimulation to the nervous system and chronic stress that is harmful to the health of wildlife species and their reproductive fitness (Fletcher 1980, 1990). Responses vary among species of animals and among individuals of a particular species. Variations in response may be due to temperament, sex, age, and prior experience with noise. Minor responses include head-raising and body-shifting, while more overt responses include running or moving short distances. Birds may fly or exhibit other alert or nervous behavior. Panic and escape behavior can result from more severe disturbances, although some species adapt to such disturbances (NPS 1995).

Behavioral and physiological responses have the potential to cause injury, energy loss (from movement away from noise source), decrease in food intake, habitat avoidance and abandonment, and reproductive losses (NPS 1995). Studies have shown that when certain bird species are flushed from nests in response to noise, eggs may be trampled or ejected from the nest and young are exposed to injury and predators (Bunnell et al. 1981; Gladwin, Asherin, and Manci 1987). Young mammals have been trampled as adults attempt to flee from aircraft (Miller and Broughton 1974).

One owl species that has been studied extensively is the Mexican Spotted Owl (*Strix occidentalis lucida*) in the western United States. Several noise and disturbance studies have been conducted on this species. Delaney et al. (1999) found that the number of owls flushing (e.g., fleeing their cover) was negatively related to distance and positively related to noise level (the closer the distance and the louder the noise, the more the owls flushed). They found that impacts to Mexican Spotted Owls generally occur at levels greater than 45 dBA. Spotted Owls do not occur in Tennessee; however, Barred Owls (*Strix varia*) are a

similar species and may be impacted in similar ways. Barred Owls are not a threatened or endangered species.

Impacts to birds from noise from compressors associated with oil and gas production were greatest in areas with high sound levels, greater than 50 dBA, but were measureable in areas with moderate sound levels, 40-50 dBA (LaGory et al. 2001). Lucas and others (2007), also studying noise impacts from compressors, found that chronic industrial noise affects ovenbirds in areas near high sound levels (specific dBA levels and distance not provided, but with compressor equipment similar to that in the LaGory et al. 2001 study).

It is not currently possible to understand how and at what levels human-caused sounds impact animals; there are too many different species and too many different scenarios of human-caused sounds to understand all the possible combinations. Overall, available literature suggests that intermittent human-caused sounds <40–45 dBA do not significantly impact wildlife species. Chronic (near continuous) noise levels greater than 45 dBA appear to impact some species but not others.

The potential impact of noise from surface coal mines on wildlife is likely similar to the types of impacts listed above. There may be some impact when sound levels are greater than 45 dBA, but the impacts are likely variable and impact different species differently; some species are tolerant while others are not.

### **Methodology for Determining Coal Mining Noise Levels**

As discussed in “Chapter 3: Alternatives” existing ambient acoustic conditions of the NCWMA and ERTCE were monitored. Acoustic data were also collected at two operating coal mines, National Coal (36.189359N, 84.310123W), and Triple H (36.439836N, 84.113285W). The National Coal mine was located outside of the evaluation area at Zeb Mountain in Campbell County (the mine is no longer active as of a 2013 settlement agreement with environmental groups) (Sierra Club 2013). The Triple H mine is located within the evaluation area in the Sundquist Unit, 7,000 feet west of US 25-W. National Coal was a large coal mine with 24-hr operations, while Triple H is a small coal mine with activity occurring during the daytime only. Using these two data sets, the measured current ambient sound levels and the measured sound levels of the two mines, a computer sound model (SoundPlan) was used to estimate acoustic impacts of coal mining on the soundscape of the NCWMA and ERTCE. The SoundPlan model accounts for terrain and vegetation effects on noise attenuation. Detailed information the modeling methodology is provided in the 2012 report by Ambrose and others (appendix D). Because the 2012 Ambrose report was completed before the development of the alternatives evaluated in this PED/EIS, it is not specific to a particular alternative, but instead provides a basis for understanding the soundscape impacts of surface coal mining more generally.

### **Methodology for Comparing Soundscapes Impacts of Alternatives**

To assess the impacts of each alternative on noise-sensitive areas, a spatial analysis was conducted that estimated noise levels at 25 analysis locations throughout and adjacent to the evaluation area. The analysis considers the areas that could experience mining (or re-mining) under each alternative and the distance of this potential mining from each analysis location.

The 25 analysis locations are shown in figure 6-62 and were selected to include specific noise-sensitive features (residences, Elk Viewing tower, Cumberland trail), as well as undeveloped forested areas to address effects on wildlife. The 25 locations are not intended to be representative of every portion of the evaluation area, but rather data points for measuring impacts.

Noise levels at each analysis location were estimated based on the assumption of standard stationary source attenuation of 6 dBA per doubling of distance (FHWA 2011). The noise levels shown in the results are a very conservative approximation of the potential extent of impacts because they do not take into account topographic, vegetation or atmospheric effects that would reduce noise levels. The reference sound levels used in the analysis (table 6-90) are from the monitoring conducted for the 2012 Ambrose report.

As shown in table 6-90, noise impacts of coal mining vary based on the type and timing of mining activity. Therefore, impact calculations are presented separately for large coal mines and small coal mines (daytime) to provide for a range of potential impacts. Given the intermittent nature of blasting, the quantitative analysis focuses on the operational (continuous) noise.

**TABLE 6-90: MINING REFERENCE NOISE LEVEL AND MAXIMUM EXTENT OF IMPACTS**

	<b>Reference Mining Sound Level (L<sub>eq</sub>, dBA) and Distance</b>	<b>Distance to 55 dBA (Human Annoyance Threshold)</b>	<b>Distance to 45 dBA (Wildlife Threshold)</b>
Large Coal Mine- Daytime	71 dBA at 1,312 feet	8,278 feet	26,177 feet
Small Coal Mine- Daytime	50 dBA at 1,066 feet	600 feet	1,896 feet
Large Coal Mine- Nighttime	68 dBA at 1,312 feet	5,860 feet	18,532 feet
Blasting	75.2 dBA at 1,066 feet	10,908 feet	34,495 feet

**Area of Analysis**

The analysis area is the evaluation area, which consists of NCWMA and ERTCE, and adjacent land where changes in soundscapes could occur from ridge top surface coal mining.

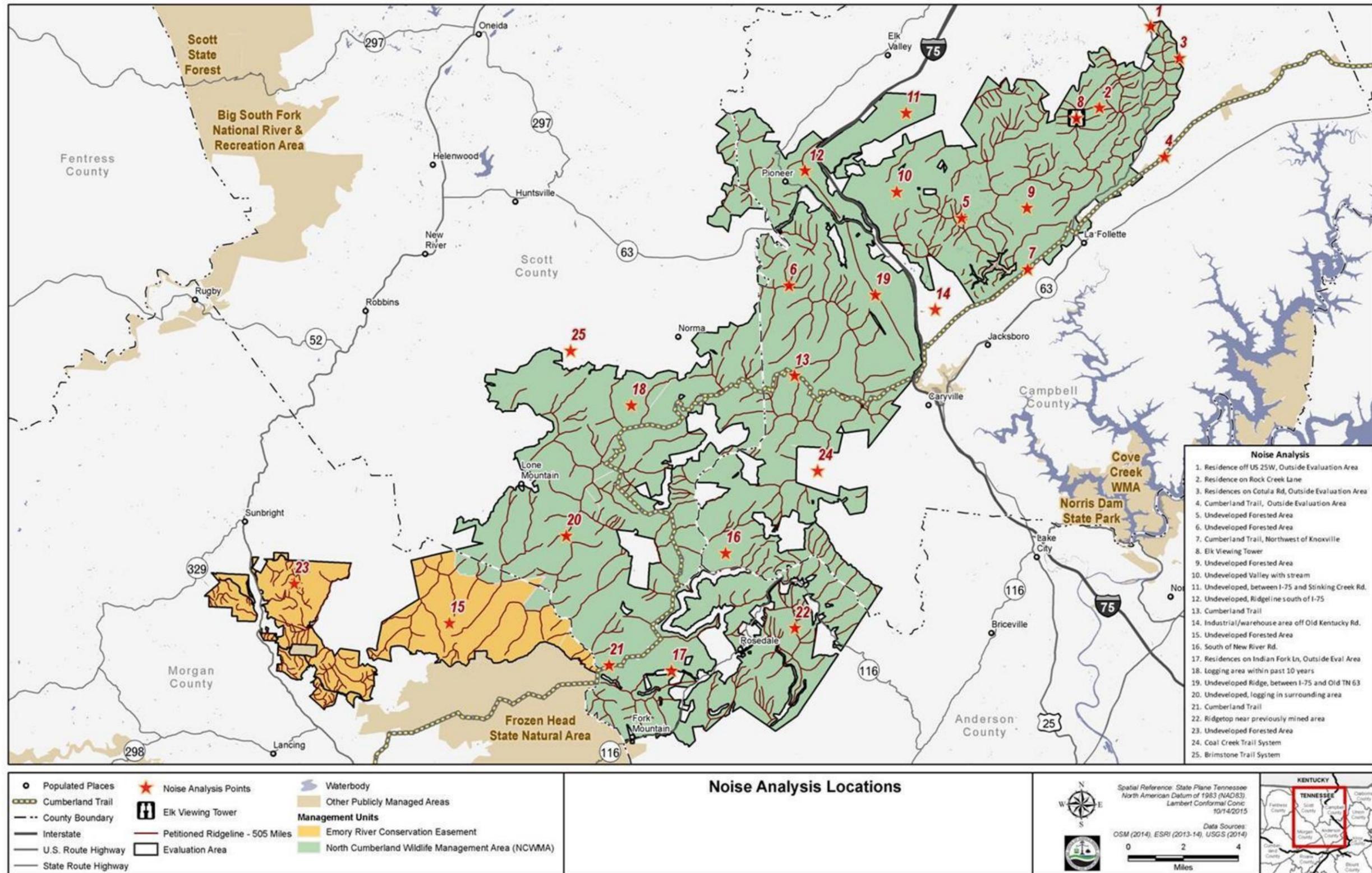


FIGURE 6-62: NOISE ANALYSIS LOCATIONS

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**GENERAL IMPACT OF COAL MINING IN TENNESSEE ON THE NATURAL SOUNDSCAPE**

Table 6-91 compares the impact of a typical large coal mine (based on monitoring of the National Coal mine) and a small coal mine (based on monitoring of the Triple H mine). At a distance of 1,312 feet, heavy equipment and other operational noise at a large coal mine could increase sound levels by almost 40 dBA over the low background ambient level during the day and at night. The impact of a smaller coal mining operation is substantially less, resulting in an increase of 12 dBA over the ambient at a distance of 1,066 feet during the daytime. For context, a 10 dBA increase in sounds levels is typically perceived as doubling of loudness. At the distances at which the monitoring was conducted, the large coal mine would substantially exceed the human annoyance (55 dBA) and wildlife disturbance (45 dBA) impact thresholds. The small coal mine would not exceed the human annoyance threshold with a daytime sound level of 50 dBA  $L_{eq}$ , but would exceed the wildlife disturbance threshold.

**TABLE 6-91: TYPICAL NOISE IMPACT OF TWO SURFACE COAL MINES IN THE NCWMA AREA**

Operation	Existing Ambient $L_{eq}$ (dBA)	National Coal <sup>a</sup> (at 1,312 feet) $L_{eq}$ (dBA)	National Coal <sup>a</sup> Increase over Ambient (dBA)	Triple H (at 1,066 feet) $L_{eq}$ (dBA) <sup>b</sup>	Triple H Increase over Ambient (dBA) <sup>b</sup>
All Hours	33	70	38	39	7
Daytime	38	71	34	50	12
Nighttime	30	68	38	31	1

<sup>a</sup> Large coal mine with 24-hour operation.

<sup>b</sup> Small coal mine with daytime operation.

Table 6-92 provides an estimate of the total acreage that would likely experience elevated sound levels due prior mining operations in the analysis area (National Coal and Triple H) as well as modeled results of ten hypothetical mines along ridgelines in the evaluation area. The table reflects noise from the mine itself, noise generated by haul trucks traveling along access roads is not included (haul truck noise is discussed separately below). The modeled impacts of ten hypothetical mines is greater than the National Coal mine because these ten mines are along the ridgelines in the evaluation area, they are elevated in nature, and their propagated sounds are less influenced by terrain blockage. The ten hypothetical mines do not reflect actual mining proposals, or any specific alternatives evaluated in this PED/EIS. Rather, they area an illustrative example developed for the 2012 soundscapes study to provide context for the potential area of impact from multiple coal mines operating simultaneously within the evaluation area.

**TABLE 6-92: AREAS OF ACOUSTIC IMPACT OF NATIONAL AND TRIPLE H COAL MINES (NO HAUL TRUCK ROADWAYS) AND TEN HYPOTHETICAL RIDGELINE MINES IN THE EVALUATION AREA**

dBA	National Coal Mine (acres of impact)	Triple H Coal Mine (acres of impact)	Average Acres of Impact from Ten Hypothetical Ridge Mines
>40 dBA	3,639	107	9,626
>45 dBA (selected wildlife disturbance indicator)	1,149	46	2,841
>50 dBA	348	12	915
>55 dBA (selected human annoyance indicator)	141	6	240

The modeled results show the drop in mining noise with increasing distance, including effects of terrain and vegetation attenuation. For example, terrain features and thick vegetation can cause the resulting noise level to decrease compared to flat and unvegetated conditions. The ten hypothetical mines could result in sound levels 45 dBA or greater on approximately 2,841 acres in and adjacent to the evaluation area and sound levels 55 dBA or greater on 240 acres in the evaluation area. Human annoyance impacts could occur to residences near the coal mine (if any), or to recreational users of the NCWMA and ERTCE, during mine operating hours (see “Impacts of the Alternatives on Land Use and Recreation” section for more information on the areas where recreation is most common).

**Coal Haul Truck Sound Levels:** Coal haul truck sounds were measured at the National Coal mine. A typical hour (10:00-11:00 on November 9, 2011) revealed nine trucks with a median 77.1 dBA at 50 feet (range 73.9-78.4 dBA), and duration of each greater than 45 dBA averaged 1:28 minutes. In other words, a truck pass-by was over 45 dBA at the measurement location for 1:28 minutes (with the noise level decreasing below that level as the truck travelled farther away from the monitoring location). In the case of a future mine location, it is not possible to model potential coal truck impact without knowing the mine location and the proposed roadway to the mine. However, it is possible to model the potential impact of coal haul trucks on a unit, per-mile basis. The impacts of five coal haul trucks per hour for a 1-mile distance on both the National Coal Mine road and the Triple H road are shown in table 6-93.

**TABLE 6-93: MODELED AREA OF IMPACTS (IN ACRES) OF FIVE COAL HAUL TRUCKS PER HOUR AT 30 MPH FOR A 1-MILE DISTANCE ON TWO DIFFERENT ROADS**

dBA	National Coal Mine Road	Triple H Mine Road
>40 dBA	441	428
>45 dBA	288	244
>50 dBA	170	121
>55 dBA	76	63

**Blast Sound Levels:** A single blast event was measured during the acoustic measurements at the mine sites. The blast event occurred at the Triple H mine, on October 31, 2010, at 13:39:46. The maximum sound level at 1,066 feet was 75.2 dBA, and the total event duration was about 10 seconds (table 6-94). Data from this blast event were used to model blast impacts at the Triple H mine. The area impacted by the blast event in the short term was considerably larger than the area impacted by normal mining sounds; however, the duration of this impact was less than 10 seconds. As with the ten hypothetical mines modeled, a great deal of variability in the area impacted would be expected due to terrain features.

**TABLE 6-94: L<sub>EQ</sub> CONTOURS AND AREA IN ACRES IMPACTED BY MINING SOUNDS AND A SINGLE BLAST EVENT AT TRIPLE H MINE**

dBA Contour	Triple H Mine Only	Triple H Mine and Single Blast Event
>40 dBA	107	833
>45 dBA	46	303
>50 dBA	12	140
>55 dBA	6	72

**Coal Mine Sounds Compared to Non-Coal Mining Sounds:** Table 6-95 provides a comparison of the mining operation sound levels and other sources at similar distances. Sound levels of noise other than mining sounds were adjusted to the same distance (1,312 feet) used to measure the coal mining sounds to

provide a relative comparison of sound sources in the evaluation area. The results show the source noise level of a large coal mine (62.6 dBA) is similar to the source level of an interstate highway. However, the modeling presented in appendix D shows the linear nature of a highway results in a substantially greater acreage of noise impacts compared to the impact of a coal mine. The data show the source level of a small coal mine is similar to a logging operation.

**TABLE 6-95: SOUND LEVELS OF COAL MINING AND OTHER HUMAN ACTIVITIES IN AND NEAR NCWMA**

Sound Source	Sound Level at 50 feet	Sound Level at 1,312 feet
Surface Coal Mine, large	NA	62.6 dBA
Surface Coal Mine, small	NA	48 dBA (1,066 feet)
Logging Operation	75.5 dBA	47.1 dBA
Interstate Highway (70 mph)	76.8 dBA	62.6 dBA
Highway (45-55 mph)	60.8 dBA	46.6 dBA
Off-Road Vehicle (at 25 mph)	69.7 dBA	35.3 dBA

Note: Refer to Ambrose et al. 2012 for detailed source information for this table.

**Conclusions Regarding General Impacts of Surface Coal Mining:** Sound levels generated by a large contour strip mining operation are high compared to ambient baseline levels. These sound levels diminish as one gets further away from the operations. Coal mining sounds are fairly constant throughout the day when the mine is operating 24 hours per day (which is typical for large coal mines only). Under current OSMRE mining regulations in Tennessee, the area of coal removal is limited to 1,500 linear feet along the contour elevation (30 CFR § 942.816(e)(1)). Compared to other current human-caused sound sources in the NCWMA and ERTCE such as vehicles (including off-road vehicles) and logging, a large coal mine such as National Coal, although louder than many other sources, may acoustically impact a smaller geographic area since it is confined to a limited area (compared to long linear infrastructure such as highways).

Potential acoustic impacts of a large contour strip coal mine, based on a criterion of greater than 55 dBA as a level of significance, could occur on approximately 240 acres (average of 10 modeled hypothetical mines). Potential acoustic impacts based on a criterion of greater than 45 dBA as a level of significance, could occur on approximately 2,841 acres (average of 10 modeled hypothetical mines). The potential impacts of a large ridgeline mine were found to be generally higher than the National Coal mine due to the elevated nature and fewer terrain effects along the ridgeline.

## Summary Tables

This section provides summary tables for the soundscapes analysis of 25 locations. Table 6-96 shows the distance from each analysis point to the closest location where surface coal mining could occur under each alternative. A distance of zero indicates locations where mining could occur directly on the analysis point. Table 6-97 shows the predicted sound level (discounting terrain effects as discussed in the methodology) at each analysis location assuming a large surface coal mine was developed at the closest allowable point. Table 6-98 shows the predicted sound level assuming a small surface coal mine (which is the more common type in the evaluation area) was developed at the closest allowable point to each noise analysis location. The results for each alternative are discussed in greater detail following the tables.

**TABLE 6-96 CLOSEST DISTANCE FROM NOISE ANALYSIS POINTS TO A POTENTIALLY MINEABLE AREA IN THE EVALUATION AREA (FEET)**

ID	Description	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
1	Residence off US 25W, Outside Evaluation Area	373	373	373	373	373	373
2	Residence on Rock Creek Lane	160	160	160	160	160	160
3	Residences on Cotula Rd, Outside Evaluation Area	1,012	1,136	1,136	1,136	1,012	1,075
4	Cumberland Trail, Outside Evaluation Area	5,028	5,139	5,139	5,139	5,028	5,028
5	Undeveloped Forested Area	266	1,033	1,033	1,033	1,033	468
6	Undeveloped Forested Area	0	994	663	663	994	68
7	Cumberland Trail, Northwest of Knoxville	413	872	872	872	705	572
8	Elk Viewing Tower	0	376	0	0	376	33
9	Undeveloped Forested Area	0	0	0	0	0	0
10	Undeveloped Valley with stream	0	0	0	638	638	0
11	Undeveloped, between Interstate 75 and Stinking Creek Rd.	4,825	4,825	4,825	4,825	4,825	4,825
12	Undeveloped, Ridgeline south of Interstate 75	1,559	1,559	1,559	1,559	1,559	1,559
13	Cumberland Trail	534	534	534	534	778	534
14	Industrial/warehouse area off Old Kentucky Rd.	6,881	6,881	6,881	6,881	6,881	6,881
15	Undeveloped Forested Area	1,288	1,288	1,288	1,288	1,288	1,288
16	South of New River Rd.	86	86	86	86	86	86
17	Residences on Indian Fork Ln, Outside Eval Area	324	324	324	324	324	324
18	Logging area within past 10 years	574	574	574	574	574	574
19	Undeveloped Ridge, between Interstate 75 and Old TN 63	3,076	3,076	3,076	3,076	3,076	3,076
20	Undeveloped, logging in surrounding area	0	678	294	294	0	249
21	Cumberland Trail	331	550	294	502	643	331
22	Ridgetop near previously mined area	0	387	203	203	0	87
23	Undeveloped Forested Area	18,780	19,686	19,686	19,686	18,780	19,363
24	Coal Creek Trail System	3,453	3,453	3,453	3,453	3,453	3,453
25	Brimstone Trail System	1,922	1,922	1,922	1,922	1,922	1,922

**TABLE 6-97 NOISE IMPACTS OF A LARGE COAL MINE DEVELOPED AT NEAREST MINEABLE AREA (dBA, L<sub>Eq</sub>)**

ID	Description	Alt 1	Alt 2	Change from Alt 1	Alt 3	Change from Alt 1	Alt 4	Change from Alt 1	Alt 5	Change from Alt 1	Alt 6	Change from Alt 1
1	Residence off US 25W, Outside Evaluation Area	82	82	0	82	0	82	0	82	0	82	0
2	Residence on Rock Creek Lane	89	89	0	89	0	89	0	89	0	89	0
3	Residences on Cotula Rd, Outside Evaluation Area	73	72	-1	72	-1	72	-1	73	0	73	-1
4	Cumberland Trail, Outside Evaluation Area	59	59	0	59	0	59	0	59	0	59	0
5	Undeveloped Forested Area	85	73	-12	73	-12	73	-12	73	-12	80	-5
6	Undeveloped Forested Area	N/A	73	N/A	77	N/A	77	N/A	73	N/A	97	N/A
7	Cumberland Trail, Northwest of Knoxville	81	75	-6	75	-6	75	-6	76	-5	78	-3
8	Elk Viewing Tower	N/A	82	N/A	N/A	N/A	N/A	N/A	82	N/A	103	N/A
9	Undeveloped Forested Area	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10	Undeveloped Valley with stream	N/A	N/A	N/A	N/A	N/A	77	N/A	77	N/A	N/A	N/A
11	Undeveloped, between Interstate 75 and Stinking Creek Rd.	60	60	0	60	0	60	0	60	0	60	0
12	Undeveloped, Ridgeline south of Interstate 75	70	70	0	70	0	70	0	70	0	70	0
13	Cumberland Trail	79	79	0	79	0	79	0	76	-3	79	0
14	Industrial/warehouse area off Old Kentucky Rd.	57	57	0	57	0	57	0	57	0	57	0
15	Undeveloped Forested Area	71	71	0	71	0	71	0	71	0	71	0
16	South of New River Rd.	95	95	0	95	0	95	0	95	0	95	0
17	Residences on Indian Fork Ln, Outside Eval Area	83	83	0	83	0	83	0	83	0	83	0
18	Logging area within past 10 years	78	78	0	78	0	78	0	78	0	78	0
19	Undeveloped Ridge, between Interstate 75 and Old TN 63	64	64	0	64	0	64	0	64	0	64	0

ID	Description	Alt 1	Alt 2	Change from Alt 1	Alt 3	Change from Alt 1	Alt 4	Change from Alt 1	Alt 5	Change from Alt 1	Alt 6	Change from Alt 1
20	Undeveloped, logging in surrounding area	N/A	77	N/A	84	N/A	84	N/A	N/A	N/A	85	N/A
21	Cumberland Trail	83	79	-4	84	1	79	-4	77	-6	83	0
22	Ridgetop near previously mined area	N/A	82	N/A	87	N/A	87	N/A	N/A	N/A	95	N/A
23	Undeveloped Forested Area	48	47	0	47	0	47	0	48	0	48	0
24	Coal Creek Trail System	63	63	0	63	0	63	0	63	0	63	0
25	Brimstone Trail System	68	68	0	68	0	68	0	68	0	68	0

N/A = not applicable, analysis location is located within mineable area (zero distance).

Orange: exceeds human annoyance threshold of 55 dBA.

Yellow: exceeds wildlife disturbance threshold of 45 dBA, but is less than 55 dBA.

**TABLE 6-98 NOISE IMPACTS OF A SMALL COAL MINE DEVELOPED AT NEAREST MINEABLE AREA (dBA, L<sub>Eq</sub>)**

ID	Description	Alt 1	Alt 2	Change from Alt 1	Alt 3	Change from Alt 1	Alt 4	Change from Alt 1	Alt 5	Change from Alt 1	Alt 6	Change from Alt 1
1	Residence off US 25W, Outside Evaluation Area	59	59	0	59	0	59	0	59	0	59	0
2	Residence on Rock Creek Lane	66	66	0	66	0	66	0	66	0	66	0
3	Residences on Cotula Rd, Outside Evaluation Area	50	49	-1	49	-1	49	-1	50	0	50	-1
4	Cumberland Trail, Outside Evaluation Area	37	36	0	36	0	36	0	37	0	37	0
5	Undeveloped Forested Area	62	50	-12	50	-12	50	-12	50	-12	57	-5
6	Undeveloped Forested Area	N/A	51	N/A	54	N/A	54	N/A	51	N/A	74	N/A
7	Cumberland Trail, Northwest of Knoxville	58	52	-6	52	-6	52	-6	54	-5	55	-3
8	Elk Viewing Tower	N/A	59	N/A	N/A	N/A	N/A	N/A	59	N/A	80	N/A
9	Undeveloped Forested Area	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10	Undeveloped Valley with stream	N/A	N/A	N/A	N/A	N/A	54	N/A	54	N/A	N/A	N/A

ID	Description	Alt 1	Alt 2	Change from Alt 1	Alt 3	Change from Alt 1	Alt 4	Change from Alt 1	Alt 5	Change from Alt 1	Alt 6	Change from Alt 1
11	Undeveloped, between Interstate 75 and Stinking Creek Rd.	37	37	0	37	0	37	0	37	0	37	0
12	Undeveloped, Ridgeline south of Interstate 75	47	47	0	47	0	47	0	47	0	47	0
13	Cumberland Trail	56	56	0	56	0	56	0	53	-3	56	0
14	Industrial/warehouse area off Old Kentucky Rd.	34	34	0	34	0	34	0	34	0	34	0
15	Undeveloped Forested Area	48	48	0	48	0	48	0	48	0	48	0
16	South of New River Rd.	72	72	0	72	0	72	0	72	0	72	0
17	Residences on Indian Fork Ln, Outside Evaluation Area	60	60	0	60	0	60	0	60	0	60	0
18	Logging area within past 10 years	55	55	0	55	0	55	0	55	0	55	0
19	Undeveloped Ridge, between Interstate 75 and Old TN 63	41	41	0	41	0	41	0	41	0	41	0
20	Undeveloped, logging in surrounding area	N/A	54	N/A	61	N/A	61	N/A	N/A	N/A	63	N/A
21	Cumberland Trail	60	56	-4	61	1	57	-4	54	-6	60	0
22	Ridgetop near previously mined area	N/A	59	N/A	64	N/A	64	N/A	N/A	N/A	72	N/A
23	Undeveloped Forested Area	25	25	0	25	0	25	0	25	0	25	0
24	Coal Creek Trail System	40	40	0	40	0	40	0	40	0	40	0
25	Brimstone Trail System	45	45	0	45	0	45	0	45	0	45	0

NA = not applicable, analysis location is located within mineable area (zero distance).

Orange: exceeds human annoyance threshold of 55 dBA.

Yellow: exceeds wildlife disturbance threshold of 45 dBA, but is less than 55 dBA.

## **ALTERNATIVE 1: NO-ACTION ALTERNATIVE**

Under alternative 1, OSMRE would deny the State's petition to designate the subject lands as "unsuitable for surface coal mining operations" (30 CFR § 764.13). Therefore, the no-action alternative would have the same effect as deciding not to designate any of the petition area as unsuitable for surface coal mining operations. Alternative 1 is considered to have the largest impact of all of the considered alternatives.

### **Direct and Indirect Impacts**

As shown in table 6-97, development of a large coal mine in the areas potentially mineable under alternative 1 would exceed the human annoyance threshold at all but one analysis location, and the wildlife disturbance threshold would be exceeded at all 25 analysis locations. Under alternative 1, six of the analysis locations are located directly within areas that could potentially be mined. The maximum noise level at the analysis locations outside of potentially mineable land would range from 48 to 95 dBA  $L_{eq}$ . Large coal mines could be anticipated to have 24-hour operations, although blasting would only be allowed during the daytime hours (see regulatory framework).

As shown in table 6-98, the development of small coal mines would have substantially lower noise impacts compared to large coal mines. The maximum noise level at the analysis locations outside of potentially mineable land would range from 25 to 72 dBA  $L_{eq}$ . With a small coal mine, the human annoyance threshold of 55 dBA would be exceeded at 15 of the analysis locations (including those that could be mined directly) and the wildlife disturbance threshold of 45 dBA would be exceeded at an additional 5 analysis locations.

Overall, alternative 1 would likely result in significant impacts depending on the location of the surface coal mine and location and sensitivity of the noise receptor (i.e., person or wildlife). However, the intensity of the impact would dissipate with increasing distances from the source of the noise.

### **Cumulative Impacts**

Non-coal mining-related sources contributing to cumulative impacts on soundscapes in the evaluation area include existing roadway traffic, logging, oil and gas development and off-road recreational vehicles. There would be substantial spatial variation in the intensity of cumulative impact within the evaluation area depending on the location of human activity areas and wildlife habitat in relation to coal mining and non-coal mining noise sources. The impacts of alternative 1, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on natural soundscapes. Alternative 1 would contribute to temporary adverse cumulative impacts in the vicinity of mine sites.

### **Conclusion**

In conclusion, alternative 1 (no action) would have near-term localized significant adverse effects on soundscapes. Thresholds for human annoyance and disturbance of wildlife would be exceeded in the vicinity of coal mining areas and along roadways used by coal haul trucks. Following reclamation, these mining-related sources would cease. Therefore, there would be no long-term impact on soundscapes at any one mine site, although mining could continue at varying locations at approximately 112 acres per year within the area for decades.

## **ALTERNATIVE 2: STATE PETITION DESIGNATION**

Under alternative 2, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State's petition. Under this alternative, 505 miles of ridgelines with a 1,200-

foot corridor (600 feet on both sides of the ridgeline) would be designated as unsuitable for surface coal mining.

### **Direct and Indirect Impacts**

As shown in table 6-97, development of a large coal mine in the areas potentially mineable under alternative 2 would exceed the human annoyance threshold at all but one analysis location, and the wildlife disturbance threshold would be exceeded at all 25 analysis locations. However, the number of analysis locations directly within areas that could potentially be mined is reduced to two (compared to six under alternative 1). In other words, four locations where mining could have occurred under alternative 1 would be within the petition area corridors.

With large coal mines, maximum noise level at the analysis locations outside of potentially mineable land would range from 47 to 95 dBA  $L_{eq}$ . Large coal mines could be anticipated to have 24-hour operations, although blasting would only be allowed during the daytime hours (see regulatory framework).

As shown in table 6-98, development of small coal mines would have substantially lower noise impacts compared to large coals mines. The maximum noise level at the analysis locations outside of mineable land would range from 25 to 72 dBA  $L_{eq}$ . With a small coal mine, the human annoyance threshold of 55 dBA would be exceeded at 11 of the analysis locations and the wildlife disturbance threshold of 45 dBA would be exceeded at an additional 8 analysis locations.

For analysis locations 1–4, 11–19, and 23–25, the impact of alternative 2 would be the same or very similar (1 dBA or less change) to alternative 1, as surface coal mining would still occur outside the petition area and could affect the soundscape within the petition area (several of the analysis locations are also located outside the petition area). For analysis locations 6, 8, 9, 10, 20, and 22, alternative 2 would prevent surface coal mining, demonstrating the protective effect of the petition area within localized areas. For analysis locations 5, 7, and 21, alternative 2 would result in reduction of the maximum potential mining noise level by 12, 6, and 4 dBA, respectively, compared to alternative 1, as these locations would limit surface mining to areas farther from certain receivers.

Overall, alternative 2 would result in some improvements to the soundscape. However, mining outside the petition area could still result in short-term significant adverse impacts to areas within the petition area.

### **Cumulative Impacts**

As with alternative 1, non-coal mining-related sources contributing to cumulative impacts on soundscapes in the evaluation area include existing roadway traffic, logging, oil and gas development and off-road recreational vehicles. Given the uncertainty in both the locations that would potentially be mined and the locations of non-coal mining sources, the potential for cumulative impacts cannot be predicted in detail. In general, locations within the petition area would experience lower cumulative impacts due to the absence of coal mining in these areas; however the other sources of noise could still occur in the petition area. The impacts of alternative 2, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on natural soundscapes. Alternative 2 would contribute to temporary adverse cumulative impacts in the vicinity of surface coal mining operations. However, their contribution would cease upon completion of mining operations.

### **Conclusion**

In conclusion, alternative 2 would have fewer impacts than alternative 1, but would still result in near-term significant adverse impacts in the vicinity of potential coal mine locations outside the petition area

that could affect soundscapes in the petition area. Thresholds for human annoyance and disturbance of wildlife would be exceeded in the vicinity of surface coal mining operations and along roadways used by coal haul trucks. No new or additional adverse impacts would occur compared to the no-action alternative. Mining could continue in the evaluation area at an average rate of 112 acres per year. Following reclamation, these mining-related sources would cease. Therefore, there would be no long-term impact on soundscapes at any one mine site, although mining and associated soundscape impacts could continue in the long term at varying locations within the region.

### **ALTERNATIVE 3: STATE PETITION DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS**

Under alternative 3, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State's petition with a 1,200-foot ridgeline corridor, as described under alternative 2. Unlike alternative 2, alternative 3 would not prohibit re-mining (pursuant to 30 CFR chapter VII), but would require reclamation. Alternative 3 would also allow construction and maintenance of haul roads inside the designation area.

#### **Direct and Indirect Impacts**

As shown in table 6-97, development of a large coal mine in the areas potentially mineable under alternative 3 would exceed the human annoyance threshold at all but one analysis location, and the wildlife disturbance threshold would be exceeded at all 25 analysis locations. However, an indicator of the beneficial effect of alternative 3 on soundscapes is that the number of analysis locations directly within areas that could potentially be mined is reduced to three (compared to six under alternative 1). In other words, three locations where mining could have occurred under alternative 1 would be within the designation area corridors (and also outside of areas potentially subject to re-mining).

With large surface coal mines, the maximum noise level at the analysis locations outside of potentially mineable land would range from 47 to 95 dBA  $L_{eq}$ . Large coal mines could be anticipated to have 24-hour operations, although blasting would only be allowed during the daytime hours (see regulatory framework).

As show in table 6-98, development of small coal mines would have substantially lower noise impacts compared to large coals mines. The maximum noise level at the analysis locations outside of potentially mineable land would range from 25 to 72 dBA  $L_{eq}$ . With a small coal mine, the human annoyance threshold of 55 dBA would be exceeded at 12 of the analysis locations and the wildlife disturbance threshold of 45 dBA would be exceeded at an additional 7 analysis locations.

For analysis locations 1–4, 11–19, and 23–25, the impact of alternative 3 would be the same or very similar (1 dBA or less change) to alternative 1. Locations indicating no change show the overlap in the potentially mineable areas between the alternatives and that there are a large number of potentially mineable areas outside the designation area (as well as potentially remineable areas within the designation area) that could impact the soundscape inside the designation area. In addition, some of the analysis locations are outside of the designation area. For analysis locations 6 and 20–22, alternative 3 would prevent surface coal mining, demonstrating the protective effect of the designation area within localized areas. These locations were not mined previously; therefore no impacts from re-mining could occur. For analysis location 5, alternative 3 would result in a reduction of the maximum potential mining noise level by 12 dBA compared to alternative 1. This location shows the effect of the alternative 3 in limiting surface mining to areas farther from certain receivers. Overall, alternative 3 would result in some improvements to the soundscape as the designation area would provide areas that would not be subject to surface coal mining operations or re-mining. However, mining outside the designation area and re-mining

within the designation area could still result in short-term significant adverse impacts to portions of the designation areas.

### **Cumulative Impacts**

Non-coal mining-related sources contributing to cumulative impacts on soundscapes in the evaluation area include existing roadway traffic, logging, oil and gas development and off-road recreational vehicles. There would be substantial spatial variation in the intensity of cumulative impact within the evaluation area depending on the location of human activity areas and wildlife habitat in relation to coal mining and non-coal mining noise sources. Given the uncertainty in both the locations that would potentially be mined and the locations of non-coal mining sources, the potential for cumulative impacts cannot be predicted in detail. In general, locations within the designation area would experience lower cumulative impacts due to the absence of coal mining in these areas (excluding the potential re-mining areas). The impacts of alternative 3, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on natural soundscapes. Alternative 3 would result in temporary adverse cumulative impacts in the vicinity of mine sites. However, their contribution would cease upon completion of mining operations.

### **Conclusion**

In conclusion, alternative 3 would have fewer impacts and would be beneficial compared to alternative 1, but would still result in near-term significant adverse impacts in the vicinity of new coal mine locations adjacent to the designation area and previously mined areas undergoing re-mining. However, no new or additional adverse impacts would occur compared to the no-action alternative. Thresholds for human annoyance and disturbance of wildlife would be exceeded in the vicinity of coal mining areas (including re-mining) and along roadways used by coal haul trucks. Following reclamation, these mining-related sources would cease. Therefore, there would be no long-term impact on soundscapes at any one mine site, although mining could continue at varying locations within the region for decades.

### **ALTERNATIVE 4: EXPANDED CORRIDOR DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS (PREFERRED ALTERNATIVE)**

Under alternative 4, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State's petition, as described under alternative 2, and on additional ridgelines. Like alternative 3, alternative 4 would not prohibit re-mining, reclamation activities, and construction and maintenance of haul roads within the designation area and protected ridgeline boundaries.

### **Direct and Indirect Impacts**

As shown in table 6-97, development of a large coal mine in the areas potentially mineable under alternative 4 would exceed the human annoyance threshold at all but one analysis location, and the wildlife disturbance threshold would be exceeded at all 25 analysis locations. However, an indicator of the beneficial effect of alternative 4 on soundscapes is that the number of analysis locations directly within areas that could potentially be mined is reduced to two (compared to six under alternative 1). In other words, four locations where mining could have occurred under alternative 1 would be within the designation area corridors (and also outside of area potentially subject to re-mining).

With large coal mines, maximum noise level at the analysis locations outside of mineable land would range from 47 to 95 dBA  $L_{eq}$ . Large coal mines could be anticipated to have 24-hour operations, although blasting would only be allowed during the daytime hours (see regulatory framework).

As show in table 6-98, development of small coal mines would have substantially lower noise impacts compared to large coals mines. The maximum noise level at the analysis locations outside of mineable land would range from 25 to 72 dBA  $L_{eq}$ . With a small coal mine, the human annoyance threshold of 55 dBA would be exceeded at 12 of the analysis locations and the wildlife disturbance threshold of 45 dBA would be exceeded at an additional 7 analysis locations.

The impact of alternative 4 for analysis locations 1–4, 11–19, and 23–25, would be the same or very similar (1 dBA or less change) to alternative 1. The locations indicating no change show the overlap in the potentially mineable areas between the alternatives and that there are a large number of potentially mineable areas outside the designation area (as well as potentially remineable areas within the designation area) that could impact the soundscape inside the designation area. In addition, some of the analysis locations are outside of the designation area. For analysis locations 6, 10, and 20–22, alternative 4 would prevent surface coal mining, demonstrating the protective effect of the designation area within localized areas. These locations were not mined previously; therefore no impacts from remining could occur. For analysis locations 5, 7, and 21, alternative 4 would result in a reduction of the maximum potential mining noise level by 12, 6, and 4 dBA, respectively, compared to alternative 1. This location shows the effect of alternative 4 in limiting surface mining to areas farther from certain receivers. Overall, the impacts of alternative 4 would be similar to alternative 3 and could result in short-term significant adverse impacts to portions of the designation areas.

### **Cumulative Impacts**

As under alternative 1, non-coal mining-related sources contributing to cumulative impacts on soundscapes in the evaluation area include existing roadway traffic, logging, oil and gas development and off-road recreational vehicles. These sounds would continue. There would be substantial spatial variation in the intensity of cumulative impact within the evaluation area depending on the location of human activity areas and wildlife habitat in relation to noise sources. Given the uncertainty in both the locations that would potentially be mined and the locations of non-coal mining sources, the potential for cumulative impacts cannot be predicted in detail. The impacts of alternative 4, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on natural soundscapes. Alternative 4 would contribute to temporary adverse cumulative impacts. However, their contribution would cease upon completion of mining operations.

### **Conclusion**

In conclusion, alternative 4 would have fewer noise-related impacts than alternative 1, but would still result in near-term significant adverse impacts in the vicinity of surface coal mining operations and remining areas. However, no new or additional adverse impacts would occur compared to the no-action alternative. Thresholds for human annoyance and disturbance of wildlife would be exceeded in the vicinity of coal mining areas outside the designation area and where potential remining is done, and along roadways used by coal haul trucks. Following reclamation, these mining-related sources would cease. Therefore, there would be no long-term impact on soundscapes at any one mining location.

### **ALTERNATIVE 5: TARGETED RESOURCE PROTECTION DESIGNATION**

Under alternative 5, OSMRE would designate lands as unsuitable for surface coal mining operations based on the presence of sensitive resources. Alternative 5 would protect environmentally sensitive habitat areas including portions of Stinking Creek and Thompson Creek within the Upper Cumberland watershed.

## Direct and Indirect Impacts

As shown in table 6-97, development of a large coal mine in the areas potentially mineable under alternative 5 would exceed the human annoyance threshold at all but one analysis location, and the wildlife disturbance threshold would be exceeded at all 25 analysis locations. However, alternative 5 would eliminate mining activity from three analysis locations located in the designation area, compared to alternative 1. With large coal mines, maximum noise level at the analysis locations outside of mineable land would range from 48 to 95 dBA  $L_{eq}$ .

As show in table 6-98, development of small coal mines would have substantially lower noise impacts compared to large coals mines. The maximum noise level at the analysis locations outside of mineable land would range from 25 to 72 dBA  $L_{eq}$ . With a small coal mine, the human annoyance threshold of 55 dBA would be exceeded at 7 of the analysis locations and the wildlife disturbance threshold of 45 dBA would be exceeded at an additional 10 analysis locations.

For analysis locations 2–4, 11–19, and 23–25, the impact of alternative 5 would be the same or very similar (1 dBA or less change) to alternative 1, as there are a large number of potentially mineable areas outside the designation area that could impact it (and some of the analysis locations are outside of the designation area). In analysis locations 6–8 and 10, alternative 5 would prevent surface coal mining from occurring, providing protection of the soundscape within these localized areas. Finally for analysis locations 5, 7, 13, and 21, alternative 5 would result in reduction of the maximum potential mining noise level by 12, 5, 3, and 6 dBA, respectively, compared to alternative 1, limiting the effect of surface coal mining operations to areas farther from certain receivers.

Overall, alternative 5 would result in small improvements to the soundscape as the designation area would provide areas that would not be subject to surface coal mining operations or remining. However, mining outside the designation area could still result in short-term significant adverse impacts to portions of the designation areas.

## Cumulative Impacts

As under alternative 1, non-coal mining-related sources contributing to cumulative impacts on soundscapes in the evaluation area include existing roadway traffic, logging, oil and gas development and off-road recreational vehicles. These sounds would continue. In general, locations within the designation area would experience lower cumulative impacts due to the absence of surface coal mining operations in these areas, but these areas are relatively small in size under this alternative. The impacts of alternative 5, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on natural soundscapes. Alternative 5 would contribute to temporary adverse cumulative impacts in the vicinity of mine sites. However, their contribution would cease upon completion of mining operations.

## Conclusion

In conclusion, alternative 5 would have fewer impacts than alternative 1 and would avoid impacts to specific noise-sensitive areas, but would still result in near-term significant adverse impacts in the vicinity of allowable coal mine locations. However, no new or additional adverse impacts would occur compared to the no-action alternative. Following reclamation outside the designation area, these mining-related sources would cease. Therefore, there would be no long-term impact on soundscapes at any one mine site.

## **ALTERNATIVE 6: REDUCED CORRIDOR DESIGNATION**

Under alternative 6, OSMRE would designate as unsuitable for surface coal mining operations all public access lands proposed in the State's petition. Lands protected under alternative 6 would be the same as those protected under alternatives 2 and 3, except that the corridor width would be reduced by half (600-foot corridor instead of 1,200-foot corridor).

### **Direct and Indirect Impacts**

As shown in table 6-97, development of a large coal mine in the areas potentially mineable under alternative 6 would exceed the human annoyance threshold at all but one analysis location, and the wildlife disturbance threshold would be exceeded at all 25 analysis locations. However, the number of analysis locations directly within areas that could potentially be mined is reduced to two (compared to six under alternative 1). In other words, four locations where mining could have occurred under alternative 1 would be within the designation area corridors.

With large coal mines, maximum noise level at the analysis locations outside of mineable land would range from 48 to 103 dBA  $L_{eq}$ .

As show in table 6-98, development of small coal mines would have substantially lower noise impacts compared to large coals mines. The maximum noise level at the analysis locations outside of mineable land would range from 25 to 74 dBA  $L_{eq}$ . With a small coal mine, the human annoyance threshold of 55 dBA would be exceeded at 15 of the analysis locations and the wildlife disturbance threshold of 45 dBA would be exceeded at an additional 4 analysis locations.

Overall, the impact of alternative 6 would be the same or very similar (1 dBA or less change) to alternative 1 for analysis locations 1–4, 11–19, and 23–25, as there are a large number of potentially mineable areas outside the designation area that could affect it (and some of the analysis locations are outside of the designation area). For analysis locations 6–8 and 20–22, alternative 6 would prevent surface coal mining from occurring, as they occur in the designation area. For analysis locations 5 and 7, alternative 6 would result in a reduction of the maximum potential mining noise level by 5 and 3 dBA, respectively, compared to alternative 1, indicating the effect of the alternative 6 in limiting surface mining to areas farther from certain receivers. Alternative 6 would result in small improvements to the soundscape as the designation area would provide areas that would not be subject to surface coal mining operations or remining. However, mining outside the designation area could still result in short-term significant adverse impacts to portions of the designation areas.

### **Cumulative Impacts**

As under alternative 1, non-coal mining-related sources contributing to cumulative impacts on soundscapes in the evaluation area include existing roadway traffic, logging, oil and gas development and off-road recreational vehicles. These sounds would continue. Given the uncertainty in both the locations that would potentially be mined and the locations of non-coal mining sources, the potential for cumulative impacts cannot be predicted in detail. In general, locations within the designation area would experience lower cumulative impacts due to the absence of coal mining in these areas. The impacts of alternative 6, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on natural soundscapes. Alternative 6 would contribute to temporary adverse cumulative impacts in the vicinity of mine sites. However, their contribution would cease upon completion of mining operations.

## Conclusion

In conclusion, alternative 6 would have fewer impacts than alternative 1, but surface coal mining operations in the vicinity would still result in near-term significant adverse impacts in the designation area. However, no new or additional adverse impacts would occur compared to the no-action alternative. Thresholds for human annoyance and disturbance of wildlife would be exceeded in the vicinity of coal mining areas and along roadways used by coal haul trucks. Following reclamation of mine sites outside the designation area these mining-related sources would cease. Therefore, there would be no long-term impact on soundscapes at any one mine site.

## IMPACTS OF THE ALTERNATIVES ON SOCIOECONOMICS

### METHODS FOR ANALYSIS

#### Applicable Statutes, Regulations, and Policies

The Council on Environmental Quality regulations implementing NEPA state that when economic or social effects and natural or physical environmental effects are interrelated, the EIS will discuss these effects on the human environment (40 CFR § 1508.14). The Council on Environmental Quality regulations further state that the “human environment shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment.” This socioeconomic analysis evaluates how elements of the human environment such as population, employment, tax revenues, and public services might be affected by the action alternatives.

The “Impacts of the Alternatives on Socioeconomics” section of the PED/EIS follows the guidance of the Bureau of Land Management Land Use Planning Handbook, appendix D, and characterizes impacts to existing conditions and trends from each of the alternatives under consideration, including the no-action alternative. By statute, regulation, and Executive order, the Bureau of Land Management is required to use social science in the preparation of informed, sustainable land use planning decisions. Section 202(c)(2) of the Federal Land Policy and Management Act requires the Bureau of Land Management to integrate physical, biological, economic, and other sciences in developing land use plans (43 USC § 1712(c)(2)). Federal Land Policy and Management Act regulations 43 CFR §§ 1610.4-3 and 1610.4-6 also require the Bureau of Land Management to analyze social, economic, and institutional information. Section 102(2) (A) of NEPA requires federal agencies to “insure the integrated use of the natural and social sciences ... in planning and decision making” (42 USC § 4332(2)(A)).

#### Assumptions and Methodology

Possible changes in mining activity and production could affect surface and underground mining employment, potentially impacting regional economic conditions.

Based on the analysis provided in “Chapter 5: Evaluation of Coal Resources,” the average annual production from surface coal mining anticipated under the no-action alternative (alternative 1) in the evaluation area was assumed to range from 54,000 to 240,000 tons. The level of coal production under all of the alternatives is assumed to remain the same across the evaluation area (see “Chapter 5: Evaluation of Coal Resources”). Therefore, the level of economic impacts across all of the alternatives is anticipated to be approximately the same.

The methodology to evaluate the economic impacts of the alternatives used a recent study conducted by the University of Tennessee (English et al. 2012) to estimate the economic impacts in the evaluation area

that included estimates of employment, labor income, gross regional production, and total economic output. These estimates, which were estimated with the IMPLAN model and data, have been adjusted to reflect production levels under the alternatives.

### Area of Analysis

The evaluation area includes approximately 172,000 acres within four counties in Tennessee: Anderson, Campbell, Morgan, and Scott. This four-county region is defined as the socioeconomic study area. In addition, the socioeconomic analysis also considers impacts to a smaller area that includes 19 census tracts surrounding the evaluation area. This is further explained in “Chapter 4: Affected Environment.”

## ALTERNATIVE 1: NO-ACTION ALTERNATIVE

### Direct and Indirect Impacts

**Population and Regional Economic Conditions:** Under the no-action alternative, annual average coal production from the evaluation area is anticipated to range from 54,000 to 240,000 tons per year (see “Chapter 5: Evaluation of Coal Resources”). Recent trends show that coal production in the evaluation area and in Tennessee has been steadily decreasing since 2008, driven by considerable decreases in surface mining. This level of production is consistent with the period between 2006 and 2013.

The economic benefits of the coal production within the evaluation area were evaluated in the University of Tennessee study (English et al. 2012). The study evaluated the average annual coal production (2006 to 2010) of 126,742 tons of surface and 340,447 tons of underground coal, for total production of 467,189 tons in the evaluation area. The prices used to evaluate the value of the coal production were \$56.84 per ton and \$79.83 per ton for surface and underground mines in 2009. This approach assumes that the 54,000 to 240,000 tons of coal have surface and underground production consistent with English et al. (2012) – 73% underground production. The prices and structure of the economy are assumed to be in 2009 values (English et al. 2012). Adjusting the model to account for 54,000 to 240,000 tons of coal potentially minable under the no-action alternative, the results indicate that between \$5 million and \$25 million would be generated in sales from coal production, which would support between 30 and 133 jobs in the four-county region. Table 6-99 includes the total impacts, including the direct (the coal industry) as well as indirect (supporting businesses) and induced (workers spending their wages) multiplier impacts (English et al. 2012).

**TABLE 6-99: ECONOMIC BENEFITS OF COAL PRODUCTION UNDER THE NO-ACTION ALTERNATIVE**

Total Economic Impacts	467,189 tons per year	54,000 tons per year	240,000 tons per year
Total Industrial Output (sales)	\$47,332,411	\$5,470,912.62	\$24,315,167.18
Total Value Added (Gross Regional Product)	\$19,490,707	\$2,252,831.68	\$10,012,585.23
Employment	259	30	133

Source: English et al. 2012.

In 2012, the four-county area had a population of approximately 160,000 and employment of 81,629. The current employment of an estimated 30 to 133 jobs accounts for considerably less than 1% of employment in the four-county area. The mining and multiplier employment is anticipated to have short-term beneficial impacts on the local economy, although the number of jobs supported is small relative to current employment in the area. Because the level of mining production under alternative 1 would be

consistent with the level experienced between 2006 and 2013, it is anticipated that the mining activity and production under alternative 1 would continue to support a similar trend in employment and income as currently occurring within the four-county area.

Employment in the four-county area that is related to mining activity would continue to support the existing population, but the contribution to population growth would not be noticeable. The no-action alternative would not result in any change to current contributions that the NCWMA has on the regional economy.

**Tax Revenues:** Severance tax receipts under the no-action alternative would continue to benefit counties in the evaluation area with mineable reserves, although the receipts are a very small proportion of county revenues; severance tax receipts are anticipated to be the same as experienced under existing conditions.

Coal production from the evaluation area is anticipated to continue under the no-action alternative, ranging from 54,000 to 240,000 tons of coal. Because the coal severance tax is currently \$1.00 per ton (University of Tennessee 2014), an estimated \$54,400 to \$240,000 in severance taxes would be paid to the counties in which production occurs. The county tax revenue is split evenly between the county educational system and highway and stream cleaning systems, as defined in Tennessee State legislation (University of Tennessee 2014). Fiscal tax receipts in the four-county area account for approximately 37% of the total severance tax collected in the State in fiscal year 2013. Recent and current annual coal produced from the evaluation area accounts for between approximately 14 to 51% of 2013 coal severance tax receipts to the counties in the evaluation area.

Campbell County contains the largest portion of coal reserves that are potentially mineable (i.e., all coal resources if no mining has ever occurred) and therefore would continue to be the largest beneficiary of severance tax receipts under the no-action alternative. The 2013 severance tax receipts were approximately 0.5% of the revenues in the county (Campbell County 2013). Anderson County's mineral and coal severance tax receipts were also approximately 0.5% of total generated revenues in the county (Anderson County 2014). Morgan County's mineral severance tax receipts are approximately 1.2% of total generated tax revenues in the County (Morgan County 2014a). Scott County has not had any coal production since 2005 and the 2014 severance tax receipts were approximately 0.2% in the county (Scott County 2014a). Table 6-100 shows the potentially minable acres by alternative, including potential new areas and previously augered, underground, and surface areas. The potentially mineable acres provide an indication of the allocation of fiscal receipts to counties for coal mining activities in the future under the no-action alternative. For the entire evaluation area, there are 91,800 potentially mineable acres, of which 45% fall in Campbell County, 31% in Scott County, 16% in Anderson County, and 8% in Morgan County.

**TABLE 6-100: ALTERNATIVE 1 POTENTIALLY MINEABLE ACRES BY COUNTY, INCLUDING PREVIOUSLY MINED AREAS**

Alternative	Anderson	Campbell	Morgan	Scott	Total
Alternative 1	14,856	41,079	7,276	28,549	91,759
Percent of Total	16%	45%	8%	31%	100%

**Fiscal Resources: Franchise and Excise Taxes:** Franchise and excise taxes are privilege taxes imposed on corporations, limited partnerships, limited liability companies, and business trusts chartered, organized or operating their business within Tennessee. The franchise tax is 0.25% of a corporation's net worth or real and tangible personal property, whichever is greater. The excise tax is a 6.5% rate on net earnings or income (Tennessee Department of Revenue 2013b). Total franchise and excise taxes collected by the

State of Tennessee in fiscal year 2013 were \$2 billion or 14% of total revenue collected by the State (Tennessee Department of Revenue 2013a). Estimated franchise and excise taxes paid by the statewide coal industry in 2010 were a fraction of the receipts, approximately \$403,000 (WVCBP 2010). With 4.5 to 25% of the state production supported from the evaluation area (see “Chapter 5: Evaluation of Coal Resources”), these fiscal receipts would continue to benefit the state, but would be a small proportion of state receipts.

**Logging and Forestry Associated with Mining:** As described in the “Impacts of the Alternatives on Land Use and Recreation” section, surface coal mining under alternative 1 could have potential long-term adverse impacts on forestry uses because it requires the clearing of large areas of vegetation that could take many decades to return to a desired harvestable resource. The length of time necessary for a site to return to a forested condition would result in long-term adverse impacts to forestry-related uses. However, the extent of forested land on the NCWMA combined with the relatively limited surface mining disturbance (3,360-acre area or 2% of the evaluation area) predicted over the 30-year analysis period suggests that adverse impacts would be minimal. In the short term, timber would be harvested off of lands to accommodate surface mining and surface mining operations, benefitting forestry jobs and income in the area. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions. This expected rate of surface disturbance would result in a small amount of timber harvested and displaced future timber harvests in the evaluation area. It is not anticipated that forestry activities and jobs and income supported by this activity would be noticeably affected in the short or long term because of the relatively small amount of surface mining disturbance projected annually and over time.

**Recreation:** The evaluation area draws a number of visitors to the region through its parks, wilderness areas, off-highway vehicle trails, and other recreation resources (see the “Impacts of the Alternatives on Land Use and Recreation” section and “Land Use and Recreation” in chapter 4). Across the four-county study area, nonlocal visitors spent approximately \$177.4 million in the four-county study area, approximately 65% of which was in Anderson County. Together, the four counties in the study area account for approximately 1% of the nonlocal visitor spending in the state. In total, travel and tourism-related expenditures support 1,420 jobs in the study area, as well as \$10.4 million in state tax receipts and \$6.0 million in local tax receipts (see table 4-42 in chapter 4).

A recreation survey and economic study that specifically focused on the evaluation area found that recreational users were estimated to spend approximately 230,500 recreational days in the area annually (English et al. 2012; Schexnayder et al. 2012) and spent \$10.3 million in 2011 (reported in 2009 dollars). This visitor spending supports 230 jobs and \$9.2 million in value added within the region (English et al. 2012). The most prevalent visitors are hunters (81,920 recreational days), followed by off-highway vehicle users (48,266), warm-water anglers (28,737), other users (site-seeing, wildlife viewing, biking, photography – 27,740 recreational days), and hikers (12,491 recreational days). The evaluation area represents approximately 6% of the visitor spending in the four-county study area.

An estimated 3,360 acres of surface disturbance over a 30-year time period under alternative 1 accounts for 2% of the evaluation area. Since this estimate is based on historic trends, one can assume that the amount of disturbance in the past 30 years has also accounted for 2% of the evaluation area. Currently, 1,941 acres of mining activities are permitted within the evaluation area. The current level of disturbance has coincided with 230,000 recreational visitor days in the evaluation area. As mining in an area is completed, areas are backfilled, graded, and revegetated, in general, the level of recreational activity described above is anticipated to continue because the level of mining activity is expected to continue at current rates. However site-specific impacts to recreation and visitation could occur under alternative 1.

The reintroduction of elk into the area began in 2000, and there are currently about 400 elk in Tennessee; it is hoped that over the next 30 years, the population of elk will expand to a population of 1,400 to 2,000. The Cumberland Plateau was chosen for elk reintroduction because it has habitat suitable for supporting elk herds and because it contains few farm crops and people (TWRA n.d.). The evaluation area (approximately 172,000 acres) is within the Elk Restoration Zone, which comprises 670,000 acres (figure 4-7). The Hatfield Knob Elk Viewing Tower was constructed in 2005 on the Sundquist Unit of the NCWMA. In 2006, 468 people visited the viewing area, over 90% of which were from Tennessee (Rocky Mountain Elk Foundation 2007). Since 2006, visitation to the elk viewing tower has increased steadily with 14,370 visitors reported in 2013 (Elkins pers. comm. 2015).

Elk reintroduction in other eastern states has brought economic benefits to proximate communities. For example in a Maryland survey, residents indicate that they would spend an average of more than \$300 per trip to view elk. A survey of Kentucky visitors found that residents spent an actual amount of roughly \$50 per elk-viewing trip (Responsive Management 2012; Rocky Mountain Elk Foundation 2007). At the time of the study, there were 6,000 elk within a 13-county area in Southeast Kentucky; now there are an estimated 10,000 elk (Kentucky Forward 2014). An estimated 1.25% of the population of Kentucky travels to see the elk in Kentucky each year (Responsive Management 2012; Rocky Mountain Elk Foundation 2007). It is likely that as the elk herd in Tennessee grows in numbers, it will draw additional visitors, most of which will be from Tennessee. If 1.25% of the population of Tennessee visited the NCWMA (with an average of two people per trip) and spent \$50 per trip, using the assumptions from the Maryland study, 81,250 people would visit the NCWMA, spending \$2 million dollars, supporting 45 jobs, and state and local tax revenue (Responsive Management 2012). In addition, more elk in the future would likely result in more permits for elk hunting in the NCWMA, with additional benefits to local communities associated with visitor spending. Tennessee's sixth annual elk hunt took place in 2014, with 6 permits issued.

As described in the "Impacts of the Alternatives on Land Use and Recreation" section, the greatest potential for adverse impacts to recreation would likely occur at Hatfield Knob elk viewing tower, along the Cumberland Trail, and at associated campgrounds. To the extent that visitors would be discouraged from coming to the region because of continued or increased disturbance from mining activity or decreased wildlife viewing opportunities, there would be long-term adverse impacts to recreation and tourism spending. However, because there are ample recreational opportunities in the region and because adverse impacts would be highly dependent on the location of an individual mining operation and its proximity and visibility to areas important for recreation, the intensity of any long-term adverse impacts of decreased visitor spending from the no-action alternative would be uncertain.

Some literature provides support for regional population and economic growth in rural communities associated with tourism amenities and quality of life attributes, while counties that have a higher amount of natural resource extraction industries are associated with slower economic growth. Although the Appalachian counties, and specifically the four-county study area, are experiencing population growth, it is not at a rapid rate of growth. For rural counties in America that are growing most rapidly (mostly in the west), the cause of the growth does not appear to come from traditional resource extractive industries and manufacturing. Rather, analysis by Nord and Cromartie (1997) and Beale and Johnson (1998), among others, suggest that natural amenities and other non-market attributes that contribute to overall quality of life may be the driving factors (Deller et al. 2001). Deller et al. (2001) find that mountain areas and publicly owned land resources contribute to the growth of tourist economies (i.e., population and employment growth) in rural areas, while economic difficulties are associated with agricultural-dependent areas (Deller et al. 2001). James and Aadland (2011) find that resource-dependent counties (i.e., counties with a large portion of natural resource earnings) exhibit slower economic growth in terms of annual growth in per capita personal income compared to counties without a considerable portion of natural resource earnings.

Black, McKinnish, and Sanders (2005) examined the impact of the coal boom in the 1970s and the subsequent coal bust in the 1980s on local economies in Kentucky, Ohio, Pennsylvania, and West Virginia and addressed the question of how non-mining industry sectors were affected by the shocks (i.e., boom) to the mining sector. The results indicate modest employment spillovers into the local goods sectors. One mining job created during the boom generates 0.17 local sector jobs; one mining job lost during the bust destroys 0.35 local sector jobs, and there is no evidence of positive spillovers into the traded goods sector (e.g., manufacturing). On the other hand, there is little evidence to suggest negative spillovers; therefore, it does not appear that the coal boom crowded out other industry in these areas (Black, McKinnish, and Sanders 2005). Crowding out can occur when the increase in labor demand and local services from a booming natural resource sector leads to increases in relative wages and the cost of services. The increase in demand for labor in the extracting sector and the resulting increase in wages pulls workers from other sectors. Direct demand by firms and workers in the resource extracting sector may also increase local prices for goods and services, potentially creating a disadvantage for local businesses. Increased local price volatility may also deter local entry of new firms. Other parts of the local economy not closely related to the resource extraction industry may have limited ability to increase the wages they pay their employees or pass on the higher cost of services to other customers (Black, McKinnish, and Sanders 2005). Rural areas endowed with key natural resources amenities can manage these resources to capture growth more effectively, which may entail managing for a range of tourism activities and amenities (Deller et al. 2001). Alternative 1 would allow mining throughout the evaluation area, which would contribute to mining employment and earnings in the region, possibly adversely affecting visitation and tourism in the area. Although considerable growth in coal mining activity does not appear to adversely affect service sectors, it does appear that coal mining could be associated with long-term adverse impacts due to decreased regional economic growth and per capita personal income in rural counties. Although the literature is not conclusive, continued coal mining under alternative 1 could result in slightly adverse impacts to regional economic growth and income compared to existing conditions.

### **Cumulative Impacts**

Actions inside and outside of the evaluation area, local, regional, and national drivers and trends in oil and gas and mining supply and demand can cumulatively affect local and regional economies. Any construction or development activities would provide short-term economic activity to the evaluation area. Recreation and visitor spending would beneficially affect local communities as visitors stay and spend their income in the area. Actions that induce or discourage visitation and visitor spending can affect local economies.

Generally, economies are subject to business cycles with upturns and downturns affecting economic activity across most regional economies. To the extent that economic activity increases, there would be beneficial effects. Conversely, if economic activity decreases there could be adverse effects to regional economies, affecting jobs, income, fiscal receipts, and downstream economic activity. For example, the manufacturing industry in the region is currently experiencing declines in employment due to multiple factors and is currently adversely affecting the region's economy.

Coal mining, timber harvesting, and oil and gas development and production are also affected by cumulative actions or circumstances, many of which are beyond industry or OSMRE control. These include natural resource prices, state resource regulation, federal policies and regulations, development costs, the risks of successful development, production costs, and many others. Coal production is expected to continue to decrease in the Appalachian Basin in the future (EIA 2014f), which would have short-term and possibly long-term adverse impacts on employment, income, and fiscal receipts in the evaluation area, if the trend continues in the future. Shale gas development may occur in the region in the future if development and production become economically viable. Timber harvesting activities are anticipated to continue in the evaluation and four-county area; although timber harvesting in the four-

county area only accounts for 4% of the harvested volume in the state (USDA 2014b). These timber and gas activities would benefit jobs, income, and downstream economic activity in the evaluation area. On the other hand, decreased development and production compared to existing conditions would adversely affect local economies.

The impacts of alternative 1, when added to the impacts of actions by others, would result in both beneficial and adverse cumulative impacts on socioeconomics, which would vary depending on current economic conditions. The no-action alternative would not result in any changes to the current contributions that coal mining and timber harvesting have on the regional economy and would not contribute more than minimally or sporadically to cumulative impacts.

## Conclusion

Existing contributions to the local and regional economy would continue to benefit the region's economy because coal mining would continue to be produced from the petition area. Thus, implementing the no-action alternative would have no new impact on the regional economy. In addition, mining activities could expand in the evaluation area because no areas would be designated as unsuitable for mining. These natural resource activities would support an estimated 30 to 133 jobs, income, and economic activity in the evaluation area. Severance, sales, and franchise and excise taxes would continue to accrue to local and state governments. However, these economic and fiscal impacts are anticipated to be small relative to the size of the four-county economy. In addition, allowing mining activity on the ridge-tops and in the petition area may adversely affect recreation in the long term, with adverse impacts to visitation and supporting recreation-based jobs and income in service sectors in the region, especially for mining near recreational resources (campgrounds and the elk viewing tower).

## ALTERNATIVE 2: STATE PETITION DESIGNATION

Under alternative 2, approximately 67,326 acres would be designated as unsuitable for surface mining (the petition area), while 787 acres are currently permitted and would be excluded from the designation. Alternative 2 includes the designation of 505 miles of ridgeline with a 1,200-foot corridor of lands. Underground mining and auger mining from outside the petition area, resulting in no surface disturbance within the petition area would be allowed.

### Direct and Indirect Impacts

**Population and Regional Economic Conditions:** In the short term, currently permitted mines would continue to operate and impacts would be the same as described for alternative 1. In the long term, there would be a shift in mining from future sites within the petition area to other areas within the evaluation area. The level of production is anticipated to be the same within the evaluation area, from 54,000 to 240,000 tons per year (see "Chapter 5: Evaluation of Coal Resources"). Therefore, the impacts to regional economic conditions are anticipated to be the same as those described for the no-action alternative.

**Fiscal Resources: Severance Taxes:** Under alternative 2, the impacts to severance tax receipts in the short term would be the same as those described under alternative 1 because permitted mining would continue to occur in the evaluation area. In the long term, there would be a shift in mining from areas within the petition area to other areas outside the petition area and within the evaluation area. Because the level of production is anticipated to be the same as under the no-action alternative, the total tax receipts to the four counties would be the same described under alternative 1. As described in alternative 1, Campbell County would continue to be the largest beneficiary of severance tax receipts under the no-action alternative in the evaluation area because it contains the largest portion of coal reserves that are potentially mineable (table 6-101). The potentially mineable acres provide an indication of the allocation

of fiscal receipts to counties for coal mining activities in the future under alternative 2. Comparing the percentages of potentially mineable acres for alternative 2 with those for the evaluation area, there is the potential for very slight changes in the allocation of fiscal receipts across the counties: slight increases for Anderson and Scott Counties and slight decreases in Campbell and Morgan Counties.

**TABLE 6-101: ALTERNATIVE 2 POTENTIALLY MINEABLE ACRES BY COUNTY, INCLUDING PREVIOUSLY MINED AREAS**

Alternative	Anderson	Campbell	Morgan	Scott	Total
Alternative 2	7,782	19,504	2,854	14,032	44,172
Percent of Total	18%	44%	6%	32%	100%

Similar to alternative 1, severance tax receipts under alternative 2 would continue to benefit the counties in the evaluation area with mineable reserves, although the receipts are a small proportion of county revenues. Severance tax receipts are anticipated to be the same as experienced under the no-action alternative although the allocation of the receipts among the counties may change, but only slightly.

**Fiscal Resources: Franchise and Excise Taxes:** Estimated franchise and excise taxes paid by the statewide coal industry are anticipated to be very small portion of state receipts and would be the same as described under alternative 1.

**Logging and Forestry Associated with Mining:** As described in the “Impacts of the Alternatives on Land Use and Recreation” section, alternative 2, would result in 22,122 acres of potentially mineable area and 8,345 acres of potentially remineable area within the total area designated unsuitable for surface mining. Since 91% of the evaluation area is forested, the likelihood is high that these acreages represent largely forested lands. Alternative 2 would result in fewer acres harvested in the short term for surface mining, than under alternative 1, although this impact is not likely to noticeably affect the local economy. In addition, long-term conversion to non-forested conditions would occur on fewer lands in the evaluation area, resulting in slightly better impacts than under alternative 1. These impacts would not be noticeable within the region’s economy.

**Recreation:** Under alternative 2, recreational use of the area and ridgelines would continue to occur. Impacts to dispersed recreation related to access restrictions and area closures as well as noise, fugitive dust and emissions from mining vehicle traffic and mining equipment would not occur on approximately 73,000 acres, resulting in beneficial impacts to recreation within this area. Under alternative 2, additional visitors could be drawn to the area with additional recreational amenities, wildlife viewing opportunities, decreased truck traffic, and improved viewsapes and mountain vistas compared to alternative 1, especially if these protections are provided in areas that are popular viewing locations or visitor attractions. However, because impacts to recreation would be highly dependent on the location of an individual mining operation and its proximity and visibility to areas important for recreation in the wider evaluation area, the intensity of the change in visitor spending relative to the no-action alternative would be uncertain. Wildlife viewing opportunities and visitation would continue under alternative 2, and overall impacts to long-term visitor spending, and associated jobs and income, would be beneficial compared to alternative 1.

Impacts to visitation and associated visitor spending, jobs and income would be beneficial compared to alternative 1. Fewer visitors would be discouraged from coming to the region because of less disturbance from mining activity or continued wildlife viewing opportunities compared to alternative 1. Under alternative 2, there would be long-term beneficial impacts to recreation and tourism spending because recreational experience would be beneficial compared to alternative 1 and would encourage visitation,

although some disruptions and nuisances would occur outside the petition area. The intensity of any beneficial impacts of increased visitor spending from alternative 2 (compared to alternative 1) would be uncertain.

As described under the no-action alternative, some literature provides support for regional population and economic growth in rural communities associated with tourism amenities and quality of life attributes, while counties that have a higher amount of natural resource extraction industries are associated with slower economic growth. Reduced emphasis on the boom-bust natural resource extraction industries and maintaining and improving natural vistas and tourism amenities in the NCWMA and ERTCE area is likely to benefit the local economies in the long term. It is likely that tourism and visitor spending would be slightly better under alternative 2 relative to alternative 1 because of the potential for increased wildlife viewing opportunities, potential future trail developments, improvements in scenic qualities, and a decreased amount of industrial disturbance (i.e., truck traffic, industrial noise, etc.).

### **Cumulative Impacts**

Similar to alternative 1, actions inside and outside of the evaluation area, local, regional, and national trends in oil and gas and mining supply and demand can cumulatively affect impacts on local and regional economies. Any construction or development activities would provide short-term economic activity to the evaluation area. Coal mining and oil and gas development and production are affected by cumulative actions or circumstances, many of which are beyond industry or OSMRE control, such as natural resource prices, state resource regulation, federal policies and regulations (such as the Mercury and Air Toxics Standards), development costs, the risks of successful development, production costs, and many others.

The impacts of alternative 2, when added to the impacts of actions by others, would result in both beneficial and adverse cumulative impacts on socioeconomics, which would vary depending on current economic conditions. Alternative 2 is expected to continue to benefit the local economy because current coal mining would continue to be produced from the petition area and the evaluation area. However, near-term surface mining in the petition area along 505 miles of ridgelines would be restricted; 67,326 acres would be designated as unsuitable for surface mining. Because ample reserves exist in the evaluation area, underground mining could occur under the petition area, and current mining would continue to be permitted, the same coal production level is anticipated to occur within the evaluation area under alternative 2, resulting in no change in regional economic conditions and population from mining activity. The contribution to cumulative impacts of alternative 2 would be negligible given the other factors driving coal and shale gas production, coal mine development costs, and the many other cumulative impacts affecting local and regional economies. In the long term, alternative 2 could contribute to cumulative beneficial impacts on recreation and tourism in the region.

### **Conclusion**

Alternative 2 is expected to continue to benefit the region's economy because coal mining would continue to be produced from the evaluation area. These natural resource activities would continue to support an estimated 30 to 133 jobs, income, and economic activity in the evaluation area. Severance, sales, and franchise and excise taxes would continue to accrue to local and state governments. However, these economic and fiscal impacts are anticipated to be small relative to the size of the four-county economy. No impacts to population or public facilities or services are anticipated under alternative 2. In addition, fewer tourism visitors would be discouraged from coming to the region because of fewer disturbances from mining activity or continued wildlife viewing opportunities than under alternative 1. Under alternative 2, there would be long-term beneficial impacts to recreation and tourism spending because recreational experience would be beneficial compared to alternative 1 and would encourage visitation, although some disruptions and nuisances would occur outside the petition area. The intensity of any

beneficial impacts of increased visitor spending from alternative 2 (compared to alternative 1) would be uncertain.

### **ALTERNATIVE 3: STATE PETITION DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS**

Under alternative 3, approximately 67,326 acres would be designated as unsuitable for surface mining, while 787 acres are currently permitted and would be excluded from the designation. Alternative 3 includes the designation of 505 miles of ridgeline with a 1,200-foot corridor of lands. Underground mining and auger mining from outside the petition area, resulting in no surface disturbance within the petition area would be allowed. In addition, potential remining of previously mined areas as well as the development of access and haul roads could also be allowed under alternative 3.

#### **Direct and Indirect Impacts**

**Population and Regional Economic Conditions:** In the short term, currently permitted mines would continue to operate and impacts would be the same as described for alternative 1. In the long term, there would be a shift in surface mining from future sites within the petition area to other areas within the evaluation area; however, underground and remining could potentially occur within the designation area. There is likely to be more mining activity within and adjacent to the designation area than experienced under alternative 2. However, under alternative 3, the level of production is anticipated to be the same within the evaluation area, from 54,000 to 240,000 tons per year (see “Chapter 5: Evaluation of Coal Resources”). Therefore, the impacts to regional economic conditions and population are anticipated to be the same as those described for the no-action alternative.

**Fiscal Resources: Severance Taxes:** Under alternative 3, the impacts to severance tax receipts in the short term would be the same as those described under alternative 1 because permitted mining would continue to occur in the evaluation area. In the long term, there would be a shift in new surface coal mining from areas within the designation area to other areas within the evaluation area. However, remining could still occur in the designation area. Because the level of production is anticipated to be the same as under the no-action alternative, the total tax receipts to the four counties would be the same described under alternative 1. Similar to alternative 1, Campbell County would continue to be the largest beneficiary of severance tax receipts because it contains the largest portion of coal reserves that are potentially mineable (table 6-102). The impacts to the allocation of fiscal receipt to counties would be the same as described under alternative 1.

**TABLE 6-102: ALTERNATIVE 3 POTENTIALLY MINEABLE ACRES BY COUNTY, INCLUDING PREVIOUSLY MINED AREAS**

<b>Alternative</b>	<b>Anderson</b>	<b>Campbell</b>	<b>Morgan</b>	<b>Scott</b>	<b>Total</b>
Alternative 3	7,782	19,504	2,854	14,032	44,172
Percent of Total	18%	44%	6%	32%	100%

Similar to alternative 1, severance tax receipts under alternative 3 would continue to benefit the counties in the evaluation area with mineable reserves, although the receipts are a very small proportion of county revenues. Severance tax receipts are anticipated to be the same as experienced under existing conditions although the allocation of the receipts among the counties may change, but only very slightly.

**Fiscal Resources: Franchise and Excise Taxes:** Estimated franchise and excise taxes paid by the statewide coal industry are anticipated to be very small portion of state receipts and would be the same as described under alternative 1.

**Logging and Forestry Associated with Mining:** As described in the “Impacts of the Alternatives on Land Use and Recreation” section, alternative 3 would result in similar forestry-related impacts as experienced under alternative 2; in addition, near-term beneficial impacts would result from the clearing of forested area for potential access and haul road construction and the re-mining of unreclaimed, previously mined areas. In the long term, beneficial impacts to forestry-related uses would result from the reclamation and permanent reforestation of re-mined areas, although the impacts on the local economy would not be noticeable. Alternative 3 would not result in noticeable impacts to jobs and income supported by forestry activities, the same as those described for alternative 2.

**Recreation:** Recreational use of the area and ridgelines would continue to occur under alternative 3. Any changes in recreation and visitor spending would be highly dependent on the location of individual mining operations, potential re-mining, and roads, and their proximity and visibility to areas important for recreation in the area. In the long term, reclamation of these previously mined areas would benefit wildlife habitat and benefit wildlife viewing and hunting opportunities compared to the no-action alternative. Similar to alternative 2, wildlife viewing opportunities and visitation would continue under alternative 3, and overall impacts to long-term visitor spending, and associated jobs and income, would be beneficial compared to alternative 1.

Under alternative 3, there would be long-term beneficial impacts to recreation and tourism spending because recreational experience would be beneficial compared to alternative 1 and reclamation of wildlife habitat areas would occur in the designation area, encouraging visitation, although some disruptions and nuisances would occur outside the designation area. The intensity of any beneficial impacts of increased visitor spending from alternative 3 (compared to alternative 1) would be uncertain.

As described under the no-action alternative, some literature provides support for regional population and economic growth in rural communities associated with tourism amenities and quality of life attributes, while counties that have a higher amount of natural resource extraction industries are associated with slower economic growth. Alternative 3 is likely to be slightly better for tourism and visitor spending because of the potential for increased wildlife viewing opportunities, potential future trail developments, improvements in scenic qualities, and a decreased amount of dis-amenities (i.e., truck traffic, industrial noise, etc.) relative to alternative 1. Without further assessment of these changes through surveys and analysis, the intensity of any beneficial long-term impacts of increased visitor spending from alternative 3 would be uncertain.

## Cumulative Impacts

Actions inside and outside of the evaluation area, local, regional, and national trends in oil and gas and mining supply and demand can cumulatively affect impacts on local and regional economies. Any construction or development activities would provide short-term economic activity to the evaluation area. Coal mining and oil and gas development and production are affected by cumulative actions or circumstances, many of which are beyond industry or OSMRE control, such as natural resource prices, state resource regulation, federal policies and regulations (such as the Mercury and Air Toxics Standards), development costs, the risks of successful development, production costs, and many others.

The cumulative impacts of alternative 3 would be very similar to those described under alternative 2. Under alternative 3, the same amount of coal production would be expected in the long term as alternatives 1 and 2. The impacts of alternative 3, when added to the impacts of actions by others, would

result in both beneficial and adverse cumulative impacts on socioeconomics, which would vary depending on current economic conditions. Continued benefits to the region's economy from current and future coal mining would continue. Surface mining in the petition area along 505 miles of ridge-lines would be restricted – 67,326 acres would be designated as unsuitable for surface mining. Contribution to cumulative impacts of alternative 3 would be negligible given the other factors driving coal and shale gas production, coal mine development costs, and the many other cumulative impacts affecting local and regional economies. In the long-term, alternative 3 could contribute to cumulative beneficial impacts on recreation and tourism in the region.

## **Conclusion**

Similar to alternative 2, alternative 3 is expected to continue to benefit the region's economy because coal mining would continue to be produced from the evaluation area. These natural resource activities would continue to support an estimated 30 to 133 jobs, income, and economic activity in the evaluation area. In addition, potential remining of previously mined lands in the designation area could also occur. Severance, sales, and franchise and excise taxes would continue to accrue to local and state governments. However, these economic and fiscal impacts are anticipated to be small relative to the size of the four-county economy. No impacts to population or public facilities or services are anticipated under alternative 3. In addition, fewer tourism visitors would be discouraged from coming to the region because of fewer disturbances from mining activity or continued wildlife viewing opportunities than under alternative 1. Under alternative 3, there would be long-term beneficial impacts to recreation and tourism spending because recreational experience would be beneficial compared to alternative 1 and would encourage visitation, although some disruptions and nuisances would occur outside the designation area. The intensity of any beneficial impacts of increased visitor spending from alternative 3 (compared to alternative 1) would be uncertain.

## **ALTERNATIVE 4: EXPANDED CORRIDOR DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS (PREFERRED ALTERNATIVE)**

Under alternative 4 approximately 76,133 acres would be designated as unsuitable for surface coal mining operations, 13% more acres than designated under alternatives 2 and 3. There are 920 acres within the designation area that are currently permitted and would be excluded from the designation. Alternative 4 includes the designation of 569 miles of ridgeline with a 1,200-foot corridor of lands. Underground mining and auger mining from outside the petition area, resulting in no surface disturbance within the petition area would be allowed. In addition, potential remining of previously mined areas as well as the potential development of access and haul roads could also be allowed under alternative 4.

## **Direct and Indirect Impacts**

**Population and Regional Economic Conditions:** In the short term, currently permitted mines would continue to operate and impacts would be the same as described under alternative 1. In the long term, there would be a shift in surface mining from future sites within the petition area to other areas within the evaluation area; however, potential remining could occur within the designation area to reclaim previously mined areas. There is likely to be more mining activity within and adjacent to the designation area than experienced under alternative 2. However, under alternative 4, the level of production is anticipated to be the same within the evaluation area, from 54,000 to 240,000 tons per year (see "Chapter 5: Evaluation of Coal Resources"). Therefore, the impacts to regional economic conditions and population are anticipated to be the same as those described for the no-action alternative.

**Fiscal Resources: Severance Taxes:** Under alternative 4, the impacts to severance tax receipts in the short term would be the same as those described under alternative 1 because permitted mining would

continue in the evaluation area. In the long term, there would be a shift in mining from areas within the petition area to other areas outside the petition area and within the evaluation area. Because the level of production is anticipated to be the same as under the no-action alternative, the total tax receipts to the four counties would be the same described under alternative 1. Similar to alternative 1, Campbell County would continue to be the largest beneficiary of severance tax receipts in the evaluation area because it contains the largest portion of coal reserves that are potentially mineable (table 6-103).

**TABLE 6-103: ALTERNATIVE 4 (PREFERRED ALTERNATIVE) POTENTIALLY MINEABLE ACRES BY COUNTY, INCLUDING PREVIOUSLY MINED AREAS**

Alternative	Anderson	Campbell	Morgan	Scott	Total
Alternative 4 (Preferred Alternative)	7,189	17,861	2,433	12,271	39,754
Percent of Total	18%	45%	6%	31%	100%

The potentially mineable acres provide an indication of the allocation of fiscal receipts to counties for coal mining activities in the future under the no-action alternative. Comparing the percentages for alternative 4 with those for the evaluation area, there is the potential for very slight changes in the allocation of fiscal receipts across the counties: slight increases for Anderson County, slight decrease for Morgan County, and the same for Campbell and Scott Counties.

Similar to alternative 1, severance tax receipts under alternative 4 would continue to benefit the counties in the evaluation area with mineable reserves, although the receipts are a very small proportion of county revenues. Severance tax receipts are anticipated to be the same as experienced under existing conditions although the allocation of the receipts among the counties may change, but only very slightly.

**Fiscal Resources: Franchise and Excise Taxes:** Estimated franchise and excise taxes paid by the statewide coal industry are anticipated to be very small portion of state receipts and would be the same as described under alternative 1.

**Logging and Forestry Associated with Mining:** As described in the “Impacts of the Alternatives on Land Use and Recreation” section, alternative 4 would result in similar forestry-related impacts as experienced under alternative 3 with slightly more acres designated unsuitable for surface mining. Alternative 4 would not prohibit remining in the designation area. Similar to alternative 3, near-term beneficial impacts would result from the clearing of forested area with benefits for timber harvesting for surface mining. In the long term, beneficial and adverse impacts to forestry-related uses would result from the reclamation and permanent reforestation of remined areas, while adverse impacts would occur with continued surface mining outside the designation area because of the time necessary for a site to return to a forested condition. Similar to alternative 3, alternative 4 would result in only slight impacts to jobs and income supported by forestry activities.

**Recreation:** Improved habitat areas would allow for wildlife in the area to thrive, improving opportunities for hunting and wildlife viewing in the short term. Any changes in recreation and visitor spending would be highly dependent on the location of an individual mining operation, remining, and roads, and their proximity and visibility to areas important for recreation in the area. Similar to alternative 3, wildlife viewing opportunities and visitation would continue under alternative 4, and overall impacts to long-term visitor spending, and associated jobs and income, would be beneficial compared to alternative 1.

Overall, fewer visitors would be discouraged from coming to the region because of less disturbance from mining activity or continued wildlife viewing opportunities than under alternative 1. Under alternative 4, there would be long-term beneficial impacts to recreation and tourism spending because recreational experience would be beneficial compared to alternative 1 and reclamation of wildlife habitat areas would occur in the designation area, encouraging visitation, although some disruptions and nuisances would occur outside the designation area. The intensity of any beneficial impacts of increased visitor spending from alternative 4 (compared to alternative 1) would be uncertain.

As described under the no-action alternative, some literature provides support for regional population and economic growth in rural communities associated with tourism amenities and quality of life attributes, while counties that have a higher amount of natural resource extraction industries are associated with slower economic growth. Similar to alternatives 2 and 3, alternative 4 is likely to benefit tourism and visitor spending because of the potential for increased wildlife viewing opportunities, potential future trail developments, improvements in scenic qualities, and a decreased amount of disamenities (i.e., truck traffic, industrial noise, etc.) relative to alternative 1. Without further assessment of these changes through surveys and analysis, the intensity of any long-term beneficial impacts of increased visitor spending from alternative 4 would be uncertain.

### **Cumulative Impacts**

Actions inside and outside of the evaluation area; local, regional, and national trends in oil and gas; and mining supply and demand can have cumulatively impacts on local and regional economies. Any construction or development activities would provide short-term economic activity to the evaluation area. Coal mining and oil and gas development and production are affected by cumulative actions or circumstances, many of which are beyond industry or OSMRE control, such as natural resource prices, state resource regulation, federal policies and regulations (such as the Mercury and Air Toxics Standards), development costs, the risks of successful development, production costs, and many others.

The cumulative impacts of alternative 4 would be very similar to those described under alternative 3. The impacts of alternative 4, when added to the impacts of actions by others, would result in both beneficial and adverse cumulative impacts on socioeconomics, which would vary depending on current economic conditions. There could be slightly less coal produced in the near term under alternative 4, with continued small and beneficial impacts to regional economic conditions. The contribution to cumulative impacts of alternative 4 would be negligible given the other factors driving coal and shale gas production, coal mine development costs, and the many other cumulative impacts affecting local and regional economies. In the long-term, alternative 4 could contribute to cumulative beneficial impacts on recreation and tourism in the region, and these benefits would be marginally higher than those under alternative 2 and 3.

### **Conclusion**

Similar to alternative 3, alternative 4 is expected to continue to benefit the region's economy because coal mining would continue to be produced from the evaluation area. These natural resource activities would continue to support an estimated 30 to 133 jobs, income, and economic activity in the evaluation area. In addition, potential re-mining of previously mined lands in the designation area could also occur. Severance, sales, and franchise and excise taxes would continue to accrue to local and state governments. However, these economic and fiscal impacts are anticipated to be small relative to the size of the four-county economy. No impacts to population or public facilities or services are anticipated under alternative 4. Under alternative 4, there would be long-term beneficial impacts to recreation and tourism spending. The recreational experience would be beneficial compared to alternative 1 and reclamation of wildlife habitat areas would occur in the designation area, encouraging visitation, although some disruptions and

nuisances would occur outside the designation area. The intensity of any beneficial impacts of increased visitor spending from alternative 4 would be uncertain compared to alternative 1.

### **ALTERNATIVE 5: TARGETED RESOURCE PROTECTION DESIGNATION**

Under alternative 5, approximately 12,331 acres would be designated as unsuitable for surface mining. This alternative would focus on designating lands around sensitive resources, including the Cumberland Trail State Park, watersheds, elk viewing tower, and habitat areas for sensitive species. No haul roads would be allowed within the petition area.

#### **Direct and Indirect Impacts**

**Population and Regional Economic Conditions:** In the short term, currently permitted mines would continue to operate and impacts would be the same as alternative 1. In the long-term, there would be a shift in surface mining from future sites within the designation area to other areas within the evaluation area, most likely where mining has previously occurred; however, auger and underground mining could occur in the designation area as long as it does not disturb surface resources. There is likely to be more mining activity adjacent to the designation area than experienced under alternative 2 because fewer acres are designated under this alternative. However, under alternative 5, the level of production is anticipated to be the same within the evaluation area, from 54,000 to 240,000 tons per year (see “Chapter 5: Evaluation of Coal Resources”). Therefore, the impacts to regional economic conditions and population are anticipated to be the same as those described for the no-action alternative.

**Fiscal Resources: Severance Taxes:** Under alternative 5, the impacts to severance tax receipts in the short term would be the same as those described under alternative 1 because permitted mining would continue in the evaluation area. In the long term, there would be a shift in mining from areas within the petition area to other areas outside the petition area and within the evaluation area. Because the level of production is anticipated to be the same as under the no-action alternative, the total tax receipts to the four counties would be the same described under alternative 1. Similar to alternative 1, Campbell County would continue to be the largest beneficiary of severance tax receipts under the no-action alternative in the evaluation area because it contains the largest portion of coal reserves that are potentially mineable (table 6-104).

**TABLE 6-104: ALTERNATIVE 5 POTENTIALLY MINEABLE ACRES BY COUNTY, INCLUDING PREVIOUSLY MINED AREAS**

<b>Alternative</b>	<b>Anderson</b>	<b>Campbell</b>	<b>Morgan</b>	<b>Scott</b>	<b>Total</b>
Alternative 5	14,266	34,266	7,244	24,895	80,672
Percent of Total	18%	42%	9%	31%	100%

The potentially mineable acres provide an indication of the allocation of fiscal receipts for coal mining activities in the future under the no-action alternative. Comparing the percentages for alternative 5 with those for the evaluation area, there is the potential for very slight changes in the allocation of fiscal receipts across the counties: slight increases for Anderson and Morgan Counties, slight decrease in Campbell County, and the same for Scott County.

Similar to alternative 1, severance tax receipts under alternative 5 would continue to benefit the counties in the evaluation area with mineable reserves, although the receipts are a very small proportion of county revenues. Severance tax receipts are anticipated to be the same as experienced under existing conditions although the allocation of the receipts among the counties may change, but only very slightly.

**Fiscal Resources: Franchise and Excise Taxes:** Estimated franchise and excise taxes paid by the statewide coal industry are anticipated to be very small portion of state receipts and would be the same as described under alternative 1.

**Logging and Forestry Associated with Mining:** As described in the “Impacts of the Alternatives on Land Use and Recreation” section, fewer numbers of acres would be designated unsuitable for surface coal mining under alternative 5 than under the other action alternatives. This translates to fewer short-term benefits for timber harvesting and greater long-term benefits because fewer acres would be disturbed and could be available for more optimal timber harvesting activities. However, it is not anticipated that forestry activities and jobs and income supported by this activity would be noticeably affected in the short or long term because of the relatively small amount of surface mining disturbance projected annually and over time.

**Recreation:** Under alternative 5, the protection of sensitive resource areas from mining would improve habitat and benefit wildlife in the area. However, this alternative would protect the least number of acres from mining compared to alternatives 2, 3, 4, and 6.

Overall, fewer visitors may be discouraged from coming to the region because of less disturbance from mining activity or continued wildlife viewing opportunities than under alternative 1. Under alternative 5, there would be long-term beneficial impacts to recreation and tourism spending because recreational experience would be improved compared to alternative 1, encouraging visitation, although some disruptions and nuisances would occur outside the designation area. The intensity of any beneficial impacts of increased visitor spending from alternative 5 (compared to alternative 1) would be uncertain.

As described under the no-action alternative, some literature provides support for regional population and economic growth in rural communities associated with tourism amenities and quality of life attributes, while counties that have a higher amount of natural resource extraction industries are associated with slower economic growth. Because alternative 5 only protects 241 acres from mining over 30 years compared to alternative 1, it is unclear if the level of mining under alternative 5 (3,119 acres over 30 years) would provide sufficient tourism amenity protections to offset the adverse impacts of mining on recreation, such as truck traffic, impaired views, and reduced wildlife viewing and hunting opportunities. Without further assessment of these changes through surveys and analysis, the intensity of any beneficial or adverse long-term impacts of changes in visitation and tourism spending from alternative 5 would be uncertain.

## **Cumulative Impacts**

Actions inside and outside of the evaluation area, local, regional, and national trends in oil and gas and mining supply and demand can cumulatively affect impacts on local and regional economies. Any construction or development activities would provide short-term economic activity to the evaluation area. Coal mining and oil and gas development and production are affected by cumulative actions or circumstances, many of which are beyond industry or OSMRE control, such as natural resource prices, state resource regulation, federal policies and regulations (such as the Mercury and Air Toxics Standards), development costs, the risks of successful development, production costs, and many others.

The cumulative impacts of alternative 5 would be very similar to those described under no-action alternative. The impacts of alternative 5, when added to the impacts of actions by others, would result in both beneficial and adverse cumulative impacts on socioeconomics, which would vary depending on current economic conditions. Beneficial impacts would result on the economy of the evaluation area because coal, timber, and oil and gas would continue to be produced from the evaluation area and any mining restrictions in designated unsuitable lands would be offset with production within the evaluation

area or underground of the petition area. These natural resource activities support jobs, income, and economic activity in the evaluation area. However, these impacts are anticipated to be small relative to the size of the evaluation area economy and impacts would vary with economic conditions. Tourism and recreation could benefit in the long term under alternative 5 due to buffers around sensitive habitat and recreation resources. No impacts to population or public facilities or services are anticipated under alternative 5.

The contribution to cumulative impacts of alternative 5 would be negligible given the other factors driving coal and shale gas production, coal mine development costs, and the many other cumulative impacts affecting local and regional economies.

## Conclusion

Under alternative 5, mining activities would continue to support an estimated 30 to 133 jobs, income, and economic activity in the region. Severance, sales, and franchise and excise taxes would continue to accrue to local and state governments. However, these economic and fiscal impacts are anticipated to be small relative to the size of the four-county economy. No impacts to population or public facilities or services are anticipated under alternative 5. Impacts to visitation and associated visitor spending, jobs and income would be beneficial compared to alternative 1. However, out of all action alternatives, alternative 5 would have the least potential to minimize adverse noise-related impacts to recreational experience and wildlife with potential adverse impacts to wildlife viewing opportunities, visitor spending, and associated jobs and income.

## ALTERNATIVE 6: REDUCED CORRIDOR DESIGNATION

Under alternative 6, approximately 39,106 acres would be designated as unsuitable for surface mining, while 446 are currently permitted and would be excluded from the designation. Alternative 6 includes the designation of 505 miles of ridgeline with a 600-foot corridor of lands. Underground mining and auger mining from outside the petition area, resulting in no surface disturbance within the petition area would be allowed. In addition, remining of previously mined areas as well as the development of access and haul roads would not be allowed under alternative 6. Mining could occur on lands outside the petition area and on currently permitted lands within the petition area.

### Direct and Indirect Impacts

**Population and Regional Economic Conditions:** In the short term, currently permitted mines would continue to operate and impacts would be the same as described under alternative 1. In the long-term, there would be a shift in surface mining from future sites within the designation area to other areas within the evaluation area; however, auger and underground mining could occur in the designation area as long as it does not disturb surface resources. There is likely to be more mining activity adjacent to the designation area than experienced under alternative 2 because fewer acres are designated under this alternative. However, under alternative 6, the level of production is anticipated to be the same within the evaluation area, from 54,000 to 240,000 tons per year (see “Chapter 5: Evaluation of Coal Resources”). Therefore, the impacts to regional economic conditions and population are anticipated to be the same as those described for the no-action alternative.

**Fiscal Resources: Severance Taxes:** Under alternative 6, the impacts to severance tax receipts in the short term would be the same as those described under alternative 1 because permitted mining would continue to occur in the evaluation area. In the long term, there would be a shift in mining from areas within the petition area to other areas outside the petition area and within the evaluation area. Because the level of production is anticipated to be the same as under the no-action alternative, the total tax receipts to

the four counties would be the same as described under alternative 1. Comparing the percentages for alternative 6 with those for the evaluation area, there is the potential for very slight changes in the allocation of fiscal receipts across the counties: slight increase for Scott County and slight decrease for Morgan County. Anderson and Campbell County allocations would remain the same as under alternative 1 (table 6-105).

**TABLE 6-105: ALTERNATIVE 6 POTENTIALLY MINEABLE ACRES BY COUNTY, INCLUDING PREVIOUSLY MINED AREAS**

Alternative	Anderson	Campbell	Morgan	Scott	Total
Alternative 6	10,686	29,107	4,830	20,541	65,164
Percent of Total	16%	45%	7%	32%	100%

Similar to alternative 1, severance tax receipts under alternative 6 would continue to benefit the counties in the evaluation area with mineable reserves, although the receipts are a very small proportion of county revenues. Severance tax receipts are anticipated to be the same as experienced under existing conditions although the allocation of the receipts among the counties may change, but only very slightly.

**Fiscal Resources: Franchise and Excise Taxes:** Estimated franchise and excise taxes paid by the statewide coal industry are anticipated to be very small portion of state receipts and would be the same as described under alternative 1.

**Logging and Forestry Associated with Mining:** As described in the “Impacts of the Alternatives on Land Use and Recreation” section, fewer numbers of acres would be designated unsuitable for surface coal mining under alternative 6 than under the other action alternatives (not including alternative 5). This translates to fewer short-term benefits for timber harvesting and greater long-term benefits because fewer acres would be disturbed and could be available for timber harvesting activities. However, it is not anticipated that forestry activities and jobs and income supported by this activity would be noticeably affected in the short or long term because of the relatively small amount of surface mining disturbance projected annually and over time.

**Recreation:** Under alternative 6, the designation of the petition area would result in short-term adverse implications for wildlife visitors and hunters in the area, possibly decreasing visitation in the future if wildlife has been displaced or the elk herd has not grown to projected levels. There would be continued potential for adverse impacts to recreation on the Cumberland Trail and at designated campgrounds within the park resulting from noise related to surface mining operations outside the designation area, due to the distance at which mining operations are typically audible. However, impacts to visitation and associated visitor spending, jobs and income would be beneficial compared to alternative 1.

Overall, fewer visitors would be discouraged from coming to the region because of less disturbance from mining activity or continued wildlife viewing opportunities than under alternative 1. Under alternative 6, there would be long-term beneficial impacts to recreation and tourism spending because recreational experience would be beneficial compared to alternative 1, encouraging visitation, although some disruptions and nuisances would occur outside the designation area. The intensity of any beneficial impacts of increased visitor spending from alternative 6 (compared to alternative 1) would be uncertain.

As described under the no-action alternative, some literature provides support for regional population and economic growth in rural communities associated with tourism amenities and quality of life attributes, while counties that have a higher amount of natural resource extraction industries are associated with slower economic growth. Similar to alternatives 2, 3, and 4, alternative 6 is likely to benefit tourism and

visitor spending compared to alternative 1 because of the potential for increased wildlife viewing opportunities, potential future trail developments, improvements in scenic qualities, and a decreased amount of dis-amenities (i.e., truck traffic, industrial noise, etc.). Because alternative 6 only protects 763 acres from mining over 30 years compared to alternative 1, it is unclear if the level of mining under alternative 6, 2,597 acres over 30 years, would provide sufficient tourism amenity protections to offset the adverse impacts of mining on recreation, such as truck traffic, impaired views, and reduced wildlife viewing and hunting opportunities. Again, the intensity of these avoided adverse impacts under alternative 6 relative to alternative 1 would be uncertain because impacts to visitors are highly dependent on the location of mining operations and proximity to recreation attractions. Without further assessment of these changes through surveys and analysis, the intensity of any long-term beneficial or adverse impacts of changes in visitation and tourism spending from alternative 6 would be uncertain.

### **Cumulative Impacts**

Actions inside and outside of the evaluation area, local, regional, and national trends in oil and gas and mining supply and demand can cumulatively affect impacts on local and regional economies. Any construction or development activities would provide short-term economic activity to the evaluation area. Coal mining and oil and gas development and production are affected by cumulative actions or circumstances, many of which are beyond industry or OSMRE control, such as natural resource prices, state resource regulation, federal policies and regulations (such as the Mercury and Air Toxics Standards), development costs, the risks of successful development, production costs, and many others.

The cumulative impacts of alternative 6 would be very similar to those described under alternatives 2 and 3. The impacts of alternative 6, when added to the impacts of actions by others, would result in both beneficial and adverse cumulative impacts on socioeconomics, which would vary depending on current economic conditions. Continued economic and fiscal benefits to the region's economy from current and future coal mining would continue. Surface mining in the petition area along 505 miles of ridgelines would be restricted – 39,106 acres would be designated as unsuitable for surface mining. The contribution to cumulative impacts of alternative 6 would be negligible given the other factors driving coal and shale gas production, coal mine development costs, and the many other cumulative impacts affecting local and regional economies.

### **Conclusion**

Continued economic and fiscal benefits to the region's economy from current and future coal mining would continue because coal mining would continue to be produced from the evaluation area. In addition, mining activities would continue to support an estimated 30 to 133 jobs, income, and economic activity in the region. Severance, sales, and franchise and excise taxes would continue to accrue to local and state governments. However, these economic and fiscal impacts are anticipated to be small relative to the size of the four-county economy. No impacts to population or public facilities or services are anticipated under alternative 6. Under alternative 6, there would be long-term beneficial impacts to recreation and tourism spending because recreational experience would be beneficial compared to alternative 1, encouraging visitation, although some disruptions and nuisances would occur outside the designation area.

## **IMPACTS OF THE ALTERNATIVES ON ENVIRONMENTAL JUSTICE**

### **METHODS OF ANALYSIS**

#### **Applicable Statutes, Regulations, and Policies**

The following analysis follows guidance published by the EPA under Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. EPA defines a community with potential environmental justice populations as one that has a meaningfully greater percentage of minority or low-income populations compared to other neighboring communities (EPA 1994). Executive Order 12898 directs federal agencies to incorporate environmental justice as part of their mission by identifying and addressing the effects of programs, policies, and activities on minority and low-income populations. The fundamental principles of Executive Order 12898 are as follows (EPA 1994):

- Ensure full and fair participation by potentially affected communities in the decision-making process
- Prevent the denial of, reduction, or significant delay in the receipt of benefits by minority or low-income population
- Avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations
- Encourage meaningful community representation in the NEPA process through the use of effective public participation strategies and special efforts to reach out to minority and low-income populations
- Identify mitigation measures that address the needs of the affected low-income and minority populations.

#### **Assumptions and Methodology**

In this section, potential impacts to those communities identified within the study area as potential environmental justice communities were analyzed on the basis of whether elements of the alternatives would result in disproportionate adverse effects. The impact analysis for environmental justice includes a description of potential impacts of the alternatives on socioeconomic factors such as local economic conditions and employment. Impacts on potential environmental justice communities are assessed in terms of the degree to which any adverse impacts would disproportionately affect those communities identified within the study area as being potential environmental justice communities on the basis of race and poverty attributes. Direct, indirect, and cumulative impacts are assessed. Conclusions are based on overall impacts occurring or potentially occurring.

Environmental justice analysis consists of two basic steps:

- Determine if environmental justice populations exist in the relevant evaluation area.
- If environmental justice populations exist, determine if they would be disproportionately affected by development and operation of the proposed action.

Once the locations of the environmental justice populations have been identified, adverse effects occurring as a result of the action alternatives are considered in order to determine if the selected

alternative has the potential to create “disproportionately high and adverse” impacts on human health or the environment in these environmental justice populations. Impacts include cumulative and multiple impacts, and are evaluated to determine which, if any, disproportionately and adversely affect these populations.

EPA defines a community with potential environmental justice populations as one that has a greater percentage of minority or low-income populations than an identified reference community (EPA 1994). Minority populations are those populations having (1) 50% minority population in the affected area; or (2) a significantly greater minority population than the reference area. There are no specific thresholds provided for low income or poverty populations. For this analysis, the following definitions of minority and low-income have been used to determine the presence of environmental justice communities and populations within the environmental justice study area.

**Minority:** For this analysis, “minority” includes all racial groups other than “white, not Hispanic or Latino.” Individual(s) identified as “minority” include members of the following population groups: American Indian and Alaskan Native; Asian, Black or African American; Non-White Hispanic; Native Hawaiian and other Pacific Islander; Some other race; and Two or more races.

**Minority Population:** In identifying minority communities for this study, minority populations were identified as those with populations having either (1) 50% minority population in the affected area; or (2) a population percentage of the affected area that is meaningfully greater than the minority population percentage in the general population. EPA has not specified any percentage of the population that can be characterized as “significant” to define environmental justice populations. Therefore, a conservative approach was used to identify potential environmental justice populations in which it was assumed that if the affected area minority population was more than 10 percentage points higher than that of the general population in the reference area, the population was defined as an environmental justice population of concern. For the purposes of this analysis, current race data was obtained from the Census Bureau American Community Survey 2008–2012 Five-Year Estimates; data at the census tract level is reported in “Table DP05: ACS Demographic and Housing Estimates.”

**Low-Income Population:** Low-income populations are defined by the annual statistical poverty thresholds from the Bureau of the Census Current Population Reports, Series P-60 on Income and Poverty. Poverty is generally described as a condition in which a person or community lacks the financial resources to enjoy a minimum standard of life and well-being considered acceptable in society. Thresholds of income related to poverty are adjusted annually by the US Census Bureau for inflation using the federal Consumer Price Index, which reflects annual changes in the price of consumer goods and services.

## Area of Analysis

The study area for environmental justice assessment includes the counties and communities that comprise and are immediately adjacent to the evaluation area. These counties include Anderson, Campbell, Morgan, and Scott in Tennessee. Although all four counties exhibit low-income characteristics, there are individual areas that appear to have concentrated areas of low-income residents. Three census tracts with concentrations of low-income residents were identified as potential environmental justice communities. They are as follows:

- Census Tract 9507 in Campbell County has a poverty level of approximately 42.0% and is located in the LaFollette area.

- Census Tract 9506 in Campbell County has a poverty level of approximately 35.1% and is located in the Fordtown and northern LaFollette area.
- Census Tract 9753 in Scott County has a poverty level of approximately 29.4% and is located in the Norma/Huntsville area.

The following analysis assesses the degree to which disproportionate adverse impacts would affect these communities.

## **GENERAL IMPACT OF COAL MINING IN TENNESSEE ON ENVIRONMENTAL JUSTICE**

Impacts of surface coal mining to environmental justice communities occur as a result of direct and indirect impacts from mining activities on public health, air and water quality, recreational opportunities, aesthetics, and employment. Specific impacts to these resources are described in detail in the respective resource sections of this document and summarized briefly here. It should be noted the degree to which disproportionate impacts affect environmental justice communities is dependent upon the extent to which effects of surface coal mining operations are located in closer proximity to these communities as compared to the wider population. Direct adverse impacts to sensitive communities can include health effects resulting from reductions in local air quality. Data collected in a 2008 study by the West Virginia University Institute for Health Policy Research (West Virginia University 2008) demonstrates that pollution from coal-mining is linked to chronic illness among residents in coal mining communities, who have demonstrated an increased risk for developing hypertension, kidney disease, and chronic obstructive pulmonary disease such as emphysema. Health impacts stemming from surface water quality in environmental justice communities could occur from pollutant and sediment loading in surface coal mine discharges that result in changes in chemical and physical properties. Impacts to recreational opportunities near environmental justice communities could result from vehicle and equipment noise and dust and create diminished opportunities for visitors who are seeking a park-like or natural experience. Surface mining operations can also result in localized impacts to aesthetics near environmental justice communities in cases where complete removal and clearing of vegetation and permanent conversion of forested areas to non-forested areas occurs during the development of an individual mine. Beneficial effects to local communities from increased employment can also occur. However, the current and possible future employment of 143 jobs accounts for less than 1% of the employed workforce in the evaluation area, and the contribution to population growth would not be noticeable. The extent to which beneficial impacts on any increased employment would accrue to environmental justice communities in particular would depend upon the resulting employment in those specific communities as compared to the wider population.

### **ALTERNATIVE 1: NO-ACTION ALTERNATIVE**

#### **Direct and Indirect Impacts**

Under the no-action alternative, there would be continued and surface coal mining production in the evaluation area. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions. It is not possible to determine with precision the location of coal resources with respect these potential environmental justice communities. Although the entire evaluation area could be considered to be low-income due to a poverty rate above 20% (and with portions of counties within the evaluation area reflecting higher rates of poverty compared to the counties overall), there are individual areas that appear to contain concentrated areas of low-income residents. As described in chapter 4, these include: Census

Tract 9507 in the LaFollette area of Campbell County; Census Tract 9506 in the Fordtown and northern LaFollette area of Campbell County; and Census Tract 9753 in the Norma/Huntsville area of Scott County. The location of potential environmental justice communities is described in detail in “Chapter 4: Affected Environment.” Due to the uncertainty of where surface coal mining operations would be located within the evaluation area, it is not possible to determine the degree to which potential environmental justice communities would be impacted. However, the no-action alternative is expected to benefit the economy in the evaluation area because coal mining would continue in the evaluation area. Jobs would continue to be supported by the mining activity. For the environmental justice communities identified in the study area, beneficial impacts would occur as mining activities support jobs, income, and economic activity. However, these impacts are anticipated to be small relative to the size of the study area economy, and near-term mining activity may adversely affect recreation and visitation in the region. Impacts to environmental justice communities would likely be beneficial in the near term and uncertain in the long term and would not be disproportionate to Environmental Justice communities.

### **Cumulative Impacts**

For those environmental justice communities identified within the study area, the beneficial contribution to cumulative impacts of the no-action alternative would be slight given the other factors driving energy production, coal mine development costs, and the many other cumulative impacts affecting local and regional economies. Boom and bust cycles associated with mineral production can contribute to stagnant economic development and persistent poverty. These factors would continue to contribute to adverse cumulative socioeconomic impacts to environmental justice communities in the study area. Conversely, the beneficial effects of economic development initiatives, such as those occurring through the Appalachian Regional Commission, would continue to contribute to beneficial cumulative socioeconomic impacts to environmental justice communities in the study area. The impacts of alternative 1, when added to the impacts of actions by others, would result in both beneficial and adverse cumulative impacts on environmental justice populations, which would vary depending mainly on current economic conditions. The incremental beneficial contribution of the no-action alternative to cumulative impacts on environmental justice communities would be relatively slight in the context of wider regional economic factors affecting the environmental justice study area.

### **Conclusion**

Overall, continued surface coal mining operations within the evaluation area would not result in significant disproportionate adverse impacts to those environmental justice communities identified within the evaluation area because beneficial impacts of mining jobs would be small relative to employment in the evaluation area. Gains in jobs in the evaluation area would not disproportionately affect environmental justice communities.

## **ACTION ALTERNATIVES 2 THROUGH 6**

### **Direct and Indirect Impacts**

Although coal production would be reduced in the different petition and designation areas under each of the action alternatives, it is assumed that the average rate of surface coal mining of 112 acres per year would not change. The action alternatives would change the locations of where surface coal mining operations could potentially occur, but the same amount of mining would likely continue in the evaluation area. Therefore the impacts of the actions alternatives on environmental justice populations would be the same. Disproportionate impacts to potential environmental justice communities would occur in cases where such communities were located near designated areas. Since there is no substantial change in employment expected, the impacts of the action alternatives would be similar to those of the no-action

alternative. There may be some benefits associated with improved natural resource and recreation conditions in the petition or designation areas. Any changes in employment would not disproportionately affect environmental justice communities.

### **Cumulative Impacts**

Cumulative impacts under the action alternatives would be the same as those under the no-action alternative. The impacts of the action alternatives, when added to the impacts of actions by others, would result in both beneficial and adverse cumulative impacts on environmental justice populations, which would vary depending on current economic conditions. The action alternatives are not expected to contribute substantially to adverse cumulative impacts. The incremental beneficial contribution of the action alternatives to cumulative impacts on environmental justice communities would be relatively slight in the context of wider regional economic factors affecting the environmental justice study area.

### **Conclusion**

Continued surface coal mining operations within the evaluation area would not likely change under the action alternatives, although the location of the operations would change. Therefore, the impacts associated with the action alternatives would not result in significant disproportionate adverse impacts to those environmental justice communities identified within the environmental justice study area. Any changes in jobs in the evaluation area would not disproportionately affect environmental justice communities.

## **IMPACTS OF THE ALTERNATIVES ON CULTURAL RESOURCES**

### **METHODS FOR ANALYSIS**

#### **Applicable Statutes, Regulations, and Policies**

This section provides an overview of the major federal regulations relating to paleontological and cultural resources to provide an understanding of the coordination and oversight that currently exists when impacts would occur. Many of the existing regulations apply only to federal actions, actions on federal lands, or actions occurring on lands held in trust by the federal government. OSMRE regulates mining on Indian lands as if they are federal lands. The regulations also require state SMCRA programs to include processes for consulting with state, federal and local agencies having responsibility over historic, cultural, and archeological resources (30 CFR § 731.14 (g)(17)). These processes would therefore apply to mining conducted on land (public or private) where the state has primacy over the mining program.

This PED/EIS describes in “Chapter 4: Affected Environment” where and under what conditions cultural and paleontological resources are expected to occur within the coal-bearing regions. These resources do not occur in all areas that are or could be mined, and where they do occur, it is also possible that the permit applicant would choose to avoid mining in the specific area to avoid the resources and associated regulatory requirements for coordination and mitigation.

Coal mining can affect cultural resources in a number of ways. Mining can impact archaeological artifacts and fossils (paleontological resources) due to the disturbance of the materials in which they lay. This disturbance can occur during earth moving activities associated with removal of the vegetation and roots prior to mining, or during removal of the materials (overburden) overlying the coal seam. Subsidence from underground mining can also impact cultural resources by disrupting the vertical position and alignment of artifacts; this can cause some of the information associated with the site to be lost. Subsidence is typically predictable and adverse effects can be planned for and mitigated in advance. Coal

mining activities may also require the removal of historic properties during site preparation. Disturbance of these resources can destroy them or adversely affect their integrity to the extent where they are no longer significant on a national, state, or local level. As described below, statutes and regulations are in place to address these impacts during the permit process through identification of resources and coordination to develop and implement required protective measures. However, it is still possible that undiscovered resources may exist and be disturbed by mining activity.

### **Paleontological Resources**

As discussed in “Chapter 4: Affected Environment,” coal mining activities are known to coincide with areas known for fossil remains. Paleontological resources are not afforded specific protection under existing regulations and OSMRE does not collect data on impacts to paleontological resources from coal mining. Given the intensive site disturbance associated with surface coal mining it is reasonable to assume that scientifically insignificant sites are impacted when they coincide with mining activity. Impacts to paleontological resources from coal mining would include physical damage, destruction, or other loss of fossils, or alteration or loss of contextual information. On the other hand, it is well documented that the excavation activities and subsidence associated with coal mining have resulted in the discovery of important paleontological sites. Mining exposes sediments that often have preserved organisms or casts within them (Parker and Balsley 1989). Requirements to reclaim the site after mining can in fact conflict with the opportunity to leave the site open for further investigation. This was the case at the Steven C. Minkin Paleozoic Footprint Site in Alabama, formerly the Union Chapel Mine Site, at which more than 4,000 fossil specimens have been collected (Geological Survey of Alabama State Oil and Gas Board 2006).

Nothing in existing regulations would preclude issuance of a permit to conduct mining that would impact paleontological resources, except where the SMCRA regulatory authority has designated the area as unsuitable for mining as discussed below or where a state with primacy has implemented additional regulations. Existing federal laws that may affect the consideration and management of paleontological resources during mining are summarized in the text below.

**Surface Mining Control and Reclamation Act of 1977 (30 USC § 1201 et seq.):** The State regulatory authority or the Secretary of the Interior is authorized by section 522(e) of SMCRA (30 USC § 272(e)) to prohibit or limit surface coal mining operations on or near certain private, federal, and other public lands, subject to valid existing rights and except for those operations that existed on August 3, 1977. The implementing regulations require the regulatory authority, upon petition, to designate an area unsuitable for surface coal mining if mining there would affect fragile or historic lands in which the operations could result in significant damage to important historic, cultural, scientific, or esthetic values of natural systems (30 CFR § 762.11). The definition of “fragile lands” per 30 CFR § 762.5 specifically includes paleontological sites as an example. To date, OSMRE is unaware of any petition decisions that have designated areas as unsuitable for coal mining based partially or entirely on the need to protect paleontological resources.

Otherwise, neither SMCRA nor the current implementing regulations contain any requirement to identify, inventory, avoid, protect, or mitigate paleontological resources on federal or non-federal lands. On federal lands, the Antiquities Act applies, and, in practice, the regulatory authority sometimes addresses paleontological resources as part of the National Historic Preservation Act (NHPA) consultation where those resources are considered important as cultural markers in the discussion of traditional cultural value.

**National Environmental Policy Act of 1969, as amended (42 USC §§ 4321, 4331–4335):** NEPA requires consideration of adverse effects to significant scientific, cultural or historical resources (40 CFR § 1508.27(b)(8)). As such, federal agencies are required to consider effects to scientifically or culturally

important paleontological resources in evaluating actions to determine if the action would significantly impact the human environment. Paleontological resources are often included as a resource for consideration when federal agencies prepare NEPA documentation. Impacts to paleontological resources may differ between alternatives and in these instances these differences would be part of the information the decision maker has available for comparison of the reasonable alternatives and to determine the significance of impacts of the alternatives on the environment. However, NEPA applies only to federal actions (40 CFR § 1500.1).

OSMRE would prepare NEPA documentation when the proposed mining activity would occur on federal or Indian lands, and for mining on all lands in the coal-producing states where OSMRE retains the role of regulatory authority (Tennessee and Washington). NEPA does not apply to state actions, including state permitting for mining on private lands.

**Antiquities Act of 1906 as amended (16 USC §§ 431–433):** The Antiquities Act protects sensitive cultural resources on land owned or controlled by the federal government. Specifically, it prohibits the removal, damage, or destruction of “any historic or prehistoric ruin or monument, or any object of antiquity, situated on lands owned or controlled by the Government of the United States, without the permission of the Secretary of the Department of the Government having jurisdiction over the lands on which said antiquities are situated” and establishes criminal penalties for such activities (16 USC § 433). Although paleontological resources are not specifically mentioned, “objects of antiquity” has often been interpreted to include fossils and other paleontological resources (Harmon et al. 2006). If the paleontological resource was considered to be an “object of antiquity,” the removal of any objects would require a permit under the Antiquities Act (43 CFR § 3.1).

**Paleontological Resources Preservation Act of 2009 (16 USC § 470 (aaa)(aaa)(11)):** In 2009, the Paleontological Resources Preservation Act was signed into law as part of the Omnibus Public Land Management Act. The requirements of the law have limited applicability to OSMRE’s responsibilities and authorities under SMCRA. The Paleontological Resources Preservation Act requires the Secretary of the Interior to manage and protect paleontological resources on lands “controlled or administered by the Secretary of the Interior, except Indian land” (16 USC § 470 (aaa)(aaa)(1)). The Paleontological Resources Preservation Act therefore applies to lands managed by the Bureau of Land Management, National Park Service (NPS), Bureau of Reclamation, and the USFWS. OSMRE is under the Department of the Interior but does not control or administer land.

The Paleontological Resources Preservation Act prohibits collection of paleontological resources from federal land without a permit, with some exceptions (16 USC § 470 (aaa)(3)), and prescribes civil penalties for acts such as damaging or removing paleontological resources located on federal lands (16 USC § 470 (aaa)(5)). However, the Paleontological Resources Preservation Act specifically clarifies that nothing in the law should be construed as invalidating, modifying, or imposing any additional restrictions or permitting requirements on any activities permitted at any time under the general mining laws, or laws providing for the management or regulation of these activities including SMCRA (16 USC § 470 (aaa)(10)). Under existing SMCRA regulations OSMRE (or a delegated state regulatory authority) would continue to be responsible for consulting with the federal land management agency with respect to any special requirements necessary to protect non-coal resources (such as paleontological resources) in the areas affected by surface coal mining and reclamation operations (30 CFR § 740.4(c)(2)).

## **Cultural Resources**

Existing federal laws that may affect the consideration and management of archaeological and historic resources specifically during mining include, the Antiquities Act; the Historic Sites Act of 1935, as amended (16 USC §§ 461–467); the NHPA; NEPA; SMCRA; the Historic and Archaeological

Preservation Act of 1974, as amended ((16 USC §§ 469–469(c)(2)); the Archaeological Resources Protection Act of 1979, as amended (16 USC § 470 (aa)(mm)); the American Indian Religious Freedom Act of 1978, as amended (42 USC §§ 1996 and 1996a); and the Native American Graves Protection and Repatriation Act of 1996 (25 USC §§ 3001–3013). The discussion below focuses on the federal laws with most impact and applicability to surface mining effects on cultural resources.

Mining-related impacts to these resources cannot always be avoided under the no-action alternative. The NHPA requires resolution of adverse effects only for impacts to resources listed or eligible for listing on the National Register of Historic Places, as discussed in the implementing regulations at 36 CFR § 800.6. The NHPA applies only to federal actions or on federal lands, such as those permitting actions in Tennessee.

Despite data from cultural resources inventories, sites and resources remain unknown, and it is therefore possible that inadvertent impacts could occur to previously unidentified sites during mining. The NHPA recognizes this possibility and includes procedures to address post discovery situations as they arise (36 CFR § 800.13).

As discussed above, the regulatory authority can designate lands where mining would have an adverse effect on a publically owned park or any place include on the National Register of Historic Places (not just eligible for it) as unsuitable for mining in coordination with the federal, state, or local agency with jurisdiction over the park or place (30 CFR § 761.11(c)). However, permit applications that involve adverse impacts on these resources are not uncommon, and regulatory authorities routinely grant approval of these operations once consultation requirements are successfully completed.

Under all regulatory programs, consultations with the State Historic Preservation Office or Tribal Historic Preservation Office during the permit process allow for avoiding impacts to these resources where possible, and where not possible, identify requirements for minimization and mitigation if the mining is allowed to move forward. Applicants sometimes choose to avoid the effect so that there is no need to pursue approval or to bear the cost or time delay associated with implementing mitigation required to resolve the effect.

**Surface Mining Control and Reclamation Act of 1977 (30 USC § 1201 et seq.):** As discussed in previous sections, most coal mining states have approved state programs for those states to regulate coal exploration and surface coal mining and reclamation operations on non-federal and non-Indian lands within their boundaries. The State, and not OSMRE, issues the mine permit where there is an applicable approved state regulatory program. State-issued permits under SMCRA are not federal undertakings for purposes of the NHPA.

While state issued permits are not federal undertakings afforded consideration under the NHPA, existing regulations in 30 CFR § 731.14(g)(17) require that state programs seeking federal approval and include a process for consulting with state, federal, and local agencies having responsibilities for historic, cultural, and archaeological resources. The role of the OSMRE in accordance with 30 CFR part 732 is to ensure that implementation of approved state programs is no less effective than federal regulations.

Additionally, cultural resources are considered during review of amendments to state regulatory programs. The states are required to provide their proposed amendments to the State Historic Preservation Office and Advisory Council on Historic Preservation for comment if those amendments would have an effect on historic properties (30 CFR § 732.17(h)(4)).

Information regarding cultural resources is also required of permit applicants for specific proposed operations. For example, permit application packages for surface coal mining must contain descriptions of

any cultural or historical sites listed on the National Register of Historic Places within the permit and adjacent areas of the proposed surface coal mining and reclamation operation (30 CFR § 779.12(b)(1); 30 CFR § 783.12(b)). The regulatory authority may require the applicant to protect historic or archaeological properties on or eligible for listing on the National Register of Historic Places through appropriate mitigation and treatment measures (30 CFR § 780.31(b)).

Where OSMRE is the regulatory authority (for example on federal lands, on Indian lands, and in states without approved programs) the full federal agency requirements of the NHPA would apply in addition to the requirements of SMCRA. Where the proposed mining would occur on Indian lands the permit must also address compliance with federal laws aimed at protecting cultural resources on Indian lands in addition to compliance with the NHPA. On Indian lands, OSMRE is responsible for determining if the materials provided in the application are sufficient to determine possible adverse impacts on cultural resources (30 CFR § 750.12(c)(3)(ii)(B)).

Gathering this information is important for the protection of these resources and also to determining whether existing prohibitions of 30 CFR § 761.11(c) apply. With the exception of areas subject to valid existing rights (valid and existing rights are described at 30 CFR § 761.16), surface coal mining is prohibited on any lands where mining will adversely affect any publicly owned park or any places included in the National Register of Historic Places, unless jointly approved by the regulatory authority and the federal, state, or local agency with jurisdiction over the park or place (30 CFR § 761.11(c)). Surface coal mining operations are also prohibited within 100 feet of cemeteries, although the regulations do allow for relocation of cemeteries to allow mining if authorization is granted by applicable state law or regulations (30 CFR § 761.11(g)).

The information required in application packages can include information from the State Historic Preservation Office or Tribal Historic Preservation Office and from local archeological, historical, and cultural preservation agencies. The regulatory authority can require the applicant to provide additional information including through further field investigation (30 CFR § 779.12(b)).

Upon agreement of all parties that the operation can move forward despite adverse effects on listed or eligible historic or archaeological properties, the regulatory authority may require the applicant to protect historic or archeological properties listed on or eligible for listing on the National Register of Historic Places through appropriate mitigation and treatment measures (30 CFR § 784.17(b)). Appropriate mitigation and treatment measures may be implemented after permit issuance, provided that the required measures are completed before the properties are affected by any mining operation (30 CFR §§ 780.31(b) and 784.17(b)).

**National Historic Preservation Act of 1966 (54 USC § 300101 et seq.):** The NHPA requires federal agencies to take into account the effects of their undertakings on historic properties, and to afford the Advisory Council on Historic Preservation a reasonable opportunity to comment (36 CFR § 800.1(a)). Historic properties as defined under the NHPA are any prehistoric or historic district, site, building, structure, or object included in or eligible for inclusion on the National Register of Historic Places (36 CFR § 800.16(1)). Historic properties under the NHPA may also include traditional cultural properties listed on the National Register of Historic Places. The term “historic properties” corresponds to the phrase used in SMCRA and the implementing regulations § 779.12(b)(1) “historic or archaeological resources listed or eligible for listing.” This procedure is commonly known as the “Section 106” process and the goal of consultation under this section is to identify historic properties potentially affected by the undertaking, assess its effects and seek ways to avoid, minimize or mitigate any adverse effects on historic properties. For specific properties, the federal agency taking the action determines eligibility of the resource in consultation with the appropriate State Historic Preservation Officer or Tribal Historic Preservation Officer (36 CFR § 800.4).

The criteria for evaluation are broad so that a diversity of resources may be found eligible if they meet the criteria. To be eligible, properties must display significance in American history, architecture, archaeology, engineering, and culture and possess integrity of location, design, setting, materials, workmanship, feeling and association (36 CFR § 60.4). In addition, eligibility for listing on the National Register of Historic Places is determined with consideration to the following criteria (36 CFR § 60.4):

- **Criterion A:** Properties associated with the events that have made a significant contribution to the broad patterns of American history; or
- **Criterion B:** Properties associated with the lives of people significant in our past; or
- **Criterion C:** Properties that embody the distinctive characteristic of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant or distinguishable entity whose components may lack individual distinction; or
- **Criterion D:** Properties that have yielded or may likely yield information important in prehistory or history.

The responsibilities of the State Historic Preservation Office or Tribal Historic Preservation Office under the NHPA extend to undertakings funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including those carried by or on behalf of a federal agency; those carried out with federal financial assistance; and those requiring a federal permit, license or approval (36 CFR § 800.16(y)). The Advisory Council for Historic Preservation recognizes that federal agency influence on activities that take place on non-federal lands is generally limited to conditioning the assistance, permit, or license with stipulations setting what the recipient will do, not necessarily how the applicant will do it (ACHP 2009).

The NHPA requires federal agencies to consult with federally recognized Indian tribes that attach religious or cultural significance to historic properties (54 USC § 302706(b)). The NHPA requires tribal consultation not only for tribal lands, but also for ancestral homelands of an Indian tribe or tribes (36 CFR § 800.2(c)(2)). Properties with traditional cultural significance may be eligible for inclusion in the National Register of Historic Places. The National Register Bulletin 38 (Parker and King 1992) justifies their inclusion by defining a traditional cultural property as one that is “eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community’s history, and (b) are important in maintaining the continuing cultural identity of the community.” Such properties may be a simple, unmodified location, a mountain peak, a rural community, an urban neighborhood, or any other place that holds important meaning for a community. Traditional cultural properties may be encountered across the country. States with extant Native American lands and populations might be expected to contain more traditional cultural properties than other parts of the country. The extremely variable nature of traditional cultural properties, and their often secret nature and poor documentation, makes it impracticable to learn or describe the traditional cultural property resources of each state here in this PED/EIS.

Methodologies for cultural resource evaluations and treatment of artifacts retrieved from archaeological sites are contained in the implementing regulations for the NHPA at 36 CFR part 63 (Determination of Eligibility for Inclusion in the National Register of Historic Places) and 36 CFR part 79 (Curation of Federally-Owned and Federally Administered Archaeological Collections). Artifacts recovered from private lands during archaeological surveys and excavations during the course of section 106 reviews are usually the property of the landowner, unless state or local law mandates otherwise. Human remains are generally covered under specific laws. On federal land, human remains are addressed under Native American Graves Protection and Repatriation Act (43 CFR part 10); on non-federal lands, state laws would apply.

**Archaeological Resources Protection Act (16 USC § 470):** The Archaeological Resources Protection Act and its implementing regulations at 43 CFR part 7, addresses legitimate archaeological investigation on public lands and provides for enforcement actions against vandals and looters of these resources. Section 9 of Archaeological Resources Protection Act, 16 USC § 470 (aa)(mm), specifically prohibits the release of information concerning the nature and location of archaeological sites excavated or removed under an Archaeological Resources Protection Act permit unless the federal land manager determines that releasing the information furthers the purposes of Archaeological Resources Protection Act and will not create a risk of harm to the resources (16 USC § 470(hh)). The purposes of Archaeological Resources Protection Act as set out at 16 USC § 470(aa) are: “to secure, for the present and future benefit of the American people, the protection of archaeological resources and sites which are on public lands and Indian lands, and to foster increased cooperation and exchange of information between governmental authorities, the professional archaeological community, and private individuals ...” Therefore, information from archaeological sites on private lands or non-federal public lands is protected under Archaeological Resources Protection Act.

### **Assumptions and Methodology**

Due to the variety of potential uses of the evaluation area, this analysis employs a programmatic approach to analyzing the impacts on cultural resources instead of the traditional section 106 process. Compliance with section 106 would be completed after the selection of an alternative and would be phased to correspond with the implementation of the selected alternative. Therefore, the analysis presented in this section provides a general discussion of the potential impacts of each alternative on archaeological and architectural resources and is not a site specific analysis of effects to these resources.

As discussed in “Chapter 4: Affected Environment,” there has been limited cultural resources inventory within the evaluation area. These studies have identified eleven archaeological sites that have the potential to be eligible for listing in the national register (currently not evaluated) within the evaluation area. No previously identified eligible architectural resources are located in the evaluation area. For this analysis, the locations of known cultural resources are compared to known coal seams to determine potential impacts. Cultural resources within 100-feet of coal seams are considered at risk from coal mining activities. Given the limited survey of the area, this analysis serves as a general comparison of known resources; however, it is not comprehensive as cultural resources may exist near coal seams but have not yet been identified. Thus, it does not indicate whether one alternative has a greater potential to impact or protect cultural resources.

Based on nearby archaeological studies, there is a high potential for cultural resources to be present within the petition area. These resources could include prehistoric occupation and use sites, such as rock shelters and camps, as well as historic resources related to occupation and mining of the area. There is a low to moderate potential for intact architectural resources within the evaluation area due to the fact that few people inhabited this area. Any standing structures that remain within the petition area are likely associated with historic mining sites and the transportation of materials from these sites or through the region (e.g., roads, railroads, and associated features).

It is assumed that alternatives that include ground-disturbing activities or the construction of large features would have a greater potential to directly impact cultural resources than those with localized or no ground disturbance or construction. Many of the alternatives include remining and reclamation as well as the construction of haul and access roads to these sites. Overall, haul and access roads are assumed to have a minimal impact on cultural resources because their locations can be altered to avoid or minimize impacts to cultural resources. Therefore, the impacts of these features are assumed to be the same regardless of the alternative.

Ethnographic resources, cultural and natural features that continue to have significance for traditionally associated peoples, are not analyzed. The importance of ethnographic resources is defined by the community that continues to use those resources. Therefore, the identification of these resources and potential impacts are determined through consultation with these communities. To date, no ethnographic resources have been identified within the evaluation or petition area. Tribal consultation is ongoing and impacts to ethnographic resources will be addressed should they be identified.

### **Area of Analysis**

The geographic evaluation area for cultural resources is the evaluation area, which encompasses the petition area and designation areas, and includes the larger NCWMA and ERTCE Area.

### **GENERAL IMPACT OF COAL MINING IN TENNESSEE ON CULTURAL RESOURCES**

In general, impacts to cultural resources from coal mining would include disturbance and/or removal of archaeological or architectural resources due to ground-disturbing activities. Impacts to cultural resources could also come from development of the evaluation area for uses such as mining or infrastructure improvements. Impacts can also occur from increased development of the project area (for example due to roads) by increasing the chance for inadvertent or intentional pedestrian and off-road vehicle access to cultural resources. Cultural resources can also be indirectly impacted by introducing noise and visual characteristics into the landscape and altering the aesthetics associated with a resource. Any such effects may vary in temporal and/or spatial scale; in some instances potentially extending beyond the coal mine permit boundary and after mining activities have concluded.

As discussed in “Applicable Statutes, Regulations, and Policies,” any proposed mining activity would be permitted by OSMRE and thus, be required to comply with the section 106, of the NHPA and the stipulations of SMCRA that relate to cultural resources. In accordance with Advisory Council on Historic Preservation regulations implementing section 106 (36 CFR part 800, Protection of Historic Properties), impacts on cultural resources were identified and evaluated by (1) determining the area of potential effect; (2) identifying cultural resources present in the area of potential effect that are either listed in or eligible to be listed in the National Register of Historic Places (i.e., historic properties); (3) applying the criteria of adverse effect to affected historic properties; and (4) considering ways to avoid, minimize, or mitigate adverse effects. Under NHPA, cultural resources need to be considered in the planning process and adverse impacts resolved per 36 CFR § 800.6; it does not require the preservation of these resources in situ.

Similar to NHPA, SMCRA would require the identification of cultural resources (30 CFR §§ 779.12(b) and 783.12(b)) and the preparation of a plan to prevent or minimize adverse effects to resources that are eligible or listed in the national register before the mining permit could be approved under (30 CFR § 780.31(a) or § 784.17(a)). If a plan cannot be agreed upon by both the SMCRA regulatory authority and the agency with jurisdiction for the historic site, then the mining permit is denied. Before issuing a permit, OSMRE must make a finding that the application review process has taken into account the effect of the proposed permitting action on properties listed on and eligible for listing on the National Register of Historic Places (30 CFR § 773.15(k)). OSMRE and the Tennessee State Historic Preservation Office have entered into a programmatic agreement in order to meet the requirements of SMCRA. The details of this programmatic agreement are discussed in “Applicable Statutes, Regulations, and Policies.”

## **ALTERNATIVE 1: NO-ACTION ALTERNATIVE**

### **Direct and Indirect Impacts**

This alternative has the greatest potential to adversely affect archaeological resources as the entire evaluation area would be available for potential ground-disturbing mining activities. Surface mining activities are anticipated to continue to occur. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions. There are 11 known archaeological sites within the evaluation area that are potentially eligible to the national register. Of these, 7 sites (40CP0046, 40CP0048, 40CP0049, 40CP0050, 40CP0137, 40MO0082, and 40MO0083) are within 100 feet of coal seams and could be impacted by mining activities, regardless of the type of mining undertaken. However, there have been limited archaeological investigations within the evaluation area and as noted in “Chapter 4: Affected Environment,” there is a high potential for additional resources within the evaluation area. Therefore, more archaeological resources are likely to be impacted under this alternative than is implied by the low number of known resources.

Given the area available for mining and high probability for archaeological resources, there is the potential for adverse impacts to archaeological sites within this area. Underground mining and re-mining would also be allowed throughout the evaluation area but would have less of an effect on archaeological resources as the majority of activities would be subsurface or in previously disturbed areas. There is the potential for inadvertent impacts to archaeological resources due to the increase in activities and people within the area. Compliance with section 106 of the NHPA would limit the potential impacts to archaeological resources through avoidance, minimization, or mitigation of these effects.

Similar to the impacts on archeological resources, alternative 1 has the potential to have a long-term adverse impact on architectural resources. A total of 3,360 acres would be mined over the course of 30 years, which would have the potential of adverse impacts to aboveground resources due to infrastructure and access improvements and from mining itself. However, impacts to aboveground resources are dependent on the location of the mine and the location of architectural resources. Compliance with section 106 of the NHPA and SMCRA would limit the potential impacts to architectural resources through avoidance, minimization, or mitigation of these effects.

In addition to these impacts, the development of this area for mining would bring more people to the evaluation area and increase the potential for effects to archaeological resources and architectural resources. Tribal consultation is ongoing and the impacts to potential ethnographic resources are currently unknown.

### **Cumulative Impacts**

Past, present, and reasonably foreseeable future coal mining, haul road construction, oil and gas development, logging, and development within or adjacent to the petition area would have the potential to adversely affect cultural resources due to the potential for ground disturbance, if areas with known cultural resources cannot be avoided. Future mining activities permitted by OSMRE would also be required to comply with the requirements of the NHPA and SMCRA, with appropriate mitigation applied if needed. However, other activities not tied to federal funding or permitting would not be subject to compliance with NHPA requirements and therefore have a higher potential to adversely impact cultural resources. The impacts of alternative 1, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on cultural resources. Based on the requirement to consult under

NHPA, the contribution to adverse cumulative effects from alternative 1 would be minimal; however, the overall cumulative impacts have the potential to be adverse due to other actions.

## **Conclusion**

In summary, alternative 1 would have the potential to adversely impact cultural resources, primarily through the continuation of mining and ground-disturbing activities and inadvertent damage that could occur. Based on mining rates over the last 30 years, it is assumed that an average of 112 acres of mining would occur per year. However, all mining activities permitted by OSMRE would be required to comply with section 106 of the NHPA and SMCRA and would be required to identify and avoid, minimize, or mitigate adverse effects. Therefore, even if adverse effects are identified, no significant impacts under NEPA are expected.

## **ALTERNATIVE 2: STATE PETITION DESIGNATION**

### **Direct and Indirect Impacts**

This alternative would result in the least adverse impacts to archaeological resources of all the alternatives because the entire petition area would be set aside as unsuitable for mining and no re-mining would occur. There are four archaeological sites present within the petition area; all of which are within 100-feet of coal seams (40MO0082, 40MO0083, 40CO00046, and 40CP0137). Since mining or re-mining would not be allowed under this alternative, these resources would be protected from these activities. However, there have been limited archaeological investigations within the evaluation area and as noted in “Chapter 4: Affected Environment,” there is a high potential for additional resources within the evaluation area. Therefore, this alternative would likely result in the protection of numerous archaeological resources.

Overall, there would be little to no potential for impacts to these resources from ground-disturbing activities within the petition area. Existing use of the area, such as for recreation activities, would continue but an increase in the number of people to the area is not anticipated and impacts to archaeological resources would remain minimal. Outside of the petition area, compliance with section 106 of the NHPA would limit the potential impacts to archaeological resources from underground or auger mining access and haul road construction through avoidance, minimization, or mitigation of these effects. The entirety of the petition area would be set aside as unsuitable for mining, reducing the potential for long-term impacts to architectural resources from mining activities compared to alternative 1.

### **Cumulative Impacts**

Past, present, and reasonably foreseeable future coal mining, haul road construction, oil and gas development, logging, and other development activities within or adjacent to the petition area would have the potential to adversely affect cultural resources due to the potential for ground disturbance, if areas with known cultural resources cannot be avoided. Mining activities permitted by OSMRE would be required to comply with the requirements of the NHPA and SMCRA, with appropriate mitigation applied if needed. However, other activities not tied to federal funding or permitting would not be subjected to comply with these requirements and therefore have a higher potential to adversely impact cultural resources. The impacts of alternative 2, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on cultural resources. Since there is minimal potential for impacts to cultural resources under alternative 2, the contribution to adverse cumulative effects from alternative 2 would be negligible. Given that this alternative would protect cultural resources, there is the potential for beneficial cumulative impacts from alternative 2; however, the overall cumulative impacts have the potential to be adverse due to other actions.

## **Conclusion**

Under alternative 2, land within the petition area would be protected from mining activities. In addition, any mining activities permitted in the evaluation area by OSMRE would be required to comply with section 106 of the NHPA and would identify and avoid, minimize or mitigate adverse effects. Therefore even if adverse effects are identified, no significant impacts under NEPA are expected. No new or additional adverse impacts would occur compared to the no-action alternative.

## **ALTERNATIVE 3: STATE PETITION DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS**

### **Direct and Indirect Impacts**

This alternative has a low potential to adversely affect archaeological resources as there would be no new ground disturbance associated with mining activities within the designation area. There are four archaeological sites present within the designation area; all of which are within 100-feet of coal seams (40MO0082, 40MO0083, 40CO00046, and 40CP0137). However, there have been limited archaeological investigations within the evaluation area and as noted in “Chapter 4: Affected Environment,” there is a high potential for additional resources within the evaluation area. Therefore, this alternative would likely result in the protection of numerous archaeological resources since mining would be restricted within the designation area.

Alternative 3 would not prohibit remining within the designation area, which could increase the potential for impacts to archaeological resources if they happen to be located in or adjacent to these areas and were not previously disturbed. There are six known archaeological sites located in areas that have been previously mined (40MO0082, 40MO0083, 40CP0048, 40CP0049, 40CP0050, and 40CP0137). Under this alternative, these sites may be impacted by remining and reclamation activities. Given the limited archaeological investigations within the designation area, there is the potential for additional resources to be impacted by remining and reclamation. Compliance with section 106 of the NHPA and SMCRA would limit the potential impacts to archaeological resources from remining and reclamation activities through avoidance, minimization, or mitigation of these effects.

Similar to alternative 2, lands within the designation area would not be subject to surface mining, eliminating ground disturbance and long-term adverse impacts from the mining and from other mining-related activities. Potential roads and remining within this alternative have the potential to impact architectural resources, but impacts could be easily avoided or mitigated. Compliance with section 106 of the NHPA and SMCRA would be required for all remining and limit the potential impacts to architectural resources through avoidance, minimization, or mitigation of these effects.

### **Cumulative Impacts**

Past, present, and reasonably foreseeable future coal mining, haul road construction, oil and gas development, logging, and other development activities within or adjacent to the designation area would have the potential to adversely affect cultural resources due to the potential for ground disturbance, if areas with known cultural resources cannot be avoided. Mining activities permitted by OSMRE would be required to comply with the requirements of the NHPA and SMCRA, with appropriate mitigation applied if needed. However, other activities not tied to federal funding or permitting would not be subjected to comply with these requirements and therefore have a higher potential to adversely impact cultural resources. The impacts of alternative 3, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on cultural resources. Since there is minimal potential for impacts to cultural resources under alternative 3, the contribution to adverse cumulative effects from alternative 3

would be negligible. Given that this alternative would protect cultural resources, there is the potential for beneficial cumulative impacts from alternative 3. However, the overall cumulative impacts have the potential to be adverse due to other actions.

## **Conclusion**

Under alternative 3, land within the designation area would be protected from mining activities, but potential remining and road construction could have the potential to adversely impact cultural resources, primarily through ground-disturbing activities. However, all mining activities permitted by OSMRE would be required to comply with section 106 of the NHPA and SMCRA and would identify and avoid, minimize, or mitigate adverse effects. No new or additional adverse impacts would occur compared to the no-action alternative. Therefore, even if adverse effects are identified, no significant impacts under NEPA are expected.

## **ALTERNATIVE 4: EXPANDED CORRIDOR DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS (PREFERRED ALTERNATIVE)**

### **Direct and Indirect Impacts**

Alternative 4 has a low potential to impact archaeological resources. Under this alternative, more lands would be set aside as unsuitable for surface coal mining operation than other alternatives (76,133 acres or 44% of the evaluation area), therefore preserving archaeological resources where mining could occur in that area. There are four archaeological sites present within the designation area; all of which are within 100-feet of coal seams (40MO0082, 40MO0083, 40CO00046, and 40CP0137). However, there have been limited archaeological investigations within the evaluation area and as noted in “Chapter 4: Affected Environment,” there is a high potential for additional resources within the evaluation area. Therefore, this alternative would likely result in the protection of numerous archaeological resources since mining would be restricted within the designation area.

Alternative 4 would not prohibit remining within the designation area. There is the potential for these activities to result in impacts to archaeological resources should they be located within or adjacent to these areas. There are six known archaeological sites located in areas that have been previously mined (40MO0082, 40MO0083, 40CP0048, 40CP0049, 40CP0050, and 40CP0137). Under this alternative, these sites may be impacted by potential remining and reclamation activities. Given the limited archaeological investigations within the designation area, there is the potential for additional resources to be impacted by remining and reclamation. Despite this, the larger area set aside as unsuitable for mining would result in less ground disturbance both within the designation area and the larger evaluation area and therefore would protect archeological resources better than alternative 1. Compliance with section 106 of the NHPA and SMCRA would limit the potential impacts to archaeological resources from mining activities through avoidance, minimization, or mitigation of these effects.

Alternative 4 has a low potential to adversely affect architectural resources with 44% of land within the evaluation area designated as unsuitable for mining. Lands within the designation area would not be subject to surface mining, eliminating long-term adverse impacts from the mining and from other related activities. Roads and remining within this alternative have the potential to impact architectural resources, but impacts could be easily avoided or mitigated. Compliance with section 106 of the NHPA and SMCRA would limit the potential impacts to architectural resources through avoidance, minimization, or mitigation of these effects.

## **Cumulative Impacts**

Past, present, and reasonably foreseeable future coal mining activities, haul road construction, gas and oil development, logging, and other development activities within or adjacent to the designation area would have the potential to adversely affect cultural resources due to the potential for ground disturbance, if areas with known cultural resources cannot be avoided. However, any mining activities permitted by OSMRE would also be required to comply with the requirements of the NHPA and SMCRA, with appropriate mitigation applied if needed. The impacts of alternative 4, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on cultural resources. Since there is minimal potential for adverse impacts to cultural resources under alternative 4, there would be no adverse cumulative impacts expected to cultural resources. Given that an expanded area is considered under this alternative, resulting in increased protection for cultural resources within the larger evaluation area, there is the potential for beneficial cumulative impacts. However, the overall cumulative impacts have the potential to be adverse due to other actions.

## **Conclusion**

Under alternative 4, land within the designation area would be protected from mining activities, but remining and road construction would have the potential to adversely impact cultural resources, primarily through ground-disturbing activities. However, all potential mining activities permitted through SMCRA would be required to comply with section 106 of the NHPA and SMCRA and would identify and avoid, minimize, or mitigate adverse effects. Therefore, even if adverse effects are identified, no significant impacts under NEPA are expected. No new or additional adverse impacts would occur compared to the no-action alternative.

## **ALTERNATIVE 5: TARGETED RESOURCE PROTECTION DESIGNATION**

### **Direct and Indirect Impacts**

Under this alternative a total of 12,331 acres (7% of the evaluation area) would be designated as unsuitable for mining. No remining would occur under this alternative. There are two archaeological sites located within the designation area, both of which are within 100-feet of coal seams (40CP0046 and 40CP0137). However, there have been limited archaeological investigations within the evaluation area and as noted in “Chapter 4: Affected Environment,” there is a high potential for additional resources within the evaluation area. Therefore, this alternative would likely protect additional archaeological sites, but not as many as alternatives that set aside larger areas as unsuitable for mining.

Overall, this alternative would have a high potential to adversely affect archaeological sites. Compliance with section 106 of the NHPA and SMCRA would limit the potential impacts, and therefore the significance of those impacts, to archaeological resources through avoidance, minimization, or mitigation of these effects.

Similar to impacts on archaeological resources, alternative 5 has the potential to adversely impact architectural resources because only 7% of lands within the evaluation area would be designated as unsuitable for mining and, almost no change compared to alternative 1. Therefore, this alternative would have a high potential to adversely affect architectural resources. Compliance with section 106 of the NHPA and SMCRA would limit the potential impacts to architectural resources through avoidance, minimization, or mitigation of these effects.

## **Cumulative Impacts**

Past, present, and reasonably foreseeable future coal mining, haul road construction, gas and oil development, logging, and other development activities within or adjacent to the designation area would have the potential to adversely affect cultural resources due to the potential for ground disturbance, if areas with known cultural resources cannot be avoided. Mining activities permitted by OSMRE would also be required to comply with the requirements of the NHPA and SMCRA, with appropriate mitigation applied if needed. However, other activities not tied to federal funding or permitting would not be subjected to comply with these requirements and therefore have a higher potential to adversely impact cultural resources. The impacts of alternative 5, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on cultural resources. Based on the requirement to consult under NHPA, the contribution to adverse cumulative effects from alternative 5 would be minimal. There would be minimal beneficial impacts associated with this alternative. However, the overall cumulative impacts have the potential to be adverse due to other actions.

## **Conclusion**

Under alternative 5, only a small area within the designation area would be protected from mining and related activities, but there would be no remining, and all mining activities permitted by OSMRE would be required to comply with section 106 of the NHPA and SMCRA and would identify and avoid, minimize or mitigate adverse effects. No new or additional adverse impacts would occur compared to the no-action alternative. Therefore, even if adverse effects are identified, no significant impacts under NEPA are expected.

## **ALTERNATIVE 6: REDUCED CORRIDOR DESIGNATION**

### **Direct and Indirect Impacts**

This alternative would have the potential to adversely affect archaeological resources because less land would be designated as unsuitable for mining than under alternative 2 (total of 39,106 acres or 23% of the evaluation area). There are four archaeological sites present within the designation area; all of which are within 100-feet of coal seams (40MO0082, 40MO0083, 40CP00046, and 40CP0137). However, there have been limited archaeological investigations within the evaluation area and as noted in “Chapter 4: Affected Environment,” there is a high potential for additional resources within the evaluation area.

The prohibition on remining could provide further protection to archaeological resources than in other instances where these activities are allowed. Compliance with section 106 of the NHPA and SMCRA would limit the potential impacts to archaeological resources through avoidance, minimization, or mitigation of these effects.

Alternative 6 protects 23% of lands within the evaluation from ground-disturbing mine activities and lands within the designation area would not be subject to surface mining, eliminating long-term adverse impacts to architectural resources from the mining and from other related activities. Roads and remining within this alternative have the potential to impact architectural resources, but impacts could be easily avoided or mitigated. Compliance with section 106 of the NHPA and SMCRA would limit the potential impacts to architectural resources through avoidance, minimization, or mitigation of these effects.

### **Cumulative Impacts**

Past, present, and reasonably foreseeable future coal mining, haul road construction, gas and oil development, logging, and other development activities within or adjacent to the designation area would

have the potential to adversely affect cultural resources due to the potential for ground disturbance, if areas with known cultural resources cannot be avoided. Mining activities permitted by OSMRE would also be required to comply with the requirements of the NHPA and SMCRA, with appropriate mitigation applied if needed. However, other activities not tied to federal agencies, funding, or permitting would not be subjected to comply with these requirements and therefore have a higher potential to adversely impact cultural resources. The impacts of alternative 6, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on cultural resources. Based on the requirement to consult under NHPA, the contribution to cumulative effects from alternative 5 would be minimal. Since lands are being set aside as unsuitable for mining, cultural resources would be better protected under this alternative than the no-action alternative, resulting in the potential for beneficial cumulative impacts. However, the overall cumulative impacts have the potential to be adverse due to other actions.

## **Conclusion**

Under alternative 6, land within the designation area would be protected from mining activities. Any mining activities permitted through SMCRA outside the designation area would be required to comply with section 106 of the NHPA and SMCRA and would identify and avoid, minimize, or mitigate adverse effects. No new or additional adverse impacts would occur compared to the no-action alternative. Therefore, even if adverse effects are identified, no significant impacts under NEPA are expected.

## **IMPACTS OF THE ALTERNATIVES ON PUBLIC HEALTH AND SAFETY**

### **METHODS FOR ANALYSIS**

#### **Applicable Statutes, Regulations, and Policies**

SMCRA (30 USC §§ 1251–1279) and the federal Mine Safety and Health Act of 1977 (Pub. L. 95-164) have direct effects on public health and safety as they relate to the construction, operation, or closure of a coal mine. The Department of Labor, Mine Safety and Health Administration administers the provisions of the federal Mine Safety and Health Act (Federal Mine Safety and Health Act of 1977, Public Law 91-173, as amended by Public Law 95-164) and enforces compliance with mandatory safety and health standards as a means to eliminate fatal accidents; to reduce the frequency and severity of nonfatal accidents; to minimize health hazards; and to promote improved safety and health conditions in the nation's mines (MSHA 2014). The Mine Safety and Health Administration carries out the mandates of the Mine Safety and Health Act at all mining and mineral processing operations in the United States, regardless of size, number of employees, commodity mined, or method of extraction.

SMCRA, administered by the OSMRE, regulates all surface mines. SMCRA set standards for working with states to permit mining, establishing better mining practices to protect citizens and the environment during mining activities, and provide funding for reclamation of pre-1977 abandoned mine lands. The authority designated in Title V of the act, 30 USC § 1251 (sections 501–127529), set forth minimum performance standards describing how coal must be mined and what reclamation activities are required to protect the environment and public health.

#### **Assumptions and Methodology**

The method of analysis was to conduct a comparison between the health and safety conditions that would exist with the adoption of each of the proposed alternatives with the health and safety conditions as they currently exist.

All surface mining activity in Tennessee requires a permit from OSMRE and the Tennessee Division of Water Resources, Mining Section and this analysis assumes that all surface mining activities will be conducted in accordance with the conditions of the permits and all applicable surface mining rules and regulations including those governed by Mine Safety and Health Administration, Occupational Safety and Health Administration, OSMRE and Tennessee Division of Water Resources. The permittee must submit, as required, detailed information and meet all permit conditions, including allowing for inspections. It is further assumed that the OSMRE and the Tennessee Division of Water Resources, Mining Section will inspect surface mining operations and revoke or suspend any permit for violation of permit conditions.

For most potential hazards, qualitative analysis was used to assess impacts to public health and safety. Specific measurable differences in impact levels were not expected for each action alternative because no quantitative data exists that could be used to accurately predict and quantify the potential future risk to the public associated with each of the hazards.

To obtain a quantitative assessment of impacts to terrain hazards, the location of existing highwalls was mapped for each alternative and lengths of potentially remineable highwalls were calculated and compared for each alternative.

### **Area of Analysis**

The area of analysis for public health and safety includes the evaluation area, which includes the limits of the petition area and the larger NCWMA and ERTCE.

## **GENERAL IMPACT OF COAL MINING IN TENNESSEE ON PUBLIC HEALTH AND SAFETY**

Surface mining hazards that pose a risk to public health and safety include the formation of terrain hazards such as highwalls and pits; vehicle traffic; construction of haul roads; combustion from engines; noise; fugitive dust; blasting; fire; and water contamination. Overall, safety is addressed in the permitting process, which requires taking all possible steps to minimize any adverse impact to the environment or public health and safety resulting from noncompliance with any term or condition or the permit (30 CFR § 773.17).

**Surface Mining: Highwalls and Pits / Remining Considerations:** Highwalls are vertical cliffs that can be unstable at the top and the bottom and have the potential to collapse. When approached from the top, the vertical edge of a highwall may not be seen or may crumble, leading to a potentially fatal fall (BLM 2011). Open pits can be dry or filled with water. Water-filled pits can be an attractive nuisance. They can contain submerged physical hazards, pose a drowning risk, and the water can be highly acidic or contain harmful chemicals (BLM 2011). Existing highwalls and pits within the evaluation area from past surface mining activities present a direct long-term adverse impact to the safety of the public. Current mining regulations require when mining is completed, disturbed areas must be backfilled and graded with all available earthen materials to reestablish the approximate original contours that existed prior to any mining unless a variance is received (30 CFR § 785.16). In order to achieve the approximate original contour, the permittee must transport, backfill, compact, and grade all spoil material to eliminate all highwalls, spoil piles, and depressions. The postmining graded slopes must approximate the premining natural slopes in the area (30 CFR § 816.102 and 30 CFR § 715.14). Therefore terrain hazards at current and future surface mining activities should result in only near-term direct impacts. Proper site security and signage would minimize public access to terrain hazards at active mines. Remining and its associated reclamation could reduce the existence of terrain hazards on previously surface mined lands, but would also have near-term adverse impacts similar to surface mining. When remining is conducted, the operator must use all reasonably available spoil in the immediate vicinity of the remining operation to eliminate all highwalls to the maximum extent technically practicable (816.106(b)(1)(b)(2)(b)(3), and (b)(4)), grading

to a slope that provides adequate drainage and long-term stability (816.106(b)(1)(b)(2)(b)(3), and (b)(4)), and ensuring that any highwall remnant is stable and does not pose a hazard to public health and safety or to the environment (30 CFR §§ 816.106 b3 and b4). Where removing of pre-SMCRA highwalls is not economically viable, fencing or signs around existing hazards may prevent impacts to public health and safety. Installing and maintaining these safety features across the miles of highwalls present within the evaluation area may be cost-prohibitive. According to the Community Trespass Prevention Program Guide prepared by the US Department of Transportation, the key audience for trespass prevention in 2003 was 18–34-year-olds. The guide contends that the rise of social media provides an excellent method of reaching this challenging audience. By pairing physical outreach with a comprehensive social media program on the Internet geared to teens, college and post-college adults, difficult trespassing problems can be successfully attacked at their root (USDOT 2011). Therefore education and outreach about the existence of terrain hazards could reduce the potential impact on some members of the public.

**Surface Mining: Land Hazard Considerations:** A significant portion of the evaluation area consists of a steep mountainous region with slope gradients equal to or in excess of 20 degrees (36.4%). Steep slopes are susceptible to land movement including landslides and snow-covered steep slopes could be susceptible to snow slides (under the right conditions). These existing natural conditions present a potential long-term adverse impact to the safety of the public. Development activity such as mining on steep slope areas can increase the risk of disturbance-caused landslides. For interim program permits, SMCRA includes specific requirements such as prohibiting the disposal of overburden on slopes steeper than 20 degrees to prevent landslides (30 CFR § 716.2). OSMRE’s regulations at 30 CFR § 816.107 prohibits the disposal of spoil materials and wastes downslope of the mining operation and includes provisions about burying woody materials in the backfill. See the section “Impacts of the Alternatives on Earth Resources” for a more detailed discussion of landslides and other impacts to geology from rainfall, snowmelt, and disturbance from human activities.

**Surface Mining: Vehicle Traffic:** Transportation of coal over roads within the evaluation area presents a near-term risk to the health and safety of the public. On the occasion when a recreational user encounters coal-related vehicular traffic, the noise, dust, and exhaust could present a risk to the health of the user. There is also potential for coal-related vehicle accidents with recreational users crossing or traveling along haul roads. Vehicle traffic could have a near-term adverse impact on the health and safety of hikers, off-highway vehicle riders, auto tourists, workers, and residents within the evaluation area. The construction of new haul roads could also pose a potential risk to the health and safety of those in the vicinity of the construction.

**Surface Mining: Combustion from Engines:** Exhaust from diesel engines used in mining operations contains a mixture of gases and very small particles that can create a health hazard when not properly controlled. Diesel particulate matter is a component of diesel exhaust that includes soot particles made up primarily of carbon, ash, metallic abrasion particles, sulfates, and silicates. Diesel soot particles have a solid core consisting of elemental carbon, with other substances attached to the surface, including organic carbon compounds known as aromatic hydrocarbons. Short-term exposure to high concentrations of diesel exhaust/diesel particulate matter can cause headache, dizziness, and irritation of the eye, nose and throat severe enough to distract or disable miners and other workers. Prolonged diesel exhaust/diesel particulate matter exposure can increase the risk of cardiovascular, cardiopulmonary, and respiratory disease and lung cancer (OSHA and MSHA 2012). Combustion from engines within the evaluation area is a potential near-term adverse impact to public health. Air quality impacts and mitigation measures are discussed in greater detail in the section “Impacts of the Alternatives on Air Quality.”

**Surface Mining: Noise:** Noise is generated by mining equipment, blasting, and transportation of the coal. According to the World Health Organization, noise can have the following adverse health effects on humans: noise-induced hearing impairment; interference with speech communication; disturbance of rest

and sleep; psychophysiological, mental-health and performance effect; effects on social behavior and annoyance; as well as interference with intended activities (WHO 1999). Noise generated by surface mining operations within the evaluation area has the potential to impact the health of members of the public who are in the vicinity of the mine or haul road at the time the noise is generated. Surface mining noise could have a near-term adverse impact on public health and safety. Noise impacts and mitigation measures are discussed in greater detail in the “Impacts of the Alternatives on the Natural Soundscape” section.

**Surface Mining: Fugitive Dust:** Fugitive dust is generated during surface mining operations and transportation of coal. Particulates in the 2.5 microns to 10 micron size range can carry contaminants into the deepest and most susceptible part of the lungs. The smaller the size of particulate matter the farther it can travel into the lungs. Particulate matter less than 2.5 microns in size is small enough that it bypasses the body’s natural defenses and gets trapped in the air sacs of the lungs, causing an inflammatory response increasing the potential for a heart attack. When inhaled with other pollutants, particulate matter can increase the incidence and severity of respiratory diseases. Children, the elderly, and people suffering from heart or lung disease, such as asthma, are especially at risk. Particulate matter of any size can also impair visibility and contaminate materials and buildings (NDEQ 2014). Dust generation could have a near-term adverse impact on members of the public exposed to the dust. Air quality impacts and mitigation measures are discussed in greater detail in the section “Impacts of the Alternatives on Air Quality.”

**Surface Mining: Blasting:** There is an inherent risk to human health and safety associated with blasting. According to Ken Eltschlager, Mining/Explosives Engineer with OSMRE, blasting is the most likely activity that can cause an off-site fatality. Flyrock can travel thousands of feet from a blast site and it is particularly difficult to control at steep slope mines (OSMRE 2011b). Since the implementation of SMCRA in 1977, there has been one blasting incident in Tennessee where a passenger in a vehicle on Interstate 75 north was killed by flyrock. The cause of this accident was found to be negligence as the approved blasting plan was not followed (NIOSH n.d.). Although tragic, the single occurrence of an offsite blasting fatality in Tennessee over the last 30 years indicates that the risk to the public from blasting is low. Blasting controls including warning signs, public and property owner notification, pre-blast surveys of nearby structures, limiting public access, and limitations on allowable air blast, ground vibration, and flyrock are required to protect the public and minimize potential impacts to nearby structures (30 CFR §§ 816.61–68). The permittee must comply with all applicable local, state, and federal laws and regulations and the requirements of this section in the storage, handling, preparation, and use of explosives. Blasting operations that use more than the equivalent of 5 pounds of TNT must be conducted according to a time schedule approved by the regulatory authority. All blasting operations must be conducted by experienced, trained, and competent people (30 CFR § 715.19). In Tennessee, all blasting must be done between sunrise and sunset (30 CFR § 942.816(h)). Blasting, if performed properly in accordance with SMCRA regulations and an approved blasting plan, is not expected to have impacts outside the permit area (with the exception of noise, vibrations, and possibly dust); flyrock impacts should be contained to the permit area. All impacts from blasting on public health and safety would be near term.

**Surface Mining: Fire:** Fire is a potential hazard during surface coal mining operations. Fires can cause physical damage to the surrounding areas and emit toxic fumes and ash that can be harmful to humans and wildlife (OSMRE 2014b). The greatest potential for fire exists when the mine is active, resulting in potential near-term adverse impacts to health and safety.

**Surface Mining: Water Contamination:** Contamination of surface water and groundwaters from active and past mining activities pose a potential public health risk. Acid mine drainage can lower the pH of surrounding surface water, making it corrosive and unable to support certain forms of aquatic life and vegetation. Humans may also be affected by consuming contaminated water and fish tissue (BLM 2014).

Water contamination would have long-term adverse impacts on public health and safety. Re-mining of previously mined lands would mitigate some existing water quality problems. Current regulations, specifically (30 CFR § 816.41(d)), requires that surface-water quality be protected by handling earth materials, ground-water discharges, and runoff in a manner that minimizes the formation of acidic or toxic drainage; prevents, to the extent possible using the best technology currently available, additional contribution of suspended solids to streamflow outside the permit area. Water quality impacts and mitigation measures are discussed in greater detail in the section “Impacts of the Alternatives on Water Resources.”

**Surface Mining: Potential Long-Term Health Issues:** Various studies have been conducted to date that draw correlations between long-term health issues and coal mines. One study, “The association between mountaintop mining and birth defects among live births in Central Appalachia, 1996-2003” found that rates of birth defects were significantly higher in mountain top mining areas for six of seven types of defects evaluated. This study looked at data from four states including Tennessee. For the purpose of the study, mountaintop mining was identified from satellite imagery as a surface mining site that crosses over a ridge or mountain peak, and that either (1) spans at least 320 acres including at least 40 acres of removed ridge top or (2) spans 40–320 acres and contains at least 10–40 acres of removed ridgeline. Two counties in Tennessee (Campbell and Claiborne) were specifically identified by the study map as having mountain top mining present (the study does not distinguish between abandoned or closed mines and active mines). Eight other Tennessee counties were also included in the study and identified as having other mining present (Ahern et al. 2011). Another study titled “Relations between Health Indicators and Residential Proximity to Coal Mining in West Virginia” indicates that residents of coal-mining communities are at an increased risk of developing chronic heart, lung, and kidney diseases (WV Health Science Center 2008). This study was based on a statistical analysis of 16,400 health profiles provided by people living in West Virginia. A third study by the West Virginia University, Mary Babb Randolph Cancer Center, found a connection between coal mining dust and increased lung cancer risk. The study exposed lung cells in a laboratory to dust collected from communities near mountaintop mining sites in southern West Virginia. It simulated a dust exposure level equal to what a resident of a coal mining community might experience in less than a decade. As a result of that exposure, according to the study report, the lung cells showed changes in structure indicative of “lung tumor promotion and progression” (West Virginia University 2014). These studies indicate that there could be a long-term increased potential for risk to public health from surface coal mining.

**Logging Related to Mining:** The tools and equipment used for logging such as chain saws and logging machines pose physical hazards wherever they are used. Loggers handle heavy weights and must deal with the momentum of falling and rolling trees and logs. Most hazards are limited to people working at the site but these hazards could impact the public if a member of the public unknowingly enters an active logging site. On the occasion when a recreational user encounters logging-related vehicular traffic, the noise, dust, and exhaust associated with the traffic, as well as potential for collision with the vehicle, could present a potential risk to the health of the user. Therefore, the transportation of equipment and logs along roads in the evaluation area would also present a potential temporary adverse impact to the public.

**Underground and Auger Mining:** Underground mining and auger mining hazards include cave-ins, explosions, vehicle or equipment collision, chemical leakage, electrocution, fire, and water contamination. Many of these hazards occur during mining operations and pose the greatest risk to mine workers and a lesser risk to the public. The hazards that could impact the health or safety of the public include chemical leakage, water contamination, fire, electrocution, and surface subsidence. Chemicals such as hydraulic fluid and diesel fuel are frequently used and stored at mine sites. Leakage can occur when chemicals are not properly handled or stored. Water contamination can also occur in the form of acid or mineralized mine drainage, which is analyzed along with other mining-related water-quality impacts in the section “Impacts of the Alternatives on Water Resources.” Depending on where the

leakage occurs it could potentially contaminate subsurface drinking water supplies or surface waters and have long-term adverse impacts. Humans could be adversely impacted by consuming contaminated water or fish. Fire is another potential hazard of coal mining that could impact the public. Fires can cause physical damage to the surrounding areas and emit toxic fumes and ash that can be harmful to humans (OSMRE 2014b). No significant coal mine fires have been reported in Tennessee in recent history. Significant underground coal mine fires or explosions have been reported in Alabama, Kentucky, Pennsylvania, Virginia, and West Virginia (NFPA 2010). Electrocuting is another potential hazard to the public. OSMRE has one reported incident of a state wildlife agency employee in the NCWMA being shocked by coming in contact with a downed power line that served a former underground mine (OSMRE pers. comm. 2014d). Subsidence could also pose a potential risk to the public. In most instances where subsidence related to underground mining in Tennessee has occurred, the mine operator had not followed an approved mining plan. The likelihood of subsidence would be minimized through adherence to an approved mining plan. Overall, underground and auger mining could have potential near- and long-term adverse impacts to public health and safety. It is noted that when operators follow applicable rules and regulations, the possibility of these occurring is minimal.

### **ALTERNATIVE 1: NO-ACTION ALTERNATIVE**

Under alternative 1, OSMRE would deny the State's petition to designate the subject lands as "unsuitable for surface coal mining operations" (30 CFR § 764.13). Therefore, the no-action alternative would have the same effect as deciding not to designate any of the petition area as unsuitable for surface coal mining operations.

#### **Direct and Indirect Impacts**

It is assumed that under the no-action alternative there would be continued surface coal mining, re-mining, surface disturbances from underground mining and auger mining at various locations throughout the petition and evaluation area as well as logging related to mining, haul road construction and associated transportation. There are 12,975 acres of already permitted coal mining activities within the approximately 172,000-acre evaluation area. The permitted lands include active and inactive mine sites. The active sites total 8,308 acres and include coal mining and reclamation activities occurring or permitted but not yet disturbed. The inactive areas total 4,667 acres and include Phase II completed mines, temporary cessation of operations or coal mining completed and reclamation activities initiated.

The selection of the no-action alternative would not by itself result in the approval of any specific surface coal mining operations within the evaluation area. Approval or denial of a specific surface coal mining operation can be issued only after an applicant has submitted to the OSMRE a permit application with site-specific data that meet all the requirements of SMCRA and the implementing regulatory program (30 CFR § 773.4).

The potential adverse impacts due to present and future constructed highwalls and pits; vehicle traffic; construction of haul roads; combustion from engines; noise; fugitive dust; blasting, fire, and logging associated with mining would be near term (during active construction or mining) and localized (limited to the area in the immediate vicinity of the activity). The potential adverse impacts of possible long-term health issues and water contamination could reach beyond the immediate vicinity of the mining activity. Possible long-term health issues are discussed in the general impacts section and impacts on water quality are discussed in detail in section "Impacts of the Alternatives on Water Resources."

The potential long-term adverse impacts due to the presence of pre-SMCRA highwalls and pits are limited to the immediate vicinity of the terrain hazards. There are 390.7 miles of pre-SMCRA highwalls present within the evaluation area. Based on the coal resources data and calculations performed by

OSMRE, approximately 183.7 miles of these pre-SMCRA highwalls have been identified as probable remineable highwalls. Remining and its associated reclamation within the petition area would have near-term adverse localized impacts but could also have long-term beneficial impacts on public health and safety if the highwalls are removed reducing the existing terrain hazards. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions.

## **Cumulative Impacts**

Past, present, and reasonably foreseeable future activities associated with coal mining, logging, oil and gas extraction, road building, and transportation would have potential adverse impacts on public health and safety for the no-action alternative. According to the GIS data, there are 397 oil and gas wells located in the petition area. Several health and safety hazards are associated with oil and gas exploration and extraction. Oil and gas wells can release hydrogen sulfide and expose people in the vicinity of the well to hydrogen sulfide gas. Hydrogen sulfide is both an irritant and a chemical asphyxiant with effects on both oxygen utilization and the central nervous system (OSHA 2005). People in the vicinity of the active oil and gas sites could be exposed to respirable crystalline silica during processes that use sand such as hydraulic fracturing. Breathing in silica can cause inflammation and scarring in lungs and increase the risk of lung cancer. Harmful noise and diesel particulate can be generated during operation of machinery, equipment, and vehicles. Hazardous chemicals are used and produced at oil and gas extraction sites. Handling these substances properly can mitigate potential for human harm. The development and operation of oil and gas wells includes the potential for well fires or explosions. These incidents are rare but can be dangerous if they occur. During oil and gas well drilling, a mixture of oil, gas, and water is often times pumped to the surface. The extracted water can contain salts, other dissolved minerals, and in some cases naturally occurring radionuclides. If not handled properly, this drilling by-product could pose a threat to public health and safety (EPA 2014d). Questions have been raised in recent years regarding the impacts of gas drilling on groundwater supplies. “Stakeholders have expressed concerns about hydraulic fracturing endangering subsurface drinking water resources by creating high permeability transport pathways that allow hydrocarbons and other fluids to escape from hydrocarbon-bearing formations” (EPA 2012d). EPA is currently studying the potential impacts from hydraulic fracturing. Overall oil and gas exploration and extraction would have near-term adverse impacts on public health and safety during active operations with the potential for long-term adverse impacts to subsurface drinking water supplies, if such impacts are found to exist. The transportation of oil and gas equipment along roads in the evaluation area would also present a potential near-term adverse impact to the health and safety of the public. Oil and gas pipelines that connect the wellheads to storage tank areas or compressor stations could also pose a potential risk to the public especially if the pipeline is located near a public use area.

The impacts of alternative 1, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on health and safety. Alternative 1 would contribute a high potential for adverse effects, but with adherence to standards and regulatory requirements, would contribute a minor adverse increment to overall adverse cumulative impacts.

## **Conclusion**

There would be near-term adverse localized impacts to public health and safety for the no-action alternative due to surface mining, underground mining, auger mining, logging operations, oil and gas extraction, road building, and associated transportation. There could also be potential for increased risk of other long-term health issues from surface mining as described in the general impacts section “Surface Mining: Potential Long-Term Health Issues.” Overall, safety is addressed in the permitting process, which

requires taking all possible steps to minimize any adverse impact to the environment or public health and safety resulting from noncompliance with any term or condition or the permit (30 CFR § 773.17), but accidents and unintended environmental harm could still occur during mining or reclamation activities. Adherence to the requirements of SMCRA and the Federal Mine Safety and Health Act (Public Law 91-173, as amended by Public Law 95-164) would reduce the risk to public health and safety from surface mining operations. Impacts from the no-action alternative on public health and safety would overall be minor and not significant.

## **ALTERNATIVE 2: STATE PETITION DESIGNATION**

Under alternative 2, the State's petition area, consisting of a 1,200 foot corridor along 505 miles of ridgeline, would designate approximately 67,326 acres as unsuitable for surface coal mining.

### **Direct and Indirect Impacts**

There are 7,906.6 acres of already permitted coal mining activities within the 67,326 acre State petition area. The permitted lands include active and inactive mine sites. The active sites total 5,302.8 acres and include coal mining and reclamation activities occurring or permitted but not yet disturbed. The inactive areas total 2,603.8 acres and include Phase II completed mines, temporary cessation of operations or coal mining completed and reclamation activities initiated. Under alternative 2, remining would not occur in the petition area, therefore, adverse impacts on water contamination and terrain hazards would continue on a portion of the unreclaimed mines within the corridor. There are approximately 201.6 miles of pre-SMCRA highwalls within the State's petition area and no beneficial impacts to public health and safety would be realized for removal since no remining is allowed for this alternative. It is noted that SMCRA has a Title IV (Abandoned Mine Reclamation) section and a Title V (Control of the Environmental Impact of Surface Coal Mining) section. A designation of unsuitability under alternative 2 would not allow any reclamation through remining of these abandoned mine lands under Title V. As no coal removal typically occurs under a Title IV funded abandoned mine lands reclamation project, such projects would not be impacted by a designation of unsuitability. Due to the extent of existing highwalls present in this area, Title IV work within the petition area would likely never reclaim the vast majority of terrain hazards existing in the petition area due to funding limitations (OSMRE pers. comm. 2014c).

Precluding mining in the petition area would eliminate potential adverse health and safety impacts from future mining in the petition area, which is an area that attracts and supports a large number of recreational users of the ridgelines and trails. Impacts to the health and safety of dispersed recreational users related to mine sites, access restrictions, and area closures as well as noise, fugitive dust and emissions from mining vehicle traffic and mining equipment would not occur within the petition area, resulting in beneficial impacts within this area.

### **Cumulative Impacts**

Cumulative impacts on public health and safety from logging, oil and gas extraction, and related road-building and use within the evaluation area would be adverse as described in the "Cumulative Impacts" section of alternative 1. It is noted that there are 189 oil/gas wells within the petition area for alternative 2. The impacts of alternative 2, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on health and safety. Alternative 2 would contribute to adverse impacts on terrain hazards and water quality in the vicinity of pre-SMCRA mine sites due to the ban on remining and would contribute potential beneficial impacts on public health and safety due to the reduction in overall mining activity within an area of high recreational use.

## **Conclusion**

Alternative 2 would reduce near-term localized hazards associated with surface mining operations in the petition area, a small benefit to recreational users in that area. However, barring remining from the petition area would allow localized terrain hazards and water quality issues from pre-SMCRA mines to persist because no highwalls would be reclaimed or water quality improvements realized through remining and reclamation. Permits stipulate safety requirements and environmental protection measures (30 CFR § 773.17), but accidents and unintended environmental harm could still occur during mining or reclamation activities. Adherence to the requirements of SMCRA and the Mine Safety and Health Act would reduce the risk to public health and safety from surface mining operations. Impacts from alternative 2 would overall be minor and not significant.

## **ALTERNATIVE 3: STATE PETITION DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS**

Under alternative 3, the State's petition area is the same area as described for alternative 2. Alternative 3 would not prohibit remining in previously mined areas of the designation area or the development and use of access and haul roads for use in remining.

## **Direct and Indirect Impacts**

There are 7,906.6 acres of already permitted coal mining activities within the 67,326 acre State petition area. The permitted lands include active and inactive mine sites. The active sites total 5,302.8 acres and include coal mining and reclamation activities occurring or permitted but not yet disturbed. The inactive areas total 2,603.8 acres and include Phase II completed mines, temporary cessation of operations or coal mining completed and reclamation activities initiated.

There are approximately 201.6 miles of pre-SMCRA highwalls within the State's petition area. The allowance of remining in the designated area could have a long-term beneficial impact to public health and safety due to potential removal of some highwalls and pits, which would occur through remining and reclamation. Based on the coal resources data and calculations performed by OSMRE, approximately 102.2 miles of these pre-SMCRA highwalls have been identified as potential surface mineable highwalls. Therefore according to the GIS-based calculations, slightly more than half of the 201.6 miles of highwalls present within the greater petition area could be remined (based on the existence and location of coal reserves). Reclamation associated with potential remining could also reduce or eliminate health impacts associated with contaminated surface water from the previously mined areas. Since potential remining is also allowed under the no-action alternative, there would be no change to the impacts associated with remining under alternative 3 compared to the no-action alternative, but there would be benefits compared to other alternatives that prohibit remining. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions. A portion of this average assumed mining rate could possibly be remined. Also, precluding mining in the designation area would eliminate adverse health and safety impacts to recreational users in this area from future mine site hazards, vehicle traffic; construction of haul roads; combustion from engines; noise; fugitive dust; blasting; fire; and water contamination.

## **Cumulative Impacts**

Cumulative impacts on public health and safety would be adverse as described in the "Cumulative Impacts" section of alternative 1. The impacts of alternative 3, when added to the impacts of actions by

others, would result in overall adverse cumulative impacts on health and safety. Alternative 3 would contribute to adverse impacts in the vicinity of remining areas and haul roads, and beneficial impacts from a reduced area of mining along ridgelines and associated high-use recreation areas and reclamation of remined areas.

## **Conclusion**

Alternative 3 would reduce near-term localized hazards associated with surface mining operations in the designation area. Remining within the designation area would have near-term localized adverse impacts, but could have localized long-term beneficial impacts on public health and safety if the reclamation reduces the existing terrain hazards. Reclamation associated with remining could also reduce or eliminate the health impacts of contaminated surface water from the previously mined areas. Permits stipulate safety requirements and environmental protection measures (30 CFR § 773.17), but accidents and unintended environmental harm could still occur during mining or reclamation activities. Adherence to the requirements of SMCRA and the Mine Safety and Health Act would reduce the risk to public health and safety from surface mining operations. Impacts from alternative 3 would be minor and not significant.

## **ALTERNATIVE 4: EXPANDED CORRIDOR DESIGNATION WITH POTENTIAL REMINING AND ROAD ACCESS (PREFERRED ALTERNATIVE)**

The designation of a 1,200 foot corridor centered on 569 miles of ridgelines as unsuitable for surface coal mining would prevent surface coal mining operations and any surface operations or impacts associated with underground coal mines on 75,213 acres. Alternative 4 would not prohibit remining in previously mined areas of the designation area or the development and use of access and haul roads for use in remining.

## **Direct and Indirect Impacts**

There are approximately 219.5 miles of pre-SMCRA highwalls within the combined area of the State's petition boundary plus additional ridgelines that OSMRE determined that the State had omitted. The potential remining in the designated area could have a beneficial impact to public health and safety due to potential removal of some highwalls and pits, which could occur through reclamation. Based on the coal resources data and calculations performed by OSMRE, approximately 111.9 miles of the pre-SMCRA highwalls have been identified as potential surface mineable highwalls. Therefore according to the GIS-based calculations, slightly less than half of the 219.5 miles of highwalls present within the greater petition area are likely to be remined (based on the existence and location of coal reserves). Reclamation associated with potential remining could also reduce or eliminate the health impacts of contaminated surface water from the previously mined areas. In order to better understand the context and intensity of potential impacts, OSMRE assumes mining could impact on average 112 acres per year (totaling 3,360 acres over the 30-year planning timeframe). OSMRE developed this average rate based on the historic trend; however, the rate could fluctuate over time depending on engineering and economic factors and/or other free market conditions. A portion of this average mining rate of 112 acres per year could be remining.

## **Cumulative Impacts**

Cumulative impacts on public health and safety would be adverse as described in the "Cumulative Impacts" section of alternative 1. It is noted that there are 199 oil/gas wells within the petition area. The impacts of alternative 4, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on health and safety. Alternative 4 would contribute to adverse impacts in the vicinity

of remining areas and haul roads, and beneficial impacts from a reduced area of mining along ridgelines and associated high-use recreation areas and reclamation of remined areas.

### **Conclusion**

Alternative 4 would reduce near-term localized hazards associated with surface mining operations in the designation area. Potential remining within the designation area could have near-term localized adverse impacts but could have long-term beneficial impacts on public health and safety if the reclamation reduces the existing terrain hazards. Reclamation associated with remining could also reduce or eliminate the health impacts of contaminated surface water from the previously mined areas. Permits stipulate safety requirements and environmental protection measures (30 CFR § 773.17), but accidents and unintended environmental harm could still occur during mining or reclamation activities. Adherence to the requirements of SMCRA and the Mine Safety and Health Act would reduce the risk to public health and safety from surface mining operations. Impacts from alternative 4 would overall be minor and not significant.

### **ALTERNATIVE 5: TARGETED RESOURCE PROTECTION DESIGNATION**

Alternative 5 would designate as unsuitable for surface coal mining 12,162 acres of the NCWMA and ERTCE due to the presence of sensitive resources.

### **Direct and Indirect Impacts**

There are approximately 30 miles of highwalls within the designation area and no beneficial impacts to public health and safety would be realized for removal of highwalls through remining and reclamation since no remining under SMCRA Title V is allowed for this alternative. As no coal removal typically occurs under a Title IV funded abandoned mine lands reclamation project, such projects would not be impacted by a designation of unsuitability. Impacts to public health and safety from alternative 5 would be the very similar to those described under alternative 1 except because surface mining would not occur in the designation area, there would be no impacts to recreational users in the designation areas from future mine site hazards, vehicle traffic; construction of haul roads; combustion from engines; noise; fugitive dust; blasting; fire; and water contamination.

### **Cumulative Impacts**

Cumulative impacts on public health and safety would be adverse as described in the “Cumulative Impacts” section of alternative 1. It is noted that there are 17 oil/gas wells within the sensitive resource area). The impacts of alternative 5, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on health and safety. The slight impacts of alternative 5 would not alter the cumulative level of impact.

### **Conclusion**

Alternative 5 would reduce near-term localized hazards associated with surface mining operations in the designation area. Barring remining from the designation area would allow terrain hazards and water quality issues from pre-SMCRA mines to persist. Permits stipulate safety requirements and environmental protection measures (30 CFR § 773.17), but accidents and unintended environmental harm could still occur during mining or reclamation activities. Adherence to the requirements of SMCRA and the Mine Safety and Health Act would reduce the adverse risks to public health and safety from surface mining operations. Impacts from alternative 5 would be very minor and not significant.

## **ALTERNATIVE 6: REDUCED CORRIDOR DESIGNATION**

The designation of a 600 foot corridor centered on 505 miles of ridgelines as unsuitable for surface coal mining would prevent new surface coal mining operations and any surface operations or impacts associated with underground coal mines on 38,660 acres.

### **Direct and Indirect Impacts**

There are approximately 108 miles of highwalls within the reduced State petition area and no beneficial impacts to public health and safety would be realized for removal of highwalls through re-mining and reclamation since no re-mining is allowed for this alternative. Impacts to public health and safety from alternative 6 would be the very similar to those described under alternative 1 except, because surface mining would not occur in the designation area, there would be no impacts to recreational users in the designation area from future mine site hazards, vehicle traffic; construction of haul roads; combustion from engines; noise; fugitive dust; blasting; fire; and water contamination.

### **Cumulative Impacts**

Cumulative impacts on public health and safety would be adverse as described in the “Cumulative Impacts” section of alternative 1. It is noted that there are 126 oil/gas wells within the reduced corridor petition area. The impacts of alternative 6, when added to the impacts of actions by others, would result in overall adverse cumulative impacts on health and safety. The impacts of alternative 6 would be minor and would not alter the cumulative level of impact.

### **Conclusion**

Alternative 6 would reduce near-term localized hazards associated with surface mining operations in the designation area. Barring re-mining from the designation area would allow terrain hazards and water quality issues from pre-SMCRA mines to persist. Permits stipulate safety requirements and environmental protection measures (30 CFR § 773.17), but accidents and unintended environmental harm could still occur during mining or reclamation activities. Adherence to the requirements of SMCRA and the Mine Safety and Health Act would reduce the slight adverse risks to public health and safety from surface mining operations. Impacts from alternative 6 would be minor and not significant.

## **UNAVOIDABLE ADVERSE IMPACTS**

Unavoidable adverse impacts are those impacts that would likely occur from an alternative even after mitigation has been implemented (42 USC § 4332 (c)(ii)). Unavoidable adverse impacts would stem largely from alternatives that allow for mining and potential re-mining activities to occur, while some would also likely occur from the designation of lands as unsuitable for surface coal mining operations. The following discussion describes potential unavoidable impacts.

**Earth Resources:** Unavoidable adverse impacts would occur from disturbances to earth resources (geology and topography) resulting from surface coal mining operations and road development associated with all permitted activities. The no-action alternative would result in more unavoidable impacts than under the action alternatives if coal mining operations are permitted and implemented. Alternatives 3, 4, and 6 would allow for potential re-mining operations, which would have unavoidable impacts even after site reclamation has occurred. Alternatives 2, 5, and 6 would only allow for underground and auger mining from outside the designation areas; however, the removal of earth resources (coal and overburden) would have unavoidable adverse impacts to earth resources. Alternative 5 would designate much less land

as unsuitable for surface coal mining operations and would likely result in higher unavoidable adverse impacts than other action alternatives.

**Air Quality and Greenhouse Gases:** Alternatives that allow for coal mining operations such as surface coal mining under the no-action alternative and potential remining under alternatives 3, and 4 would result in the avoidable emission of air pollutants and greenhouse gases. The no-action alternative would result in the most avoidable impacts, although the reduced designation area associated with alternative 5 would allow for surface coal mining in more areas than other action alternative, indirectly resulting in unavoidable impacts. Alternative 2, 5, and 6 would result in the least emissions as only underground and auger mining is allowed from outside the petition designation area. However, there would still be unavoidable releases of air pollutants and greenhouse gases.

**Water Resources:** Unavoidable adverse impacts to water resources include impacts to surface water and groundwater, and wetlands. All alternatives would allow mining to continue within land subject to active permits. Unavoidable adverse impacts to water resources could result from the release of sediments and pollutants to water bodies during operations, including surface waters and wetlands. In addition, all alternatives would allow underground coal mining operations from outside designated areas. Although mitigation would take place there would likely be longer-term alterations of groundwater flows due to the presence of the mine. Alternatives 2, 5, and 6, which do not allow remining, would result in pre-SMCRA activities continuing impact nearby water resources and impact flows. Furthermore, the smaller petition designation area in alternative 5 would allow for permitted surface coal mining operations to take place in non-designated areas indirectly increasing impacts on downslope and downstream water resources. These impacts could include wetlands removal and acid mine drainage, and discharges of pollutants.

**Vegetation and Soils:** Unavoidable adverse impacts common to all alternatives that allow for some level of surface coal mining or remining operations include all clearing of, and disturbance to, vegetation and soils resulting from mine site preparation and road development. These alternatives would continue to have indirect adverse impacts on vegetation and soils until operations are completed and reclamation occurs. Alternative 1, the no-action alternative, would allow for the most surface coal mining operations to occur within the petition area. Therefore it would result in the most unavoidable adverse impacts to vegetation and soils. Alternatives 3, and 4 could result in some level of impact through potential remining, although reclamation would result in long-term site and vegetation restoration. Alternatives 2, 5, and 6 would result in the least amount of unavoidable adverse impacts since surface coal mining and remining would not be allowed in the designation areas.

**Fish and Wildlife:** Many of the unavoidable adverse impacts to fish and wildlife would be as a result of indirect effects to vegetation and water resources, either through habitat loss or degradation (both terrestrial and aquatic). In addition, the use of heavy machinery, blasting, and coal transport has the potential to result in killing less mobile species of wildlife. Noise disturbance and the presence of humans would also result in wildlife avoiding particular areas. Most of the unavoidable adverse impacts would result from alternative 1, the no-action alternative, through the permitting of future coal mining operations. In contrast, alternatives 2, 5, and 6 would seek to provide protection to fish and wildlife through the designation of lands unsuitable for surface coal mining operations. Alternatives 3, and 4 would result in varying amount of impacts, although reclamation could result in long-term benefits.

**Special-Status Species:** Unavoidable adverse impacts could also occur to special-status species. These impacts would be similar to those described above for fish and wildlife generally. However, the intensity of the impacts could be greater given the sensitive nature of potentially affected protected species (see Fish and Wildlife discussion above).

**Land Use and Recreation:** Alternatives that allow for coal mining operations such as surface coal mining under the no-action alternative and remining under alternatives 3 and 4 would result in the unavoidable effects on surface resources within the NCWMA. However, the evaluation area has been subject to surface coal mining operations and changes to the use of the area could also be adverse to some interests. For example, under alternative 1 the permitting of future surface coal mining operations would continue. This could interfere with recreation and wildlife management in the area; however the use would be consistent with past practices. The action alternatives would all result in a designation of lands unsuitable for coal mining operations, which would result in adverse impacts to coal mining interests, yet preserve habitat and improve access to recreation.

**Aesthetics:** Unavoidable impacts to visual resources and light pollution would occur as a result of continued surface coal mining operations under the no-action alternative as well as in alternatives 3 and 4. The degree of impacts would vary based on the different alternatives and the associated amount of land available for surface coal mining, with the no-action alternative, resulting in the greatest unavoidable adverse impacts based on the greater availability of lands for mining operations. Unavoidable impacts to visual resources include intrusions into the landscape by mining personnel and equipment and through the removal of vegetation and construction of highwalls, access roads, and mines. While the lack of scenic vistas and mitigation through the replanting of vegetation would work to minimize these impacts, localized impacts would still remain. Similarly operations occurring at night have the potential to create light pollution, adversely affecting the night sky and while the scale of these impacts is dependent on the amount and type of activity, impacts to the night-sky would still occur. Alternatives 2, 5, and 6 would allow for underground and auger mining outside of the designated areas as well as for surface mining in lands already permitted under SMCRA. Unavoidable impacts to aesthetics and the night-sky would be similar to those presented above, albeit substantially reduced for both alternatives as a result of the reduction in area available for potential surface mining operations, with alternative 2 having the least amount of potential unavoidable adverse impacts of any of the alternatives. Unavoidable adverse impacts are not anticipated as a result of underground mining.

Although best management practices and required performance standards would result in reduced ambient sound levels relative to noise-sensitive receptors, increased ambient sound levels from truck traffic, blasting, and other heavy machinery would still occur for the duration of mining activities, and is therefore unavoidable for each alternative that allows surface coal mining. Sound levels between a mining site and a potential receiver will fluctuate based on the direction of blasting, transport routes, and changes in the density, relative humidity, and temperature of the volume of air in the atmosphere. Noise will also vary based on the alternative, with the no-action alternative having the greatest impact on the soundscape. Alternatives 2, 5, and 6 would have the least unavoidable impacts as only underground or auger mining could occur from outside the petition area. However, alternative 5 would designate less land, leaving more available for future surface coal mining operations.

**Socioeconomics and Environmental Justice:** Unavoidable impacts to socioeconomic resources would occur as a result of restrictions on surface coal mining operations under the action alternatives. The degree of impacts would vary based on the different alternatives and the associated amount of land available for surface coal mining, resulting in various reduced levels of coal mining production (compared to the no-action alternative), with alternative 4, resulting in the greatest unavoidable adverse impacts based on the least availability of lands for mining operations. Unavoidable impacts to socioeconomic resources associated with reduced coal mining include a loss in mining jobs, income, and additional economic activity. However, the loss of mining jobs account for a very small proportion of the workforce in the evaluation area, and the losses may be offset as mining companies find other suitable lands to mine or develop underground mines outside the petition area to access minerals under the petition area. Unavoidable impacts to socioeconomic resources could also occur as a result of continued surface coal mining operations under the no-action alternative and its possible adverse effects on recreation and

visitor spending in the area. Unavoidable impacts to recreation and visitor spending could also occur under the action alternatives, but these would be less than those experienced under the no-action alternative. The degree of impacts would vary based on the different alternatives and the potential impact on recreational amenities, trails, viewscapes, and other factors that might draw visitors to the area.

Disproportionate impacts are not expected to accrue to minority and low-income populations within the evaluation area, as compared to the general population, from either continued mineral production (as under the no-action alternative) or as a result of a reduction in the available area for mineral production resulting from the designated protection area (under the action alternatives). Therefore, no unavoidable impacts to minority and low-income populations are expected to occur.

**Cultural Resources:** The exact nature of unavoidable adverse impacts to cultural resources is currently unknown. Continuing consultation and follow-up cultural resources investigations would be completed prior to any ground-disturbing work to identify resources and determine the potential adverse effects. Any unavoidable adverse effects identified during these investigations would be documented in consultation with the State Historic Preservation Office and consulting parties and the appropriate mitigation measures would be established. There is the potential for cultural resources to be adversely affected during construction. Protective measures would be established to ensure that construction activities would not occur until consultation with the State Historic Preservation Office and consulting parties is complete and protective or mitigation measures established.

**Public Health and Safety:** Although all practicable efforts would be made to eliminate public health and safety concerns, unavoidable adverse impacts in designated areas may still occur under all alternatives. Alternative 1 has the highest potential for avoidable impacts as it would allow for the permitting of surface coal mining operations in the petition area. Permits would stipulate safety requirements, but accidents could still occur. The relative risk of unavoidable adverse impacts would be lessened for the alternatives that designate lands unsuitable for surface coal mining operations while still allowing for remining, such as alternatives 3 and 4. Alternative 2, 5, and 6 would pose the lowest risks in designated areas.

## **RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY**

NEPA requires each EIS to discuss “the relationship between local short-term uses of man’s environment and the maintenance of and enhancement of long term productivity” (42 USC § 4332 (C)(iv)). OSMRE must consider if the effects of the alternatives involve tradeoffs of the long-term productivity and sustainability of resources for the immediate near-term use of those resources. It must also consider if the effects of the alternatives are sustainable over the long term.

Under any alternative that would allow mining, if a mining operation were approved, operations within the petition area would result in disturbances necessary to remove the coal resource as well as construct haul roads, sediment ponds, and other ancillary mine structures and facilities. Components of the present ecological system, some of which have already been affected by previous mining in the area, would be further modified or eliminated.

The postmining topography of the area would be returned to the approximate original contour. Therefore, long-term mining-related impacts to the topography would be minimal, following reclamation of the mined areas.

Under any alternative that would allow surface mining, productivity of the disturbed areas would be lost during mining. Reclamation of the surface mine area would typically return the mine sites to their postmining land use. The productivity of grassland or open field type habitats is restored relatively

quickly following mining. If forestry is the planned postmining land use, reestablishment of the forest would occur 15 to 20 years after mining. There would be minor localized impacts on less mobile wildlife populations, but reclaimed mine sites would provide habitat diversity in the predominantly forested watershed (see the Fish and Wildlife section).

During mining the hydrologic balance within and downstream of the permit area would be altered. With the exception of sedimentation, changes in water quality would generally be long term. Based on existing abandoned mine data, chemical changes to water and depletion of water would last many years. The affects would vary depending on the amount of rainfall the watershed receives during mining. Short-term increases in sedimentation could result during sediment basin and haul road construction and during storm events exceeding the 10-year, 24-hour precipitation event design of the structures. However, there should be no long-term effects on aquatic habitat from siltation. Sedimentation effects would be near term; returning to background levels or less within 5 to 10 years after mining.

The immediate impact on groundwater resources would be dependent on the type and intensity of mining within the petition area. The primary impact to groundwater under the alternatives that allow mining would be resource diminution resulting from subsidence of aquifers and piracy of groundwater into mine voids through stress-relief fracturing. Although there are no local well users identified in the petition area to be impacted by contamination or diminution of the groundwater resources, regulations (30 CFR § 816.41(h)) require that any person who conducts surface mining activities that result in adverse impacts to water supplies must replace those water supplies.

Mining and hauling operations would degrade the visual resources of the permit area during the life of the mine. However, following the removal of surface facilities and completion of reclamation, the overall long-term impact on visual resources would be negligible after reforestation. In those situations where pre-SMCRA abandoned mine problems such as highwalls were present, remining of these areas has the potential to improve the visual resources of the area following reclamation and reforestation.

Coal has been mined within the evaluation area for many years and unless precluded by an unsuitability designation, is likely to continue for some years into the future. However, when compared to earth or ecologic processes, coal extraction is a short-term use of the land and once used, the coal resource is non-renewable. Although a short-term use of the land, coal mining has a beneficial economic impact in terms of direct employment, royalty payments, severance taxes, and a reclamation fee on every ton of coal removed by surface or underground mining. This fee is used to reclaim mines with problems that occurred prior to the passage of SMCRA if the mined areas would allow the scenic, recreational, and timber value of the area to recover, permitting tourism, recreation, and logging to continue as long-term economic influences. Under any action alternative that precludes or limits mining, the above identified jobs, royalty payments, and tax and reclamation fee collections would be lost or reduced commensurate with the level to which coal extractions would be reduced.

## **IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES**

NEPA requires that each EIS to describe “any irreversible and irretrievable commitments of resources” associated with implementation of the alternatives (42 USC § 4332 (C)(v)). A resource commitment is considered *irreversible* when impacts from its use limit future use options. Irreversible commitment applies primarily to nonrenewable resources, such as minerals or cultural resources, and to those resources that are renewable only over long time spans, such as soil productivity. A resource commitment is considered *irretrievable* when the use or consumption of the resource is neither renewable nor recoverable for use by future generations. Irretrievable commitment applies to the loss of production,

harvest, or natural resources. For example, in the surface mining of coal, the removal of coal would be an irreversible and irretrievable commitment of resources. While the coal would be irreversibly retrieved from the geologic formations, it is also irretrievably committed when burned for electrical generation. Another example of irreversible loss involves soil loss or erosion. Soil losses from handling, erosion losses from topsoil stockpiles, and other unavoidable erosion losses of native soils would be irreversible. The Clean Water Act and SMCRA require soil erosion and sedimentation to be minimized and otherwise controlled to mitigate these effects to the maximum extent feasible.

### **ALTERNATIVE 1: NO-ACTION ALTERNATIVE**

The no-action alternative would allow for surface coal mining operations to occur in the evaluation area including the State's petition area. These mining operations would result in the removal of coal, which would be used in the future to generate electricity. As described above, this would be considered an irreversible commitment of resources. The operations activities necessary for the removal of coal would result in the use of fossil fuel combustion engines, which would also result in an irreversible commitment of resources.

The no-action alternative would also result in the irretrievable commitment of resources. The surface coal mining process would result in the removal of timber, other vegetation, and soils. These activities could limit vegetative regeneration and soil productivity. It could also result in the killing of less mobile species of wildlife.

### **ACTION ALTERNATIVES 2 THROUGH 6**

The action alternatives would result in similar impacts to the no-action alternative, although to a lesser degree. "Alternative 2: State Petition Designation," and "Alternative 6: Reduced Corridor Designation," would result in the least amount of irreversible and irretrievable commitment of resources because no surface coal mining operations would be permitted in their respective areas. Surface coal mining could occur in a larger area under alternative 6 because the reduced corridor width would allow for the potential to permit surface coal mining operations. However, the designation of lands unsuitable for surface coal mining operation could result in economic irretrievable commitment of resources, as revenue from coal mining areas would decrease from less coal being minable.

"Alternative 3: State Petition Designation with Potential Remining and Road Access" and "Alternative 4: Expanded Corridor Designation with Potential Remining and Road Access," would result in the mining of coal through potential remining. This could result in the removal of coal and the associated irreversible commitments of resources as described for the no-action alternative. Alternative 3 would result in higher irreversible commitments of resources because less land would be designated as unsuitable for surface coal mining operations than under alternative 4. The irretrievable commitment of resources would be similar to that described for the no-action alternative, although remining would reduce the length of time for site reclamation and revegetation. Although these two alternatives could also result in economic losses, the losses would be lower than those alternatives that do not allow for remining.

"Alternative 5: Targeted Resource Protection Designation," would result in more irreversible commitments of resources than alternatives 2, 3, 4, and 6, as it would designate the least amount of land as unsuitable for surface coal mining operations. Although alternative 5 would protect certain areas, irreversible and irretrievable commitment of resources would be more similar to the no-action alternative than the other action alternatives.

# CLIMATE CHANGE

## INTRODUCTION

Climate is the prevailing condition of the atmosphere for a particular region and time period, usually measured over 30 years (National Aeronautics and Space Administration 2005). Climate change refers to any *significant change* in this measure, which can be as small as 2°F (EPA 2014e). The average temperature of the earth has risen 1.4°F over the past century (EPA 2014e). This small change in the average global temperature may translate to potentially dangerous shifts in climate and weather (EPA 2014e). Several activities contribute to the phenomenon of climate change, including emissions of greenhouse gases from fossil fuel development, large wildfires, activities using combustion engines, changes to the natural carbon cycle, and changes to radiative forces and reflectivity (albedo) (McNulty et al. 2013; BLM 2008).

Climate change can produce a range of environmental effects. Effects may include increases or decreases in temperature and precipitation on a seasonal basis, increases in freeze-thaw cycles, and increased occurrences of flooding, drought, and wind erosion (US Department of State 2013). It may also lead to broader effects such as changes to terrestrial and aquatic flora and fauna (US Department of State 2013). Reports by the US Climate Change Science Program and the Fifth Assessment Report of the Intergovernmental Panel on Climate Change show that there have been clear patterns of elevated global temperatures and long-term trends in precipitation change around the world since 1900 (IPCC 2014, US Forest Service 2011). There are currently gaps in information about the timing, scale, and location of specific climate change impacts (US Forest Service 2011). Therefore, it is important to note that greenhouse gases may have a sustained climatic impact over different spatial and temporal scales (EPA 2014e). In the southeastern United States, researchers anticipate decreased water availability exacerbated by population growth, land-use change, and extreme weather events (Melillo, Richmond, and Yohe 2014).

## METHODOLOGY

There is no settled methodology for analyzing climate change in the impact assessment of a project (Gerrard 2008). Several different protocols exist, including those from the Massachusetts Executive Office of Energy and Environmental Affairs, the California Association of Environmental Professionals, and the Canadian Environmental Assessment Agency. The World Resources Institute and the World Business Council for Sustainable Development have developed a Greenhouse Gas Protocol Initiative that assesses climate change based on several broad categories: operational impacts (i.e., smokestack emissions), purchased electricity, induced trips, construction impacts, and the impact of climate change on the project. The Council on Environmental Quality issued final guidance document in 2016 to provide federal agencies with direction on how to consider the effects of both greenhouse gas emissions and climate change in their evaluation of proposed actions.

A greenhouse gas analysis was provided in the section on Air Quality and will not be reiterated below. The climate change analysis herein follows the guidance of the Council on Environmental Quality concerning the environmental effects of climate change. The potential impacts to natural resources are assumed to be the sum of at least three variables: (1) the rate of temperature change, (2) the level of temperature change, and (3) changes in precipitation and evaporation.

## **THE RELATIONSHIP BETWEEN GREENHOUSE GASES, CLIMATE CHANGE, AND MINING**

The greenhouse effect is a natural phenomenon that insulates the Earth. As incoming solar radiation is absorbed and re-emitted back from the surface of the earth as infrared energy, greenhouse gases in the atmosphere prevent some of this heat from escaping into space, instead reflecting the energy back to further warm the surface (Center for Sustainable Systems 2014a). Any disturbance to this process of incoming and outgoing energy, such as those emissions produced by human activities, is referred to as a positive or a negative climate forcing (Center for Sustainable Systems 2014b). Positive forcings include the release of greenhouse gases, and exert a warming influence on the Earth. Negative forcings include the release of sulfate aerosols, and exert a cooling influence. Increased concentrations of greenhouse gases from both human and non-human sources have inflated the absorption and emission of infrared energy, enhancing the natural greenhouse effect.

Climatic fluctuations as a result of greenhouse gases are not spatially consistent around the globe. Although climate change models are rarely numerically homogenous, they do generally agree that temperatures will increase in the United States (IPCC 2014). If, for example, the average global temperature rose 3.6°F, nearly every subsequent summer would be warmer than the hottest 5% of summers in recent history (National Research Council 2011). In Tennessee, precipitation has fluctuated between 35.6 and 66.6 inches annually over the last century, with an average near the evaluation area of 51.9 inches (NOAA 2014). Despite this level of rainfall, records since 2000 indicate that drought levels were highest in 2007, with wildfire frequency peaking that same year (NDMC 2014; BurnSafeTN 2014). In that same period, evaporation statewide was highest in 2013 (NOAA 2014).

As mentioned in the section on air quality, emissions from the combustion of coal would contribute to increased greenhouse gases (i.e., carbon dioxide, methane, and nitrous oxide). Coal mining in the petition area would generate direct emissions from the use of heavy-duty diesel equipment, coal haul trucks, and worker transportation. Coal mining would also generate indirect emissions from the use of extracted coal by end-users. Complete combustion of 1 short ton of coal generates about 2.86 short tons of carbon dioxide (Hong and Slatick 1994). Approximately 302,135 short tons of coal was extracted from mines in Anderson and Campbell Counties in 2012. This amount of coal, when burned, would emit approximately 864,106 short tons of carbon in one year. Furthermore, mining produces significant quantities of methane, which has a warming potential twenty times greater than that of carbon dioxide (EPA 2014c). This means that methane has a larger impact on global temperatures over a shorter amount of time than carbon dioxide. However, the amount of methane released from mining activities depends on coal rank, seam depth, and the methods used to mine (Irving and Tailkov 1999).

### **CHANGING ENVIRONMENTAL BASELINE**

A baseline period is needed to define the observed climate, with which climate change information is usually combined to create a climate scenario. Environmental processes that occur over longer timescales may require very long observational baselines before much scientific progress can be made (IPCC 2013). If baselines change or are changing, many scenarios related in some way to “natural” climatic conditions will assume erroneous starting points (Pinnegar 2008). As problematic as this may be, the emergence of climate change modeling and adaptation have resulted in greater emphasis on establishing baselines. Regardless of the baseline used, nearly all climate scenarios conclude warming will continue (IPCC 2013).

Two primary sources were used in the following discussion: (1) Climate Change and Potential Impacts to Wildlife in Tennessee, developed by the TWRA, and the (2) Economic Impacts of Climate Change on Tennessee, developed by the Center for Integrative Environmental Research at the University of Maryland.

## Precipitation

The seasonal variability of precipitation may increase over most areas in Tennessee (McNulty et al. 2013). Streamflow patterns may change in response to reduced snowpacks and increasing or decreasing precipitation (Kunkel et al. 2013; BLM 2008). Peak flows in spring are expected to occur earlier and be of lower magnitude because of snowpack changes. Runoff from greater amounts of winter rainfall may cause higher winter flows. Summer flows may be lower, but with higher variability depending on the severity of storm events (BLM 2008).

## Fire Frequency

Fire frequency, severity, and extent may increase because of the increased availability of fine fuels (i.e., grasses, forbs, and invasive species) and accumulation of fuels from previous growing seasons (i.e., down woody debris (McNulty et al. 2013; BLM 2008). Higher temperatures may extend the length of fire seasons (McNulty et al. 2013). Increasing tree densities could increase the number of high severity crown fires. Higher rates of insect damage and disease also may increase fuel accumulations (BLM 2008). Under warmer climate scenarios, catastrophic fire could be the major change agent for decline of southeastern forests (TWRA 2009).

## Biodiversity

Sensitive species and overall biodiversity may be reduced (Staudt et al. 2013; BLM 2008). High-elevation habitats may shrink in the area or disappear as lower-elevation plant communities expand. It is probable that some mammalian and avian species that currently inhabit this area may become extirpated, as the Appalachian Mountains have served as climate refugia for these animals (Lawler et al. 2013; BLM 2008). Higher rates of disease and insect damage also may pose threats to other sensitive plant and animal species (Staudt et al. 2013; BLM 2008). Within the Cumberland Plateau, the following biological effects could potentially be seen (TWRA 2009):

## Vegetative Growth and Invasive Plants

Some populations of native trees, invasive species, and pests may expand (McNulty et al. 2013; BLM 2008). Increasing amounts of atmospheric carbon dioxide and precipitation during the growing season may provide favorable growth conditions for native grasses, perennial forbs, and woody species. However, decreased precipitation during the growing season may reduce the competitiveness of some native species such as those in the oak genus (McNulty et al. 2013; Ibanez, Clark, and Dietze 2008). Insect populations may also increase because milder winter temperatures could improve reproduction and survival rates (BLM 2008).

## Trees

- Climate change could intensify infestations of the native southern pine beetle and could result in 4 to 7.5 times the current annual mortality of pines (TWRA 2009).
- Changing precipitation and temperatures patterns may increase the likelihood of pests and mortality associated with loblolly pine. Use of the loblolly pine is expected to increase meet market demands (TWRA 2009).

- Within the Cumberland Plateau, forest types may shift as temperatures increase (TWRA 2009):
  - Currently modeled forest types consist of 97% oak-hickory, 3% without available data.
  - Projected change under high carbon conditions: oak-hickory decreases to 90% and oak-pine increases from 0% to 7%, with remaining 3% without available data.
  - Projected change under low carbon conditions: oak-hickory decreases to 83%, and oak-pine increases from 0% to 14%, with remaining 3% without available data.
  - Eastern hemlock expected to disappear completely due to the hemlock woolly adelgid epidemic.

## **Birds**

- Temperature change could affect the timing and distance of waterfowl migration (Lehikoinen et al. 2013). Warmer fall and winter temperatures in northern regions would make it unnecessary for waterfowl to fly as far south to find ice-free water and suitable food.
- Nongame birds found in wetlands and mature forests may suffer declines in Tennessee with habitat loss, northward range shifts, and reduced reproductive success related to spring arrival. The timing of peak insect emergence, reduced insect availability with drought conditions, and poor physical condition due to food availability may further affect nongame birds.
- Long-distance migrant non-game birds may likely suffer the greatest declines with the confounding factors of reduced winter habitat quality (i.e., more xeric) and direct loss of winter habitats in the tropics, thus birds may arrive to breed when in poor physical condition (Both et al. 2010).

## **Amphibians**

- Wetland acreage may be reduced and aquatic and semi-aquatic species may suffer declines as habitat disappears (Mantyka-Pringle 2012). Because species distributions are a function of dispersal ability, amphibians may suffer more than other vertebrates (Pounds et al. 2006).
- The green treefrog is expanding eastward in range. The west Tennessee species can now be found in Hamilton and Anderson Counties. Possible explanations may be climate change, anthropogenic interference or the release of pet green treefrogs.
- Climate change in the Blue Ridge Mountains may be linked to green salamander declines because the population is at higher elevations, and thus in a colder climate, than other populations (Corser 2001). Furthermore, the green salamander may lose up to 49% of its habitat by 2050 (Sutton et al. 2014).

## **Fish**

- Effects on fish and mussel populations are expected to be greatest in mountainous parts of the Cumberland Plateau and east Tennessee where large numbers of endemic species exist.
- The coldest headwaters and spring influenced habitats are at risk of being lost due to increased air temperature. Brook trout are likely to lose the most habitat (Wenger et al. 2011). Brown and rainbow trout may be able to shift upstream in a warmer headwater habitat, while the brook trout may have no alternative habitat.

- Changes in the amount, frequency, and timing of precipitation, and the shift toward more rainy and icy winters could compromise water supplies and water availability for fish and various habitats.

## Mammals

- Warming or drying of Tennessee's mountainous climate could restrict the distribution of the red squirrel, star-nosed mole, water shrew, rock vole, and the Carolina northern flying squirrel as these mammals prefer cool and humid environments.

## Economic Effects

As an inland state, Tennessee may not be directly influenced by sea level rise. Additionally, much of the State's economy is based on the service sector, most of which is not linked to climate (Center for Integrative Environmental Research 2008). Yet, the service sector may experience impacts to the extent that energy and water supply are affected by climate, and as other parts of the economy, for which services are provided, experience losses in productivity, revenue, or employment. Other economic sectors in the states are linked to climate variables. The two industries most impacted by impending climate change may be forestry and agriculture (Center for Integrative Environmental Research 2008).

**Forestry:** Tennessee is the number one producer of hardwood flooring in the United States and is ranked second in the United States in hardwood lumber production (US Department of Commerce, Economics and Statistics Administration 2006). In 2000, the forest product industry accounted for 6.6% of the State's gross domestic product, generated \$21.7 billion in economic output, and employed 180,000 people in the forest product industry (English, Jensen, and Menard 2001). Tennessee forests are large, natural economic assets, covering 55% of state land. Hardwood species, including oak, maple, and hickory, constitute the majority of trees on forested lands (Tennessee Department of Agriculture 2008). In contrast to the national trend, forested land in Tennessee has increased in recent years due to farmland conversion. Almost all of the additional growth has occurred naturally (Center for Integrative Environmental Research 2008).

Forest growth could be stimulated under climate change scenarios that predict increases in temperature and precipitation. Higher temperatures increase the metabolic rates of plants, and enhanced precipitation can also positively impact growth. Furthermore, higher concentrations of carbon dioxide can increase productivity through "carbon fertilization" (Fuhrer 2003). One research study has found that a 50% increase in atmospheric carbon dioxide concentrations resulted in a 23% increase in forest productivity (Zhang 2007).

If such an increase occurs, it would add nearly \$8.7 billion in direct and indirect economic contributions to the State's economy (Regional Economic Studies Institute 2008). However, researchers estimate that if ground-level ozone increases as expected, plant productivity could decline by over 10% by 2100 (Center for Integrative Environmental Research 2008). Ground-level ozone is harmful to plants because it interferes with their ability to store nutrients, which could counteract some of the productivity gains from carbon fertilization (Center for Integrative Environmental Research 2008). Thus, the net effect on the productivity of the Tennessee forestry sector has both positive and negative impacts.

**Agriculture:** In 2007, crop and livestock production accounted for less than 1% (\$1.7 billion) of the Tennessee State gross domestic product (Bureau of Economic Analysis 2007). Cattle and calves are the top agricultural commodity with 18.8% of state agricultural receipts. Poultry is second at 16%, followed by cotton, greenhouse/nursery products, and soybeans (NRCS 2006). Tobacco, though a modest contributor to state sales, also remains an important crop, as Tennessee ranks third in the country in

tobacco production. Most agricultural land is devoted to livestock foraging, followed by soybean and cotton production (USDA 2002).

Due to the projected increase in temperature and carbon dioxide, crop productivity is likely to increase for specific crops. One study modeled the effect of doubled carbon dioxide on soybean yields (Center for Integrative Environmental Research 2008). Given warming alone, yields are likely to decrease. However, the effect of carbon fertilization dominates soybean yields, producing between a 14% and 30% increase in yields and between \$350,000 and \$750,000 in increased soybean sales depending on the climate scenario (Alexandrov and Hoogenboom 2000). Cotton is projected to thrive under warmer and high carbon dioxide scenarios with cotton yields in Tennessee increasing between 6 and 37%. Such a change in productivity could increase annual cotton sales by \$200,000 to \$1.2 million (Doherty et al. 2003). The positive economic impacts from higher cotton and soybean yields top \$2 million (Regional Economic Studies Institute 2008).

Despite these gains in the state agricultural sector from higher temperatures and carbon dioxide concentrations, many uncertainties exist, including precipitation variability and ozone levels (Center for Integrative Environmental Research 2008). For example, researchers at the Massachusetts Institute of Technology predict a reduction in crop yield by as much as 10% when changes in ground-level ozone concentration are considered (Reilly et al. 2007). While precipitation is likely to increase for Tennessee on an annual average basis, so are extreme events such as heat waves, droughts, and floods. Because these types of events are highly unpredictable, a large amount of uncertainty exists for agricultural productivity, especially concerning livestock.

## **SUMMARY**

A standard climatic baseline is needed to better predict the impacts of climate change on Tennessee. Currently, most climate change scenarios conclude continued warming of the planet. Although climatic fluctuations as a result of greenhouse gases are not spatially consistent around the globe, continued warming may lead to broad effects on the environment. For example, plants may have longer growing seasons. However, the health of plants will be dependent on the quantity of rainfall, wildfire variability, and the level of insect infestation. Long-distance migrant non-game birds may likely suffer the greatest declines among avian species as a result of reduced winter habitat quality. Wetland acreage may be reduced under increased temperature scenarios, negatively impacting aquatic and semi-aquatic species. Effects on fish, mussel, and mammalian populations are expected to be greatest in the mountainous parts of the Cumberland Plateau and eastern Tennessee.

Timber and crop productivity in the forestry and agriculture sectors may increase as a result of precipitation and temperatures changes. Higher temperatures increase the metabolic rates of plants, and enhanced precipitation can also positively impact growth. Furthermore, higher concentrations of carbon dioxide can increase productivity through “carbon fertilization.”

The EPA projects that the increased temperatures in Tennessee may become more hospitable to disease-carrying insects, potentially increasing incidences of malaria, Lyme disease, and dengue fever. Higher temperatures and heat waves may likely increase the number of heat-related deaths and illnesses as well.

# Chapter 7

## Consultation and Coordination

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## **CHAPTER 7: CONSULTATION AND COORDINATION**

Consultation and coordination contributes to a successful, collaborative petition evaluation document / environmental impact statement (PED/EIS). The goal of the consultation and coordination process is to identify key issues and sources of information early in the process to inform the analysis of project actions. The process ensures that the information requirements for each agency's permit review process are adequately addressed. Early involvement with federal, tribal, state, and local governments establishes a working relationship among agencies and governments, building trust and credibility while broadening the sources of available data for use in development of the PED/EIS, biological assessment, and cultural resource programmatic agreements. Many agency staff serve as subject matter experts in the development and review process. In addition, the cooperation among agencies and governments ensures that a diverse and comprehensive set of issues and concerns are evaluated, as each participating agency and government investigates its regulatory interest or special concerns.

At the beginning of the process, the Office of Surface Mining and Reclamation and Enforcement (OSMRE) sent letters to relevant federal, state, and county agencies to introduce this North Cumberland Wildlife Management Area, Tennessee Lands Unsuitable for Mining Draft Petition Evaluation Document / Environmental Impact Statement (draft PED/EIS). These letters initiated coordination between OSMRE and other governments and agencies that continued throughout the PED/EIS development process. Specific consultation and coordination tasks are listed below.

### **COOPERATING AGENCY COORDINATION**

#### **PROCESS/SUMMARY OF COORDINATION WITH US ENVIRONMENTAL PROTECTION AGENCY, US FISH AND WILDLIFE SERVICE, NATIONAL PARK SERVICE**

An entity may be included as a cooperating agency, if it is a federal, state, or local government agency or Native American government that has either jurisdiction by law or that has special expertise regarding the potential environmental impacts of a proposal or reasonable alternative for a major federal action affecting the quality of the human environment. The benefits of participation by cooperating agencies in the preparation of a PED/EIS include the following:

- Disclosure of relevant information early in the analytical process;
- Application of available technical expertise and staff support;
- Avoidance of duplication of other federal, tribal, state, and local procedures; and
- Establishment of a mechanism for addressing intergovernmental issues.

On June 13, 2011, a memorandum of agreement was signed to establish a cooperating agency relationship between several federal agencies, for the purpose of preparing a draft PED/EIS. Parties to the agreement included OSMRE, the US Fish and Wildlife Service (USFWS), US Environmental Protection Agency (EPA), and the National Park Service (NPS). Pursuant to the National Environmental Policy Act (NEPA), a cooperating agency is an agency that either has jurisdiction by law or special expertise related to a lead agency's proposed action. OSMRE is the lead agency for this project.

These entities agreed to provide information to meet OSMRE data needs, expand upon and provide expertise related to issue areas identified during scoping and public comment periods, and provide advance reviews of the draft PED/EIS.

Close communication between OSMRE and the cooperating agencies has been maintained during development of the PED/EIS through the preparation of monthly status reports from the lead agency to the cooperating agencies, monthly teleconference calls among all the cooperating agencies, and in-person meetings at key times during PED/EIS development requiring specific input from the cooperating agencies. The cooperating agencies assisted in the development of projects to be analyzed in the cumulative impact analysis, provided feedback on project description and alternatives to be considered, information related to their information needs in their own permit actions to ensure consistency of analysis, and provided comprehensive review of the draft PED/EIS prior to release for public comment.

## **TRIBAL CONSULTATION**

### **PROCESS/COORDINATION WITH TRIBES**

OSMRE has initiated coordination and consultation with seven tribes regarding the project. Follow-up letters were sent. Of the tribes contacted, none have requested to participate in a formal government-to-government consultation process. The following tribes were contacted:

- Absentee Shawnee Tribe of Oklahoma
- Cherokee Nation
- Chickasaw Nation
- Eastern Band of Cherokee Indians
- Eastern Shawnee Tribe of Oklahoma
- Shawnee Tribe
- United Keetoowah Band of Cherokee Indians in Oklahoma

## **PUBLIC COMMENT PROCESS**

Public participation opportunities were present throughout the NEPA process through completion of the PED/EIS. Both formal and informal participation by local residents, special interest groups, and interested persons occurred via telephone calls, electronic mail, a project website, and letters.

As required by NEPA, OSMRE conducted scoping in the early stages of the draft PED/EIS preparation to encourage public participation and solicit public comments on the scope and significance of the proposed action (Council on Environmental Quality Regulations, 40 CFR § 1501.7). OSMRE initiated the scoping process on February 8, 2011, by announcing upcoming public scoping meetings and requesting comments to determine the scope of issues and concerns that need to be considered during the analyses conducted for the PED/EIS.

### **PUBLIC NOTIFICATION**

The public scoping period for the draft PED/EIS began on February 8, 2011, with publication of the Notice of Intent in the Federal Register (76 FR § 6826) and continued until April 14, 2011. Newspaper advertisements announcing the intent to prepare a PED/EIS and hold public scoping meetings were published in several newspapers: *Clinton Courier News* on February 27 and March 6, 2011; *Knoxville News Sentinel* on February 27 and March 6, 2011; *Lafollette Press* on February 24 and March 3, 2011; *Morgan County News* on February 23 and March 2, 2011; and *Scott County News* on February 24 and March 3, 2011.

## PUBLIC MEETINGS

OSMRE hosted a total of 3 public scoping meetings in Huntsville, Lafollette, and Oak Ridge. These meetings were attended by a total of 311 people. The scoping meetings were held in a hearing format. Staff team members at the welcome station greeted meeting attendees and encouraged them to sign in to receive project information and future notifications. Table 7-1 lists the locations of these meetings.

**TABLE 7-1: PUBLIC SCOPING MEETINGS**

Meeting Locations	Date	Speakers	Attendees
Huntsville Middle School	March 8, 2011	17	66
Lafollette Middle School	March 10, 2011	40	164
Oak Ridge Middle School	March 15, 2011	24	81

The draft PED/EIS was released for public comment on December 11, 2015, for 45 days through the publication of a Notice of Availability in the Federal Register. Public meetings were held at four locations in Scott, Morgan, Anderson, and Campbell Counties. A total of 210 people attended the hearings and of those, 89 presented oral comments (table 7-2). A total of 3,854 correspondences with comments were received, including 11 form letters. There were 2,138 unique correspondences received to which OSMRE responded. See appendix J. Responding to requests by stakeholders, OSMRE reopened the comment period until February 26, 2016, on the draft PED/EIS.

**TABLE 7-2: PUBLIC COMMENT MEETINGS**

Meeting Locations	Date	Speakers	Attendees
Wartburg Central High School	January 11, 2016	16	40
Roane State Community College, Huntsville	January 12, 2016	17	29
Clinton Community Center	January 13, 2016	24	65
Campbell County High School, JROTC Room, Jacksboro	January 14, 2016	32	76

## LIST OF RECIPIENTS OF THE PETITION EVALUATION DOCUMENT / ENVIRONMENTAL IMPACT STATEMENT

The agencies, organizations, and businesses listed below were notified of the availability of the draft PED/EIS. This document was also provided to other entities and individuals who requested a copy.

### FEDERAL CONGRESSIONAL DELEGATES

- Lamar Alexander, US Senate
- Bob Corker, US Senate
- John Duncan, US House of Representatives
- Chuck Fleischmann, US House of Representatives
- Phil Roe, US House of Representatives

## **FEDERAL AGENCIES**

- EPA Region 4
- Mine Safety & Health Administration
- National Park Service, Big South Fork National River & Recreation Area, and Obed Wild and Scenic River
- US Army Corps of Engineers
- US Department of Agriculture, Natural Resources Conservation Service
- US Fish and Wildlife Service

## **STATE OF TENNESSEE**

- Bill Haslam, Governor
- Ken Yager, Senator
- Jim Hackworth, Representative
- Kelly Keisling, Representative
- Dennis Powers, Representative
- John Ragan, Representative
- Statewide Organizing for Community Empowerment
- Tennessee Department of Transportation
- Tennessee Division of Natural Areas
- Tennessee Division of Water Pollution Control
- Tennessee Historical Commission

## **AMERICAN INDIAN TRIBES**

- Absentee Shawnee Tribe of Oklahoma, Governor George Blanchard
- Cherokee Nation, Principal Chief Bill J. Baker
- Chickasaw Nation, Governor Bill Anoatubby
- Eastern Band of Cherokee Indians, Principal Chief Michell Hicks
- Eastern Shawnee Tribe of Oklahoma, Chief Glenna J. Wallace
- Shawnee Tribe, Chairperson Ron Sparkman
- United Keetoowah Band of Cherokee Indians in Oklahoma, Chief George Wicklilffe

## **LOCAL GOVERNMENT**

- Anderson County Mayor
- Mayor, City of Jacksboro
- Mayor, City of Wartburg
- Scott County Mayor
- Anderson County, Tennessee, Commissioners
- Campbell County, Tennessee, Commissioners
- Morgan County, Tennessee, Commissioners
- Scott County, Tennessee, Commissioners
- Anderson County Highway Department
- Anderson County Planning Commission
- Campbell County Highway Department
- Caryville Planning Commission
- LaFollette Regional Planning Commission

- Morgan County Executive
- Morgan County Highway Department
- Scott County Highway Department
- Scott County Planning Commission
- Winfield Planning Commission

### **PETITIONER**

- Tennessee Office of the Attorney General / Environmental Division
- Tennessee Wildlife Resources Agency

### **INTERVENORS**

- Campbell County, Tennessee
- Defenders of Wildlife
- National Coal, LLC
- National Mining Association
- National Park Conservation Association
- Natural Resources Defense Council
- Sierra Club and its Tennessee Chapter
- Tennessee Environmental Council
- Tennessee Mining Association
- Tennessee Ornithological Society
- Wartio Chapter of the National Audubon Society

### **PROPERTY OWNERS (SURFACE OR MINERAL)**

- Emory River Land Company, LLC
- Fund 7 Domestic, LLC
- Tennessee Valley Authority
- The Brimstone Company
- The Nature Conservancy
- Triple H Coal, LLC

### **OTHER STAKEHOLDERS**

- Alliance for Appalachia
- Appalachian Center for the Economy and the Environment
- Appolo Fuels, Inc.
- Center for Biological Diversity
- Chickasaw National Headquarters
- Clear Energy Corporation
- Dalco Coal Tennessee, LLC
- Davis Creek Energy, LLC
- DRC Coal, LLC & Mountainside Coal Company
- Earth First
- Hood Coal Corporation
- Kopper Glo Fuel, Inc. & Kopper Glo Mining, LLC
- Middlesboro Mining Operations, Inc.

- Montie's Resources, LLC
- Network for Environmental & Economic Responsibility
- Obed Watershed Community Association
- Peoples Appalachian Center for the Environment
- Sierra Club - Harvey Broome Group
- Tennessee Clean Water Network
- Tennessee Consolidated Coal Company
- TIAMCE, LLC
- The Coal Creek Company
- TN Citizen for Wilderness Planning
- Upper Cumberland Group Sierra Club

## LOCAL LIBRARIES

- Huntsville Public Library
- Jacksboro Public Library
- Lawson McGhee Library
- Oak Ridge Public Library
- Wartburg Public Library

## APPLICABLE LAWS ASSOCIATED COMPLIANCE AND CONSULTATION

This section addresses consultation, review, and permit requirements potentially applicable to the proposed action associated with the Endangered Species Act and the National Historic Preservation Act (NHPA).

**Endangered Species Act of 1973, as amended:** The Endangered Species Act of 1973 (16 USC § 1536), as amended in 1988, establishes a national program for the conservation of threatened and endangered species of fish, wildlife, and plants and the preservation of the ecosystems on which they depend.

The Endangered Species Act is administered by the USFWS for wildlife and freshwater species and by the National Oceanic and Atmospheric Administration Fisheries Service for marine and anadromous species. The Endangered Species Act defines procedures for listing species, designating critical habitat for listed species, and preparing recovery plans. It also specifies prohibited actions and exceptions.

Section 7(a) of the Endangered Species Act requires federal agencies to ensure that the actions they authorize, fund, and carry out do not jeopardize endangered or threatened species or their critical habitats. Section 7(c) of the Endangered Species Act and the federal regulations on endangered species coordination (50 CFR § 402.12) require that, if listed species or designated critical habitat are present and could be affected by a project, a federal agency must prepare a biological assessment to analyze the potential effects on listed species and critical habitat and make an effects determination for each species. The USFWS and/or National Oceanic and Atmospheric Administration Fisheries Service review the biological assessment and, if they conclude that the action may adversely affect a listed species or its habitat, issue a biological opinion, which includes a take statement and a list of reasonable and prudent alternatives to follow during construction. If the USFWS and/or National Oceanic and Atmospheric Administration Fisheries Service find that the proposed action may affect, but is not likely to adversely affect a listed species or its habitat, they issue a letter of concurrence.

State-listed species are those given separate or additional protection at the state level in Tennessee under the Tennessee Nongame and Endangered or Threatened Wildlife Species Conservation Act of 1974. These designations are separate from federal designation under the Endangered Species Act, but state-level designations in Tennessee are typically at the same level or higher than federal listings.

To assess threatened and endangered species within the evaluation area, a list of federally listed threatened and endangered species for Anderson, Campbell, Morgan, and Scott Counties was obtained on June 15, 2015 from the USFWS (2015b). In addition, a state list of rare species compiled by the Tennessee Natural Heritage Program (TNHP 2009) as well as county-specific lists for each of the four counties within the evaluation area was developed (TDEC 2014c). The OSMRE will fulfill its responsibilities under the act prior to implementing the preferred alternative.

**National Historic Preservation Act (NHPA) of 1966, as amended:** Section 106 of the NHPA requires federal agencies to take into account the effects of their undertakings on historic properties, and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. Historic properties are properties that are included in the National Register of Historic Places or that meet the criteria for listing in the National Register of Historic Places. If a federal agency plans to undertake a type of activity that could affect historic properties, it must consult with the appropriate state historic preservation office and/or tribal historic preservation officer to make an assessment of adverse effects on identified historic properties, and seek ways to avoid, minimize, or mitigate any adverse effects.

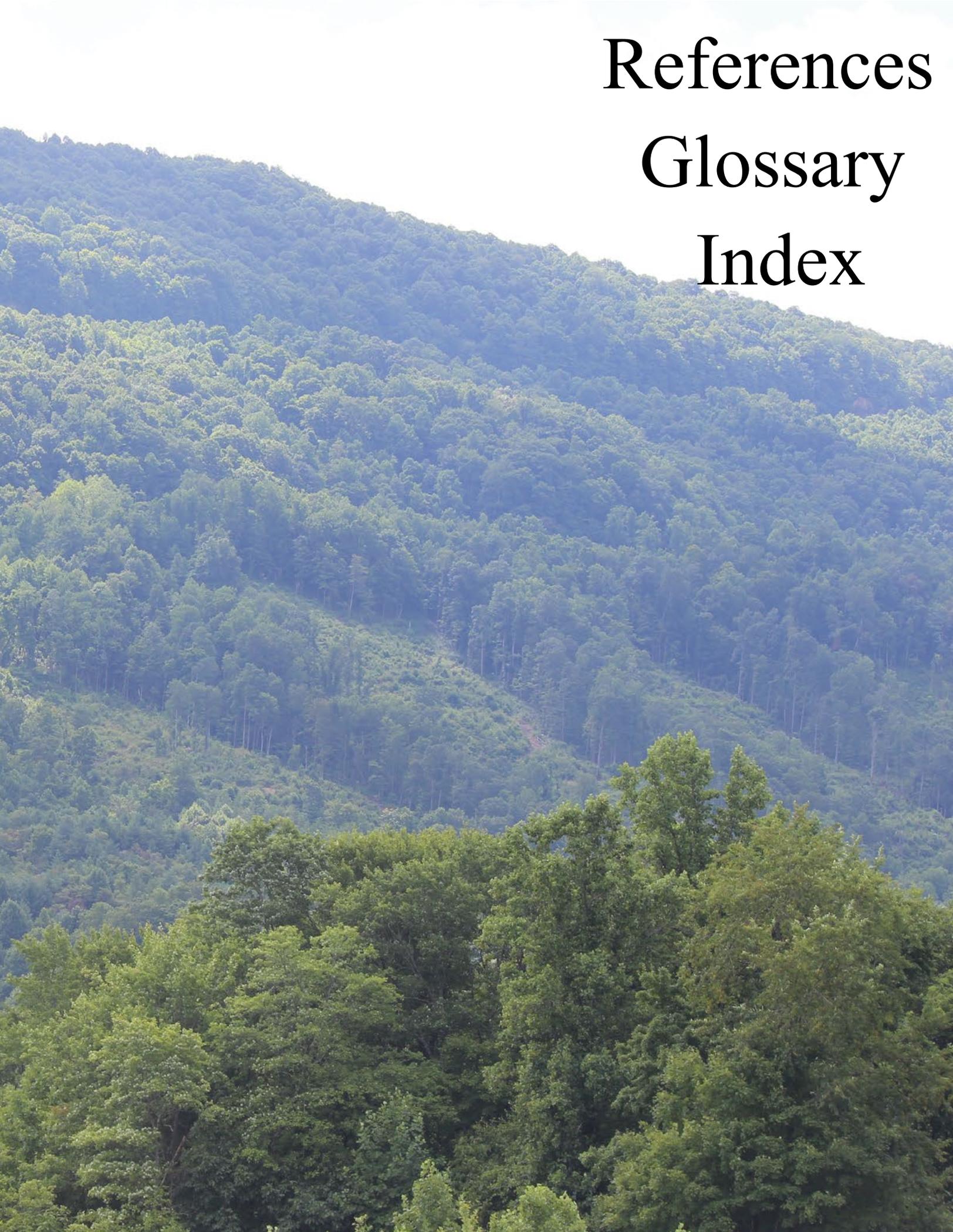
NHPA amendments specify that properties of traditional religious and cultural importance to a Native American Tribe (also known as Traditional Cultural Properties) may be determined to be eligible for inclusion on the National Register of Historic Places. In carrying out its responsibilities under section 106, the OSMRE would be required to consult with any Native American Tribe that attaches religious and cultural significance to any such properties.

OSMRE completed the section 106 process with the Tennessee State Historic Preservation Office as part of this PED/EIS process.

**Wild and Scenic Rivers Act:** This act was passed to preserve certain rivers with outstanding resource values from water development. Section 7 of the act requires federal agencies involved in water resource projects to consult with the federal river-administering agency. A water resource project can be defined as the construction or modifications of dams, water diversion projects, fisheries habitat and watershed restoration projects, bridges and roadway projects, bank stabilization, or other activities that require Clean Water Act section 404 permits from the US Army Corps of Engineers. Several of the rivers within or adjacent to the evaluation area are on the National Rivers Inventory including the Emory River, Stinking Creek, and Rock Creek. As described in “Chapter 3 Alternatives,” none of the alternatives authorize a permit for surface coal mining operations or constitute a water resources project within the definition of the act. Therefore, consultation is not required. Future permitted applications would consult on a case-by-case basis if warranted.

## LIST OF PREPARERS

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Allison Anolik	Geographic Information Systems Specialist/ Graphic Quality Control	BA Geography
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Tristyne Youngbluth, PE	Public Health and Safety	BS Civil/ Environmental Engineering

A photograph of a vast, dense forest covering a mountain range. The trees are lush green, and the perspective is from an elevated position looking across the valley. The sky is clear and bright.

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Glossary

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## GLOSSARY

**Acid mine drainage**—The term acid mine drainage is used, in this context, to refer to any polluttional discharge emanating from a mining operation. Many of these discharges are, in fact, alkaline with high levels of metals.

**Action alternative**—An alternative that would involve a change from existing conditions, including changes to established trends or management direction.

**Advisory Council on Historic Preservation(ACHP)**—The ACHP is an independent federal agency that promotes the preservation, enhancement, and productive use of our nation’s historic resources, and advises the President and Congress on national historic preservation policy.

**Affected environment**—Term used in the National Environmental Policy Act to denote surface or subsurface resources (including social and economic elements) within or adjacent to a geographic area that could potentially be affected by a proposed action; the environment of the area to be affected or created by the alternatives under consideration (40 CFR § 1502.15).

**Alternative**—Combination of management prescriptions applied in specific amounts and locations to achieve desired management goals and objectives.

**Approximate original contour**—The surface configuration achieved by backfilling and grading the mined area so that the reclaimed land closely resembles the general premining surface configuration and blends into and complements the drainage pattern of the surrounding terrain.

**Area mining**—A surface mining method that is carried on in level to gently rolling topography or relatively large tracts of land. Active area mine pits may be several miles long.

**Auger mining**—A mining technique often used by surface mine operations when the overburden becomes too thick for the coal to be mined economically using traditional surface mining methods. Large-diameter (usually 2–4 feet) horizontal holes are drilled as much as 300 feet into the v vertical face of the coal bed by an auger. Like a bit used for boring holes in wood, coal augers consist of a cutting head with a screw-like extension. As the auger turns, the head breaks up the coal and the screw carried it back into a conveyor that loads it directly into a truck.

**Backfilling**—The operation of refilling an excavation using material removed during the mining process.

**Carbon dioxide equivalent**—A metric used to reflect total greenhouse gas emissions taking into account the varying global warming potential of different greenhouse gases. For example, methane has a global warming potential of 21, which means that methane will cause 21 times as much warming as an equivalent mass of carbon dioxide over a 100-year time period. Expressing greenhouse gas emissions on a carbon dioxide equivalent basis provides a common unit for comparing the total emissions of various greenhouse gases (EPA n.d.b).

**Code of Federal Regulations (CFR)**—A publication that codifies the general and permanent rules and regulations published in the Federal Register by the Executive Branch departments and agencies of the federal government, and which carry the force of law.

**Cooperating agency (§1508.5)**—Any federal agency other than a lead agency which has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal (or a reasonable

alternative) for legislation or other major federal action significantly affecting the quality of the human environment. The selection and responsibilities of a cooperating agency are described in §1501.6. A state or local agency of similar qualifications or, when the effects are on a reservation, an Indian tribe, may by agreement with the lead agency become a cooperating agency.

**Contour mining**—A mining method commonly used in eastern mountainous topography where coal is removed in a narrow strip around the hillside. The extent of the cut into the hillside is determined by the depth of overburden at the highwall compared with the thickness of the coal seam.

**Cultural resource**—Cultural resources include archeological sites; historic sites, buildings, and districts; cultural landscapes; and ethnographic resources.

**Cumulative impact (§1508.7)**—The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

**Designation area**—The areas described by alternatives 3–6 as alternative designation areas to the petition area of alternative 2.

**Endangered species**—Any species which is in danger of extinction throughout all or a significant portion of its range.

**Environmental assessment (EA)**—A concise public document prepared to provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact. An EA includes a brief discussion of the need for a proposal, the alternatives considered, the environmental impacts of the proposed action and alternatives, and a list of agencies and individuals consulted.

**Environmental impact statement (EIS)**—A document prepared to analyze the impacts on the environment of a proposed project or action and released to the public for comment and review. EISs are prepared when there is the potential for major impacts on natural, cultural or socioeconomic resources. An EIS must meet the requirements of National Environmental Policy Act, Council on Environmental Quality, and the directives of the agency responsible for the proposed project or action.

**Environmentally preferable alternative**—The alternative required by 40 CFR § 1505.2(b) to be identified in a record of decision (ROD), that causes the least damage to the biological and physical environment and best protects, preserves, and enhances historical, cultural, and natural resources. The environmentally preferable alternative is identified upon consideration and weighing by the Responsible Official of long-term environmental impacts against short-term impacts in evaluating what is the best protection of these resources. In some situations, such as when different alternatives impact different resources to different degrees, there may be more than one environmentally preferable alternative.

**Evaluation area**—The area of land that extends beyond the petition or designation area that could experience indirect effects from the alternatives. This area may vary by resource topic but is generally described as the NCWMA and ERTCE boundaries. The evaluation area is defined more broadly than the petition area to also encompass non-public access lands.

**Federal Register**—Daily publication of the National Archives and Records Administration that updates the Code of Federal Regulations, in which the public may review the regulations and legal notices issued by federal agencies.

**Highwall**—The cliff-like excavated face of exposed overburden and coal in a surface mining.

**Historic properties**—The term “historic properties” corresponds to the phrase used in SMCRA and the implementing regulations § 779.12(b)(1) “historic or archaeological resources listed or eligible for listing.”

**Impacts**—The likely effects of an action upon specific natural, cultural, or socioeconomic resources. Impacts may be beneficial, or adverse and direct, indirect, and / or cumulative.

**Impairment (Clean Water Act)**—As used in conjunction with the Clean Water Act and associated state water quality programs, a water body is “impaired” if it does not meet one or more of the water quality standards established for it. This places the water body on the “impaired waters list,” also known as the “303(d) list” for those pollutants that exceed the water quality standard.

**Mitigation**—“Mitigation” as defined in the National Environmental Policy Act (40 CFR § 1508.20), includes: avoiding the impact altogether by not taking a certain action or parts of an action; minimizing impacts by limiting the degree or magnitude of the action and its Implementation; rectifying the impact of repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; compensating for the impact by replacing or providing substitute resources or environments.

**Mountaintop removal mining**—“[S]urface mining activities, where the mining operation removes an entire coal seam or seams running through the upper fraction of a mountain, ridge, or hill, except as provided for in 30 CFR § 824.11(a)(6), by removing substantially all of the overburden off the bench and creating a level plateau or a gently rolling contour, with no highwalls remaining, and capable of supporting postmining land uses in accordance with the requirements of this section” (30 CFR § 785.14(b)).

**No-action alternative**—An alternative that maintains established trends or management direction. For an oil and gas operation, it typically means that the action as proposed would not occur or current management would continue.

**Overburden**—Rock material overlying the coal deposit, but excluding soil. Soil is generally removed separately for use in reclamation.

**Permit**—A document issued by the regulatory authority that gives approval for the operation of a surface coal mine under conditions set forth in the Surface Mining Law and the implementing regulations.

**Permit area**—The area of land and water within the boundaries specified in the mining and reclamation permit. At a minimum, this includes all areas that will be directly affected by the surface coal mining operation during the term of the permit.

**Petition area**—The area described as alternative 2 and included as the petition from the State of Tennessee. Specifically, the petition area includes 505 miles of ridgelines with a 1,200-foot corridor (600 feet on both sides of the ridgetop). The petition area covers approximately 67,326 acres.

**Preferred alternative**—The “agency’s preferred alternative” is the alternative the agency believes would best accomplish the purpose of and need for action, and fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical, and other factors. “It may or may not be the same as the bureau’s proposed action, the non-Federal entity’s proposal or the environmentally preferable alternative” (43 CFR § 46.420).

**Reclamation**—The process of returning disturbed land to a condition that will be approximately equivalent to the pre-disturbance condition terms of sustained support of functional physical processes, biological productivity, biological organisms, and land uses.

**Regulatory authority**—The state agency, or Office of Surface Mining, which has responsibility for administering the Surface mining Law in a given geographic area.

**Remining**—Surface coal mining and reclamation operations that affect previously mined areas.

**Revegetation**—Reestablishment and development of self-sustaining plant cover. On disturbed sites, this normally requires human assistance, such as seedbed preparation, reseeding, and mulching.

**Scoping**—Scoping is done during the initial phase of project planning to seek input from a variety of sources. This input is used to identify issues, areas requiring additional study, alternative methods and locations, and topics to be analyzed in the National Environmental Policy Act document. Scoping is done internally with National Park Service staff and externally with the interested public, other agencies, and stakeholders.

**Section 106**—Section 106 of the National Historic Preservation Act of 1966 requires Federal agencies to take into account the effects of their undertakings on historic properties, and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. The historic preservation review process mandated by Section 106 is outlined in regulations issued by the Advisory Council on Historic Preservation.

**Spoil**—The rock overburden, not including the soil layers, that has been removed in surface mining to gain access to the coal seam.

**State wildlife action plans**—Plans that assess the health of each state's wildlife and habitats, identify the problems they face, and outline the actions that are needed to conserve them over the long term. (See more at: <http://www.teaming.com/state-wildlife-action-plans-swaps#sthash.hpO5rf3X.dpuf>.)

**Subsidence**—Surface caving or sinking of a part of the earth's crust due to underground mining excavations.

**Threatened species**—Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

**Viewshed**—An area of land, water, or other environmental element that is visible to the human eye from a fixed vantage point.

**Wetlands**—Lands that are transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification, wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year. (Classification of Wetlands and Deepwater Habitats of the United States by Cowardin et al. 1979).

**Wild and Scenic River**—A river designated under the National Wild and Scenic Rivers Act (Public Law 90-542; 16 USC. 1271 et seq.) as having outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. Rivers may be designated by

Congress or, if certain requirements are met, the Secretary of the Interior. Each river is administered by either a federal or state agency. Designated segments need not include the entire river and may include tributaries.

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