United States
Department of
Agriculture

Forest Service

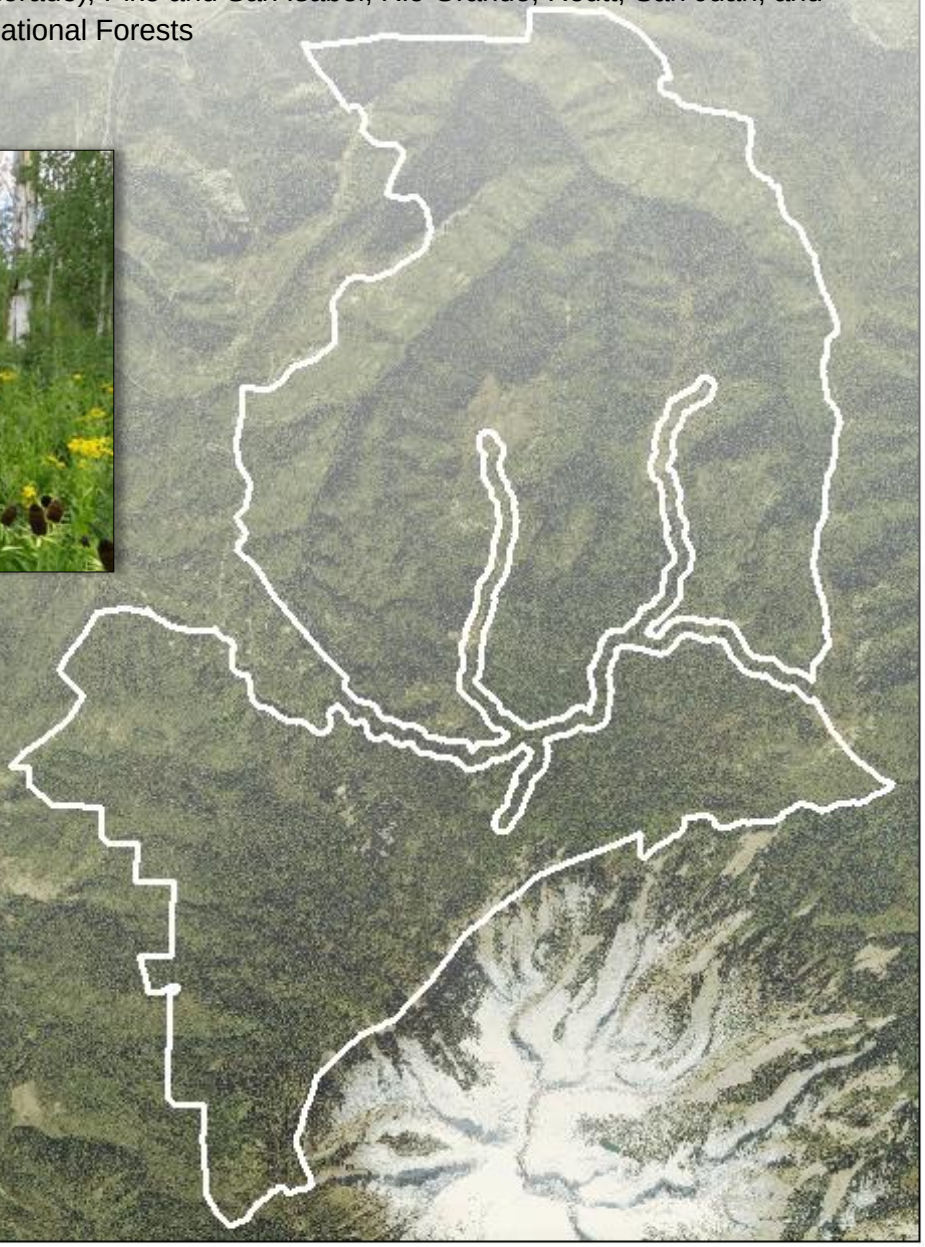
Colorado
National Forests

November 2016

Rulemaking for Colorado Roadless Areas

Supplemental Final Environmental Impact Statement

Colorado National Forests with roadless areas include:
Arapaho and Roosevelt; Grand Mesa, Uncompahgre, and Gunnison; Manti-La Sal (portion in Colorado); Pike and San Isabel; Rio Grande; Routt; San Juan; and White River National Forests



Commonly Used Acronyms and Abbreviations

2012 FEIS – 2012 Rulemaking for Colorado Roadless Areas Final Environmental Impact Statement
BLM – Bureau of Land Management
BTU – British thermal unit
CARA – Comment Analysis and Response Application
CH_4 – Methane
CO_2 – Carbon dioxide
CO_2e – Carbon dioxide equivalent
CRA – Colorado Roadless Area
DEIS – Draft Environmental Impact Statement
EIS – Environmental Impact Statement
EPA – Environmental Protection Agency
ESA – Endangered Species Act
FEIS – Final Environmental Impact Statement
GHG – Greenhouse gas
GMUG – Grand Mesa, Uncompahgre, and Gunnison National Forests
GWh – Gigawatt hour
IMPLAN – IMpact Analysis for PLANning
IPM – Integrated Planning Model
IWG – Interagency Working Group
LAA – May affect, likely to adversely affect
LCZ – Linear construction zone
MAII – May adversely impact individuals, but not likely to result in a loss of viability, nor cause a trend toward Federal listing
MDW – Methane drainage wells
N_2O – Nitrous oxide
NEPA – National Environmental Policy Act
NFS – National Forest System
NI – No Impact
NO_X – Generic term for the mono-nitrogen oxides NO and NO_2 gases
PNV – Present Net Value
OSMRE – Office of Surface Mining Reclamation and Enforcement
SCC – Social Cost of Carbon
SCM – Social Cost of Methane
SDEIS – Supplemental Draft Environmental Impact Statement
SEIS – Supplemental Environmental Impact Statement
SFEIS – Supplemental Final Environmental Impact Statement
TEPS – Threatened, Endangered, Proposed, and Sensitive
USDA – United States Department of Agriculture
VAM – Ventilation air methane

Rulemaking for Colorado Roadless Areas
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Lead Agency:	USDA Forest Service
Cooperating Agencies:	Colorado Department of Natural Resources; Bureau of Land Management; Office of Surface Mining, Reclamation and Enforcement
Responsible Official:	Under Secretary for Natural Resources and Environment, Department of Agriculture
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Abstract: The U.S. Department of Agriculture, U.S. Forest Service, in cooperation with the State of Colorado, proposes to reinstate the North Fork Coal Mining Area exception of the Colorado Roadless Rule on about 19,700 acres of National Forest System lands on the Grand Mesa, Uncompahgre, and Gunnison National Forests. This Supplemental Environmental Impact Statement is a response to deficiencies outlined by the District Court of Colorado in *High Country Conservation Advocates v. United States Forest Service* (U.S. District Court of Colorado, 2014) and supplements the 2012 Final Environmental Impact Statement for the Colorado Roadless Rule with additional analyses. Three alternatives are addressed in detail in this Environmental Impact Statement. Alternative A is the No Action Alternative and continues the current management under the Colorado Roadless Rule without a North Fork Coal Mining Area exception. Alternative B (preferred alternative), reinstates the North Fork Coal Mining Area exception, allowing temporary road construction for coal mining related activities on about 19,700 acres of Colorado Roadless acres. Alternative C (exclusion of "wilderness capable" lands) establishes the North Fork Coal Mining Area exception, but excluded National Forest System lands identified as "wilderness capable" during the 2007 Grand Mesa, Uncompahgre, and Gunnison draft Forest Plan revision process. In addition, all alternatives include a boundary correction of Colorado Roadless Areas based on new information obtained since the promulgation of the 2012 Colorado Roadless Rule.

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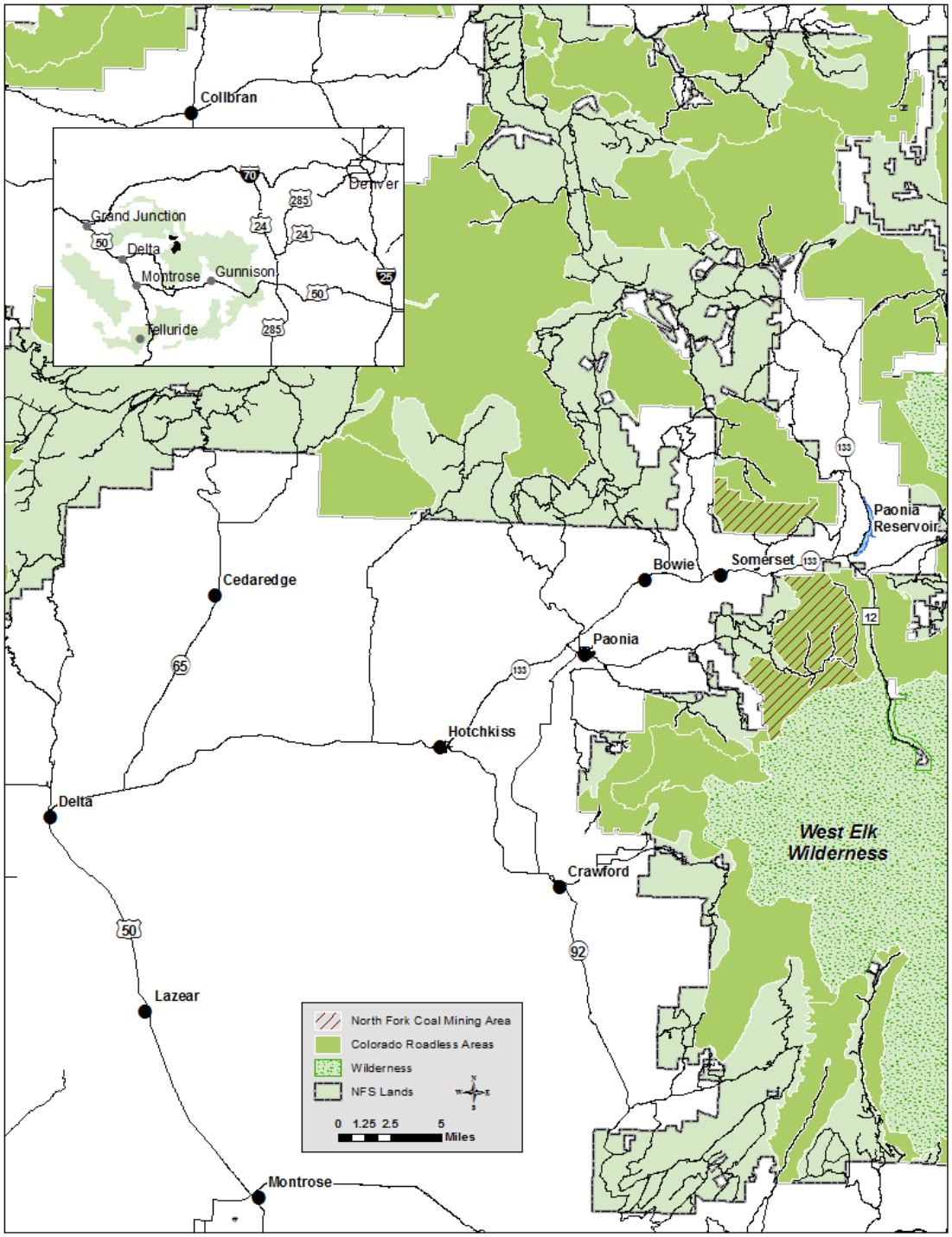

Figure i-1. *Location of North Fork Coal Mining Area.*

Chapter 1 Purpose of and Need for Action

Background

On July 3, 2012, the U.S. Department of Agriculture (USDA or Department) promulgated the Colorado Roadless Rule, a State-specific regulation for management of 4.2 million acres of Colorado Roadless Areas (CRAs) on National Forest System (NFS) lands (77 FR 39576) (U.S. Forest Service, 2012a). The State of Colorado, USDA, U.S. Forest Service, and the public worked in partnership to find a balance between conserving roadless area characteristics for future generations and allowing management activities within CRAs that are important to Colorado's citizens and economy. One State-specific concern was to avoid foreclosing exploration and development of coal resources on the Grand Mesa, Uncompahgre, and Gunnison (GMUG) National Forests. The Colorado Roadless Rule addressed this by defining the North Fork Coal Mining Area and developing an exception that allows temporary road construction for coal-related activities within that defined area. A temporary road is defined as a road necessary for emergency operations, or authorized by contract, permit, lease, or other written authorization, that is not a forest road and is not included in a forest transportation atlas.

In July 2013, High Country Conservation Advocates, WildEarth Guardians, and the Sierra Club challenged the Forest Service decision to consent to the Bureau of Land Management's (BLM) modification of two existing coal leases, the BLM's companion decision to modify the leases, BLM's authorization of an exploration plan in the lease modification areas, and the Forest Service North Fork Coal Mining Area exception of the Colorado Roadless Rule (36 CFR 294.43(c)(1)(ix)) (U.S. Forest Service, 2012a).

In June 2014, the District Court of Colorado found the environmental documents supporting the four decisions to be in violation of the National Environmental Policy Act (NEPA) due to analysis deficiencies. In September 2014, the District Court of Colorado vacated the lease modifications, the exploration plan, and the North Fork Coal Mining Area exception of the Colorado Roadless Rule.

This Supplemental Final Environmental Impact Statement (SFEIS) is a limited-scope document that complements the May 2012 Rulemaking for Colorado Roadless Areas Final Environmental Impact Statement (2012 FEIS) (U.S. Forest Service, 2012b). This SFEIS addresses the deficiencies identified by the District Court of Colorado in *High Country Conservation Advocates v. United States Forest Service (U.S. District Court of Colorado, 2014)*, and in conjunction with the 2012 FEIS, discloses the environmental consequences of reinstating the North Fork Coal Mining Area exception, including re-consultation with the U.S. Fish and Wildlife Service. The three other decisions vacated by the District Court of Colorado are not part of this analysis and will be addressed in future Forest Service and BLM NEPA efforts.

The Colorado Roadless Rule is not a coal mining rule; rather, it establishes a regulatory framework for roadless conservation that accommodates activities within CRAs that are important to the State of Colorado. Similarly, the reinstatement of the North Fork Coal Mining Area exception is a provision of the Colorado Roadless Rule that does not authorize or permit coal exploration, mining, or related activities. The exception merely removes the prohibition of temporary road construction so as to not foreclose the option for future Federal coal resource exploration and surface uses related to coal resource development in the North Fork Coal Mining Area.

Summary of Changes between Draft and Final

Changes made between the Supplemental Draft Environmental Impact Statement (SDEIS) and SFEIS were based on public comments received on the SDEIS. No new alternatives or issues were analyzed in detail in the SFEIS. Notable changes include:

- Annual and cumulative methane emission estimates were recomputed using an updated methane emissions factor based on 4 years of methane emissions data from mines in the North Fork Coal Mining Area, rather than 3 years. In addition, methane emission estimates for substituted surface and subsurface coal were recomputed.
- The market substitution analysis was updated utilizing a newer model (IPM (Integrated Planning Model) v5.15 rather than v5.13 used in the SDEIS).[1] This resulted in a reduction in the estimated GHG emission impacts and associated social costs. Specific changes include:
  - Electricity demand assumptions in the market substitution analysis were revised downward.
  - Natural gas supply assumptions in the market substitution analysis were revised downward.
  - Coal supply adjustments were made in the market substitution analysis, leading to lower coal prices.
  - Coal transportation assumptions were updated to reflect a higher diesel outlook.
  - Accounts for implementation of the final Clean Power Plan (40 CFR Part 60 subpart UUUU) rather than using a carbon price proxy to account for the proposed Clean Power Plan[2].
- The social cost of methane (SCM) was incorporated into the Present Net Value (PNV) estimates using a protocol recommended by the U.S. Interagency Working Group (IWG) on the Social Cost of Greenhouse Gases.
- The benefit-cost analysis results based on the 10th percentile SCC estimates and the Forest and National Boundary stances have been removed:
  - The 10th percentile SCC and SCM estimates were removed from the analysis based on comments from EPA and others to remain consistent with other Federal agencies' application of the IWG Technical Support Document, Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 (IWG, 2016a).
  - The Forest and National Boundary stances used in the benefit-cost analysis were removed from the analysis due to concerns expressed by EPA and other commenters that the analysis should focus on the societal costs associated with combustion and downstream use of coal because of the distinctive global nature of the climate-change issue. This analysis focuses on the Global Boundary stance.

[1] EPA uses IPM to analyze the impact of air emissions policies on the U.S. electric power sector. As part of this analysis, EPA publishes its assumptions and other information regarding its use of IPM on its website. Although this documentation provides insight into EPA's assumptions, the data and assumptions used by the Forest Service in this analysis are not necessarily the same as used by EPA. However, the Forest Service did use many of the EPA assumptions as described in more detail in Section 1.2 of documentation available in the planning record (ICF, 2015a). Because of these similarities, this analysis uses IPM nomenclature (5.13 and 5.15) similar to EPA. Use of this nomenclature is not meant to indicate that the Forest Service has used IPM in the exact manner as EPA. See Appendix C for more detail regarding the Forest Service's use of IPM.

[2] The United States is currently defending the legality of the Clean Power Plan. West Virginia v. Environmental Protection Agency, No. 15-1363 (D.C. Cir.). On February 9, 2016, the U.S. Supreme Court stayed the Clean Power Plan pending judicial review before the D.C. Circuit Court of Appeals and any subsequent proceedings in the Supreme Court.

Purpose of and Need for Action

The overarching purpose and need for reinstating the North Fork Coal Mining Area exception is the same as the 2012 purpose and need statement for the Rule. However, the specific purpose and need for reinstating the North Fork Coal Mining Area exception is to provide management direction for conserving about 4.2 million acres of CRAs while addressing the State's interest in not foreclosing opportunities for exploration and development of coal resources in the North Fork Coal Mining Area.

The original Purpose of and Need for Action as articulated in the 2012 FEIS is as follows:

The Department, the Forest Service, and the State of Colorado agree that a need exists to provide management direction for conserving roadless area characteristics within roadless areas in Colorado. In its petition to the Secretary of Agriculture, the State of Colorado indicated a need to develop State-specific regulations for the management of Colorado's roadless areas for the following reasons:

- Roadless areas are important because they are, among other things, sources of drinking water, important fish and wildlife habitat, semi-primitive or primitive recreation areas that include both motorized and non-motorized recreation opportunities, and naturally appearing landscapes. A need exists to provide for the conservation and management of roadless area characteristics.
- The Department, the Forest Service, and the State of Colorado recognize that tree cutting, sale, or removal and road construction/reconstruction have the greatest likelihood of altering and fragmenting landscapes, resulting in immediate, long-term loss of roadless area characteristics. Therefore, there is a need to generally prohibit these activities in roadless areas. Some have argued that linear construction zones (LCZs) also need to be restricted.
- A need exists to accommodate State-specific situations and concerns in Colorado's roadless areas. These include:
  - reducing the risk of wildfire to communities and municipal water supply systems,
  - facilitating exploration and development of coal resources in the North Fork coal mining area,
  - permitting construction and maintenance of water conveyance structures,
  - restricting LCZs, while permitting access to current and future electrical power lines, and
  - accommodating existing permitted or allocated ski areas.
- There is a need to ensure that CRAs are accurately mapped.

Proposed Action

The proposed action (Alternative B) is to reinstate the North Fork Coal Mining Area exception as written in 36 CFR 294.43(c)(1)(ix) on 19,700 acres of NFS lands. The exception provides for temporary road construction and reconstruction for coal exploration and/or coal-related surface activities within the North Fork Coal Mining Area. The exception also provides that such roads may be used for collection/transport of coal mine methane. The exception defines that buried infrastructure, including pipelines, needed for the capture, collection, and use of coal mine methane could be located within the rights-of-way of temporary roads that are necessary for coal-related surface activities, including the installation and operation of methane venting wells subject to site-specific permitting. No upper tier acres are designated in the North Fork Coal Mining Area under this alternative. Upper tier acres are a subset of CRAs that have limited exceptions and receive a higher-level of protection than non-upper tier CRA acres.

Decision Framework

The Secretary of Agriculture will decide whether to reinstate the North Fork Coal Mining Area exception and on what areas the exception could be applied. The decision involves a choice among the three alternatives analyzed in detail to address Court-identified deficiencies in this SFEIS, which means determining whether to do one of the following:

1. Take no action. No North Fork Coal Mining Area exception would be promulgated. CRAs would be managed according to the Colorado Roadless Rule without the exception, and the North Fork Coal Mining Area would be managed the same as other non-upper tier acres. (Alternative A).
2. Promulgate the North Fork Coal Mining Area exception and apply it to about 19,700 acres of CRAs (Alternative B).
3. Promulgate the North Fork Coal Mining Area exception and apply it to about 12,600 acres of CRAs (Alternative C).

In addition, all three of the alternatives will correct three CRA boundaries by aligning the North Fork Coal Mining Area boundary with CRA boundaries.

Public Involvement

On November 20, 2015, a notice of proposed rulemaking and notice of availability for the SDEIS were published in the *Federal Register*, initiating the 45-day SDEIS comment period that was to end on January 4, 2016. On December 30, 2015, a notice extending the 45-day comment period by 11 days to January 15, 2016, was published in the *Federal Register*. The extension was based on requests from the public due to the 45-day comment period overlapping with the holiday season. In addition to the *Federal Register* notices, the Forest Service sent about 1,400 hard copy letters and 43,000 emails to individuals and organizations known to be interested in the Colorado Roadless Rule. About 104,500 letters were received during the SDEIS comment period and about 33,000 letters were received after the close of the comment period. In addition, two public open houses were held, one in Paonia, Colorado, and one in Denver, Colorado, on December 7 and 9, 2015, respectively, to allow the public to ask questions and clarify information on the proposal to reinstate the North Fork Coal Mining Area exception.

On April 7, 2015, a notice of intent to prepare a Supplemental Environmental Impact Statement (SEIS) was published in the *Federal Register*, which initiated the 45-day scoping comment period ending on May 22, 2015. In addition to the Notice of Intent, the Forest Service sent about 1,400 hard copy letters and 43,000 emails to individuals and organizations known to be interested in the Colorado Roadless Rule to solicit comments. About 119,400 comment letters were received. The letter received from the EPA has been included for review in Appendix D.

In addition to the public comment periods associated with the supplemental, there were five formal public involvement processes associated with the development of the 2012 Colorado Roadless Rule. These five efforts included 35 public meetings held throughout Colorado and in Washington D.C. and resulted in about 312,000 public comments.

Tribal Consultation

In addition to the outreach to the general public for comments on the Colorado Roadless Rule, the Forest Service contacted the three tribes most likely to be concerned or directly impacted by the proposed rule. Those tribes included the Ute, Ute Mountain Ute, and Southern Ute Tribes. The Forest Service sent background information on the proposal to reinstate the North Fork Coal Mining Area

exception and offered government-to-government consultation meetings with each of the Tribes. The Tribes provided no formal comments and did not request any meetings.

Issues

The June 2014 District Court of Colorado's opinion in *High Country Conservation Advocates v. United States Forest Service* and public comments were used to identify key issues. Key issues are environmental issues that were studied in detail and were needed to make informed decisions in conjunction with the 2012 FEIS. The following key issues carried through the SFEIS analysis:

- **Greenhouse Gas (GHG) Emissions** – Public comments and the District Court of Colorado ruling suggested the need for a quantitative GHG analysis. Additional analyses related to GHGs were evaluated.
- **Climate Change** – The environmental issue behind the GHG emissions concern is climate change. The quantitative GHG emissions analysis was put into context of climate change for an informed decision.
- **Social Cost of Carbon** – Public comments and the District Court of Colorado ruling suggested the use of the SCC protocol to evaluate costs of increased carbon emissions generated by the proposal. The SCC was evaluated based on public comments and the Court ruling.
- **Coal Economics** – Corrections and proposed changes to the North Fork Coal Mining Area boundary and changes in demographics/economic trends throughout the State of Colorado affect the 2012 estimated economic outputs. Additional economic modeling and data were considered to address new information for the coal resources.
- **Fisheries** – After a NEPA sufficiency review of the 2012 FEIS, it was determined that new information had emerged regarding the genetics of Colorado River cutthroat trout in the southern Rockies. Supplemental analyses addressed this new information and comments received from the public.
- **Federally Listed Threatened, Endangered, Proposed, and Sensitive Species** – After a NEPA sufficiency review of the 2012 FEIS, it was determined that several species listed, and critical habitat designated, under the Endangered Species Act (ESA) affect CRAs. In addition, the Regional Forester updated the sensitive species list in August 2013. Supplemental analyses were completed under the ESA, and consultation with the U.S. Fish and Wildlife Service was re-initiated for the entire Colorado Roadless Rule. The review under ESA is a statewide review of all 4.2 million CRA acres—an area that includes, but is not limited to, the North Fork Coal Mining Area.

Issues raised by the public and considered by the interdisciplinary team that are not to be key issues are described in pages 10–11 of the 2012 FEIS, Appendix B–Issues of the SDEIS, and Appendix E – Response to Comments of this SFEIS. Issues not considered to be key issues were not analyzed in detail because they were:

- General opinions or position statements not specific to the proposed action
- Items addressed by other laws, regulations, or policies
- Items not relevant to the potential effects of the proposed action, or otherwise outside the scope of this analysis.
- Other content of the 2012 FEIS, which informs, but is not repeated.

Scope of Analysis

The scope of analysis refers to the extent the proposed action and potential impacts will be considered in the SEIS. The following were considered in determining the limited scope of the analysis for this SEIS:

- The June 2014 District Court of Colorado decision identified analysis deficiencies;
- A review of the 2012 FEIS in context of changed circumstances and/or new information;
- Council on Environmental Quality guidance for programmatic analyses (Final Guidance for Effective Use of Programmatic NEPA Reviews, 79 FR 76986); and
- Public comments, which are reflected in the key issues and issues considered but not included for detailed study.

In June 2014, the District Court of Colorado found the 2012 FEIS to be in violation of NEPA due to three deficiencies. This SEIS is developed in response to the narrow and specific Court-identified deficiencies:

- The 2012 FEIS failed to disclose the GHG emissions from mine operations;
- The 2012 FEIS failed to disclose the GHG emissions resulting from combustion of North Fork Valley coal; and
- The 2012 FEIS failed to address a report about coal substitution submitted during the public comment period for the Revised Draft Environmental Impact Statement (DEIS) ending in October 2011.

Based on the Court-identified deficiencies, this SEIS includes a quantitative GHG emissions analysis of both mine operations and end use, and addresses the report submitted during the 2011 comment period.

As part of the supplemental review process, the 2012 FEIS was reviewed in context of changed circumstances and new information. The 2012 FEIS and the associated project record are incorporated by reference for this proposed rule. The Colorado Roadless Rule interdisciplinary team determined that the majority of the analyses in the 2012 FEIS did not warrant supplementation due to changed circumstances and/or new information. However, the interdisciplinary team determined the need to supplement portions of the following analyses:

- GHG emissions due to new information;
- Climate change due to new information;
- Economics due to new information and changed circumstances;
- Federally listed wildlife species due to changed circumstances; and
- Fisheries due to new information.

Programmatic and tiered environmental reviews are valuable for providing timely and efficient environmental analyses. In December 2014, the Council on Environmental Quality provided guidance to Federal agencies on use of programmatic NEPA reviews. The Council on Environmental Quality defines the term, “programmatic review” as any broad or high-level NEPA review of proposed policies, plans, programs, or projects for which subsequent actions will be implemented based on site- or project-specific NEPA review at the time the action is proposed. The Colorado Roadless Rule establishes regulations for management of roadless areas, thus the programmatic level of review for the Colorado Roadless Rule is central to this SEIS. The Colorado Roadless Rule provides

management direction for conserving and managing 4.2 million acres of CRAs by restricting tree cutting, sale, and removal; road construction and reconstruction; and use of LCZs within CRAs with narrowly focused exceptions, such as the North Fork Coal Mining Area exception.

The North Fork Coal Mining Area exception was part of the Colorado Roadless Rule as it was originally promulgated. Similar to other portions of the Colorado Roadless Rule, the North Fork Coal Mining Area exception is a broad-level, programmatic action that addresses the ability to construct or reconstruct temporary roads for coal exploration or coal-related surface activities in the North Fork Coal Mining Area. The proposed action does not make any irreversible or irretrievable commitments of coal or other resources, nor does it authorize any project-level activity.

The Colorado Roadless Rule's exceptions may make activities possible that would not be possible in the absence of roads. However, the Colorado Roadless Rule itself only includes a general prohibition on road construction/reconstruction, tree-cutting, and the use of LCZs in CRAs and prescribes the conditions under which road construction/reconstruction, tree cutting, and use of LCZs may occur. All future site-specific activities are subject to stage-specific decision making.

With respect to exploring for or surface uses related to developing coal resources within the North Fork Coal Mining Area, there are multiple steps at which various Federal and State agencies will decide how and whether coal mining occurs (as discussed below). At each level of the analysis, additional site-specific information will become available at those stages, making consideration of mitigation measures regarding road design and methane release more appropriate. The proposed action does not foreclose consideration of such measure at future decision points.

The exception frames the scope of subsequent site-specific activities over the long term. The full range of exploration or development over the long term in the North Fork Coal Mining Area—where, if, when, and how coal exploration or surface use related to coal development may occur, as well as any needed temporary roads to provide for that coal exploration or other coal-related surface uses—is currently an unknown at this programmatic level and at this stage. Unless or until site-specific applications are received, it is neither reasonable nor efficient to attempt to estimate the full range of site-specific environmental impacts that might occur in this area over the long term. This would be akin to estimating project-specific timber sale impacts in a forest plan when the plan zones an area for timber production. Rather, when or if specific proposals to lease or explore are received, these proposals will undergo site-specific environmental analysis, tier to this programmatic landscape environmental review, and incorporate any regulatory requirements that result from this rulemaking. For example, two lease modification proposals have been received and are currently undergoing site-specific analyses, which will tier to this SFEIS.

With respect to Federal coal resource management in the North Fork Coal Mining Area, site-specific environmental analyses and subsequent decisions (including some made by other agencies such as the BLM) are required before any exploration, mining, or other on-the-ground activity can occur. When specific coal exploration requests or applications for leasing actions are received by the BLM, those proposals will then undergo site-specific environmental analysis in accordance with the requirements of NEPA. Analyses would be conducted by the Forest Service and BLM to support a) the Forest Service in deciding whether to grant or deny consent to BLM's leasing of NFS lands and in conditioning leases, through stipulations, to protect non-mineral (i.e. surface) resources, and b) the BLM's independent decision to lease (which would convey the right to develop the coal resources).

Environmental analysis would also be conducted to support BLM's decisions to allow exploration activities to provide site-specific information for leasing or specific mine plans. Environmental review also occurs for specific mine permitting actions in which the Office of Surface Mining Reclamation and Enforcement (OSMRE) and Colorado Division of Reclamation, Mining and Safety are involved. At each of these stages, additional information is gathered as the proposed activity becomes more site-specific and addresses applicable legal and regulatory requirements. At each stage

of analysis or review, there is an opportunity to mitigate focused and site-specific impacts as the proposed activity becomes more certain. In addition, at each of these stages of analyses or review, there is opportunity for public input and comments based on NEPA or other requirements.

Programmatic reviews support policy-level decisions when there are limitations in available information and uncertainty regarding the timing, location, and environmental impacts of subsequent implementing actions. Rulemaking establishes regulations under which future actions would have to comply. This rulemaking effort to reinstate the North Fork Coal Mining Area exception to the Colorado Roadless Rule is appropriate for a narrowly focused programmatic NEPA review pursuant to Council on Environmental Quality guidance. This rulemaking will guide conditions under which temporary road construction for coal-related activities may occur within the North Fork Coal Mining Area over the long term, but it does not make site-specific decisions or authorize any ground disturbing activities at this stage. At the present time, the scope and extent of potential future coal exploration or leasing proposals and surface use are unknown; thus, the site-specific environmental effects of these proposals cannot be reasonably foreseen.

The Forest Service uses the best estimates and current information available, as shown by the changes between 2012 and present day, these estimates are not always complete. Currently unknown information includes:

- coal trends and future coal markets;
- if and how exploration activities might occur;
- when and if applications to lease might be made;
- how much coal might be developed from this area;
- when the coal might be developed;
- the specific quality of that coal;
- the specific methane content of that coal;
- the specific location of surface uses, such as of methane drainage wells (MDWs) and associated temporary roads needed to ensure safe working conditions in underground mines based on specific mine plans;
- the specific end users of the coal;
- where and how the coal could reach its destination; and
- where and what type of facilities could combust the coal.

This type of project-level information is unavailable at the rulemaking stage and is not necessary to inform the decision-maker on the narrow question of whether temporary road construction should be allowed for coal exploration and coal-related activities within the North Fork Coal Mining Area. This information is gathered in subsequent stages to inform future decisions. For example, data regarding coal quantity and quality is obtained during exploration; that data then informs how the underground mining operations would be designed, which in turn informs the extent and placement of surface uses such as temporary roads and drilling locations for methane management facilities.

Many commenters pointed out that the Forest Service is currently working on an SEIS for lease modifications associated with existing leases under development at the West Elk Mine. That SEIS will estimate surface use such as temporary road and methane drainage well-site placement. The West Elk lease modification SEIS will overlap with the North Fork Coal Mining Area with about 1,700 CRA acres, which accounts for about 9% of the North Fork Coal Mining Area. The difference in projecting temporary road and well-pad placement at the leasing stage (i.e., West Elk lease

modification) is that seam-specific geologic, methane content, and underground working configuration information is available for the area immediately adjacent to the parcel in question. This provides for a preliminary estimate of temporary road and drill-site configuration, which typically changes at the specific mine plan stage. Such seam-specific information is not available for the majority of the North Fork Coal Mining Area.

Programmatic NEPA reviews can and do address the broad environmental issues relating to commensurate program level, landscape-scale decision making. For most resources, and in particular surface resources, the cause-and-effect relationship is generally limited to the proximity of the action and/or the spatial extent of the defined impact. However, in contrast to surface resources, air quality impacts related to GHG emission impacts are diffuse and highly variable, with the effects cumulative and global in nature. Because the overall magnitude of human-caused GHGs is large, a specific impact of a single project to the national or global emissions is generally not possible to determine. Therefore, the contributions to the environment from GHG emissions are best analyzed at a broader scale; as such, this SEIS contains a quantitative analysis of GHG emissions based on the existing mine operations, Elk Creek and West Elk mines, and the combustion of coal.

Some public comments received during the initial scoping period requested the Forest Service disclose a more detailed analysis than the 2012 FEIS of impacts of the reinstatement of the North Fork Coal Mining Area exception to water quality, aquatic habitat, wildlife habitat, specific species, visual quality, location of wetlands, etc. As explained above, these resources are more appropriately examined when a project-level application for exploration or leasing action is received. Under Alternative B, about 80% of the North Fork Coal Mining Area is unleased; under alternative C, about 70% is unleased. Two lease-modification proposals are currently under analysis.

Given the absence of other leasing proposals over the majority of the area, it is not reasonable or useful to attempt to speculate or foresee how, when, or whether applications to lease additional coal resources would occur. A lease proposal received 50 years from now likely could have different environmental effects than a lease proposal evaluated today. At the time a site-specific proposal is received, there will be an associated public involvement process for each of the subsequent NEPA analyses or reviews. The Forest Service has the discretion to deny consent to coal-leasing action, and to impose necessary terms and conditions to protect specific surface resources as terms of consent if the site-specific environmental consequences demonstrate they are warranted.

The 2014 Council on Environmental Quality guidance on programmatic reviews states that one of the purposes of programmatic reviews is to provide greater efficiencies to Federal agencies in complying with NEPA. While environmental impacts should be disclosed as soon as information is reasonably available and at the earliest practicable stage, it is not reasonable or efficient to develop numerous speculative potential exploration or leasing scenarios, nor is the public served by developing worst case or hypothetical activity scenarios for the North Fork Coal Mining Area. It is more reasonable and efficient to limit detailed site-specific impact analyses when specific proposals are brought before the agency. This is particularly true in the case of coal leasing, where it is necessary to conduct site-specific resource analyses using a reasonably foreseeable mining scenario to assist in determining if lease stipulations are needed for surface resource protections. Consistent with Council on Environmental Quality guidance, this SEIS will defer detailed site-specific analyses to project level analyses.

Chapter 2 Alternatives, Including the Proposed Action

This chapter describes the three alternatives considered in detail in this SFEIS. This chapter compares alternatives and describes alternatives dismissed from detailed study.

Features Common to All Alternatives

This section describes the features that are common to all alternatives analyzed in detail in this SFEIS.

Colorado Roadless Area Boundary Correction

All alternatives, including the no action alternative, propose to administratively correct CRA boundaries associated with the North Fork Coal Mining Area (36 CFR 294.47(b)). Roads that existed prior to 2012 in the vicinity of the North Fork Coal Mining Area were re-inventoried with global positioning system technology that allows for more accurate boundary location of CRAs. The boundaries of the CRAs would be adjusted to match the actual location of roads on the ground. The administrative correction to CRAs associated with the North Fork Coal Mining Area would entail:

- Adding 65 acres based on a more accurate mapping of the National Forest Boundary along the Pilot Knob CRA and more accurate inventory of forest roads 711, 711.3B, and 711.3c.
- Subtracting 35 acres based on a more accurate inventory of forest roads 711, 711.3B, and 711.3c.

The Colorado Roadless Rule recognized that CRA boundaries would need to be corrected to remedy errors and account for improvements in mapping technology. Procedures for correcting CRA boundaries require public notice and a 30-day comment period.

Colorado Roadless Upper Tier Acres

None of the alternatives would add any upper tier acres to the 2012 FEIS inventory or manage any of the acres within the North Fork Coal Mining Area CRAs as upper tier acres. Upper tier acres are a subset of CRAs that have limited exceptions and receive a higher level of protection than non-upper tier CRAs. All CRAs that are not upper-tier are considered non-upper tier or standard CRA acres. In development of the Colorado Roadless Rule, all roadless acres were first CRAs, in which all exceptions applied. Later, as public comments were addressed, the upper tier was created in which only limited exceptions applied. A second term for the rest of the CRA acres was not coined.

North Fork Coal Mining Area Range of Size

The size of the North Fork Coal Mining Area as promulgated under the 2012 Colorado Roadless Rule was substantially reduced through the 7-year collaborative process. The North Fork Coal Mining Area was originally about 55,000 acres when the State submitted the first petition in 2006. That was winnowed down to 19,500 acres by 2012 based on Forest Service analysis and input from the State, coal industry, local communities, environmental groups, and other interested publics. The SFEIS includes Alternative C, which further reduced the North Fork Coal Mining Area to 12,600 acres. This range of size from 12,600 to 55,000 acres of the North Fork Coal Mining Area considered throughout the development of the Rule, including this supplemental, is a reasonable range.

Federal and State Requirements

Management of NFS lands in Colorado is governed by a variety of Federal statutes, regulations, executive orders, and the Forest Service directive system (manuals and handbooks). In addition, some State laws and regulations apply on NFS lands within the State. The selection of any of the alternatives in this would not affect the applicability of any Federal or State requirements.

Forest Plans

The National Forest Management Act and its implementing regulations at 36 CFR 219 obligate the Forest Service to develop, amend, or revise plans for each national forest. Forest plans provide guidance for management activities on a national forest, including establishing forest-wide management requirements and direction applicable to the entire forest or to specific management areas. When guidance in a forest plan is more restrictive than direction described under the alternatives, actions must be consistent with the more restrictive direction. For example, if a forest plan standard prohibits road construction where it is allowed under a roadless rule alternative, road construction cannot occur.

None of the alternatives compel the Forest Service to amend or revise any forest plan. In addition, none of the alternatives limit the authority of a responsible official to amend or revise a forest plan. However, a responsible official would not be able to modify or reduce the restrictions of the adopted rule through a forest plan amendment or revision. Any changes to the restrictions of the adopted rule would be in the discretion of the Secretary of Agriculture and made through a future rulemaking effort.

Project-Specific Environmental Analysis

None of the alternatives authorize any exploration, leasing, or other ground-disturbing activities. Specific projects that include the leasing, exploration, or development of coal must undergo site-specific environmental analysis required by NEPA and required permitting conducted by the Colorado Division of Reclamation, Mining and Safety.

Reserved and Outstanding Rights

Under all alternatives, the reasonable exercise of reserved or outstanding rights for access, occupancy, and use of NFS lands within roadless areas would not be affected. The rights include those that exist by law, by treaty, or by other authority. They include, but are not limited to, the right to provide reasonable access across NFS lands to private property, mining claims for locatable minerals under the 1872 Mining Law, and land uses protected by Native American treaty rights.

Existing Land Use Authorizations

“Authorizations” refer to land uses allowed under a special use permit, contract, or similar legal instrument. Numerous types of lands and recreation-related authorizations are issued for occupancy and use of NFS lands. All of the alternatives allow for the continuation, transfer, or renewal of existing land-use authorizations for activities in roadless areas. “Existing authorizations” are those that are issued before the effective date of the final rule.

Private recreational activities do not require an authorization and are not affected by any alternative.

Existing coal leases would continue pursuant to the terms and stipulations of the lease. None of the alternatives revoke, suspend, or modify any existing coal leases within the North Fork Coal Mining Area (36 CFR 294.48(a)).

Other Forest Activities

Activities that are not otherwise prohibited under the alternatives (tree cutting, sale, or removal; road construction and reconstruction; and use of LCZs) are permissible in roadless areas, if not restricted by other law, regulations, and policies. These activities include, but are not limited to, the following:

- Motorized and non-motorized trail construction or maintenance;
- Hunting, fishing, camping, or other dispersed recreational uses;
- Use of a motorized vehicle on a trail open to motorized use;
- Mountain biking on a trail open to mechanized use;
- Prescribed burning, including tree cutting for fireline construction to manage a prescribed fire; and
- Livestock grazing.

Alternative A: The No Action Alternative

This alternative is the no action alternative as required by NEPA and reflects continuation of current management (Fig. 2-1) consistent with the District Court of Colorado ruling to vacate the North Fork Coal Mining Area exception to the Colorado Roadless Rule. The District Court of Colorado's ruling changed only management of CRAs in the North Fork Coal Mining Area; the remainder of the rule was left intact. Currently, the North Fork Coal Mining Area is being managed the same as non-upper tier CRAs. Rights to coal and uses associated with existing coal leases continue in accordance with the terms and conditions of those leases. This alternative would continue current management, with the general prohibitions on tree cutting, sale, and removal; road construction/reconstruction; and use of LCZs within CRAs, with some of those activities permitted under certain exceptions as defined in 36 CFR 294 Subpart D.

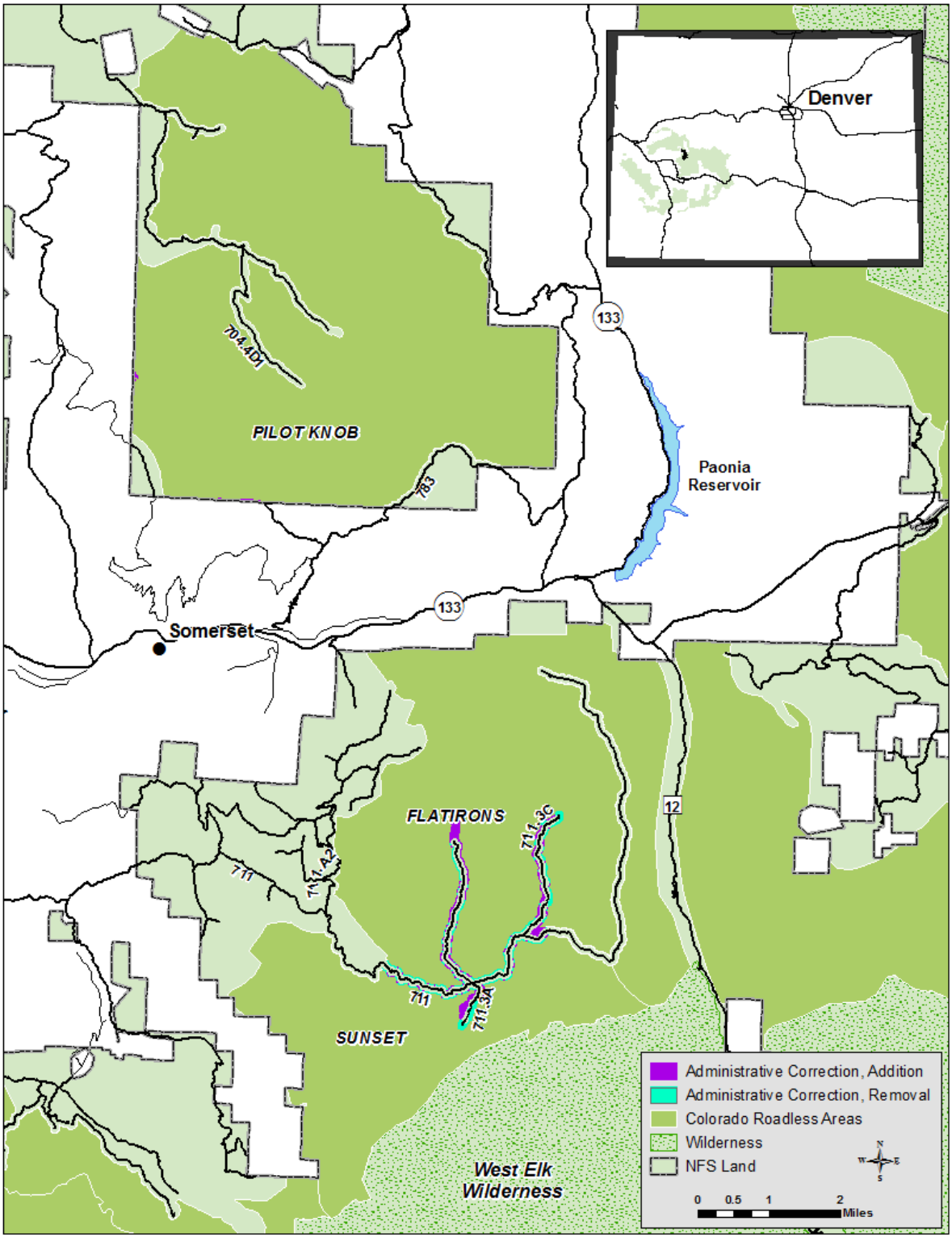

Figure 2-1. *Map of Alternative A, Colorado Roadless Areas near the analysis area with administrative corrections.*

Alternative B: Proposed Action & Preferred Alternative

Alternative B is the proposed action and preferred alternative (Fig. 2-2). This alternative would reinstate the North Fork Coal Mining Area exception as written in 36 CFR 294.43(c)(1)(ix). Specifically, the following clause would be reinstated:

> *A temporary road is needed for coal exploration and/or coal-related surface activities for certain lands within Colorado Roadless Areas in the North Fork coal mining area of the Grand Mesa, Uncompahgre, and Gunnison National Forests as defined by the North Fork coal mining area displayed on the final Colorado Roadless Areas map. Such roads may also be used for collecting and transporting coal mine methane. Any buried infrastructure, including pipelines, needed for the capture, collection, and use of coal mine methane, will be located within the rights-of-way of temporary roads that are otherwise necessary for coal-related surface activities including the installation and operation of methane venting wells.*

Alternative B would apply to an area similar to the North Fork Coal Mining Area described in the 2012 FEIS with minor differences described below.

North Fork Coal Mining Area Boundary Changes

Alternative B proposes to administratively change the North Fork Coal Mining Area boundary to align it to the CRA boundary and to resolve two errors that occurred during the development of the 2012 FEIS. These errors included:

- Changes to CRAs between the DEIS and revised DEIS: specifically, the CRA boundaries were updated but the corresponding match between the CRA boundary and North Fork Coal Mining Area boundary was not made, resulting in numerous inadvertent “slivers” along the boundary.
- Due to an error calculating acres made during the preparation of the 2012 FEIS, an area of about 470 acres was subtracted from the North Fork Coal Mining Area total acreage twice. With this error the final North Fork Coal Mining Area acreage was incorrectly reported as 19,100 acres in the FEIS but should have been reported as 19,500 acres. This error did not physically change the North Fork Coal Mining Area, but the correctly reported total acres increases.

The change to the North Fork Coal Mining Area boundary would entail:

- Adding 409 acres to align the North Fork Coal Mining Area with CRA boundaries.
- Removing 254 acres to align the North Fork Coal Mining Area with CRA boundaries.
- Total size of the North Fork Coal Mining Area would be about 19,700 acres.

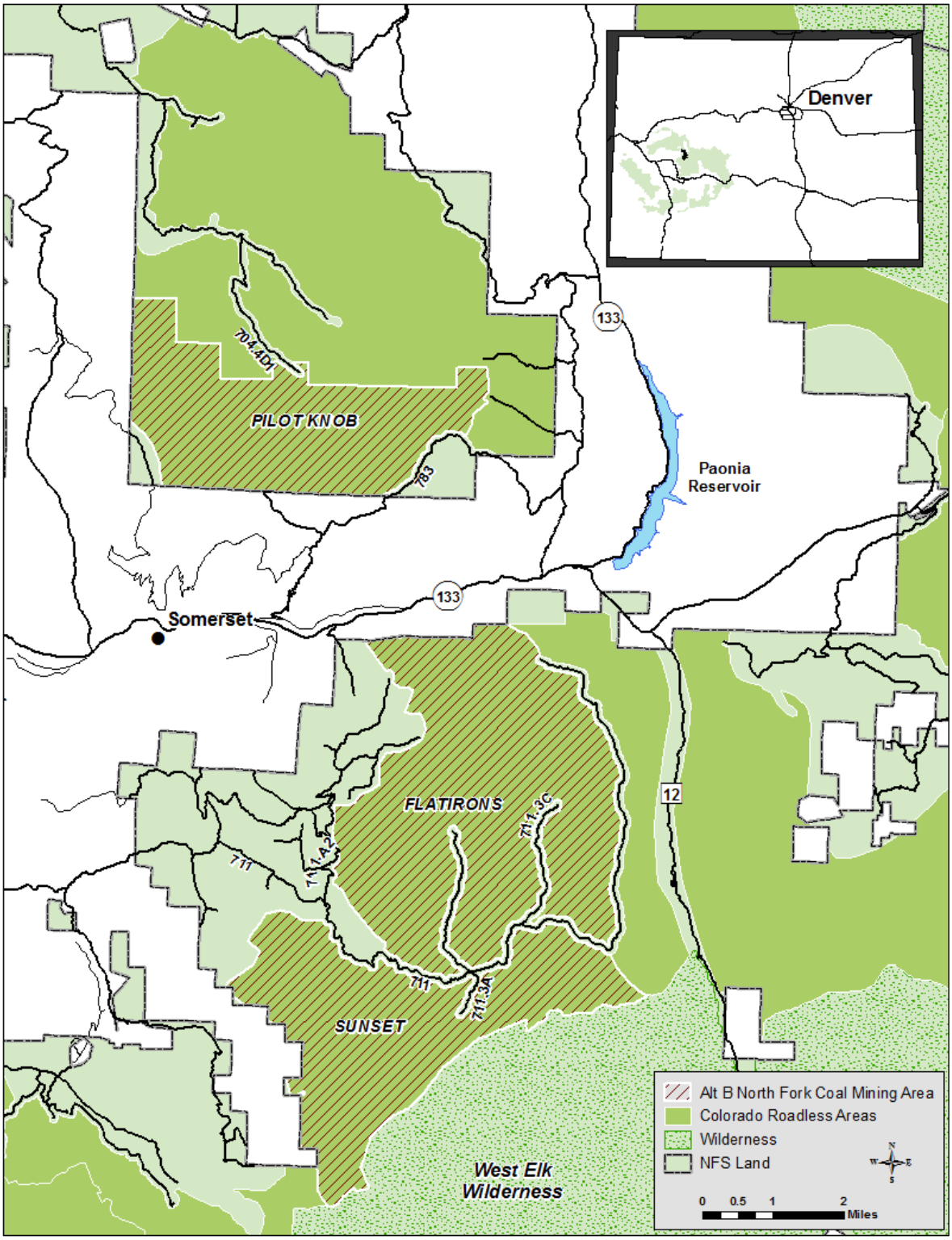

Figure 2-2. *Map of Alternative B, the North Fork Coal Mining Area.*

Alternative C: Reduced North Fork Coal Mining Area

Alternative C is similar to Alternative B in that it would reinstate the North Fork Coal Mining Area exception as written in 36 CFR 294.43(c)(1)(ix). Specifically, the following clause would be reinstated:

> A temporary road is needed for coal exploration and/or coal-related surface activities for certain lands within Colorado Roadless Areas in the North Fork coal mining area of the Grand Mesa, Uncompahgre, and Gunnison National Forests as defined by the North Fork coal mining area displayed on the final Colorado Roadless Areas map. Such roads may also be used for collecting and transporting coal mine methane. Any buried infrastructure, including pipelines, needed for the capture, collection, and use of coal mine methane, will be located within the rights-of-way of temporary roads that are otherwise necessary for coal-related surface activities including the installation and operation of methane venting wells.

North Fork Coal Mining Area Boundary Changes

Alternative C would apply to an area similar to that of Alternative B, except areas identified as "wilderness capable" in the 2007 GMUG Forest Plan revision effort would be excluded from the North Fork Coal Mining Area (Fig. 2-3). The North Fork Coal Mining Area under this alternative would be about 12,600 acres and would include no upper tier acres. Changes to the North Fork Coal Mining Area boundary would include administrative corrections to resolve the three errors described in the *Features Common to all Alternatives* section of this chapter and a boundary change to exclude the area identified as "wilderness capable."

During the 2007 GMUG plan revision effort, the capability of potential wilderness areas was defined as the degree to which that area contains the basic characteristics that would make it suitable for wilderness. Characteristics considered in the 2007 revision evaluation included:

- **Environmental** – the degree to which an area appears to be free from disturbance so that the normal biological processes continue and the degree to which the area provides a visitor opportunity for solitude and a sense of remoteness.
- **Challenge** – the degree to which the area offers visitors opportunity to experience adventure and self-reliance, often measured by physical character of the land (terrain and vegetation) and proximity to sights and sounds of developments and travel systems.
- **Manageability of boundaries** – consideration of the ability to manage the area as wilderness; factors considered are size, shape, and juxtaposition to external influences.
- **Special features** – the area's capability to provide other values such as geologic, scenic, or cultural features.

The Sunset Roadless Area, identified as "wilderness capable," was not recommended for wilderness in the 2007 GMUG revision effort due to mineral values and boundary management issues (see Appendix A). The Flatirons Roadless Area, identified as "wilderness capable," was not recommended for wilderness in the 2007 GMUG revision effort because it was less than the minimum size of 5,000 acres. If selected, Alternative C removes these "wilderness capable" acres from the North Fork Coal Mining Area but would not recommend them for wilderness. Any future evaluations and further recommendations would be completed during the GMUG forest plan revision process.

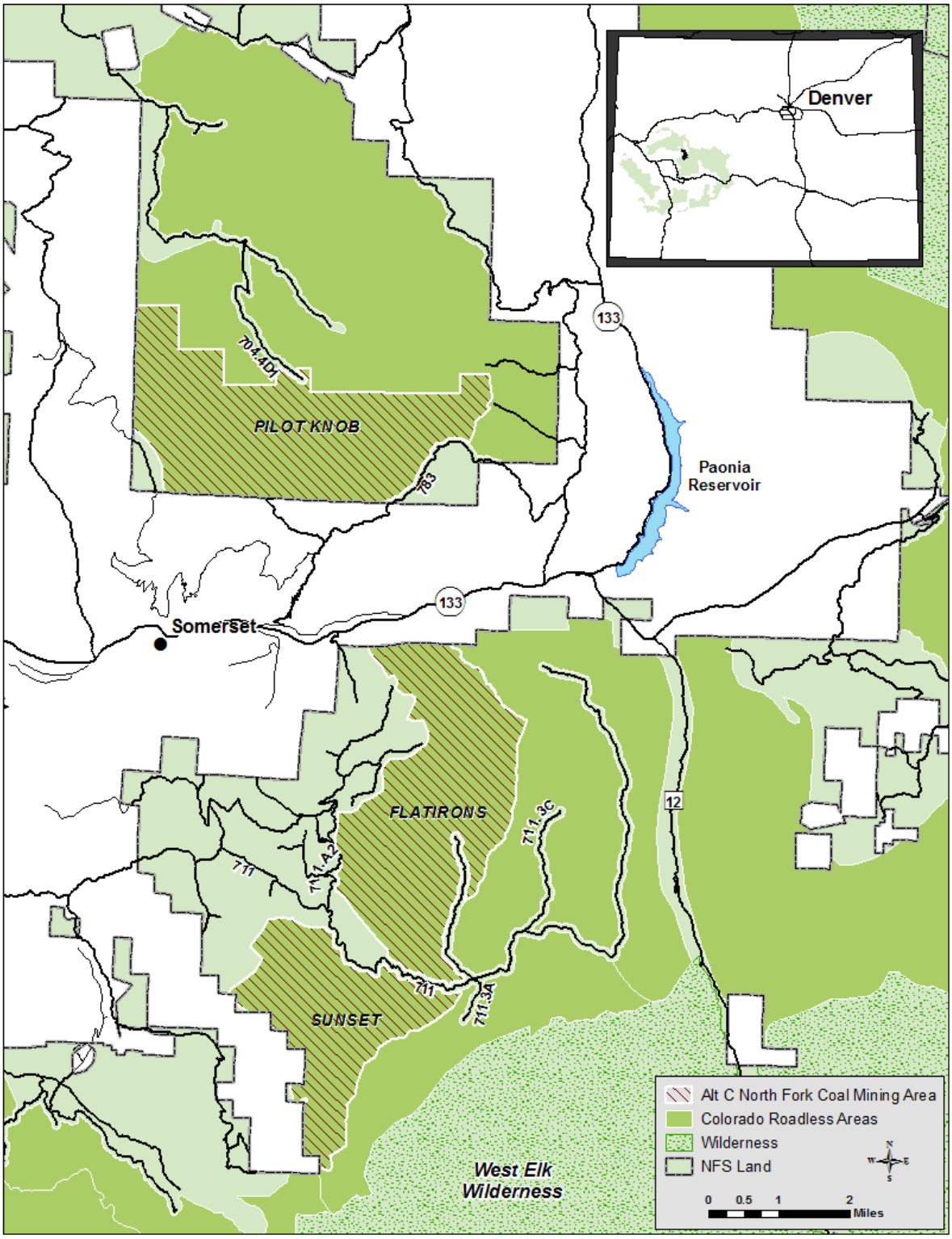

Figure 2-3. *Map of Alternative C, the North Fork Coal Mining Area excluding "wilderness capable" lands.*

Alternatives Considered but Eliminated from Detailed Study

NEPA regulations require Federal agencies to explore and evaluate all reasonable alternatives to a proposed action and to briefly discuss the reasons for eliminating alternatives from detailed study (40 CFR 1502.14). The alternatives listed below are based on comments received during scoping and the comment period on the SDEIS. The responsible official reviewed and weighed the following alternatives during the analysis process. The eliminated alternatives contribute to the range of reasonable alternatives and a reasoned choice, even though they were eliminated from detailed study. The following list describes the alternatives considered but eliminated from detailed study, and the reason(s) why these alternatives were eliminated from detailed study.

- **Methane (CH_4) capture and use or reduction.** This alternative would reduce methane emissions that could be released from coal mining made possible by the reinstatement of the North Fork Coal Mining Area exception by requiring or incentivizing use of "best available technology" to capture and/or combust methane for all or some percentage of the methane released. This alternative was dismissed from detailed analysis because it is speculative and impractical at the rulemaking stage where site-specific impacts are unknown and the necessary information to evaluate all the impacts and technology is not yet known or available. In addition, multiple future Federal and State agencies with expertise and authority over mine safety and mining operations will be better situated to realistically and meaningfully evaluate these technologies when a site-specific proposal is received. The scope of the decision being made in this rulemaking encompasses whether to allow temporary road construction in the North Fork Coal Mining Area for coal-related activities. The decision whether to apply a stipulation regarding methane capture and use or reduction is more appropriately made as part of a coal leasing or development decision. This decision does not foreclose any future lease stipulations related to methane capture and use or reduction. Temporary roads authorized under this exception may also be used for collecting and transporting coal mine methane, including any buried infrastructure, such as pipelines needed for the capture, collection, and use of coal mine methane.

  There are multiple unknown factors at the roadless rulemaking stage that affect whether and what technology can be used to capture and use or destroy methane that may be released from coal mining. Unknown factors that influence the choice of technology include but are not limited to coal gas content, coal seam thickness, coal seam permeability, rate of mining, extent of roof collapse, extent of floor heaving, amount and distribution above and below the mined seam, rock type above and below the mined seam, miner safety issues, and access to natural gas infrastructure and markets. Along with these variables, whether there will be existing infrastructure—such as pipelines or powerlines—that may be needed and if not in place, the cost and environmental effects of constructing this infrastructure would not be known until a site-specific project is proposed. In addition, the effects from additional on-site construction needed for any such technological use, such as compressors, pumps, larger well pads, etc., which could result in greater surface disturbance from the use of "best available technology" can only be evaluated at a site-specific stage. Discussions about hypothetical uses of "best available technology" for methane capture and reduction would not disclose useful information to the decision maker or the public at this roadless rulemaking stage.

  It is particularly speculative and impractical for the Forest Service to examine these issues in the context of the Colorado Roadless Rule when decisions about the use of methane reduction technologies are subject to overview by the Mine Safety and Health Administration, the agency responsible for miner safety. For example, although flaring has been an approved technology for methane reduction, the Mine Safety and Health Administration has not approved a flaring system for an active coal mine in the Western United States due to concerns about miner safety. It would be inappropriate for the Forest Service to develop an alternative at the rulemaking

stage that requires flaring as a possible "best available technology" in the face of potential opposition from the agency responsible for ensuring miner safety.

Decisions about methane capture and reduction are also subject to approval and review by other Federal and State agencies vested with authority over coal mining and energy development. In the case of coal mining, the Department of the Interior through the BLM has statutory authority to manage the Federal coal resources under mineral leasing laws and is in a better position to address questions about these technologies. In contrast, the Forest Service has discretion on which lands it consents to be leased, and has the responsibility to provide stipulations for the protection of surface resources. While the Forest Service's limited authority does not mean that the Forest Service cannot look at methane capture and use or destruction, it implies the impracticality and inefficiencies of having the Forest Service do so in the context of a statewide roadless rule that establishes a regulation, and in the absence of a site-specific proposal. The Department of Interior actions, including Secretarial Order 3338 directing the BLM to conduct programmatic review of the entire Federal coal leasing program, or BLM's advance notice for proposed rulemaking for waste mine methane capture, use, sale, or destruction, will thoroughly analyze the multitude of issues involved by the BLM as they prepare the analysis and make decisions. The most efficient means of addressing the coal mine methane capture and reduction issue at this point is to allow the BLM review processes to address it.

The present analysis is limited to correcting the specific deficiencies identified by the District Court judge in the earlier litigation over the Colorado Roadless Rule. However, this narrowed scope does not change the character of the analysis nor does it turn the analysis into a site-specific rule on coal mining and how best to engage in coal mining. Rather, it merely preserves the potential for construction of temporary roads should those roads be necessary for coal exploration or surface uses related to development activities.

Attempts to regulate and prescribe activities at a site-specific level potentially affected by a broad-scale programmatic rule do not meet the purpose and need for the rule. It defeats the benefits of tiered decision making—particularly when these decisions are better informed by site-specific information and when multiple Federal and State agencies are involved. The Colorado Roadless Rule affects, among other things, water storage/delivery, hazardous fuels, oil/gas development, and developed ski areas. If the Colorado Roadless Rule were to address all major shortcomings related to those affected activities, the rule would not meet the original purpose and need and the ability to finely craft better decisions at the local level would be lost.

- **Require a carbon offset for coal extracted.** This alternative would require a mitigation measure to require lease stipulations on any coal originating from the North Fork Coal Mining Area to include a carbon offset. Under this alternative, any coal removed from the North Fork Coal Mining Area would require a reduction of GHGs elsewhere. This alternative was dismissed from detailed analysis because the requirement for a carbon offset is dependent upon the directed use of a national carbon offset market (cap-and-trade system). While there are several cap-and-trade markets in the United States—the use of which is not being foreclosed as an option with the exception—no federally required Federal cap-and-trade market exists.

  The directed use of a cap-and-trade system is beyond the scope of roadless area conservation and therefore does not meet the purpose and need for this rule. As stated earlier, this rulemaking effort is not a coal-mining regulation. It is a regulation to prescribe broad-scale programmatic direction for managing and preserving roadless area characteristics in the State of Colorado.

- **Require a "carbon fee."** This alternative would require a fee be paid (a commenter suggested $1 per pound of coal) and funds used to protect the U.S. eastern seaboard from rising oceans. This alternative was dismissed from detailed analysis because fees are already collected from Federal coal in the form of royalty payments. BLM's programmatic review of the Federal coal

leasing program will likely address royalty payments. Portions of royalty payments are paid to the U.S. Treasury and a portion is paid to the state. How those funds are expended is outside the scope of the Forest Service's mission and does not meet the purpose and need for the Colorado Roadless Rule.

- **Limit sale of coal to Integrated Gasification Combined Cycle or Carbon Capture and Storage facilities.** This alternative would require a stipulation to limit the sale of extracted coal from coal leases within the North Fork Coal Mining area to facilities using Integrated Gasification Combined Cycle or Carbon Capture and Storage technologies. This alternative was dismissed from detailed analysis because expanding the scope of the Colorado Roadless Rule to regulations affecting coal markets is not consistent with a regulation that focuses on activities occurring on NFS lands and roadless area conservation, does not meet the purpose and need for this rule, and is beyond the scope of this rulemaking effort.
- **Factor GHG and climate effects when determining the value of coal.** This alternative would require the Forest Service to incorporate the costs of GHG emissions and the resultant climatic effects when determining the price of unmined coal. While this SFEIS will assume a value of coal for the purposes of the economic analysis and in the context of the SCC, this alternative was dismissed from further analysis because the price of coal is determined by market forces. Setting a price of coal is not within the scope of the project and does not meet the purpose and need of rulemaking effort. It is not within the authority of the Forest Service to value coal; that responsibility is in the purview of the Department of Interior.
- **Energy efficiency measures and renewable energy.** This alternative would require the Forest Service to direct its resources to energy efficiency measures, the development of NFS lands for renewable energy projects, and potential allowance of road construction in roadless areas for renewable energy projects. A broad across-the-board shift of resources is a matter of national policy and there is currently no policy directing such a broad shift of resources. In addition, this alternative was dismissed from further analysis because it is beyond the scope of this rule and does not meet the purpose and need for this rulemaking effort, which was to address the State's interest in not foreclosing exploration and development of coal resources in the North Fork Coal Mining Area.
- **Assist coal companies and local communities to switch to renewable energy.** This alternative would require the Forest Service to assist coal companies and local communities in transitioning to a renewable energy company. This alternative was dismissed from detailed analysis because it is beyond the scope of the rulemaking effort and does not meet the purpose and need for the Colorado Roadless Rule. However, other Federal agencies (Department of Commerce's Economic Development Administration, Department of Labor's Employment and Training Administration, Small Business Administration, and Appalachian Regional Commission) are working with communities impacted by the downturn in the coal economy to diversify regional economies, create jobs, and train displaced workers under the Partnerships for Opportunity and Workforce and Economic Revitalization (POWER) initiative.
- **Issuance of new coal leases based on bond obligations.** This alternative would require the Forest Service to not consent to new leases until final reclamation bond obligations are met from 50% of current leases. This alternative was dismissed from detailed analysis because it is beyond the scope of the rulemaking effort and does not meet the purpose and need for the Colorado Roadless Rule. Further, reclamation bonds are not tied to specific BLM-issued leases, but are a function of obligations under the State-issued coal mining permit, which can include operations involving multiple leases and privately held coal resources. A Federal coal lease grants rights to the coal in the lease and provides access to the surface subject to terms and conditions of the lease (including those that regulate surface use); however, a lease does not authorize mining or surface use. Rather, in the State-managed coal permitting process, a lease

demonstrates a permittee's 'right-of-entry' to coal resources, and any mining or surface uses on the leased lands are subject to State approval through the permitting process along with establishing reclamation bonding. Thus, while leases and permits are related, they are separate functions, and State-reclamation bonding is not tied to leasing actions.

- **Requirement of a $2.5 billion irrevocable bond.** This alternative would require mining companies to put up a $2.5 billion bond in which half would go the local communities in case the company went bankrupt. This alternative was dismissed from detailed analysis because it is beyond the scope for this project and does not meet the purpose and need for the Colorado Roadless Rule. In addition the Colorado Department of Natural Resources Division of Reclamation, Mining and Safety regulates and permits coal mining operations in the State of Colorado. This includes reclamation and bonding.
- **Exclusion of the Pilot Knob Roadless Area.** This alternative would remove the Pilot Knob Roadless Area, about 5,000 acres (about 25%) of the project area, from the North Fork Coal Mining Area. This alternative was dismissed from detailed analysis because the Colorado Roadless Rule is considering access to coal resources within the North Coal Mining Area over the long-term based on where recoverable coal resources might occur. The Rule preserves the option of future coal exploration and development by allowing temporary road construction for coal exploration and coal-related surface activities. One of the State-specific concerns is the stability of local economies in the North Fork Valley and recognition of the contribution that the coal industry provides to those communities. Preserving coal exploration and development opportunities in the area is a means of providing community stability.
- **Increased upper tier acreage.** This alternative would include the reclassification of more acreage in the Colorado Roadless Rule as upper tier. Upper tier areas are CRAs with limited exceptions to provide a higher level of protection. This alternative was dismissed from detailed analysis because the July 2012 final Colorado Roadless Rule designated 1,219,200 acres as upper tier after careful consideration, which included five formal public input periods that generated 312,000 public comments. The USDA, at this time, does not see a need to revisit the decision on upper tier acres and is dismissing this alternative from detailed study because resources or forest uses have not substantially changed since the 2012 FEIS to warrant reconsideration. None of the CRA acres within the North Fork Coal Mining Area are upper tier acres.
- **Increased recreational opportunities rather than industrial use.** This alternative would open the North Fork Coal Mining Area to development of recreational opportunities, such as hiking and biking trails, instead of the potential development of mineral resources. This alternative was dismissed from detailed analysis because this option is not foreclosed by the Colorado Roadless Rule. The decision to construct trails and other recreational facilities in the area is a forest plan- or project-level decision, not a Departmental decision. The promulgation of this rule does not limit the future site-specific decisions that may lead to the development of recreational opportunities in the North Fork Coal Mining Area. Therefore, this alternative is beyond the scope of this rulemaking effort.

Comparison of Alternatives

This section provides a comparative summary of each alternative from two perspectives: key issues and potential environmental consequences. The key issues of each alternative are listed in Table 2-1, and the potential environmental consequences of each alternative are listed in Table 2-2.

Table 2-1. *Key issues of Alternatives A, B, and C*

Descriptor	*Alternative A: No Action with CRA Boundary Corrections*	*Alternative B: Proposed Action – Reinstatement of North Fork Coal Mining Area with CRA Boundary Corrections*	*Alternative C: Exclusion of "Wilderness Capable" Lands with CRA Boundary Corrections*
Roadless area management direction	2012 Colorado Roadless Rule without the North Fork Coal Mining Area exception	2012 Colorado Roadless Rule with the North Fork Coal Mining Area exception	2012 Colorado Roadless Rule with the North Fork Coal Mining Area exception
Administrative correction to roadless area boundaries due to mapping errors	Yes	Yes	Yes
North Fork Coal Mining Area lands available for temporary road construction	No North Fork Coal Mining Area CRAs would be managed as non-upper tier CRAs	Yes – 19,700 acres	Yes – 12,600 acres
"Wilderness capable" lands excluded	Not Applicable	No	Yes
Addresses State of Colorado's interest in not foreclosing coal development	No	Yes	Yes

Table 2-2. *Potential environmental consequences of Alternatives A, B, and C (Refer to Chapter 3 for details)*

[See Table C-33 for detailed PNV results of all scenarios considered.]

Issue or Affected Resource	*Alternative A: No Action with CRA Boundary Corrections*	*Alternative B: Proposed Action Reinstatement of North Fork Coal Mining Area with CRA Boundary Corrections*	*Alternative C: Exclusion of "Wilderness Capable" Lands from proposed North Fork Coal Mining Area with CRA Boundary Corrections*
Coal			
Size of North Fork Coal Mining Area (acres)	19,500	19,700	12,600
North Fork Coal Mining Area not under lease (acres)	15,600	15,700	8,600
Estimated recoverable coal not under lease (short tons)	0 (with today's technology)	172 million	95 million
Estimated years of production (for the average production scenario)	2 (existing leases)	17	9.5
Estimated miles of temporary roads (for total production)	5 (existing leases)	36 for exploration 72 for development	20 for exploration 39 for development
Estimated number of Methane Drainage Wells (for total production)	From 15 to 30; ranging from about 4.5 to 9 acres of disturbance (existing leases)	Between 240 and 480; ranging from about 72 to 144 acres of disturbance	Between 130 and 260; ranging from about 39 to 78 acres disturbance
Air Resources - GHG Emissions			
Cumulative GHG emissions (metric tons CO_2e); includes methane	Not Applicable (unleased coal resource inaccessible with current technology and thus no additional GHG emissions, existing leases part of the environmental baseline)	443 million	244 million (assumed to be produced at the same rate per year as Alternative B)
Cumulative methane emissions (metric tons CO_2e)	Not Applicable (unleased coal resource inaccessible with current technology and thus no additional methane emissions, existing leases part of the environmental baseline)	34 million	19 million

Issue or Affected Resource	*Alternative A: No Action with CRA Boundary Corrections*	*Alternative B: Proposed Action Reinstatement of North Fork Coal Mining Area with CRA Boundary Corrections*	*Alternative C: Exclusion of "Wilderness Capable" Lands from proposed North Fork Coal Mining Area with CRA Boundary Corrections*
Climate	Unleased coal resources inaccessible, thus no additional GHG emissions beyond the environmental baseline; Climate change part of the environmental baseline	Greatest increase in GHG emissions among all alternatives. Greatest increase in atmospheric concentrations of GHGs.	Increase in GHG emissions and atmospheric concentrations more than Alternative A and less than Alternative B
Threatened, Endangered, and Sensitive Species			
No effect	Black-footed ferret, Colorado butterfly plant, grey wolf, grizzly bear, Lesser prairie-chicken, North Park phacelia, Osterhout milkvetch, Pagosa skyrocket, Penland beardtongue, southwestern willow flycatcher (critical habitat), Uncompahgre fritillary butterfly, Ute ladies'-tresses, yellow-billed cuckoo (proposed critical habitat)		
May affect, not likely to adversely affect	Canada lynx, Colorado hookless cactus, greenback cutthroat trout, DeBeque phacelia (species), Gunnison sage-grouse, Mexican spotted owl (species and critical habitat), Pawnee montane skipper, Penland alpine fen mustard, Preble's meadow jumping mouse (species and critical habitat), southwestern willow flycatcher (species and critical habitat), yellow-billed cuckoo (species and critical habitat)		
May affect, likely to adversely affect	Bonytail chub, Colorado pikeminnow, humpback chub, razorback sucker		
Economics			
Value of production (annual average), in millions	$37	$254 – 598	$254 – 598
Employment (annual average), in number of jobs	140	985 – 2,320	985 – 2,320
Labor income (annual average), in millions	$11	$78 – 183	$78 – 183
Present Net Value IPM® v.5.15 Social Cost of Carbon (millions of 2014 dollars)			
Global Boundary	Alternative A	Alternative B - Alternative A	Alternative C - Alternative A
Lower Estimate*	Due to the use of electric power generation cost savings as a proxy	-$1,394	-$750
3% Discount Avg. (Lower)**		-$197	-$88

Issue or Affected Resource	*Alternative A: No Action with CRA Boundary Corrections*	*Alternative B: Proposed Action Reinstatement of North Fork Coal Mining Area with CRA Boundary Corrections*	*Alternative C: Exclusion of "Wilderness Capable" Lands from proposed North Fork Coal Mining Area with CRA Boundary Corrections*
3% Discount Avg. (Upper)** Upper Estimate*	for benefits, results are provided only for Alternatives B and C, relative to Alternative A (i.e., cost savings cannot be characterized for stand-alone alternatives).	$253 $457	$204 $347
Present Net Value IPM® v.5.15 Social Cost of Carbon and Social Cost of Methane (millions of 2014 dollars)			
Global Boundary	Alternative A	Alternative B - Alternative A	Alternative C - Alternative A
Lower Estimate* 3% Discount Avg. (Lower)** 3% Discount Avg. (Upper)** Upper Estimate*	Due to the use of electric power generation cost savings as a proxy for benefits, results are provided only for Alternatives B and C, relative to Alternative A (i.e., cost savings cannot be characterized for stand-alone alternatives).	-$3,440 -$964 -$479 $206	-$1,878 -$506 -$214 $190

**Lower and upper estimates are drawn from results from all production schedules (low, average, permitted).*
***Ranges for average SCC values for 3% discount rates are singled out as representative of mid points.*

Chapter 3 Affected Environment and Environmental Consequences

This chapter, along with the 2012 FEIS, summarizes the environmental, social, and economic impacts of implementing the reinstatement of the North Fork Coal Mining Area exception. Although the reinstatement of the North Fork Coal Mining Area exception does not authorize or permit any coal exploration or development activity, or result in any ground-disturbing activity, the act of removing prohibitions of temporary road construction would facilitate access to Federal coal resources in the North Fork Coal Mining Area. This accessibility in turn could facilitate future exploration and development. Because no ground-disturbing activities will be authorized as a result of this decision, there are no direct impacts associated with the action. This chapter discloses the indirect impacts that might result should coal be produced from the mines within the North Fork Coal Mining Area under the three alternatives.

This analysis is based on the accessibility to coal resources. It is unknown how much, where, and when coal resource exploration or coal-related surface activities might occur. For the purposes of analysis and disclosure, it is assumed that all of the estimated recoverable coal resources would be recovered across the entire North Fork Coal Mining Area. This represents the maximum effects that could occur.

In addition, this analysis assumes the coal would be recovered at a steady rate until exhausted. Three assumed production scenarios were used to facilitate analyses: low scenario (~5.3 million tons annually) based on 2014 production rates; average scenario (~10 million tons annually) based on average annual production from 2001 to 2014; and permitted level scenario (15 million tons annually) based on the maximum rates authorized under current air quality permits administered by the State of Colorado. Although the permitted-level scenario would be allowed by air quality permits, based on historical production, it is unlikely that coal would ever be produced at this rate. This scenario is included as an upper limit for the analysis.

The descriptions of effects are based on best available information available at the time of this analysis, programmatic projections and assumptions, and professional judgement and show relative values. Specific amounts, areas, and costs used to describe effects are only estimates and could change during implementation of the rule.

The possible effects of future coal resource recovery, should it occur, within the North Fork Coal Mining Area on GHG emissions are examined in two different sections within this chapter. The section entitled *Air Resources and Greenhouse Gas Emissions* discloses possible total gross emissions of GHGs (carbon dioxide, methane, and nitrous oxide) that might result if all coal accessible under each of the alternatives were to be extracted and completely combusted. This section looks only at possible emissions from North Fork coal production and combustion, and does not consider how other sources of energy for electricity production and their GHG emissions might be affected by the accessibility of North Fork Coal Mining Area coal in the energy supply market. The *Economics* section includes an analysis of how the availability or absence of North Fork Coal Mining Area coal in the energy supply market might affect the mixture of energy sources used to generate electricity within the U.S. electricity market, and assesses the net impact on carbon dioxide emissions that might result from those changes.

Coal Resources

For the coal resource, potential effects of the SFEIS are framed in context of the Colorado Roadless Rule facilitating access to Federal coal resources in CRAs through the North Fork Coal Mining Area

exception to construct or reconstruct temporary roads. It is assumed that accessibility to these Federal coal resources currently depends on access with temporary roads to satisfy regulatory requirements for exploration, facilitate resource monitoring, and support lease development needs such as installing facilities to ensure safe working conditions (ventilation) at underground mines.

This SFEIS does not analyze any specific lands for exploration licensing or leasing, nor does it analyze any site-specific surface activities. The SEIS analyzes the reinstatement of the North Fork Coal Mining exception. U.S. Regulatory requirements of the Colorado Roadless Rule would be included on future coal actions in the North Fork Coal Mining Area if and when specific projects are proposed. It is unknown if, when, or who may submit future applications for coal exploration or leasing.

Federal Coal Program Process

Federal coal resource management falls under the purview of the BLM. The legal and regulatory framework governing management of Federal coal resources is briefly described below.

Coal in the North Fork Coal Mining Area is Federal coal managed by the BLM. Private industry explores for and develops Federal coal resources through a mineral leasing system managed by the BLM, which includes issuing licenses to conduct exploration, and issuing leases that convey exclusive rights to produce Federal coal. The Forest Service has a role as a surface managing agency in BLM's process to consent to BLM leasing NFS lands for development of Federal coal resources, and to prescribe conditions for use and protection of surface resources on exploration licenses and leases. When requested by the BLM, the Forest Service considers specific lands for lease as applications are made by industry through BLM's regulatory-based leasing process.

Actual exploration activity, mining, or mining-related surface uses may only occur when specific approvals for such are granted either by the BLM (for exploration licenses, and in certain cases for exploration on leases); otherwise, all mining and surface uses related to mining would be permitted by the Colorado Division of Reclamation Mining and Safety. In Colorado, coal mining permits are issued by the Colorado Division of Reclamation Mining and Safety with oversight from the OSMRE. If Federal coal resources are involved, pursuant to 30 CFR 746, OSMRE prepares and submits, to the Assistant Secretary for Land and Minerals Management, a decision document recommending approval, disapproval, or conditional approval of the mining plan. The Department of Interior Assistant Secretary for Land and Minerals Management then approves, disapproves, or conditionally approves the mining plan. The Forest Service participates in the Colorado Division of Reclamation Mining and Safety and OSMRE permitting process under roles and responsibilities assigned to the Federal land managing agency in OSMREs regulations.

This SFEIS does not analyze any specific lands for exploration licensing or leasing, nor does it analyze any site-specific surface activities. The SFEIS analyzes the reinstatement of the North Fork Coal Mining exception. Regulatory requirements of the Colorado Roadless Rule would be included on future coal actions in the North Fork Coal Mining Area if and when specific activities are proposed. It is unknown if, when, or who may submit future applications for coal exploration or leasing.

Affected Environment

The size of the North Fork Coal Mining Area as promulgated under the 2012 Colorado Roadless Rule was substantially reduced through the 7-year collaborative process. The North Fork Coal Mining Area was originally about 55,000 acres when the State submitted the first petition in 2006 and was winnowed down to 19,500 acres by 2012 based on input from the State, coal industry, local

communities, environmental groups, and other interested publics. The SFEIS includes Alternative C, which further winnows the North Fork Coal Mining Area down to 12,600 acres.

The North Fork Coal Mining Area lies within the GMUG National Forests and now encompasses 19,700 acres for alternative B and 12,600 acres for alternative C within the Somerset Coalfield where potentially mineable coal resources are known to occur in CRAs and where existing leases overlap with these CRAs. Outer boundaries of the North Fork Coal Mining Area were defined by where coal resources lie 3,500 feet below the land surface or shallower, or where geologic data indicated potentially mineable coal is not present.

Coal in the North Fork Coal Mining Area is bituminous, with energy content ranging from 10,000 to more than 13,000 BTU (British thermal unit) (Carroll, 2004). The coal has low ash and mercury content and is low in sulfur. Because of the low sulfur content, the coal is considered to be Clean Air Act "compliant" and "super-compliant coal," meaning that the coal emits less than 1.2 pounds of sulfur dioxide per million BTU when burned (compliant), or less than 1.0 pound of sulfur dioxide per million BTU when burned (super compliant).

While three coal mines exist in the area, two mines—the Elk Creek Mine (operated by Oxbow Mining, LLC) and the West Elk Mine (operated by Mountain Coal Company, LLC, an affiliate of Arch Coal Inc.)—currently operate on Federal coal leases within the North Fork Coal Mining Area. Only the West Elk Mine is currently producing coal; it produced about 5.2 million short tons in 2014 and 2015 (Colorado Division of Reclamation, Mining and Safety, 2015). The Elk Creek Mine operators idled production on December 5, 2015, due to mining difficulties and underground safety issues. As of late 2015, operations at the Elk Creek mine were focused on final reclamation. Both underground coal mine operations construct and use temporary roads and MDWs to vent and manage methane on existing leases in the North Fork Coal Mining Area as necessary.

As of 2015, there were about 13,300 acres of NFS lands on the GMUG National Forests under lease for coal, about 4,000 acres of which are in CRAs within the North Fork Coal Mining Area (Fig. 3-1). An estimated 5 miles of temporary roads were constructed in CRAs on existing leases since enactment of the Colorado Roadless Rule in July 2012 using the North Fork Coal Mining exception for temporary road construction prior to the June 2014 District Court of Colorado vacatur.

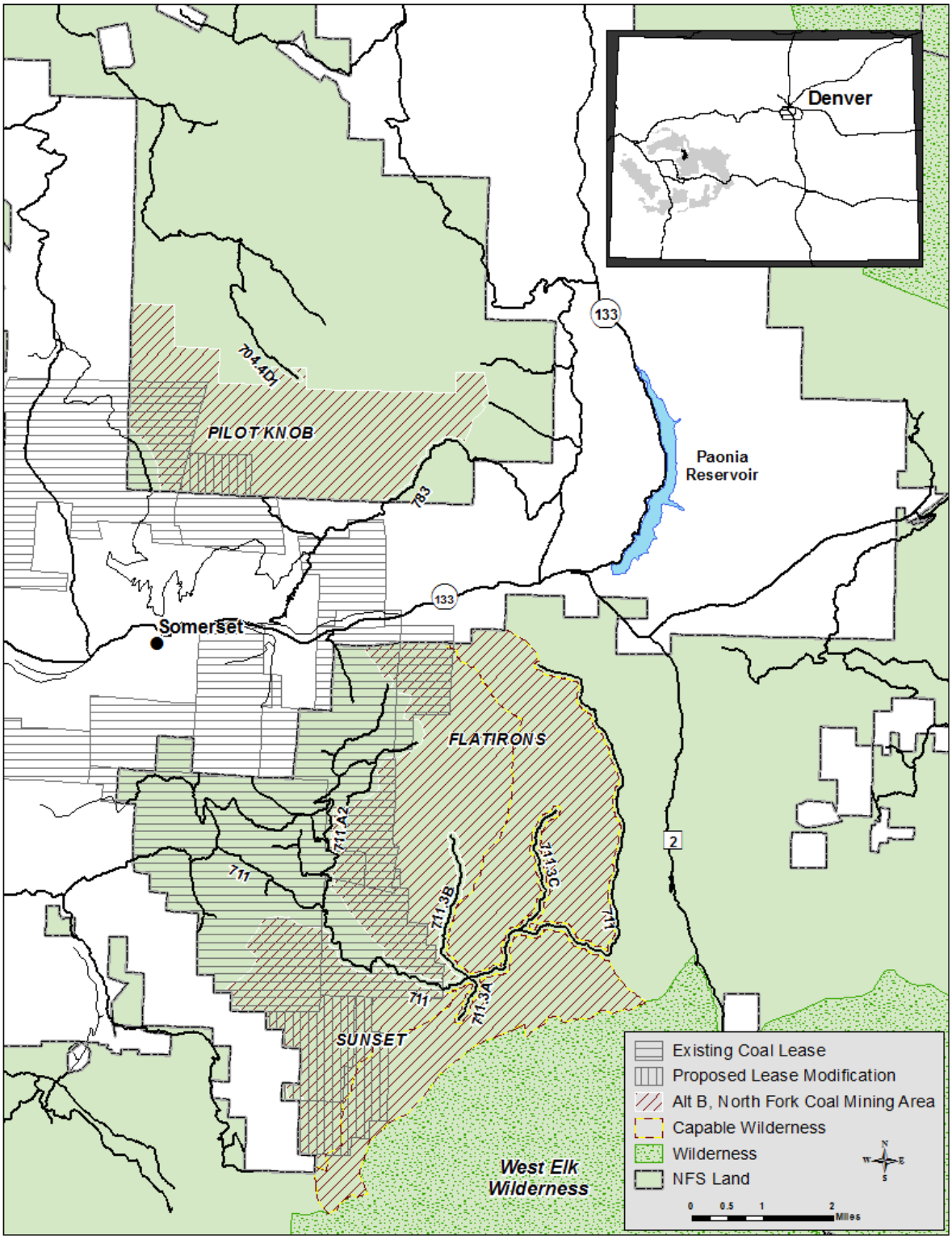

Figure 3-1. *Location of existing and proposed coal leases that overlap with the North Fork Coal Mining Area.*

Coal Resource Estimation

The coal resource estimations were made in consultation with the BLM Colorado State Office. Specific coal resource information for the North Fork Coal Mining Area is limited at this SEIS stage; therefore, for the purposes of this programmatic SEIS, exploration data and coal resource occurrence from adjacent existing mine operations were used to estimate coal resources within the North Fork Coal Mining Area. More discrete coal resource data will not be available unless or until an application to explore, or to lease lands, is made in the future. For the purposes of analysis, the generalized assumptions used were determined to provide a reasonable estimate of potential coal resources in the area, thereby providing a suitable level of information for a programmatic analysis.

Estimations of recoverable coal resources were made based on BLM's standard approach using the equation below to estimate in-place resources:

Acres x *1,830 tons of coal/acre - feet* x *height of mining horizon (in feet).*

Recoverable coal resources were then estimated at 60% of in-place resources. The estimations assumed a 10-foot mining horizon to reasonably depict the mineable coal seam thickness present in the North Fork Coal Mining Area. The estimations for the SFEIS differ from those presented in the 2012 FEIS because of new resource information that was not available during the 2012 FEIS. Where the 2012 FEIS assumed a 20-foot mining horizon, additional coal data from exploration and mining to date on leases adjacent to or within the North Fork Coal Mining Area were used by BLM to refine the mining horizon thickness to 10 feet. Similarly, a 60% recoverability factor was used for the SEIS as a reasonable estimation based on recovery rates from the existing mines. Estimations of coal in existing leases accounted for some coal resources having already been recovered from those leases; thus, the estimations reflect the amount of coal resources remaining. Acreage of the North Fork Coal Mining Area, leased acreage, and acreage with coal resources remaining by alternative is shown in Table 3-1.

Table 3-1. *Estimation of coal resources by Alternative within the North Fork Coal Mining Area*

	North Fork Mining Area and Existing Coal Leases (NFS Acres, to the nearest 100)					*Coal Resource Estimation (millions of short tons)*			
						North Fork Coal Mining Area		*Coal remaining in Existing Leased Acres in North Fork Coal Mining Area*	
Alt.	Total	Existing leases	Area not under lease (2014)	Existing leased acres already mined	Existing leased acres w/ coal reserves remaining	In place coal not under lease	Recoverable coal not under lease	In place coal remaining	Recoverable coal
A	19,500	3,900	15,600	2,900	1,000	285	171*	18	11
B	19,700	4,000	15,700	2,900	1,100	287	172	20	12
C	12,600	4,000	8,600	2,900	1,100	157	94	20	12

**Not recoverable with today's technology.*

Public scoping on the SDEIS made reference to private lands adjacent to the North Fork Coal Mining Area with private coal resources, asserting that private minerals would be accessible due to the exception, which facilitates temporary road access to Federal coal resources. The Forest Service and BLM do not have jurisdiction over private lands or private mineral estate. Thus, access to private lands and private coal resources is not dependent on the North Fork Coal Mining Area exception, and neither are private coal resources subject to the Department of Interior's leasing process. However, access to private coal resources adjacent to the Sunset CRA, which is within the North Fork Coal

Mining Area, could be made easier as a result of the exception. Thus, for the purposes of disclosure, the SFEIS assumes there are about 4.2 million tons of coal on adjacent private lands. A private mineral holder could choose to submit permit application materials to the Colorado Division of Reclamation, Mining and Safety at any time and request approval to mine the private coal resources, and/or construct surface facilities on private lands.

The Forest Service does not have jurisdiction over private lands with private mineral estate. Thus, access to private lands and private coal resources is not dependent on the Colorado Roadless Rule, and neither are private coal resources subject to the U.S. Department of the Interior's leasing process. A private mineral holder could choose to submit permit application materials to the Colorado Division of Reclamation Mining and Safety at any time and request approval to mine the private coal resources, and/or construct surface facilities on the private lands. While the Federal leasing process does not pertain to the private coal reserves adjacent to the North Fork Coal Mining Area, certain private coal estimates are available that have been provided as part of previous development proposals in the Sunset CRA. This information is provided in Table 3-2 to illustrate the potential private coal reserves adjacent to the North Fork Coal Mining Area. These data are not intended to represent all adjacent private coal and are provided for contextual purposes only.

Table 3-2. *Estimated fee coal (private coal) area adjacent to North Fork Coal Mining Area, 2004*

	Total	*Longwall*	*Barrier*	*Continuous Miner*
Acres	399	188	54	156
Recovery %	58	100	0	27
Short tons	4,217,000	3,447,000	–	770,000

Note: *Mineable tons would be about 7,300,000 tons – The barrier pillars are bigger than usual due to projections of development mains being at an angle SE across mineable coal while longwall blocks must be nearly E–W.*

Estimated Projections for Temporary Road Construction and Reconstruction

For the purposes of analysis, the SEIS assumes that accessibility to Federal coal resources depends on ability to construct temporary roads to satisfy regulatory requirements for exploration (BLM regulations establish that a certain amount of exploration data must be available in order for the BLM to consider leasing). Such data are not available for this SEIS; any future consideration of leasing within the North Fork Coal Mining Area would require additional exploration data. The analysis also assumes that without road access, coal exploration requirements could not be met. The analysis also assumes that accessibility depends on ability to construct roads for lease development purposes, such as is needed for safe and economic development of coal resources.

Typical coal-related surface uses are assumed to potentially include exploration drilling and associated temporary road construction, coal mine methane management facilities (such as MDWs) with associated temporary access roads, ventilation shaft and escape-ways with temporary access roads, resource monitoring facilities, and mine infrastructure facilities with associated temporary access roads. Placement of these surface facilities, including temporary roads, could be precluded on portions of coal leases or exploration licenses in CRAs where resource protection conditions limit surface use to protect other resources, such as cultural sites, wildlife habitat, etc.

Certain coal-related surface facilities and associated temporary roads may exist on the landscape for 20 to 30 years, as is the case with ventilation shafts, monitoring facilities, and life-of-mine roads. Other surface facilities have shorter terms of use (less than 2, or 3 to 5 years) as is the case with exploration holes or MDWs, and other short-term uses. All coal-related roads are considered temporary roads, which are decommissioned and reclaimed once no longer needed for purposes of the

lease. Experience in decommissioning and reclaiming temporary roads constructed on coal leases and exploration licenses in the area shows that reclamation practices are effective in returning the NFS lands and resources to on-going uses that support land-management plan direction. Over the long term, decommissioning temporary roads by restoring the corridor to approximate original contour, replacing topsoil resources, and revegetating returns the lands to roadless character.

About 1.5 miles of temporary road for each 640-acre section was assumed as a reasonable estimation of temporary roads for exploration purposes in unexplored areas, with respect to temporary road mileage estimations. For Alternative A, no temporary road miles for exploration were estimated, as prohibitions for road construction or reconstruction in areas outside existing leases are in effect. For Alternative B, the unleased acreage represents about twenty-four 640-acre sections. Assuming 1.5 miles of temporary road construction per section for exploration purposes, the temporary road construction is estimated at 36 miles. For Alternative C, the unleased acreage represents about thirteen 640-acre sections, for which the estimation of temporary road construction for exploration is about 20 miles.

Since early 2001, construction and/or reconstruction of temporary roads have been needed to support construction of MDWs to remove methane (an explosive gas) from the underground mines operating in the Somerset Coalfield. These wells are part of an operator's Mining Safety and Health Administration-approved ventilation plan, and are needed to meet Mining Safety and Health Administration requirements for safe methane levels in underground mines to ensure worker safety. Thus, for the purposes of the SEIS, it was assumed that road access could be needed for lease development purposes (i.e., surface facilities) to promote safe and efficient recovery of coal resources. On the basis of information from existing operations, from 10 to 20 methane drainage well locations per 640-acre section were estimated, and temporary road miles to support these facilities were estimated using an assumption of 3 miles of temporary road per 640-acre section. Thus, for construction of MDWs on unleased acres in the North Fork Coal Mining Area, about 72 miles of temporary road are estimated under Alternative B, and 39 miles are estimated under Alternative C. Estimated temporary road miles and estimated surface disturbance are listed by alternative in Table 3-3.

Table 3-3. *Estimated temporary road mileage, number of methane drainage wells, and disturbance acreage from methane drainage wells for Alternatives A, B, and C*

Alternative	*Estimated temporary road mileage*	*Estimated number of MDWs; projected disturbance acreage*	*Estimated disturbance acreage from MDWs as percentage of overall North Fork Coal Mining Area*
A	~ 5 miles for lease development	From 15 to 30; ranging from about 4.5 to 9 acres	Less than 0.5% of existing leased acreage
B	~36 miles for exploration ~72 miles for lease development	From 240 to 480; ranging from about 72 to 144 acres	Less than 1% of North Fork Coal Mining Area
C	~20 miles for exploration ~39 miles for lease development	From 130 to 260; ranging from about 39 to 78 acres	Less than 1% of North Fork Coal Mining Area

For the SEIS, the Forest Service conducted a geographic information system-based statistical review of temporary road construction related to MDWs at existing operations (Cleary and Ng, 2015). This review showed there is large variability in temporary road mileage densities, ranging from 0.01 to 11.6 mi/mi^2. The statistical analysis also showed that the average temporary road density is 2.3 mi/mi^2 with a median of 1.9 mi/mi^2, and that more than half of the sample set fell below 2 mi/mi^2. The

potential for high variability demonstrates that it is not reasonable to make precise projections of temporary road miles for rule development purposes within the North Fork Coal Mining Area. Further, since the statistical analysis showed an average of 2.3 mi/mi^2 and a median of less than 2 mi/mi^2, the 3-mile per section (or mi/mi^2) estimation carried forward from the 2012 FEIS was found to be statistically greater than the sample median, and thus represents a conservative and reasonable estimate for the purposes of the programmatic SEIS.

Temporary road construction activity related to coal exploration or for other surface uses typically occurs intensively from one to several years, and then slows. There are typically gaps of time where no temporary road construction or other activity occurs. Temporary roads used for coal exploration or surface uses (such as MDWs) are typically decommissioned as soon as they are no longer needed according to practices of contemporaneous reclamation. Therefore, it is assumed that only a portion of overall disturbance could be in place at a given time. Some temporary roads may remain on the landscape for the duration of mining in a particular area or lease, and could be dependent on production plans and monitoring required in the State-approved mining permit. Temporary roads constructed for these purposes are for approved administrative uses only and are not open for public use.

Environmental Consequences

This analysis assumes that if temporary road construction or reconstruction is prohibited in the North Fork Coal Mining Area, then recovery of the Federal coal resources could be severely limited, resulting in the coal resources being rendered not producible from either safety, technological, or productivity standpoints at this time. For the purposes of this analysis, these effects are framed in terms of overall 'accessibility' to coal resources, in which accessibility is linked to the ability to construct or reconstruct roads for exploration or lease development purposes. The analyzed area is the North Fork Coal Mining Area as defined for each alternative.

Alternative A – Direct and Indirect Effects

Alternative A assumes that the North Fork Coal Mining Area exception would not be reinstated. Without ability to construct or reconstruct temporary roads, an estimated 172 million short tons of recoverable coal on 15,600 acres of unleased lands in the North Fork Coal Mining Area could become inaccessible at this time.

Given the assumption that temporary roads are necessary to safely and economically develop Federal coal resources in the North Fork Coal Mining Area, only coal in existing leases could be produced with currently available technology. In this alternative, the North Fork Coal Mining Area includes 19,500 acres, about 4,000 of which are currently under lease. Of the leased acres, an estimated 1,000 acres have coal resources remaining, which are estimated to contain about 11 million short tons of recoverable coal resources (Table 3-1).

Alternative A projects construction of an estimated 5 miles of temporary road to support developing the coal remaining in existing leases, which are not subject to the Colorado Roadless Rule. According to the Colorado Roadless Rule, temporary road construction is subject to requirements that minimize effects to surface resources, prevent unnecessary or unreasonable surface disturbance, and comply with lease stipulations, Forest Plan direction, regulation, and laws. The temporary roads would be for administrative use only, closed to the public, and open only to coal operators, their contractors, the Forest Service, other Federal and State agencies with jurisdictional authority over coal mining activities, and emergency personnel. The Colorado Roadless Rule establishes that temporary roads be decommissioned by obliteration and reclaimed to productive conditions in accordance with requirements in the applicable lease, license, or permit. Coal mine permit conditions call for

reclaiming disturbed lands to support the post-mining land use, which would be based on the Forest Plan direction.

Alternative B – Direct and Indirect Effects

Alternative B proposes to reinstate the North Fork Coal Mining Area exception to the Colorado Roadless Rule. With the ability to construct and reconstruct temporary roads for coal mining-related purposes, an estimated 172 million tons of Federal coal resources on 15,700 acres of unleased lands in the North Fork Coal Mining Area could be accessible. This amount of coal represents about 17 years of production assuming an average production rate of 10 million tons per year.

Alternative B projects 36 miles of temporary road for exploration purposes, and 72 miles for lease development activity in the 15,700-acre North Fork Coal Mining Area. Temporary road construction or reconstruction needed for exploration licenses or for lease development purposes would follow the provisions of the Colorado Roadless Rule for construction, operation, decommissioning, reclamation, and other requirements (such as required by a mine permit) as described in Alternative A.

With reinstatement of the North Fork Coal Mining Area exception, infrastructure that may be needed to support coal mine methane management projects (collection) could be placed within the rights-of-way of temporary roads that were otherwise needed for coal-related surface activities (36 CFR 294.43(c)(1)(ix) . This could result in temporary roads remaining on the landscape for a longer period of time to support the pipeline infrastructure needed for methane management facilities.

Alternative C – Direct and Indirect Effects

Alternative C considers reinstating the North Fork Coal Mining Area exception on about 12,600 acres. With the ability to construct and reconstruct temporary roads for coal-related purposes, an estimated 95 million tons of Federal coal resources on 8,600 acres of unleased lands in the North Fork Coal Mining Area could become accessible. This amount of coal represents about 9.5 years of production assuming an average production rate of 10 million tons per year.

Alternative C projects about 20 miles of temporary road for exploration purposes, and 39 miles for lease development activity in the 12,600-acre North Fork Coal Mining Area. Temporary road construction or reconstruction needed for exploration licenses or for lease development purposes would follow the provisions of the Colorado Roadless Rule for construction, operation, decommissioning, reclamation, and other requirements as described in Alternatives A and B.

With reinstatement of the North Fork Coal Mining Area exception, infrastructure that may be needed to support coal mine methane management projects (collection) could be placed within the rights-of-way of temporary roads that were otherwise needed for coal-related surface activities (36 CFR 294.43(c)(1)(ix) . This could result in temporary roads remaining on the landscape for a longer period of time to support the pipeline infrastructure needed for methane management facilities.

Cumulative Effects

The cumulative effects analysis assumes that for all alternatives, the Rule does not affect accessibility to Federal coal resources on leased or unleased NFS lands not within the North Fork Coal mining Area, nor Federal coal resources on adjacent non-NFS lands.

Under any alternative, because the exception applies only to the North Fork Coal Mining Area, coal resources in CRAs on other national forest units or in areas of the GMUG National Forests outside the North Fork Coal Mining Area are considered inaccessible with current technologies, including undetermined amounts of coal resources in roadless areas on:

- the Pike-San Isabel National Forest,
- Routt National Forest,
- White River National Forest,
- portions of the Pagosa Springs Coalfield on the San Juan National Forest,
- coal in other coalfields on the GMUG National Forests including the Carbondale, Crested Butte, Tongue Mesa, Grand Mesa fields where they overlap with CRAs,
- an estimated 163 million tons of recoverable coal in the portion of the Grand Mesa coalfield that overlaps with the Currant Creek CRA, and
- a portion of the Flatirons CRA east of the North Fork Coal Mining Area containing an estimated 52 million tons of recoverable coal.

Inaccessibility of these resources represents lost opportunities to explore for and develop this coal given current technology.

All alternatives assume some level of potential temporary road construction, related to the amount of acreage currently under lease, or that could be accessible by alternative under the Rule; thus, Alternative A assumes less temporary road construction than Alternatives B and C. For either Alternative B or C, it was assumed that all disturbances would be temporary and would not occur all at once, but over time, and that requirements apply to decommission and reclaim the road corridor to the approximate original contour, replacing topsoil resources and revegetating when no longer needed. Over the long term, roadless area characteristics would return.

For Alternatives B and C, cumulative effects include recovery of coal remaining in existing leases within the North Fork Coal Mining Area. Under these alternatives, an estimated 1,100 acres of existing leases in the North Fork Coal Mining Area have remaining coal resources, and contain an estimated 12 million tons of recoverable coal (Table 3-1). Temporary road needs are projected to be about 5 miles, and methane drainage well needs are projected to be between 15 and 30, with an estimated range of disturbance of 4 to 9 acres. The analysis assumed that all construction, operation, and reclamation requirements are the same as described for Alternative A.

The Energy Information Administration projects that coal will supply about 34% of U.S. electrical generation needs and projects a small increase in demand for domestic coal resources through 2030 (EIA, 2014). About 10% of the national coal resources come from Federal lands. Under current mining conditions, temporary road construction and reconstruction prohibitions under Alternative A will restrict access to Federal coal resources, decreasing availability of these compliant and super-compliant resources to help meet projected coal resource needs.

Air Resources and Greenhouse Gas Emissions

This section discloses possible GHG emissions that could result under the three alternatives being considered related to the exception allowing for temporary road construction for coal exploration and coal-related surface activities within the North Fork Coal Mining Area. When considering the results presented here, it is important to understand that many uncertainties exist regarding the potential for future coal extraction. Because this decision does not authorize any ground-disturbing activities, any additional coal-related development on unleased lands would need to be authorized under subsequent decisions subject to additional NEPA analysis. It is not known when or how much development might occur, particularly when considering activities that might occur well into the future. In order to estimate possible GHG emissions, many assumptions about future development activities were made that may not hold true. Conservative assumptions about potential future activities and associated GHG emissions were made in this SEIS to estimate impacts of the different alternatives.

Direct and Indirect Emissions

Because there will be no ground-disturbing activities authorized as a result of this decision, there are no direct emissions of greenhouse gases associated with this decision. This section discloses the indirect GHG emissions that might result should coal be produced from the mines within the North Fork Coal Mining Area under the three alternatives. These include emissions that might result from the mining activity itself, as well as those that might result from activities that could occur after the coal is produced, including transportation of the coal and combustion in an industrial facility, most likely an electrical generating facility.

In order to provide some estimate of the amount of GHG emissions that might be emitted under the three alternatives, assumptions were made about possible annual coal production rates using existing mines operating in the area. They are referred to here as the low, average, and permitted level production scenarios. Under all three scenarios, it was assumed that the rate of production (i.e., the amount of coal produced annually) would remain constant from year to year.

- The low scenario as described in the SDEIS assumed that production rates would be the same as the actual 2014 production rates reported by the two mines that have existing operations in the area based upon data retrieved from the Colorado Department of Reclamation, Mining and Safety website. The Elk Creek Mine's production was 0 short tons in 2014; thus, the low scenario assumed a mining rate equal to the West Elk Mine's 2014 production. The value for 2014 production at the West Elk Mine used for the SDEIS, about 5.3 million short tons, was updated after it was retrieved by the Forest Service. Actual reported coal production for the West Elk Mine in 2014 was about 6.3 million short tons. As of February 2016, the West Elk Mine reported that production for 2015 was about 5.2 million short tons, while the Elk Creek Mine's 2015 production was again 0 short tons. Therefore, the production assumption used for the low scenario in the SDEIS (i.e., approximately 5.3 million short tons) was retained for the SFEIS.
- An average scenario assumed an average production of 10 million short tons annually, based on average production by the two existing mines from 2001 to 2014.
- The permitted level scenario is the maximum mining rates authorized by the existing mines' air quality permits: 15.5 million short tons annually. The Elk Creek Mine is permitted for no more than 7 million short tons of coal production per year, and the West Elk Mine is permitted for no more than 8.5 million short tons of coal production per year.

The low and permitted production scenarios provide upper and lower bounds for the annual GHG emissions estimates under the three alternatives. However, the total amount of coal that could be produced is different for each alternative; thus, the total GHG emissions associated with coal production is different for each alternative.

Alternative A

Under Alternative A, the current court vacatur of the North Fork Coal Mining Area exception would remain in effect. With no exception for temporary road construction for coal-related activities for future leases, this analysis assumes that unleased coal resources within the North Fork Coal Mining Area would be inaccessible and thus would not be produced; however, this may become feasible with changes in technology. Temporary roads are necessary for lease development purposes such as installing MDWs to vent methane associated with coal seams, allowing workers to safely access the underground coal. Without road access, the unleased coal resources within the North Fork Coal Mining Area are considered inaccessible and thus will generate no additional GHG emissions from producing the unleased coal resources.

Existing leases total about 11 million short tons of coal and it is assumed that they will be produced; therefore, GHGs emissions would be produced under Alternative A from existing coal leases. Annual rates of GHG emissions were calculated as described in the following discussion for Alternative B, but the duration of mining would be shorter and thus the total GHG emissions would be lower than for either of the other alternatives. Under Alternative A, the mining duration would be about 2 years under the low production scenario, 1 year under the average production scenario, and 1 year under the permitted production scenario. In total, under Alternative A, about 29 million metric tons in carbon dioxide (CO_2) equivalents (CO_2e) of GHGs could be emitted. This includes approximately 2 million metric tons CO_2e of accumulated methane emissions, which is about 8% of the total. For this alternative, given that the time needed to produce the currently leased coal within the North Fork Coal Mining Area is not expected to be more than 2 years under the assumptions made here, the average and permitted production scenarios are unlikely as only one of the two mines is currently producing.

Methodology

GHG emissions estimated in this analysis include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). The GHG calculation methodology estimated lifecycle GHG emissions from potential underground mining as the sum of:

- GHG emissions from extraction of the coal and transportation to market in the United States, referred to interchangeably as the emissions from "upstream" or "production" processes (these emissions include methane releases from the mine during coal mining),
- GHG emissions from shipping some portion of the coal overseas, and
- GHG emissions from combustion of the coal in an electrical utility or other industrial facility.

In order to estimate possible GHG emissions that might result from coal mining in a reasonable way, this analysis used a tool developed by experts at the U.S. Department of Energy's National Energy Technology Laboratory to estimate GHG emissions from the upstream processes. The National Energy Technology Laboratory implements a broad spectrum of energy and environmental research and development programs. Laboratory personnel are experts in coal, natural gas, and oil technologies and their impacts, analysis of energy systems, and international energy issues. As part of its mission, the laboratory has developed software tools to estimate lifecycle GHG emissions associated with the extraction and use of fossil fuels.

This analysis used one of these tools, known as the Upstream Dashboard (Skone and James, 2015), to create emissions factors that account for GHG emissions (carbon dioxide, methane, and nitrous oxide) for the upstream processes associated with coal mining. The upstream processes accounted for by the tool include mining the coal and transporting it by rail within the United States. It was assumed in this analysis that coal is shipped only by rail within the United States. The dashboard tool also includes methane emissions from the mine that occur during mining operations. All of the processes included in the raw material acquisition and transportation portions of the tool, which together represent the upstream processes, are documented as a life cycle analysis (NETL, 2014). The tool accounts for emissions from all phases of the mining operations, to include construction of the mine and associated facilities, operation of the mine itself and various coal handling facilities, coal mine methane emissions, and transport of the coal via train. It also includes emissions from road construction, based upon the average footprint for a mine. This tool is appropriate for use in this type of programmatic analysis as it was developed by experts in the field of energy and it accounts for a comprehensive suite of GHG-producing activities associated with coal production from typical gassy underground mines.

In order to estimate GHG emissions it was necessary to select values for the global warming potentials of the individual GHGs. The Intergovernmental Panel on Climate Change periodically releases updated reports on the current state of climate change science that include the Panel's latest

recommendations on the global warming potential of various GHGs. The global warming potential of a gas is defined by EPA as "a measure of the total energy that a gas absorbs over a particular period of time (usually 100 years), compared to carbon dioxide" (EPA, 2015a). For example, a global warming potential of 30 for a given GHG would indicate that it will absorb about 30 times as much energy as an equivalent amount of carbon dioxide over a given time period. The Intergovernmental Panel on Climate Change reports different values for the global warming potential of GHGs depending on the time period that is assumed. The 100-year time horizon is typically used by EPA (EPA, 2015e), so the Intergovernmental Panel on Climate Change 100-year global warming potentials provided in its 2007 report were used in order to be consistent with the national U.S. GHG inventory and GHG reporting requirements. Dashboard emissions factors in mass units were multiplied by their global warming potential values.

The global warming potential value used for this SFEIS was 25 for methane, which is a change from the global warming potential of 36 used in the SDEIS. The global warming potential of 25 is used consistently by the EPA for the national U.S. GHG inventory. The global warming potential used for nitrous oxide was 298 (40 CFR 98, Table A-1). Amounts of different GHGs can then be expressed in terms of their carbon dioxide equivalent (CO_2e) by multiplying the amount of each gas by its global warming potential value. Because the global warming potentials of different gases are relative to that of carbon dioxide, the global warming potential of carbon dioxide is always equal to 1.

The user needs to enter two key parameters into the Upstream Dashboard. The first parameter is the amount of methane emitted per short ton of coal produced. As mentioned previously, in order to provide some estimate of possible future methane emissions, assumptions were made using existing mines operating in the area. Methane emissions from the mines in the North Fork Coal Mining Area have proven to be highly variable and not closely tied to production. Although it is not known whether the same mines now operating in the area will continue to operate in the future, or whether they will operate in a similar manner, the default value for methane emissions in the dashboard was replaced with an estimated factor based upon available methane emissions from the existing mines. Reported methane emissions data from the West Elk and Elk Creek mines were used to derive a reasonable methane emissions factor to estimate possible future methane emissions from mines within the North Fork Coal Mining Area. Available methane release data for the West Elk and Elk Creek mines were downloaded from the EPA large-facility greenhouse gas emissions data website (EPA, 2015c) in metric tons of CO_2e (the Elk Creek Mine is listed on this site as Oxbow Mining, LLC). The site contained four years of data (2011–2014). EPA's standard value for the global warming potential of methane is 25, so the reported methane emissions in CO_2e were divided by 25 to obtain metric tons of methane. The equation used to determine cubic feet of methane from the reported methane emissions in metric tons of CO_2e is:

$$CH_4\ ft^3 = [(CH_4\ MetTons\ CO_2e)/25*(2204.62622\ lbs/metric\ ton)]/(0.0423\ lbs/ft^3).$$

The value for the density of methane, 0.0423 lbs/ft^3, is the value specified by EPA for reporting emissions under the Greenhouse Gas Reporting Rule in 40 CFR 98 subpart FF.

Finally, the ratio of methane emitted in standard cubic feet to short tons of coal produced was calculated using the reported coal production in short tons for those years. Production data were obtained from the Colorado Division of Reclamation, Mining and Safety (DRMS, 2015). The methane emissions and coal production data are listed in Table 3-4.

Table 3-4. *Methane emissions and coal production for the West Elk and Elk Creek Mines, 2011–2014*

Mine	Year	Reported Methane Emissions (metric tons CO_2e)	Methane Emissions (metric tons)	Coal Production (short tons)
West Elk	2011	1,235,400	49,416	6,042,021
	2012	922,434	36,897	6,953,879
	2013	752,128	30,085	6,143,043
	2014	651,233	26,049	6,283,478
Elk Creek	2011	1,336,633	53,465	3,007,055
(Oxbow Mining, LLC)	2012	1,151,883	46,075	2,958,016
	2013	85,707	3,428	436,383
	2014	14,945	598	0

The second key user-entered parameter in the Upstream Dashboard tool is the transport distance and type. Rail was chosen with a transport distance of 4,000 miles (round trip). This allows for transport one-way of up to 2,000 miles, which includes most of the United States, including the Midwest, all of the Western United States, and potential export locations in Long Beach, Vancouver Canada, and New Orleans. This round-trip might not quite account for the distances to ship to some locations on the eastern seaboard, such as Maine and Florida, but it includes many areas where potential customers are located, including Texas, the Southeastern United States, Arizona, the Midwest, the Tennessee Valley Authority, western Kentucky, and Mississippi. The 4,000-mile round trip distance is therefore conservative and may be an overestimate of typical domestic transport distances.

The user also chooses the type of energy being produced in the Upstream Dashboard tool, such as coal, natural gas, or crude oil. For coal, there are two profiles available for the raw material acquisition process, which includes all processes associated with mining the coal. The Illinois No. 6 coal profile was chosen to be representative of a typical gassy underground mine (NETL, 2010). The only other option would represent a surface coal mine such as a Powder River Basin coal mine, which would have lower methane emissions.

Once the user enters the parameters listed above, the Upstream Dashboard tool produces emissions factors that can be used to estimate GHG emissions associated with production and transportation of the coal. The emissions factors are expressed in terms of mass of greenhouse gas per unit mass of coal produced. The user chooses the desired units for the emissions factor. For this analysis the chosen output unit for the emissions factors was kilograms of mass for each gas per short ton of coal produced.

Three emissions factors were produced by the tool for GHGs (for methane, carbon dioxide, and nitrous oxide) in units of kilograms per short ton of coal. The emissions factors for the three gases were then multiplied by their global warming potentials and by the corresponding coal production totals under the three production scenarios to estimate upstream GHG emissions for all three GHGs. For this calculation, the global warming potentials used were 25 for methane, 298 for N_2O, and 1 for carbon dioxide.

The analysis also estimated GHG emissions that could result from combustion of the coal. Emissions factors for coal combustion were obtained from the Energy Information Administration website (Hong and Slatick, 1994). Like the National Energy Technology Laboratory, the Energy Information Administration is an agency of the U.S. Department of Energy. Average carbon dioxide emissions factors by state and coal rank in units of pounds of carbon dioxide per million BTU are provided in Table FE4 at the Energy Information Administration website. The term coal "rank" refers to how far

the coal has progressed in its change from plant material to carbon. (University of Kentucky, 2012). Coal ranks include lignite, sub-bituminous, bituminous, and anthracite. The value of 206.2 listed for bituminous coal was used.

Emissions calculations for carbon dioxide resulting from coal combustion using these emissions factors assumed all of the coal was combusted. The amount of carbon dioxide that could result from coal combustion was estimated by multiplying the emissions factor by the energy content of the coal and the amount of coal produced. The equation for this calculation is:

Carbon dioxide emissions =

coal production x *energy content* x *emissions factor*.

Finally, GHG emissions resulting from shipping of coal to overseas locations were estimated. To estimate the fraction of future U.S. coal production that might be exported, 2004–2013 production and export data were obtained from the Energy Information Administration (EIA, 2015d) and the fraction of coal exported in each year was computed. To be conservative, the upper end of the range for the coal export fraction was chosen because the proportion of coal production exported has increased in recent years. The value chosen was 0.12, or 12% of coal produced in a given year.

The National Energy Technology Laboratory Upstream Dashboard tool does not currently include emissions from overseas shipping of coal. The developers of the Upstream Dashboard tool separately calculated an emissions factor to use in estimating GHG emissions from shipping coal overseas (personal communication, Timothy J. Skone, U.S. Department of Energy, National Energy Technology Laboratory, in an email message to Debra Miller on April 10, 2015). This emissions factor is expressed in terms of short tons of carbon dioxide per short ton of coal per nautical mile. They also provided a draft GHG lifecycle analysis report that included shipping distances from likely ports that might be used to ship coal to destinations overseas (including the U.S. cities of Long Beach, New Orleans, and Baltimore, and the Canadian city of Vancouver, British Columbia). The longest distance given in the report (10,500 km one-way from Vancouver to Shanghai) was chosen to represent the average shipping distance for exported coal. Shipping carbon dioxide emissions were then estimated by multiplying the emissions factor by the estimated amount of coal being shipped and the round-trip distance. The equation for this calculation is

Carbon dioxide emissions from shipping =

coal produced x *fraction of coal exported* x *2(shipping distance one-way)* x *shipping emissions factor*.

GHG emissions from rail transport of exported coal from a receiving port overseas to a final destination were not estimated as this is

- beyond the scope of the analysis,
- overly speculative given the variety of potential final destinations, and
- small in comparison with the other sources of GHG emissions considered here.

Results

The three parts of the GHG emissions estimates (upstream processes, overseas transport, and combustion emissions) were computed for the three scenarios described earlier to estimate the potential range of possible GHG emissions. Estimates for annual emissions of GHGs for these three scenarios are provided in Table 3-5. Estimated emissions for methane shown in Table 3-5 were calculated in CO_2e by using 25 as the global warming potential for methane. Note that the emissions estimates have been rounded and the column totals do not exactly equal the sum of the entries. Estimates for annual gross emissions of GHGs for the three scenarios in Table 3-5 are for extraction

and combustion of North Fork Coal Mining Area coal. Net annual emissions of GHG emissions under Alternatives B and C will be lower after accounting for decreases in production and consumption of substitute sources of energy from other coal and natural gas supply and demand regions. Net emissions of carbon dioxide are described later in the *Economics* section, Tables 3-26 and 3-27.

Table 3-5. *Estimated annual gross lifecycle GHG emissions from potential coal mining within the North Fork Coal Mining Area under three production scenarios*

	Emissions Estimates, in metric tons CO_2e		
	Low Scenario	*Average Scenario*	*Permitted Scenario*
Coal Production (short tons)	*5,300,000*	*10,000,000*	*15,500,000*
Carbon dioxide – combustion	11,600,000	22,300,000	34,500,000
Carbon dioxide – extraction	100,000	200,000	300,000
All – rail transport	600,000	1,200,000	1,800,000
Methane – extraction	1,000,000	1,900,000	3,000,000
Nitrous oxide – extraction	0	0	0
Carbon dioxide – overseas shipping	100,000	200,000	300,000
Total	**13,500,000**	**25,800,000**	**39,900,000**

Global warming potential of methane = 25.

It is important to keep in mind that the annual emissions estimates in Table 3-5 are based upon hypothetical coal production values and therefore do not indicate what future annual GHG emissions will actually be. At no time during the years from 2003 through 2014 (the years for which production data from both mines were readily available online) did production reach the maximum permitted rate at either of the currently operating mines used to derive the production scenarios. The highest annual production rate for the West Elk Mine during that period occurred in 2012 at 6.9 million short tons, and the highest production rate over the same period for the Elk Creek Mine occurred in 2005 at 6.5 million short tons. Combined production for both mines during 2003–2015 peaked in 2004 at 13.1 million short tons and has generally decreased since then, reaching a low in 2015. The maximum production rate assumed under the permitted-level scenario represents an upper bound that, while unlikely, could possibly be reached under ideal market and production conditions. In addition, coal production at the Elk Creek Mine ceased in 2013, and as of late 2015, operations at the Elk Creek mine were focused on final reclamation. It is not known if additional mining activity will occur in the North Fork Coal Mining Area at mines other than the West Elk Mine in the future. Using the high and low hypothetical production values while holding other assumptions about emissions (such as methane released per short ton of coal produced) constant, the range in annual GHG emissions from both mines varies from 13.5 million metric tons on the low end to 39.9 million metric tons on the high end. Actual annual values are likely to fall somewhere between these two estimates. The substantial difference in the high and low estimates gives some idea of how large the uncertainty is when making estimates of future annual GHG emissions that could result from mining and combustion of North Fork Coal Mining Area coal. Cumulative greenhouse gas emissions from mining the leased coal would be approximately 29 million metric tons of CO_2e. This includes methane emissions of approximately 2 million metric tons CO_2e, which is about 8% of the total.

The estimates in Table 3-5 indicate the relative contributions of different processes to the total potential GHG emissions. They show that the most significant contributor to GHG emissions is coal combustion, followed by methane emissions during coal mining. The other contributors to the total GHG emissions estimates (from coal production and transportation) are much smaller (Fig. 3-2). The production emissions shown in the figure include mining operations and domestic transportation by rail.

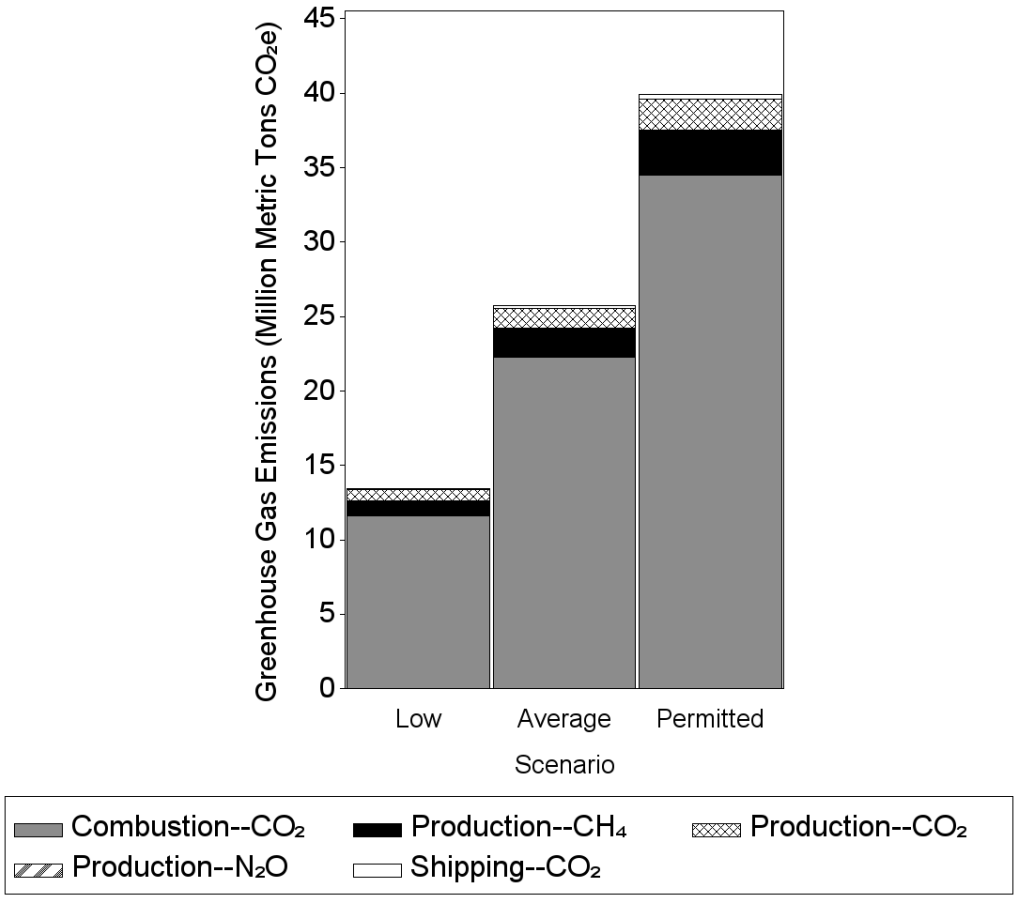

Figure 3-2. *Estimated annual GHG emissions under the low, average, and permitted level scenarios.*

In addition to the uncertainty in estimating future coal production and resulting combustion and production emissions, there is uncertainty in the estimate of methane produced during mining. The methane emissions estimates were computed as an average over the period of available data reported under the Greenhouse Gas Reporting Rule. In general, methane emissions are variable and depend on many factors, including production, the specific seam being mined, coal rank, the depth and thickness of the coal seam, and other factors. When expressed in terms of volume per short ton of coal, the methane emissions factor varied on an annual basis by a factor of roughly 2 at each of the two mines over 4 years (an annual estimate for Elk Creek in 2014 cannot be computed because the production total was zero).

Emissions from coal production were conservatively estimated. The Upstream Dashboard tool includes emissions from mine construction and a whole range of processes that could occur at mine sites. This tool was chosen because the exact parameters of possible mining operations cannot be foreseen for all of the years covered under this analysis, and this tool includes a comprehensive suite of processes that might be included. Nonetheless the contributions of mining operations to the total GHG inventory are relatively small when compared with contributions from methane venting emissions and coal combustion, and thus changes in the assumptions about mining operations would have less of an impact on emissions estimates. Transportation of coal to market contributes a relatively small amount to total GHG emissions estimates; thus, changing the distances assumed to lower values that would probably better represent typical distances would have negligible impacts to the total GHG estimates.

Alternative B

Under Alternative B, the North Fork Coal Mining Area exception would be reinstated. The exception would allow for temporary road construction for exploration and coal-related surface activities on unleased lands within the North Fork Area.

Under this alternative it is estimated that about 172 million short tons of recoverable coal resources underlie the 19,700 acres of the North Fork Coal Mining Area. Many factors influence the likelihood of additional development over the planning horizon for this analysis. These include changes in demand for coal resulting from economic variability, the replacement of coal used in electricity generation by natural gas and other sources, changes in the regulatory environment such as the recent Secretarial Order No. 3338 from the Department of Interior to the BLM to review the Federal coal program, unforeseen difficulties in accessing coal within the area, and other factors (see *Coal Resources* section).

In order to provide some estimate of the amount of GHG emissions that might be emitted under Alternative B, several assumptions had to be made. For this alternative, it was conservatively assumed that all 172 million short tons of coal could be produced. In order to estimate how long this might take, the three scenarios were used: low, average, and permitted level. Under all three scenarios, it was assumed that the rate of mining (i.e., the amount of coal produced annually) would remain constant from year to year.

Under Alternative B, the mining durations for each production scenario could be about 33 years under the low scenario, 17 years under the average scenario, and 11 years under the permitted-level scenario under the assumption that all of the coal could be produced continuously at a constant rate. If all the coal were recovered and combusted, the total gross accumulated estimated GHG emissions could be as high as 443 million metric tons of CO_2e. This includes approximately 34 million metric tons CO_2e of accumulated methane emissions, which is about 8% of the total. This represents an upper bound on total gross emissions of GHGs (including carbon dioxide, methane, and nitrous oxide) under the assumption that all available unleased coal is recovered and completely combusted, not accounting for changes in production and consumption of substitute sources of coal and natural gas. The estimate does not include the GHG estimates from mining coal already under lease (as described in Alternative A). It does not mean that this will actually occur, or that it is likely to occur.

Net emissions of GHGs from producing and consuming the 172 million short tons of unleased reserves under Alternative B are expected to be lower, after accounting for decreases in production and consumption of substitute sources of coal and natural gas, resulting from energy market responses to increases in North Fork Coal Mining Area supplies. The *Economics* section (Tables 3-26 and 3-27) discusses potential substitution effects, and projects net cumulative emissions of carbon dioxide only, that are lower than gross carbon dioxide emissions under Alternative B (as presented in Table 3-5).

No substitution is assumed to occur for Alternative A, implying gross emissions are equal to net emissions for Alternative A. Note that for the estimates of net carbon dioxide emissions in the *Economics* section, the calculation of a portion of those emissions (those from combustion) used an emissions factor expressed in terms of tons of carbon dioxide per gigawatt-hour, which is different than the form of the combustion emissions factor used here. For a discussion of this calculation, see Appendix C (Table C-22).

Alternative C

Under Alternative C, the North Fork Coal Mining Area exception would be reinstated. The exception would allow for temporary road construction on 12,600 acres of unleased coal reserves within the North Fork Coal Mining Area. For this alternative, there would be about 95 million short tons of unleased coal resources within the North Fork Coal Mining Area that could potentially be made

available for leasing. Under Alternative C, the mining durations for each production scenario would be about 18 years under the low scenario, 9 years under the average scenario, and 6 years under the permitted level-scenario under the assumption that all of the coal could be produced continuously at a constant rate. These estimates of possible mining duration do not include the mining of the 11 million short tons that are already under lease as discussed under Alternative A.

Because the annual production scenarios analyzed for Alternative C are the same as those for Alternative B, the estimates of possible annual GHG emissions associated with possible future mining activities are also the same. However, the possible duration of mining and total GHG emissions estimates over the time it could take to produce all 95 million short tons would be different. If all coal were produced and combusted, the total estimated accumulated GHG emissions could be as high as 244 million metric tons CO_2e, depending up the production scenario. This includes approximately 19 million metric tons CO_2e of accumulated methane emissions, which is about 8% of the total. This value represents an upper bound for total emissions of GHGs under the assumption that all unleased coal available under Alternative C is recovered and completely combusted. The figure does not include the GHG estimates from mining coal already under lease (as described in Alternative A). It does not mean this will actually occur, or that it is likely to occur.

Net emissions of GHGs from producing and consuming the 95 million short tons of unleased reserves under Alternative C are expected to be lower after accounting for decreases in production and consumption of substitute sources of coal and natural gas, resulting from energy market responses to increases in North Fork Coal Mining Area supplies. The *Economics* section (Tables 3-26 and 3-27) discusses potential substitution effects and projects net cumulative emissions of carbon dioxide that are lower than gross carbon dioxide emissions under Alternative C (as presented in Table 3-5).

Note that for the estimates of net carbon dioxide emissions in the *Economics* section, the calculation of a portion of those emissions (those from combustion) used an emissions factor expressed in terms of tons of carbon dioxide per gigawatt-hour, which is different than the form of the combustion emissions factor used here. For a discussion of the economic calculation, see Appendix C (Table C-22).

Cumulative Effects

Alternative A

Under Alternative A, without temporary road access, it is unlikely there would be additional coal leases and thus no additional GHG emissions from producing unleased coal resources that would contribute cumulatively to the volume of GHGs in the atmosphere from all other sources.

Alternatives B and C

Under Alternatives B and C, GHG emissions estimated from future production, transportation and combustion of additional North Fork Coal Mining Area coal that could be made available with road access would contribute cumulatively to the volume of GHGs in the atmosphere from all other sources. Due to the relatively long half-lives for GHGs in the atmosphere (including roughly 100 years for carbon dioxide and 12 years for methane), these gases once emitted become globally distributed where they contribute to the global atmospheric GHG loading. The *Climate Change* section in the 2012 FEIS, and updated for this SEIS, discusses potential future impacts in broad terms that might result from climate change.

It is possible to consider the potential contributions of GHG emissions that might result from producing additional coal within the North Fork Coal Mining Area by comparing the annual GHG emissions estimates to GHG emissions from other sources at different scales, including sources in the

same sector. According to data retrieved from EPA's Greenhouse Gas Data Inventory Explorer (https://www3.epa.gov/climatechange/ghgemissions/inventoryexplorer/#industry/allgas/source/all), coal mining in the United States accounted for 73.9 million metric tons CO_2e of GHG emissions in 2014. Estimated annual emissions from extraction of North Fork Coal Mining Area coal would be about 1.5% to 4.5% of the 2014 coal-mining emissions, depending upon the scenario (assuming a constant emission rate for comparison purposes). If transportation of North Fork Valley coal is included, estimated emissions would be about 2.4% to 7% of national 2014 coal-mining emissions, but this is likely an overestimate as the national figure does not include transportation. National emissions of CO_2 from fossil fuel combustion for generation of electricity were estimated at 2,039 million metric tons in 2014. Estimated annual CO_2 emissions from combustion of North Fork Coal Mining Area coal, including combustion assumed to occur outside the United States, would therefore be about 0.6% to 1.7% of the 2014 national estimate (assuming a constant emission rate for comparison purposes). The City of Denver estimated its 2013 annual GHG emissions to be about 13 million metric tons CO_2e (Denver Environmental Health, 2015). For 2010, total GHG emissions for the State of Colorado were about 130 million metric tons CO_2e, of which 96 million metric tons resulted from fossil fuel combustion and 36 million metric tons resulted from coal combustion (CDPHE, 2014).

Another way of putting the estimated emissions in context is to compare them to emissions of more familiar sources. The EPA has created a GHG equivalencies calculator that allows the user to enter a quantity of emissions and relate them to sources such as passenger vehicles, gallons of gasoline consumed, and homes. It also compares the emissions to amounts of carbon sequestered by trees planted and forest growth. These equivalencies are based upon national average values for each type of source (or sink), such as a typical passenger vehicle driven an average number of miles, or a typical house or power plant, so these equivalencies are only approximate. Selected results from the EPA GHG equivalency calculator (EPA, 2015b) for each of the three production scenarios are shown in Table 3-6.

Table 3-6. *Approximate equivalency of estimated annual GHG emissions for the three production scenarios*

[Data derived from EPA Carbon Equivalency Calculator (EPA, 2015b); table determined using annual totals, where 25 was used for global warming potential of methane. Values rounded to the nearest 100,000, except for coal-fired power plants.]

Estimated Annual GHGs from North Fork Coal Mining Area Coal		Annual CO_2 Emissions from		CO_2 Emissions From Consumption of	Annual GHG Emissions from Number of Passenger Vehicles Driven for 1 Year	Carbon Sequestered by	
Annual Scenario	Millions of metric tons of CO_{2e}	Number of Coal-Fired Power Plants	Number of Homes' Energy Use	Barrels of Oil		Tree Seedlings Grown for 10 Years	Acres of U.S. Forests in 1 Year
Low	13.3	3.5	1,200,000	31,300,000	2,800,000	345,200,000	11,000,000
Average	25.8	6.8	2,400,000	59,900,000	5,400,000	660,700,000	21,100,000
Permitted	39.9	10.5	3,600,000	92,800,000	8,400,000	1,023,400,000	32,700,000

Methane emissions that occur during mining operations comprise a substantial portion of the GHG emissions resulting from mining of coal within the North Fork Coal Mining Area (second only to the carbon dioxide released when the produced coal is combusted). As discussed earlier, methane emissions are variable and depend upon a number of factors in addition to production. These factors include the rank (or classification) of the coal, the particular seam being produced, and the depth and thickness of that seam. The amount of methane emitted from the Elk Creek and West Elk Mines, as a function of coal produced, varied considerably between 2011 and 2014.

Nationally, coal mining accounts for about 10% of anthropogenic methane emissions. It is the fourth-largest source behind enteric fermentation at 165 million metric tons CO_2e (2013), natural gas systems at 157 million metric tons CO_2e (2013), and landfills. Reported methane emissions and estimated U.S. methane emissions from all sources and coal mining are shown in Table 3-7. Values in Table 3-7 are provided in CO_2e, with 25 used as the global warming potential for methane. The data show that combined methane emissions from the two mines were about 0.3% of estimated national methane emissions from all sources and 3% of national coal mining methane emissions in 2012, which was the last year of full operation for the Elk Creek Mine.

Table 3-7. *Relation of methane emissions in the North Fork Valley to U.S. methane emissions, 2011–2013 (millions of metric tons CO_2e)*

Year	North Fork Coal Mining Area Reported Methane Emissions		U.S. Methane Emissions	
	Elk Creek Mine	West Elk Mine	All Sources	Coal Mining
2011	1.34	1.24	660.9	71.2
2012	1.15	0.92	647.6	66.5
2013	0.09	0.75	636.3	64.6

Climate Change

Evidence of anthropogenic (human-caused) climate change continues to grow, and is widely accepted throughout the scientific community. Fossil fuel combustion, deforestation, and other anthropogenic influences have made substantial contributions to observed warming since the 1950s. As summarized from the fifth Intergovernmental Panel on Climate Change:

- Human influence on climate is clear, and human-caused emissions of GHGs are the highest in history. Climate change has had widespread impacts on human and natural systems.
- GHGs, including carbon dioxide and methane, respectively account for about 76 and 16% of annual global emissions that are attributable to human activity.
- Increased emissions are attributed to a growing demand for energy and an increase in the percentage of coal used to meet this demand (IPCC, 2014).

Coal mining, transportation, and combustion are indirect but connected actions to Alternatives B and C and will continue to increase atmospheric concentrations of GHGs. The Council on Environmental Quality's final guidance on NEPA and climate change recommends that emissions be used as a proxy for climate change impacts. CEQ describes the cumulative nature of climate change as "resulting from the incremental addition of GHG emissions from millions of individual sources, which collectively have a large impact on a global scale." (CEQ, 2016).

Guidance for Climate Change Analysis

Climate change analysis in the SFEIS is guided by Climate Change Considerations in Project-Level NEPA Analysis (U.S. Forest Service, 2009) and the *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in the National Environmental Policy Act Reviews* (CEQ, 2016). The SDEIS also was guided by the earlier 2014 revised draft guidance from CEQ. Efforts made to estimate, quantify, and monetize GHG emissions were completed to address specific deficiencies identified by the District Court of Colorado, and to inform a benefit-cost analysis, and are not routine climate change analyses undertaken as part of the NEPA process.

The USDA guidance more generally recommends consideration of both the effect of a proposed action on climate change, and the effect of climate change on a proposed action. The projected and realized effects of climate change are described in this section. The effects of climate change (drought, temperature rise, flooding, etc.) on the proposed action will not likely impact the programmatic decision, of whether or not to allow temporary roads for coal mining and coal-related activities. Considerations of climate change impacts might be more meaningful for other types of land management projects that result in on-the-ground activities, such as tree-planting, hazardous fuel treatments, or reservoir expansion. In these cases, climate change may impact the proposed action.

Existing Condition

Greenhouse Gases and Climate Change

Anthropogenic climate change is an existing condition and is considered part of the environmental baseline. Although impacts are variable, 7 of the 10 warmest years on record in the United States, and the 10 warmest years globally, have all occurred since 1998 (White House, 2013).

Atmospheric concentrations of GHGs have increased substantially since preindustrial levels. A brief history is described in *2014 Global Carbon Budget* and describes contributions from deforestation, land-use change, and industrialization (Le Quere et al., 2014):

> The concentration of CO_2 in the atmosphere has increased from approximately 277 parts per million (ppm) in 1750 (Joos and Spahni, 2008), the beginning of the Industrial Era, to 395.31 in 2013 (Dlugokencky and Tans, 2014). Daily averages went above 400 ppm for the first time at the Mauna Loa station in May 2013 (Scripps Institute of Oceanography, 2013). The atmospheric CO_2 increase above preindustrial levels was initially, primarily, caused by the release of carbon to the atmosphere from deforestation and other land-use change activities (Ciais et al., 2013). Although emissions from fossil fuel combustion started before the Industrial Era, they only became the dominant source of anthropogenic emissions to the atmosphere from around 1920 and their relative share continued to increase until present. Anthropogenic emissions occur on top of an active natural carbon cycle that circulates carbon between the atmosphere, ocean, and terrestrial biosphere reservoirs on time scales from days to millennia, while exchanges with geologic reservoirs and even longer timescales (Archer et al., 2009).

Current atmospheric concentrations of CO_2 are about 400 parts per million (NASA, 2016). The correlation between temperature and atmospheric GHGs is represented in Figure 3-3. Atmospheric concentrations of CO_2 (generally represented by the lower line in the figure) are closely tied with global temperature changes (generally represented by the top line in the figure).

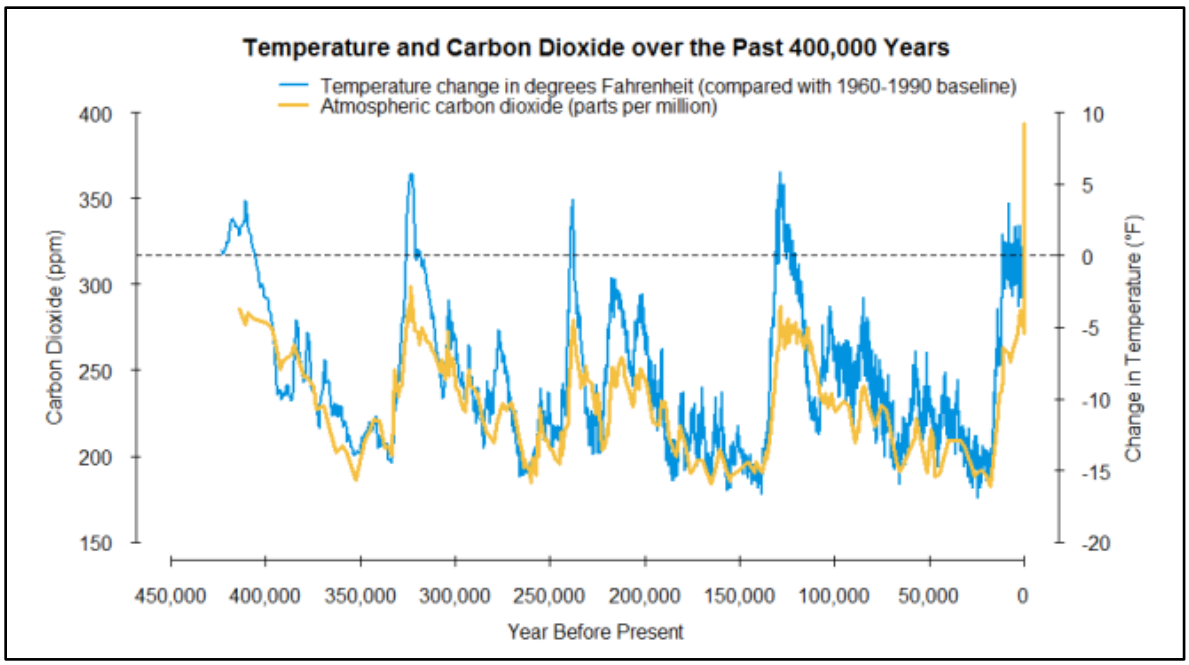

Figure 3-3. *Change in temperature and carbon dioxide over the past 400,000 years. Data from NOAA's National Climatic Data Center and the Mauna Loa Observatory.*

The type and magnitude of future climate change impacts will likely depend on the amount and timing of global emissions. Reducing emissions in the near-term will most likely lessen the impacts. Reducing global emissions will generally result in lower expected temperatures.

If GHG emissions continue to increase, the likely result will be more severe climate change impacts, some of which will be difficult to adapt to and have wide-reaching consequences (Hansen et al. 2013). Reducing emissions sooner rather than later will likely provide better chances to adapt to changing conditions. Although these general statements are speculative, they reflect accepted recommendations to avoid the worst impacts of climate change (IPCC, 2014).

Lowering carbon emissions (Fig. 3-4) largely depends on developed and developing countries to transition to lower carbon energy sources, such as renewable energy or natural gas, or pursue enhanced energy efficiency. Cleaner technologies for traditional fossil fuel resources could also reduce global emissions (IPCC, 2014).

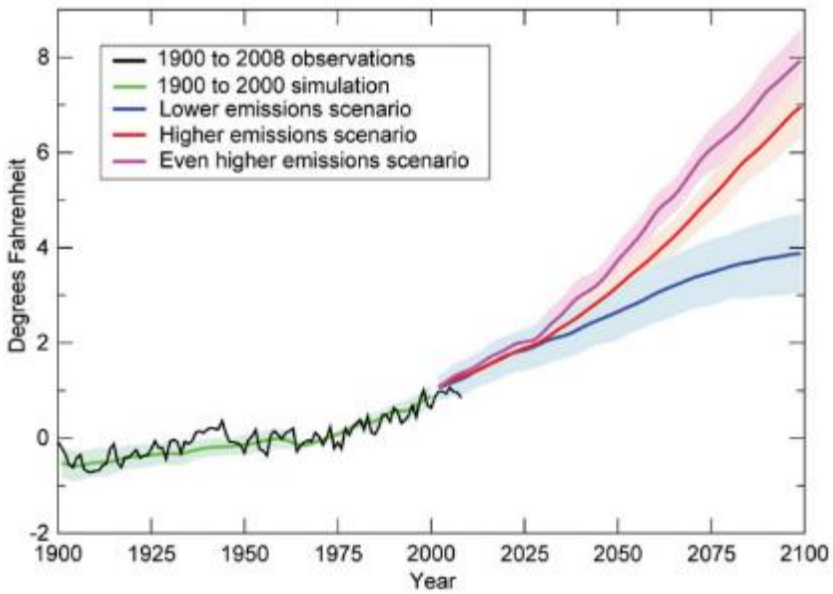

Figure 3-4. *Potential emission scenarios. From U.S. Global Change Resource Program: Karl, Melillo, and Peterson (2009).*

Climate Change Impacts

Climate change impacts will vary greatly but are likely to have wide-ranging effects including changes in agricultural production, increased ocean acidification, and threats to national security (DOD, 2015). The relative importance of impacts depends on locations and local conditions. For example, sea-level rise is a direct threat to low-lying countries in the South Pacific, while the proliferation of destructive insects threaten forests in Colorado.

The Colorado Climate Change Vulnerability Study (Gordon and Ojima, 2015) summarizes observed and predicted climate change impacts for Colorado. These include, but are not limited to:

- Increase in average annual temperatures by 2 degrees Fahrenheit over the past 30 years, and an additional increase of 2.5 to 5.5 degrees by mid-century;
- Snowmelt and peak runoff have shifted 1 to 4 weeks earlier over the past 30 years; an additional 1-3 weeks earlier are expected by mid-century; and
- More frequent drought conditions; decreases in streamflow by 2050 for major rivers.

National and statewide assessments are helpful to provide the overall context of climate change impacts and vulnerability. However, downscaled climate models and vulnerability assessments often incorporate more localized information, such as topography, hydrology, and weather patterns. *The Gunnison Basin Climate Change Vulnerability Assessment* examines the Upper Gunnison River Basin project area (Neely et al., 2011). Although this area does not contain the North Fork Coal Mining Exception Area, it is adjacent.

The Gunnison Assessment's primary objective was to evaluate species and ecosystems most at risk to climate change, but it also considering social impacts to ranching and recreation communities. The report also provides information that has been localized that is helpful when describing climate change impacts for the general area.

The study takes advantage of historical data from the local weather station at Cochetopa Creek (8,000 feet). Along with other Gunnison County information, these data show a gradual warming from mid-

century to present, as presented in Figure 3-5. Continued warming should be considered as a plausible future for this area (Neely et al., 2011).

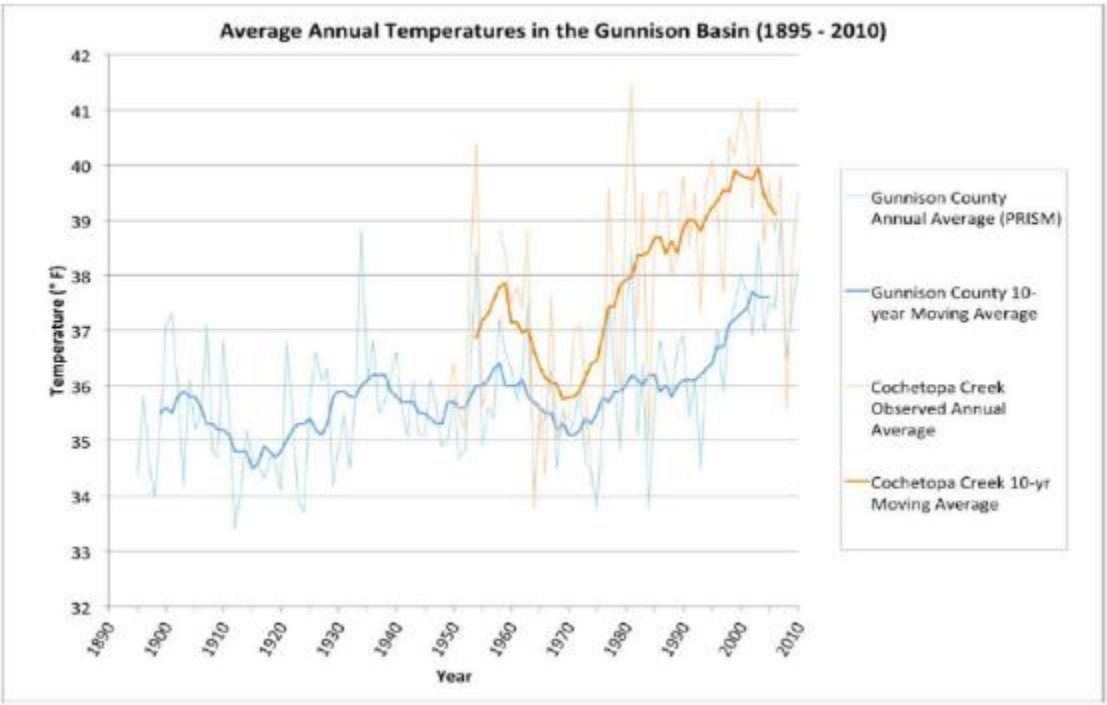

Figure 3-5. *Historical temperature data from Gunnison County and Cochetopa Creek (Neely et al., 2011).*

The assessment further describes climate scenarios with seasonal precipitation and temperature changes (Table 3-8). These scenarios were developed from available global and regional climate projections. The Moderate Scenario is near the median of these projections, and the More Extreme Scenario lies in the top 25% of model projections but is not the most extreme of the climate model projections (Neely et al., 2011).

Table 3-8. *Two scenarios of season precipitation and temperature changes from periods 1950–1999 to 2040–2060 for the Gunnison Basin. (Neely et al., 2011)*

	Moderate Scenario			*More Extreme Scenario*		
Season	*Precipitation (percent)*	*Temp °F*	*Temp °C*	*Precipitation (percent)*	*Temp °F*	*Temp °C*
Annual	~0.0	+3.6 to +5.4	+2.0 to 3.0	-10	+5.4	+3.0
Winter	+15.0	+3.6	+2.0	~0.0	+5.4	+3.0
Spring	-12.0	+4.5	+2.5	-15.0	+5.4	+3.0
Summer	-15.0	+5.4	+3.0	-20.0	+7.0	+4.0
Fall	+4.0	+4.5	+2.5	-10.0	+5.4	+3.0

The Gunnison Basin Climate Change Vulnerability Assessment goes into more detail about potential impacts of species and ecosystems, and assigns a vulnerability score and a confidence score. More specific analysis of climate change impacts is not meaningful to the programmatic decision being considered in this analysis.

Climate change impacts can also be considered in the context of roadless area management. The Colorado Roadless Rule identifies about 4.2 million acres CRAs that have roadless area characteristics, as defined by the Colorado Roadless Rule. Table 3-9 demonstrates how climate change might impacts these characteristics. These impacts are not comprehensive and are not specific to the North Fork Coal Mining Exception Area. The impacts are not attributable to potential emissions from Alternative B or Alternative C.

Table 3-9. *Roadless area characteristics and potential climate change impacts within Colorado Roadless Areas*

Roadless Area Characteristics	*Potential Impacts from Climate Change within Colorado Roadless Areas*
High quality or undisturbed soil, water, or air	Increasing wildfires corresponds to increasing smoke; Burned soils and vegetation loss increases erosion and decreased productivity; Increased sediment loads in waterways post wildfire
Sources of public drinking water	Fire frequency and intensity likely lead to sedimentation of reservoirs and other sources of drinking water; Changes in perception regimes leads to increased uncertainty of water availability
Diversity of plant and animal communities	Nonnative species often outcompete native species under drier conditions
Habitat for Threatened, Endangered, Proposed, Candidate, and sensitive species	CRAs may serve a climate change refuges for many species; however, this function could be compromised by impacts from climate change as ecosystems shift
Primitive, semi-primitive, non-motorized and semi-primitive motorized classes of dispersed recreation	Potential changes in types of recreational opportunities in CRAs, such as decreases cold-water fisheries, winter recreation, and alpine wildflower viewing
Reference Landscapes	Climate change impacts may change context for the role of protected areas as reference landscapes
Natural-appearing landscapes with high scenic quality	Some CRA natural appearing landscapes have been compromised by recent insect and disease outbreaks. Dead and downed trees may negatively affect scenic quality.
Traditional cultural properties and sacred sites	Some sacred sites may be impacted by increasing risk from wildfire, Cultural sites may be discovered as snowpack recedes at higher elevations
Locally identified unique characteristics	Climate change may change the composition and distribution of non-timber forest products (mushrooms, medicinal roots, etc.)

Consideration of potential impacts of climate change to roadless characteristics are for CRAs overall. These impacts are caused or exacerbated by climate change, in general, not from emissions associated with Alternative B or Alternative C. Information summarized from multiple vulnerability assessments, including Climate Change Impacts in the United States (USGCRP, 2014); The Threat of Carbon Pollution: Colorado (White House, 2015a); and Colorado Climate Change Vulnerability Study (Gordon and Ojima, 2015); The Gunnison Basin Climate Change Vulnerability Assessment (Neely et al., 2011).

Affected Environment

Climate Change Adaptation

Land managers often respond to drought, floods, fire, and destructive insects, and many climate change adaptation strategies and tactics are responses to these events. For example, larger culverts can mitigate flood damage, silvicultural techniques can promote forest health and resiliency, and timber harvesting can reduce hazardous fuels and fire starts in the wildland-urban interface.

The Colorado Roadless Rule provided management direction for conserving roadless area characteristics within roadless areas in Colorado. Roadless protections for about 4.2 million acres in Colorado will provide some level of climate refugia and ecological connectivity; both are adaptation approaches for conservation planning (Schmitz, 2015). Although refugia and connectivity have not been mapped specifically in the context of CRAs, the protections offered alone will provide some de facto implementation of these strategies.

The Rule protects inventoried CRAs, but also recognizes the need for some management activities. Some of these management activities are key components for climate change adaptation.

- Fire frequency and intensity is increasing with climate change (USGCRP, 2014). The Rule allows some hazardous fuel treatments to reduce the threat of wildfire.
- Water quality and timing of snowmelt are important ecosystem services that are at risk because of climate change. The Rule allows the agency to adapt with special allowances for water conveyance structures—recognizing Colorado as a headwater state.
- Snow quantity and warmer winter days could impact ski areas in Colorado (Gordon and Ojima, 2015). The Rule allows specific accommodations for some flexibility to adjust business practices within permitted boundaries.

Direct, Indirect, and Cumulative Effects

The Council on Environmental Quality recognizes that climate impacts generally are not attributable to any single action, but are exacerbated by a series of actions taken pursuant to decisions of the Federal Government, and others (CEQ, 2016). The CEQ guidance goes on to explain that climate change results from “diverse individual sources of emissions” that each make relatively small additions to the global atmospheric concentrations, but collectively have a large impact. The guidance further states that “climate change is a fundamental environmental issue, and its effects fall squarely within NEPA’s purview” (CEQ, 2016).

Direct effects are caused by the action and occurrence at the same time and place (CEQ 1508.8a). NEPA requires Federal agencies to discuss impacts in terms of direct, indirect, and cumulative effects. The actions connected to this decision—future mining, transportation, and combustion of coal—are best described as indirect emissions, since the decision being considered here does not result in any emissions as this rulemaking does not authorize any activities.

For the analysis described in the *Climate Change* section, direct and indirect effects are described as:

- **Direct GHG Emissions (Direct Effects)**: There are no direct GHG emissions that will be linked to this decision. Subsequent analyses and Federal decisions may have direct effects. However, the decision being considered here will not authorize any ground-disturbing activity.

Indirect GHG Emissions (Indirect Effects): Indirect effects are caused by the action and are later in time, or further removed in distance, but are still reasonably foreseeable. Emissions associated with coal mining, transportation, and combustion are being described as indirect

effects since they are connected, and reasonably foreseeable, but not directly as a result of a decision supported by this analysis. A range of potential emissions from these indirect activities is provided in the *Air Resources and Greenhouse Gas Emissions* section.

As estimated in the *Air Resources and Greenhouse Gas Emissions* section, annual GHG emissions from mining activities range from 13.5 to 39.9 million metric tons of CO_2e (using 25 as the global warming potential for methane).

Another way of examining the range of GHG estimates is to look at how they compare to other sources. The EPA has created a GHG equivalencies calculator that allows the user to enter a quantity of emissions and relate them to more familiar sources such as passenger vehicles, gallons of gasoline consumed, homes, trees planted, and average forest growth. These equivalencies are based upon national average values for each type of source (or sink), such as a typical passenger vehicle driven an average number of miles, or a typical house or power plant, so these equivalencies are only a rough approximation. They do provide context, which is responsive to public comment received on the SDEIS. Selected results from the EPA GHG equivalency calculator (EPA, 2015b) for each of the three production scenarios are shown in Table 3-6.

There are also indirect emissions associated with potential tree-cutting for surface use, including road construction and drainage pads. An initial analysis by the Forest Service determined that emissions associated with these activities are orders of magnitude than the GHG emissions analyzed in detail from mining and venting, transportation, and combustion. As a result, these emissions are not analyzed in detail here. Surface disturbance from these activities would result in a pulse of GHGs during the year of the construction. Areas of surface disturbance would eventually be revegetated and remediated after they are no longer needed. As trees and vegetation establish, they would grow and sequester carbon through photosynthesis. However, there would be additional GHG emissions associated with vegetation clearing for temporary road and methane well-pad construction.

Comparison of Alternatives

Alternative A

As part of existing leases, it is expected that about 11 million short tons of coal will be produced. However, there are no direct or indirect GHGs associated with Alternative A for this analysis. Therefore, there is no cumulative effect of increased atmospheric concentrations from this alterative. This alternative would have no impact on climate change because no new GHGs would be added to the atmosphere as a result of the decision. Alternative A represents the only option that would likely eliminate additional contributions of GHGs from the analysis area analyzed in the action alternatives to the atmosphere.

Alternative B

There are no direct GHGs associated with Alternative B. However, this alternative may have the most indirect GHG emissions from the connected actions of coal mining, transportation, and combustion, over the longest duration. This alternative does not require methane capture, but does not preclude it from future consideration at the project level. Methane capture or destruction would reduce GHG emissions and reduce the overall contribution to climate change.

Alternative B represents the option that would add the most GHGs to the atmosphere, contributing to the cumulative effects that are causing anthropogenic climate change.

Alternative C

There are no direct GHGs associated with Alternative C. However, this alternative likely may have the second highest indirect GHG emissions from the connected actions of coal mining, transportation, and combustion. The expected mining duration is shorter than that of Alternative B. This alternative does not require methane capture, but does not preclude it from future consideration at the project level. Methane capture or destruction would reduce GHG emissions and reduce the overall contribution to climate change.

Alternative C represents an option that would add additional GHGs to the atmosphere, contributing to the cumulative effects that are causing anthropogenic climate change.

Threatened, Endangered, Proposed, and Sensitive Species

The purpose of this section is to present the analysis and determination of effects of the alternatives under consideration on federally listed species (endangered, threatened, and proposed) and Regional Forester sensitive species (Forest Service Manual 2670.31-2670.32). This section supplements the biological evaluations and determinations for the 2012 Colorado Roadless Rule and compares the current alternatives that consider restoration of the North Fork Coal Mining Area that was vacated by a 2014 Court decision.

Forest Service policy requires that a review of programs and activities, through an effects analysis document (referred to in current Forest Service policy as a Biological Evaluation), be conducted to determine their potential effect on species listed as threatened or endangered under the ESA, species proposed for listing, and Regional Forester-designated sensitive species (Forest Service Manual 2670.3). Under the ESA, the effects analysis report is called a Biological Assessment and must be prepared for Federal actions that are “major construction activities” to evaluate the potential effects of the proposal on listed or proposed species and critical habitats. The contents of the Biological Assessment (Appendix B) are at the discretion of the Federal agency and depend on the nature of the Federal action (50 CFR 402.12(f)). A Biological Evaluation may be used to satisfy the ESA requirement to prepare a Biological Assessment. Preparation of a Biological Evaluation as part of the NEPA process ensures that Threatened, Endangered, Proposed, and Sensitive (TEPS) species receive full consideration in the decision-making process.

This Biological Evaluation conforms to legal requirements set forth under Section 7 of the ESA (19 U.S.C. 1536 (c), 50 CFR 402.12 (f) and 402.14). Section 7(a) (1) of the ESA requires Federal agencies to use their authorities to further the conservation of listed species. Section 7(a) (2) requires that Federal agencies ensure any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of federally listed species, or destroy or adversely modify designated critical habitat.

Because this is a supplemental Biological Evaluation, it will largely be focused on a re-evaluation of the new information since the 2012 rulemaking, including new listing and critical habitat decisions under the ESA since then and changes to the Regional Forester sensitive species list for the Rocky Mountain Region since then.

Background

The analysis of effects in this Biological Evaluation will help inform the SFEIS, alternatives, and selection of the final rule. This new development with the Rule provides the opportunity to review the earlier conclusions about effects to ESA-listed and proposed species and Regional Forester sensitive species. The rationale and conclusions of effect about special status species in 2012 should as a general rule continue to apply given the relatively short time that has elapsed. The focus here is to discern whether new information has emerged that would compel a re-consideration of the earlier

analyses and determinations. In particular, several species analyzed for the 2012 Colorado Roadless Rule have changed status under the ESA, including new listings and critical habitat decisions. There are also some new additions to the Regional Forester sensitive species list for the Rocky Mountain Region since 2012 to consider.

For example, Gunnison sage-grouse were listed as a threatened species under the ESA in December 2014, supplanting its prior classification as a Regional Forester sensitive species in the Rocky Mountain Region. There are several former Regional Forester sensitive species in 2012 that have since been listed under the ESA. New information may also include changes to a species known range that may result in the species changing from a sensitive to a threatened or endangered species. For example, new genetic testing methods have resulted in expansion of the known range of the greenback cutthroat trout to include the western slope, including on the GMUG National Forests. Populations that were previously thought to be Colorado River cutthroat trout, a Regional Forester sensitive species for the Rocky Mountain Region, are now designated as greenback cutthroat trout, which is a threatened species under the ESA.

Analysis Methods

The current "action" under evaluation in the SEIS is largely focused on reinstatement of the North Fork Coal Mining Area temporary road exception in some form to the Colorado Roadless Rule. As part of the SEIS process and informing the analyses of the Colorado Roadless Rule and alternatives, the current process provides an opportunity to include in the evaluation some broader review of the Colorado Roadless Rule to ensure the earlier conclusions about effects to ESA-protected species and Regional Forester sensitive species and habitats still hold today in light of any new information that may have surfaced in the interim, or given the opportunity to reconsider the analyses and conclusions made earlier. Consequently, this Biological Evaluation 1) reviews the conclusions and determinations of effect to ESA-protected species and Regional Forester sensitive species evaluated in 2012, and 2) evaluates any new species and habitats that have changed status under the ESA or as Regional Forester sensitive since the 2012 Rule.

The overall objective is to assess whether new information compels any changes to one or more alternatives to protect species in a manner consistent with Forest Service responsibilities under law and agency policy governing the protection of these species designated under the ESA or as Forest Service sensitive species. This evaluation will consider 1) effects to listed or sensitive species and habitats in a manner or to an extent not previously considered for the 2012 Rule and Section 7 consultation, 2) any modifications to the Colorado Roadless Rule proposed under the current alternatives that might represent effects to listed or sensitive species or protected habitats not previously considered in 2012, and 3) potential effects to newly listed or sensitive species or protected habitats since the 2012 Rule. Re-initiation of the Section 7 consultation on the 2012 Colorado Roadless Rule will be requested of the U.S. Fish and Wildlife Service, in the event the evaluation concludes new effects or severity of effects to ESA-protected species not previously considered in 2012.

Recent developments in genetic analysis have revealed that several native cutthroat trout populations present around the North Fork Coal Mining Area have characteristics consistent with the federally threatened greenback cutthroat trout. This is a change from the 2012 analysis and new information on cutthroat trout is considered under Alternatives B and C.

Fish Analysis Methods

Some of the newest information since 2012 germane to the current SEIS and evaluation of alternatives relates to fish in and downstream of the North Fork Coal Mining Area. The new analysis here is focused on the North Fork Coal Mining Area and incorporation of the new information and

implications to determinations of effect for listed and sensitive fish species. Information on the distribution of non-game fishes in this analysis area are taken from several sources: Colorado Parks and Wildlife stream sampling records, GMUG National Forest stream sampling records, Forest Service, the Rocky Mountain Region Sensitive Species Evaluations, and personal observations in the field. There are four non-game Sensitive Species present in watersheds that originate on the GMUG National Forest (Table 3-10). These species are known to inhabit larger riverine habitats downstream from National Forest System lands. Of the four non-game species listed in Table 3-10, only mountain sucker has been observed on the GMUG National Forest. There are no records of mountain suckers on National Forest System lands upstream of Paonia, Colorado, which includes the North Fork Coal Mining Area.

Table 3-10. *Sensitive fish species present on or downstream from the Grand Mesa, Uncompahgre, and Gunnison National Forests*

Species	*Habitat*	*Present in North Fork?*
Bluehead sucker	Low-elevation rivers: North Fork Gunnison, Gunnison, Uncompahgre	No
Colorado River cutthroat trout	High-elevation rivers and streams; removed from human influence and non-native fishes	Yes
Flannelmouth sucker	Low-elevation rivers: North Fork Gunnison, Gunnison, Uncompahgre	No
Mountain sucker	Mid-elevation rivers and streams.	No
Roundtail chub	Low-elevation rivers: Colorado, Gunnison, Uncompahgre	No

The GMUG National Forests maintain records of the distribution and size of Colorado River cutthroat trout conservation populations in the North Fork of the Gunnison watershed. This includes both the Colorado River cutthroat trout blue lineage (Rocky Mountain Region sensitive species) and Colorado River cutthroat trout green lineage (protected as Threatened under ESA). Spatial data describing the location of Conservation Populations were overlaid onto a map of the North Fork Coal Mining Area in a GIS. The total stream length occupied by Conservation Populations in the North Fork of the Gunnison watershed was calculated. These data were compared to the total stream length of occupied habitat on the GMUG National Forests and in Colorado. Data for the GMUG National Forests were obtained from the most recent forest-level status assessment for native cutthroat trout (Dare, Carrillo, and Speas, 2011). Data for the State of Colorado were taken from the most recent range-wide status assessment for Colorado River cutthroat trout (Hirsch et al., 2013).

New information since the Colorado Roadless Rule concerning cutthroat trout genetics in the southern Rockies has redefined the evolutionary relationships among native cutthroat trout species recognized in Colorado (Metcalf et al., 2012). The best available science suggests that the species called greenback cutthroat trout is native only to the South Platte River drainage, in eastern Colorado. The only remaining native population of this federally threatened species is located in a stream near Bear Creek in the Arkansas River drainage. Greenback cutthroat trout were also recently transplanted into Zimmerman Lake in the Poudre River drainage by the State of Colorado in cooperation with the U.S. Fish and Wildlife Service and the Forest Service. Given the new understanding of what constitutes the "true" greenback cutthroat trout and its vary limited occurrence, the Forest Service changed the 2012 determination of *"may affect, not likely to adversely affect"* to *"no effect"* for the greenback cutthroat trout for the 2012 Colorado Roadless Rule and FEIS, regardless of any reinstatement of the North Fork Coal Mining Area exception.

Metcalf et al. (2012) used the term "green-lineage" to identify one variety of cutthroat trout native to the Western Slope of Colorado, which is a substantial change from the naming convention for native cutthroat trout in that part of the State. The recent research by Metcalf et al. (2012) determined that the green lineage is a newly identified variety of cutthroat trout previously considered Colorado River cutthroat trout. Until the U.S. Fish and Wildlife Service, which has adopted the naming conventions proffered by Metcalf et al. (2012), completes a status review for green lineage cutthroat trout, the Service has concluded that ESA protections extend to both the green lineage of cutthroat trout and the greenback cutthroat trout. The Forest Service evaluated the new information on the green lineage cutthroat trout in the vicinity of North Fork Coal Mining Area under that ESA status, and also considered potential for effects from implementation of the larger rulemaking.

Assumptions for the Supplemental Analysis

Key assumptions underlying the supplemental review are:

- Management of National Forest System lands is governed by a variety of Federal land management statutes (laws), regulations, executive orders, and the Forest Service Directive System (Forest Service Manual and Handbooks). These would remain in effect. The Colorado Roadless Rule is a State -specific rule that superseded the 2001 Roadless Rule and has precedence over less-protective Forest Plan direction for TEPS species. None of the current alternatives change that.
- None of the alternatives would authorize any individual ground-disturbing actions, nor would they have direct effects on listed species or critical habitats. The indirect effects of implementing the regulation later in time are estimated based on projections of probable actions, and are evaluated primarily in qualitative and comparative terms.
- The estimates of effects of the management direction and potential future activities are broadly programmatic in nature. Future projects would be subject to their own site-specific NEPA analysis, conformance with requirements and management direction in Forest Plans, ESA Section 7 consultation as needed when actions may affect ESA-protected species and critical habitats, and decision-making procedures. Site-specific design criteria or mitigation measures would be incorporated into future project planning and implementation as needed to avoid or minimize adverse effects to TEPS species and, their critical habitats to the extent possible.

Regional Forester Sensitive Species Considered in this Supplemental Evaluation

Forest Service sensitive species are those identified by a Regional Forester for which population viability is a concern (Forest Service Manual 2670.5). Forest Service policy is to conserve sensitive species so that they do not become endangered or threatened as a result of Forest Service authorized activities, and to maintain their habitats well-distributed on NFS lands (Forest Service Manual 2670.22). Sensitive species therefore receive special emphasis and management attention. The list of sensitive species incorporates those that have been identified as candidates for listing under the ESA as well as many of those identified in Colorado's species of greatest conservation need (Colorado Division of Wildlife, 2006); Colorado Parks and Wildlife revised list of species of greatest conservation need (2015 draft), of particular concern globally and within the State by the NatureServe network, U.S. Fish and Wildlife Service's Birds of Conservation Concern, and others.

Most of the sensitive species considered in the Biological Evaluation for the 2012 Rule are identified in Table 3-11. The table does not include the species that have since been listed under the ESA and included later in Table 3-14: Gunnison sage-grouse, western yellow-billed cuckoo, lesser prairie-chicken, and New Mexico meadow jumping mouse. Most of the remaining species that remain Forest Service sensitive today were carried forward through the complete analysis at that time due to known or likely occurrence in CRAs, or potentially indirectly affected outside the CRAs by management activities occurring within. Some were dismissed from further consideration early in the 2012 evaluation due to the lack of any impacts expected to them because their habitat is unlikely to occur in the CRAs. All of these 2012 determinations will be briefly re-visited again later in the effects analysis discussions.

The Regional Forester sensitive species list has also undergone some changes since 2012 as a result of updates in 2013 and 2015 (the list is updated every 2–3 years). Species are added or removed from the list if there is substantial new information germane to the criteria for designation of a species as "sensitive." Additionally, by regional policy a change in ESA status can add or remove a species from the sensitive species list. For example, listing candidates are automatically added to the list, while species that have been the subject of proposed or final listing rules are removed from the list and managed under ESA requirements to Federal agencies like the Forest Service. Candidates have no ESA requirements and are evaluated as Forest Service sensitive species. Newly listed or proposed species are evaluated by their ESA status in this Biological Evaluation. Species removed from the list since 2012 are Gunnison sage-grouse, lesser prairie-chicken, New Mexico meadow jumping mouse, narrowleaf grapefern, and whitebristle cottongrass. The ESA status of the lesser prairie-chicken has been recently affected by a District Court decision in Texas that appears to have struck down the 2014 listing of the bird as federally threatened. The bird and its habitat is not associated with CRAs, so current conclusions remain unaffected by an ESA status change. Species that have been added since 2012 to the sensitive species list and their primary habitats and threats are identified in Table 3-12.

Table 3-11. *Effect determinations for Regional Forester sensitive species in the Biological Evaluation and Environmental Impact Statement for the 2012 Colorado Roadless Rule*

2012 Determination:* NI *Rationale (cumulative):* Species and habitat not expected to occur in CRAs		
Black-tailed prairie dog Burrowing owl New Mexico meadow jumping mouse Sandhill goosefoot (*Chenopodium cycloides*) Yellow-billed cuckoo		
2012 Determination:* MAII *Rationale (cumulative):* • Species are known or likely to occur in or nearby CRAs. • Ongoing management as "roadless" expected to be overall beneficial. • Some potential for low-level or localized direct or indirect impacts primarily due to activities associated with the exceptions provided under the Colorado Roadless Rule. • Extent of effects will depend on site-specific factors such as type, location, timing, duration, frequency, and magnitude of management actions. • Some impacts will likely be avoided or reduced through site-specific planning and implementation of design criteria/ mitigation measures aimed at avoiding or minimizing impact or likelihood of impact to these species.		
American hog-nosed skunk	Greater sage-grouse	Rio Grande cutthroat
American marten	Greenland primrose	Ripley's milkvetch
American peregrine falcon	Gunnison sage-grouse	River otter
Autumn willow	Gunnison's prairie dog	Rock cinquefoil
Aztec milkvetch	Harrington's beardtongue	Rocky Mountain alpineparsley
Bald eagle	Hoary bat	Rocky Mountain capshell snail
Baltic sphagnum	Hudsonian emerald dragonfly	Rocky Mountain monkeyflower
Bighorn sheep	Ice cold buttercup	Roundleaf sundew
Bill's neoparrya	Kit fox	Rydberg's golden columbine
Black swift	Kotzebue's grass of Parnassus	Sageleaf willow
Bluehead sucker	Lesser bladderwort	Sage sparrow
Boreal owl	Lesser panicled sedge	Scarlet gilia
Boreal toad	Lewis's woodpecker	Selkirk's violet
Brewer's sparrow	Livid sedge	Siberian sea thrift
Cathedral Bluff meadow-rue	Loggerhead shrike	Slender cottongrass
Chamisso's cottongrass	Missouri milkvetch	Smith's draba
Clawless draba	Mountain plover	Smooth northern-rockcress
Colorado River cutthroat trout	Mountain sucker	Sphagnum
Colorado tansyaster	Narrowleaf grapefern	Spotted bat
Columbian sharp-tailed grouse	Nokomis fritillary	Stonecrop gilia
Degener's beardtongue	North American wolverine	Susan's purse-making caddisfly
Dwarf raspberry	Northern goshawk	Swift fox
English sundew	Northern harrier	Townsend's big-eared bat
Ferruginous hawk	Northern leopard frog	Whitebristle cottongrass
Flammulated owl	Olive-sided flycatcher	White-tailed ptarmigan
Flannelmouth sucker	Plains rough fescue	Wood frog
Fremont's bladderpod	Porter's false needlegrass	Yellow lady's slipper
Fringed myotis	Purple martin	
Gray's draba	Pygmy shrew	

**The possible determinations of impact (FSM 2672.42, #5) for sensitive species are: 1) No impact (abbreviated NI); 2) Beneficial impact (wholly beneficial); 3) May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward Federal listing (abbreviated as MAII); or Likely to result in a loss of viability in the planning area, or in a trend toward Federal listing.*

Table 3-12. *Additions to the Rocky Mountain Regional Forester sensitive species list affecting national forests and grasslands in Colorado since the 2012 Colorado Roadless Rule*

Species	*Key Habitat Requirements & Threats*	*Colorado National Forest Known or Suspected*
Plains topminnow	Occur in Great Plains streams; isolated refuge habitats or pools of exposed alluvial groundwater; narrow elevation band ~4,000 to 5,600 feet; reliant upon stochastic precipitation events or un-fragmented linear riparian habitat networks for dispersal. Threats are habitat loss, degradation, and fragmentation, as well as impacts from introduced non-native fishes and competitor fish species.	Arapaho-Roosevelt
Monarch butterfly	Wholly dependent on milkweeds for breeding and larval feeding; probably widespread in the region including NFS lands in Colorado although abundance is unknown. Primary threats are loss of milkweed habitat, exacerbated by disease, predation, overutilization for commercial and educational purposes, extensive habitat loss, climate change, and extreme weather events.	Arapaho-Roosevelt GMUG (Grand Mesa, Uncompahgre, Gunnison) Manti-La Sal (CO portion)? Pike-San Isabel Rio Grande Routt San Juan White River
Western bumblebee	Need three types of habitat to survive: • plants on which to forage for pollen and nectar, • nesting sites, and • places to overwinter. Threats are likely loss or fragmentation of habitat, pesticide use, climate change, overgrazing, and competition with honey bees, low genetic diversity, and introduction of non-native pathogens.	Arapaho-Roosevelt GMUG (Grand Mesa, Uncompahgre, Gunnison) Manti-La Sal (CO portion)? Pike-San Isabel Rio Grande Routt San Juan White River
Violet milkvetch	Sagebrush and sage steppe rangelands; dry stony hillsides and benches, commonly on granite, often about oak thickets, in the pinyon-juniper and ponderosa pine zones, in oak-pinyon forests, or among sagebrush, 5,800-8,100 feet. Threats not well understood though available information suggests high rarity and potential vulnerability.	San Juan
Mancos Shale packera	Barren shale habitat; currently known from only three occurrences within 1 mile of each other in Dolores County, including on the Dolores Ranger District. Threats may include grazing practices, recreational use of the habitat, off-road vehicle traffic, road maintenance and improvements, and water impoundments.	San Juan

The black-tailed prairie dog, burrowing owl, Sandhill goosefoot (*Chenopodium cycloides*), New Mexico meadow jumping mouse, and yellow-billed cuckoo and their habitats are still not known in CRAs and the original "no impact" determinations for them continue to apply even with the ESA listing and critical habitat decisions for the meadow mouse and cuckoo since 2012. Habitat of the Plains topminnow is not expected to occur in CRAs and therefore no impact is expected from implementation of the Colorado Roadless Rule or exception for the North Fork Coal Mine Area. The Mancos Shale packera (*Packera mancosana)* is known from only three locations currently and is not known in CRAs. However, as a recently described species and newly designated sensitive species with much to learn about the full distribution of habitat and populations, the plant is carried forward for further evaluation of the alternatives. Records of the monarch butterfly, western bumblebee, and violet milkvetch are also lacking for CRAs. However, in general there are poor site-specific records for these species. It is reasonable to infer that given their habitats and wide distribution, they could, and likely do, occur in CRAs. They are also carried forward for further consideration during the evaluation of the alternatives.

Another development since the 2012 roadless rulemaking is that more recent fish surveys have verified a population of Colorado River cutthroat trout, a Regional Forester sensitive species, in the East Fork of Minnesota Creek just outside the boundary of the North Fork Coal Mining Area and in the Hoodoo Creek tributary on the southern boundary of the mine area. While Colorado River cutthroat trout were evaluated in 2012 and programmatically determined to be potentially impacted by roadless area management, this new information confirms members of the species directly associated with the North Fork Coal Mining Area. The implications to the current effect determinations are discussed during the analysis of the alternatives.

Finally, the greater sage-grouse has been the subject of an unprecedented West-wide interagency planning effort by the Forest Service and BLM to develop management direction in Federal land use plans to conserve the species across its range. Of the national forests in Colorado, only the Routt was involved in this effort, although several other national forests in the State are known to have habitats and seasonal use by greater sage-grouse. On September 21, 2015, the U.S. Fish and Wildlife Service Director determined that the species remains relatively abundant and well-distributed across its range and together with past and ongoing conservation efforts, indicate that protection for the sage-grouse under the ESA is no longer warranted. The greater sage-grouse currently remains a Regional Forester sensitive species in the Rocky Mountain and Intermountain Regions.

Threatened and Endangered Species and Critical Habitats Considered in this Supplemental Evaluation

This supplemental Biological Evaluation assesses the conclusions of effect for federally listed and proposed species and critical habitats evaluated previously for the 2012 Rule to ensure those conclusions still hold today. Currently, there are no species proposed for listing under the ESA that affect the national forests in Colorado. A summary of the determinations of effect for the species and critical habitats analyzed in 2012 is provided in Table 3-13. The U.S. Fish and Wildlife Service concurred on all of the Forest Service “not likely to adversely affect” determinations (March 28, 2012 letter).

On September 26, 2013, the U.S. Fish and Wildlife Service proposed a revision of designated critical habitat for the contiguous United States Distinct Population Segment of the Canada lynx. On September 12, 2014, the Service issued final revised critical habitat which did not include any areas in the southern Rockies ecoregion, including Colorado and the national forests in the State.

Most of the “no effect” determinations and rationales in Table 3-13 continue to apply today. No new information regarding occurrence of most of these species and their habitats related to CRAs has emerged since 2012 that would invalidate these earlier conclusions. Consequently, the determination continues to be “no effect” for grizzly bear, gray wolf, black-footed ferret, whooping crane, piping plover, least tern, pallid sturgeon, Osterhout milkvetch (*Astragalus osterhoutii*), Penland beardtongue (*Penstemon penlandii*), North Park phacelia (*Phacelia formosula*), Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*), and Ute ladies’-tresses orchid (*Spiranthes diluvialis*). These species are not carried forward for further analysis of the alternatives.

An exception is reconsideration of the 2012 no effect determination for the Pagosa skyrocket (*Ipomopsis polyantha*). In August 2012 the U.S. Fish and Wildlife Service designated final critical habitat for this plant species. Some of the information in that final rule was used to complete additional mapping of soils and potential habitat for the species in relation to CRAs. From this mapping exercise it was concluded that soils derived from Mancos Shale and habitat potential for the Pagosa skyrocket exist in the Winter Hills / Serviceberry Mountain CRA (Fig. 3-6). For similar reasons, it appears that potential habitat also exists within 1 mile of the Eight Mile Mesa Critical Habitat unit for this species.

Table 3-13. *Summary of earlier listed species and critical habitat effect determinations and rationales for the 2012 Colorado Roadless Rule*

Species	Determination	Summary of rationale
Whooping crane Piping plover Least tern Humpback chub Bonytail chub Colorado pikeminnow Razorback sucker Pallid sturgeon Osterhout milkvetch (*Astragalus osterhoutii*) Penland's beardtongue (*Penstemon penlandii*) North Park phacelia (*Phacelia formosula*) Colorado butterfly plant (*Gaura neomexicana* ssp. *Coloradensis*) Ute ladies' tresses (*Spiranthes diluvialis*) Pagosa skyrocket (*Ipomopsis polyantha*)	No effect	Not known or likely to occur in CRAs, no suitable habitat exists within CRAs, nor will management of CRAs affect them or their habitat
Grizzly bear Grey wolf Black-footed ferret	No effect	Extirpated from NFS lands in the State of Colorado
Southwestern willow flycatcher Mexican spotted owl Pawnee montane skipper Uncompahgre fritillary butterfly Canada lynx Preble's meadow jumping mouse Greenback cutthroat trout	Not likely to adversely affect	Overall high level of protection within CRAs; exceptions for road construction, oil and gas development, coal mining, and tree cutting could have local short term impacts but project design is likely to minimize the effects
Critical habitat for: Mexican spotted owl Preble's meadow jumping mouse	Not likely to adversely modify	Overall high level of protection within CRAs; limited development could have local short term impacts but project design is likely to minimize the effects
Penland alpine fen mustard (*Eutrema penlandii*) Colorado hookless cactus (*Sclerocactus glaucus*) DeBeque phacelia (*Phacelia submutica*)	Not likely to adversely affect	No new roads, tree cutting, or oil, gas, or coal developments are likely, but there may be a risk of indirect effects, especially from activities that may facilitate the spread of invasive plants.
Proposed critical habitat for: DeBeque phacelia (*Phacelia submutica*)	Not likely to adversely modify	No new developments are likely, but there may be a risk of indirect effects, especially from activities that may facilitate the spread of invasive plants.

No designated critical habitat for the Pagosa skyrocket overlaps with any CRA acreage. As a result of the proximity of critical habitat to a roadless area and occurrence of potential habitat within one of the roadless areas, the determination of effect for the Pagosa skyrocket has been updated to "May affect, not likely to adversely affect" when considering the overall roadless network and potential impacts of implementation of the 2012 Colorado Roadless Rule. Based on projections of foreseeable activities as described in the 2012 documents, limited road construction, tree cutting, or oil, gas, or coal development would be anticipated to occur in the habitat and affect the Pagosa skyrocket. However, there may be some potential that unknown Pagosa skyrocket individuals are present in at least one CRA and would be affected by activities permitted under the Colorado Roadless Rule.

Exposing this concern now should help avoid possible impacts in future project design and evaluations, but impacts cannot rule be ruled out completely. There may be some risk of indirect

effects should any of these activities inadvertently promote spread of invasive plants into adjacent areas and habitats where skyrocket may occur. Therefore, under consideration of new information, a "may affect" call for the species is appropriate.

Because designated critical habitat for the Pagosa skyrocket does not occur in any CRAs, the determination for final critical habitat remains "No effect." Specific to the North Fork Coal Mining Area, Mancos Shale does not occur in the area. The North Fork Coal Mining Area is more than 100 miles from the nearest known location of Pagosa skyrocket and it is unlikely to have individuals present (Fig. 3-6).

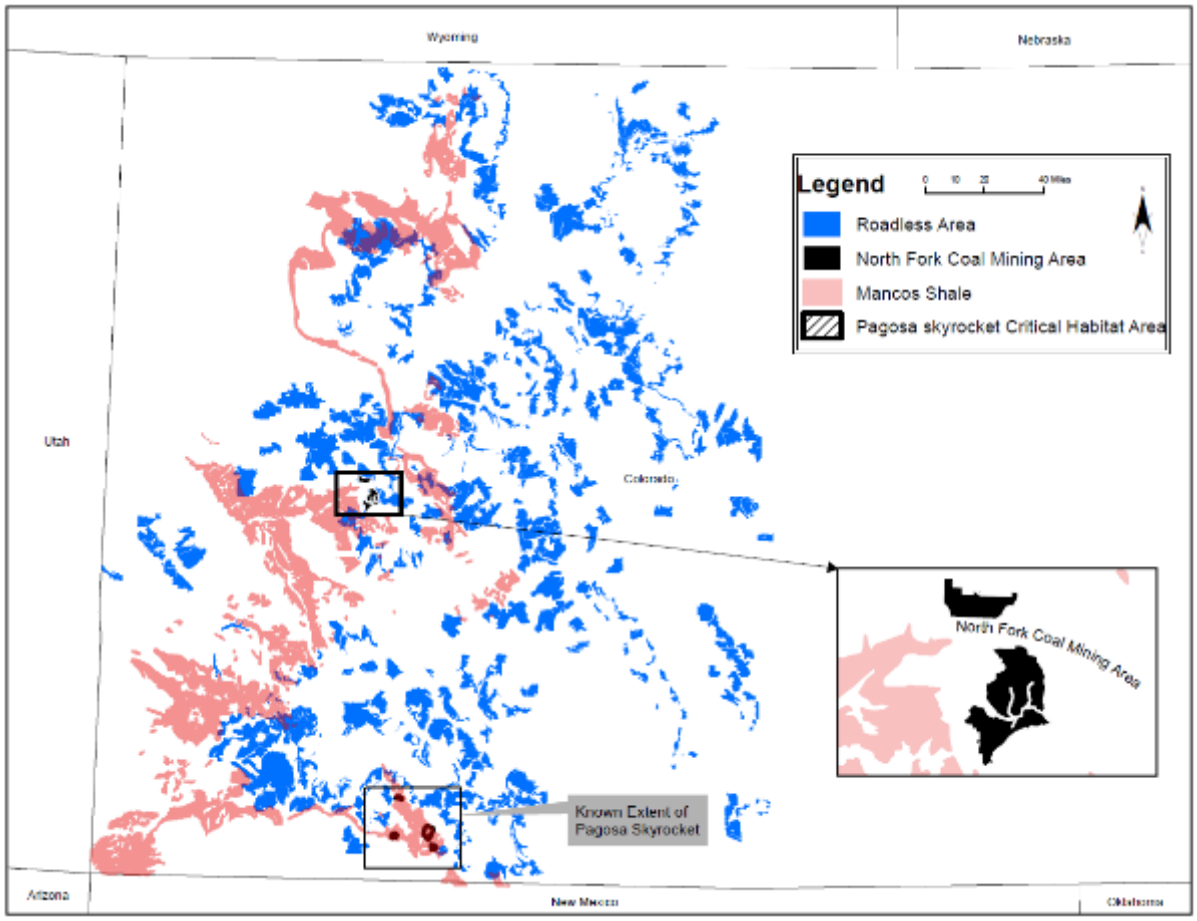

Figure 3-6. *Designated critical habitat of Pagosa skyrocket is shown in southwestern Colorado. The North Fork Coal Mining Area is shown in inset and is not known to contain Mancos Shale, which is the basis of Pagosa skyrocket habitat. The North Fork Coal Mining Area is about 100 miles north of the known extent of Pagosa skyrocket.*

Some further consideration was also given to the possibility that Ute ladies'-tresses orchid (*Spiranthes diluvialis)* habitat was present in some of the CRAs. Ute ladies'-tresses orchid was initially given a "No effect" determination for impacts from the Colorado Roadless Rule in the 2012 FEIS and associated Biological Assessment. The known locations of Ute ladies'-tresses orchid in the proximity of roadless areas and the North Fork Coal Mining Area are shown in Figures 3-7 and 3-8. There are no known instances where Ute ladies'-tresses orchids occur in any roadless area. As a result, the No Effect determination for Ute ladies'-tresses orchid is still valid due to the lack of known

individuals or their habitat in or near any roadless area or potentially affected by activities in them, including the North Fork Coal Mining area. Ute ladies'-tresses has no designated critical habitat.

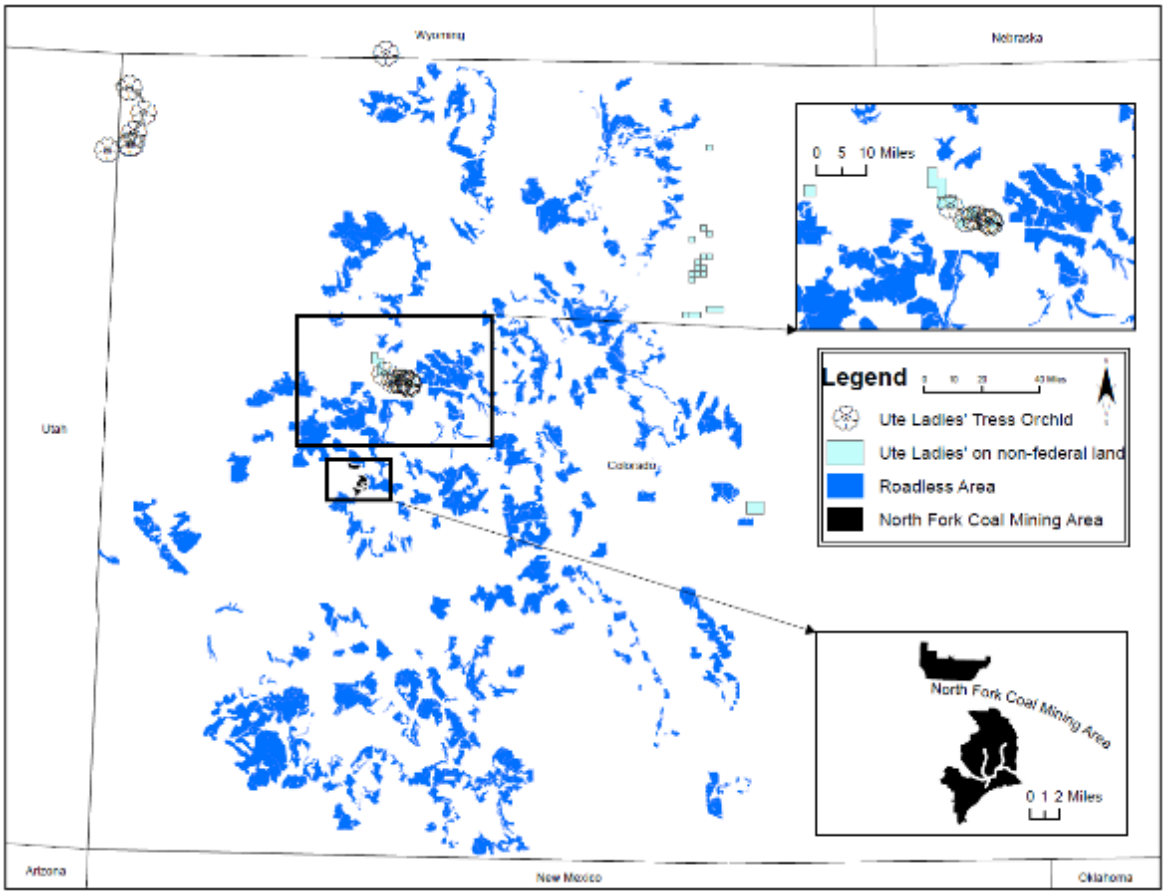

Figure 3-7. *The known locations of Ute ladies'-tresses orchids in Colorado from Forest Service and Colorado Natural Heritage Program data. Location on non- Federal lands is shown as the sections in which individuals occur.*

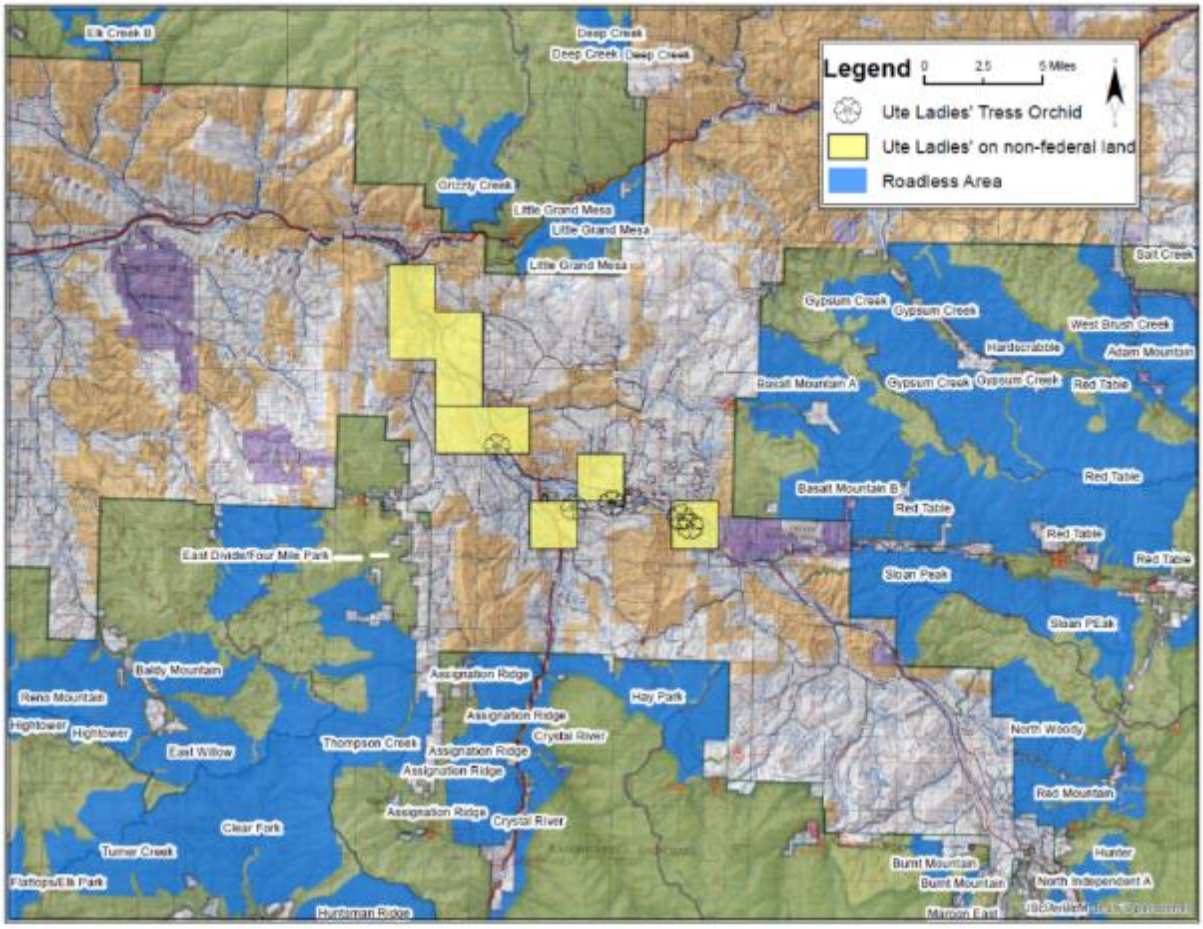

Figure 3-8. *Known locations of Ute ladies'-tresses orchid along the Roaring Fork River south of Glenwood Springs, Colorado. None of the known occurrences overlap with roadless areas. Known locations on non-Federal lands are shown only at the section-scale.*

Species that were the subject of ESA listing or critical habitat decisions since the 2012 Rule are presented in Table 3-14. All of the species since affected by listing decisions were evaluated as Regional Forester sensitive species in the Biological Evaluation for the 2012 Rule.

For the species in Table 3-14, the ESA actions since 2012 have no bearing on the rationale that led to no effect/impact determinations for yellow-billed cuckoo (western Distinct Population Segment), lesser prairie chicken, and New Mexico meadow jumping mouse. No new information has emerged about occurrence of these species or their habitats in CRAs or the North Fork Coal Mining Area; these species are not expected to be affected by management. This includes consideration of the proposed critical habitat for the western yellow-billed cuckoo (Fig. 3-9) and final designated critical habitat for the New Mexico meadow jumping mouse (Fig. 3-10). The New Mexico meadow jumping mouse has not yet been confirmed on NFS lands in Colorado, despite dedicated surveys for the mouse on the Rio Grande and San Juan National Forests (Frey, 2011, Schorr, 2015).

Table 3-14. *Species listing or critical habitat decisions under the Endangered Species Act affecting national forests in Colorado since the 2012 Colorado Roadless Rule*

Species	*ESA Decisions Since the 2012 Colorado Roadless Rule*	*2012 Status*	*2012 Determination*	*Rationale*
DeBeque phacelia	Final Critical Habitat 8/3/2012	ESA Threatened with Proposed Critical Habitat	Not likely to adversely modify	Not known to occur in CRAs but might be affected by invasive spread from CRA management
Pagosa skyrocket	Final Critical Habitat 8/3/2012	ESA Endangered with Proposed Critical Habitat	No effect	Not known or likely to occur in CRAs, or to be affected by their management
Gunnison sage-grouse	Threatened 11/20/2014 Final Critical Habitat 11/20/2014	Forest Service Sensitive	May adversely impact individuals, but not likely to.	Rule including exceptions may have some beneficial and minor adverse impacts
Yellow-billed cuckoo (western Distinct Population Segment)	Threatened 10/3/2014 Proposed Critical Habitat 8/15/2014	Forest Service Sensitive	No impact	Habitat not expected to occur in CRAs
Lesser prairie chicken	Threatened 4/10/2014 (vacated 9/1/2015)	Forest Service Sensitive	No impact	Habitat not expected to occur in CRAs
NM meadow jumping mouse	Endangered 6/10/2014 Final Critical Habitat 2/27/2015	Forest Service Sensitive	No impact	Habitat not expected to occur in CRAs
Southwestern willow flycatcher	Final Revised Critical Habitat 1/2/2013	ESA Endangered	Not likely to adversely affect (species); Critical Habitat not proposed at the time	Habitat not expected to be impacted by management activities

The yellow-billed cuckoo (western Distinct Population Segment), lesser prairie chicken, New Mexico meadow jumping mouse, and any proposed or final critical habitats for them should not be affected by the Colorado Roadless Rule and the North Fork Coal Mining Area. These species also will not be carried forward for further analysis under the alternatives.

Finally, revised critical habitat for the southwestern willow flycatcher was proposed by the U.S. Fish and Wildlife Service in July 2012 within days after the final issuance of the 2012 Colorado Roadless Rule. The final critical habitat designated in January 2013 did not include the Colorado forests (Fig. 3-11), and effects to its critical habitat are not addressed further under the alternatives.

Based on re-consideration of the 2012 effects analysis for the Colorado River listed fishes (humpback chub, bonytail chub, Colorado pikeminnow, razorback sucker) and the exception for the North Fork Coal Mining Area, our conclusion is that these fishes should be carried forward for further analysis under the current alternatives to confirm that the earlier “no effect” determinations still apply. All other listed species and critical habitats in Tables 3-13 and 3-14 are addressed under the alternatives.

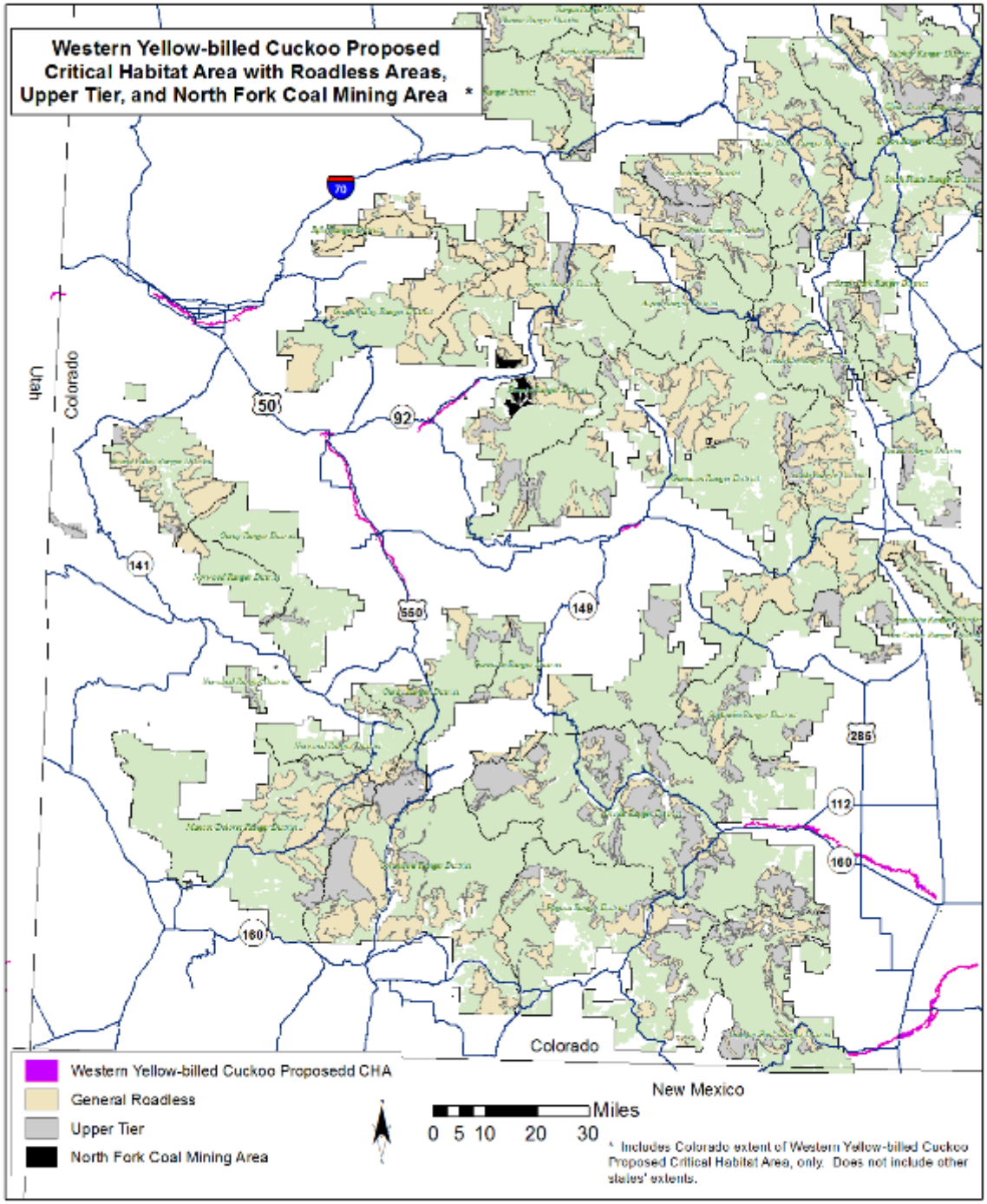

Figure 3-9. *Location of proposed critical habitat for the western yellow-billed cuckoo in relation to CRAs and the North Fork Coal Mining Area.*

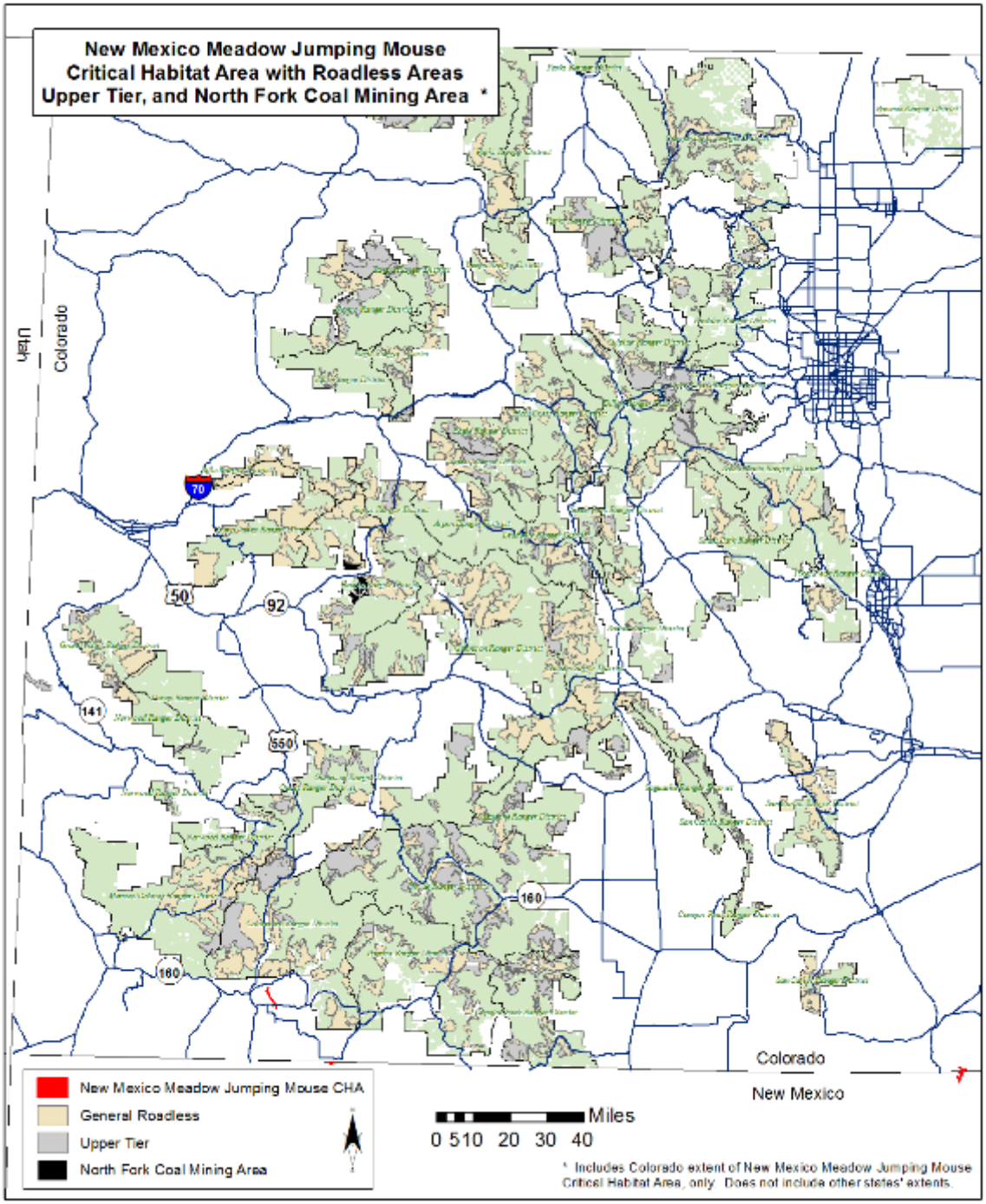

Figure 3-10. *Location of designated critical habitat for the New Mexico meadow jumping mouse in relation to CRAs and the North Fork Coal Mining Area.*

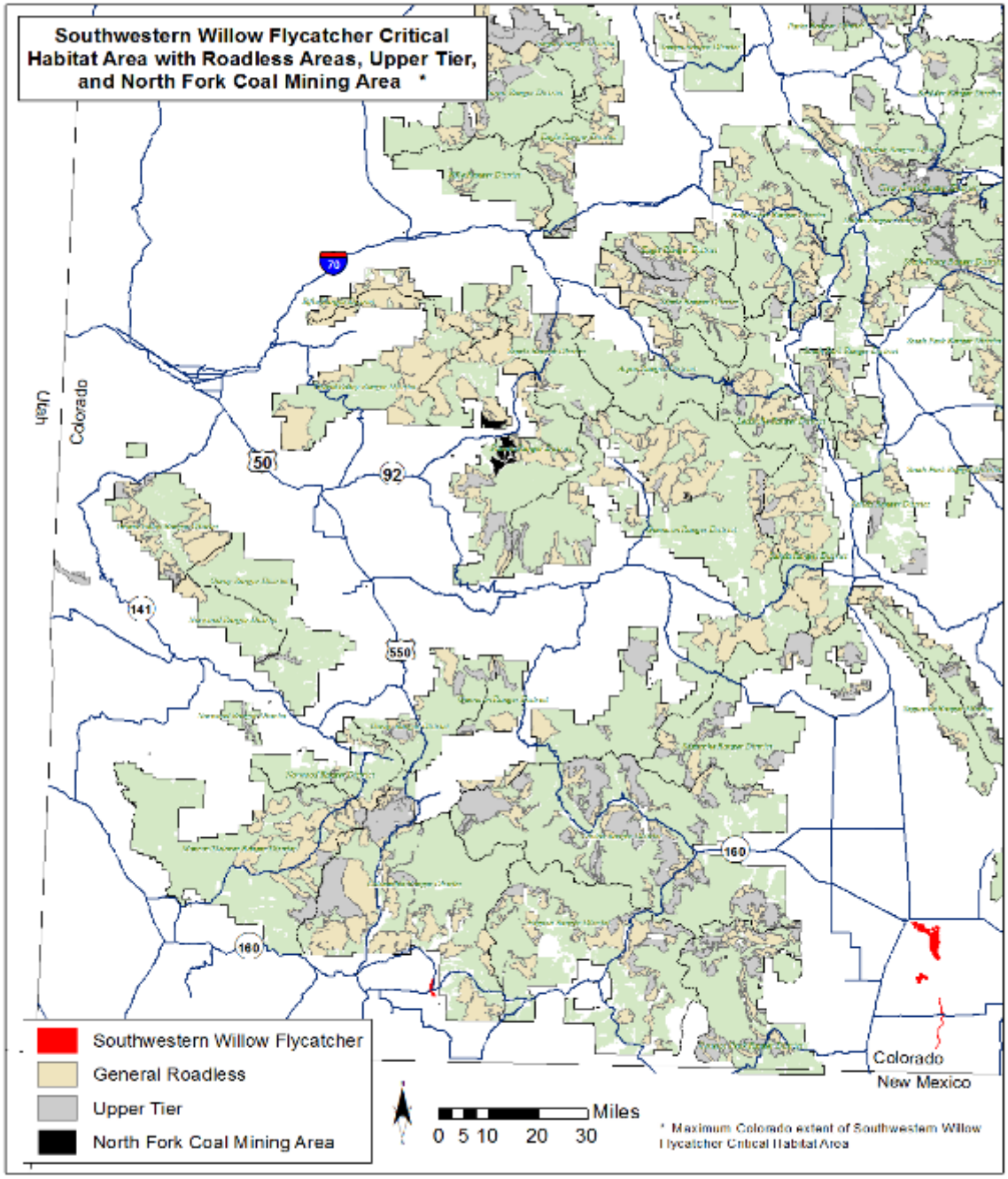

Figure 3-11. *Location of designated critical habitat for the southwestern willow flycatcher in relation to CRAs and the North Fork Coal Mining Area.*

Analysis of the Effects of the Alternatives

The joint specialist reports prepared for the Environmental Impact Statement for the 2012 rulemaking discussed in detail the general effects to wildlife, fish, and sensitive plants from management activities permissible under the 2012 Colorado Roadless Rule, including the temporary road exception for the North Fork Coal Mining Area. These still apply under the current alternatives and are summarized here. It is key to the analysis and its conclusions here that the 2012 Colorado Roadless Rule and the North Fork Coal Mining Area exception under any of the current alternatives do not authorize any ground-disturbing activities, and proposed activities would continue to be subject to the requirements of the current forest plans, further NEPA and site-specific evaluations, and consultation with the U.S. Fish and Wildlife Service under Section 7 of the Endangered Species Act whenever effects to listed species are projected under a proposed activity.

The extent to which effects occur locally to habitat and populations will depend on site-specific factors, such as the type, location, timing, duration, frequency, and magnitude of the management actions relative to risk factors for a species. Some of the potential impacts described programmatically here would likely be avoided or reduced through site-specific planning and implementation, which will include design criteria and/or mitigation measures aimed at conserving threatened, endangered, and sensitive species. Section 7 consultation with the U.S. Fish and Wildlife Service will help inform this in the event that a proposed activity may affect a listed species or critical habitat.

Road construction, reconstruction, and maintenance and tree cutting and removal can affect habitat by reducing habitat availability and effectiveness, causing habitat fragmentation, facilitating the spread of non-native invasive species, and increasing human-caused disturbance and mortality. Oil and gas and mining operations and development of LCZs can remove or degrade habitat, increase fragmentation, facilitate new introductions, or increase the spread of non-native invasive species, increase noise and other human-caused disturbance, and increase the potential for road-related mortality of wildlife due to vehicle collisions.

Fragmentation of sensitive plant habitat can result from a wide array of management actions in and around roadless areas. Habitat fragmentation has been cited frequently as a concern for fish and wildlife, and its impact on plants can vary widely depending on the species' breeding system, capacity for migration, and other factors (Lienert, 2004). Although some plant species are able to persist in very small populations over long periods of time, there is also evidence for the disruption of plant-pollinator relationships in fragmented landscapes (Harris and Johnson, 2004). The causes may include a lack of nesting sites for insect pollinators or reduced pollinator visits to small plant populations, which can lead to lower seed production, with subsequently reduced seedling establishment and eventually smaller plant populations or local extirpation of populations. Habitat fragmentation can also affect plant populations through a loss of genetic diversity within populations (U.S. Forest Service and University of California, 2006).

Determinations of effect by alternative for Regional Forester sensitive species are summarized later in Table 3-16, and determinations by alternative for ESA species and critical habitats are summarized in Tables 3-17 and 3-18.

Alternative A – No Action

Summary of Alternative

Alternative A is the no action alternative and represents the current situation and baseline, with continued implementation of the Colorado Roadless Rule and the North Fork Coal Mining Area with existing coal leases continuing to operate according to the terms of their leases. However, the North

Fork Coal Mining Area exception for temporary roads would remain vacated by the 2014 District Court of Colorado ruling and would not be restored. The North Fork Coal Mining Area would continue to be managed as non-upper tier CRA acres.

Sensitive Species

The Colorado Roadless Rule represented a statewide reclassification of areas designated as "roadless" by the 2001 Roadless Rule. The 2001 Roadless Rule and the Colorado Roadless Rule provide similar management direction for roadless areas. Ironically, designation as roadless does not preclude road construction or activities associated with roads, such as timber harvest. However, the scope of road construction is limited within CRAs compared to the potential road construction outside of them. Activities proposed within CRAs also undergo additional scrutiny by the Forest Service to ensure that negative impacts to the CRAs and their resource values are avoided and minimized.

Discussions with Forest Service resource specialists in Colorado suggest the additional administrative review associated with proposals in CRAs has had the intended effect of preventing further proliferation of roads within CRAs on national forests. Therefore, it is reasonable to continue to conclude that the Colorado Roadless Rule is overall positive over the long term for conservation of special status species (ESA, Regional Forester sensitive species) compared to non-roadless area environments. There is some potential for localized and short–term negative effects to local occurrences and individuals from implementation of the management exceptions, including for North Fork. Conversely, species that thrive in early seral conditions brought about by disturbance may not necessarily benefit from higher protections of areas from those disturbances.

This alternative that further constrains additional temporary road development and associated coal-mining activities under the North Fork Coal Mining Area exception compared to the Alternatives B and C by itself does not compromise the 2012 determinations of "*May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward Federal listing*" (MAII) for the sensitive species evaluated at that time. Implementation of this alternative could be expected to be more beneficial to some species directly or indirectly associated with the CRA by removing potential conflicts between them and their habitats associated with new temporary roads and related activities allowable under Alternatives B and C. If realized, this local benefit would improve the conservation value of the Colorado Roadless Rule for those species compared to the other alternatives, potentially in meaningful ways at a localized scale. It would, however, not have a noticeable disproportionate impact on the programmatic conclusions for the Colorado Roadless Rule and this alternative that would compel a change to a determination of "*No impact*" for sensitive species across the scale of the Colorado Roadless Rule and analysis area in 2012 (see Table 3-15).

As concluded in 2012 and still valid today in and outside of the North Fork Coal Mining Area under this alternative, some positive and negative effects to these species are anticipated with implementation of the entire Colorado Roadless Rule and management exceptions permitted. Though the temporary road exception for the North Fork Coal Mining Area was one piece contributing to the 2012 effects analyses and determinations, there is no indication that it disproportionately influenced them. The Colorado Roadless Rule and its suite of management exceptions (most of which continue to apply across all of the current alternatives) contributed to that collective MAII determination conservatively applied to all of the sensitive species at that time. It is reasonable to expect that effect determination continues to be appropriate for the sensitive species addressed in 2012 and that have retained their sensitive designation since then. This is the case even recognizing the potential for more localized benefits to some of these species under Alternative A compared to Alternative B, the preferred alternative. Alternative A may have less local conservation value than Alternative C, which substantially reduces the North Fork Coal Mining Area and therefore the area to which the road exception applies. Conversely, the larger area retained under Alternative A would not be subject to the road exception anywhere within the North Fork Coal Mining Area.

It is also seems reasonable to similarly conclude that the MAII determination for the Colorado Roadless Rule and the current alternative should be applied to the new species added to the Regional Forester sensitive species list since 2012: monarch, western bumblebee, Mancos Shale packera, and violet milkvetch. There currently is a paucity of data concerning their association directly with the CRAs. However, their association is assumed, given the current understanding of their natural history and habitats and considering the ubiquitous nature of roadless areas across the national forest network in Colorado. Activities allowed under the Colorado Roadless Rule management exceptions and ongoing activities in the North Fork Coal Mining Area under this alternative, even without the exception for that area, could have some local or temporary direct or indirect effects on these species and their habitats.

The probability of negative impacts should be minimized if not avoided altogether by the site-specific analysis, implementation of Best Management Practices, project design criteria and mitigation measures, ESA Section 7 consultation, and decision-making procedures that will continue to apply to future activities in the roadless areas and North Fork Coal Mining Area under this and all alternatives. Hence, the MAII determination continues to apply and is appropriate under Alternative A for those sensitive species evaluated in 2012, as well as the species designated sensitive as during updates to the Regional Forester sensitive species list in 2013 and 2015. The exception is Gunnison sage-grouse that is now listed under the ESA and addressed under that status in the next section.

Threatened and Endangered Species

Listed species that were the subject of Section 7 consultation for the 2012 Colorado Roadless Rule included the Southwestern willow flycatcher, Mexican spotted owl, Pawnee montane skipper, Uncompahgre fritillary, Canada lynx, Preble's meadow jumping mouse, greenback cutthroat trout, Penland's alpine fen mustard, Colorado hookless cactus, and DeBeque phacelia. For all of these species, the Forest Service determination was *"May affect, not likely to adversely affect*" across all alternatives evaluated (including notably the no action-"2001 Roadless Rule" alternative). Presented earlier, Table 3-13 summarized the rationale for these determinations that the U.S. Fish and Wildlife Service subsequently concurred with for the preferred alternative. As with the sensitive species, the determinations were an outcome of considering the CRA network across the State and various management exceptions allowed within that network. None of the determinations singled out the temporary road exception for the North Fork Coal Mining Area as having a disproportionate influence on one or more of those determinations. The information provided for these species on habitats and threats in those evaluations has also not substantially changed since then. Therefore, continuation of the Colorado Roadless Rule without the road exception under Alternative A may have some localized or temporary conservation values to species occurring there compared to Alternative B. However, our overall conclusion is that the 2012 programmatic determinations of effect for these species across the roadless network continue to apply to the Colorado Roadless Rule and current No Action Alternative A.

Colorado River listed fishes. The endangered bonytail chub (*Gila elegans*), Colorado pikeminnow (*Ptychocheillus lucius*), humpback chub (*Gila cypha*), and razorback sucker (*Xyrauchen texanus*), are native to the Colorado River and its larger tributaries. These four species are found in warm-water environments and are not present in CRAs. Impoundment and diversion of water on NFS lands can affect these species. Development of coal resources sometimes requires small, one-time water depletions associated with well drilling and other construction activities. The determination of effect for these fishes in 2012 was *"no effect."* Because the temporary road exception is not restored to the Colorado Roadless Rule under this alternative, new mining activities and associated water depletions that might otherwise be facilitated by new roads would not occur. Therefore, Alternative A does not introduce any new effects to these fishes and the no-effect conclusion is not changed (see Table 3-17).

The species that were affected by ESA listing or critical habitat decisions since the 2012 Colorado Roadless Rule are now discussed individually:

Gunnison sage-grouse. At the time of the 2012 Colorado Roadless Rule, the Gunnison sage-grouse was a Forest Service sensitive species. Within a few weeks of the 2012 roadless rulemaking, the GMUG National Forests entered into a cooperative Candidate Conservation Agreement with the U.S. Fish and Wildlife Service and several other Federal and State agencies and local governments for the Gunnison Basin sage-grouse populations that contain 87% of the known remaining population rangewide. In July 2013 the Service issued a Conference Opinion on the Agreement. On November 20, 2014, the U.S Fish and Wildlife Service listed the species as threatened and designated final critical habitat for it. Some of that critical habitat overlaps CRAs on the GMUG forest, though not in the North Fork Coal Mining Area (Fig. 3-12). On December 8, 2014, the Service adopted the 2013 Conference Opinion as a final Biological Opinion.

The 2012 effects analysis for the Gunnison sage-grouse concluded that adoption of the Colorado Roadless Rule "May adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward Federal listing." This is the appropriate determination when there is potential for a mix of beneficial and minor negative impacts to a sensitive species. The rationale at the time was that overall the Colorado Roadless Rule protections and ongoing project-level evaluations to avoid and minimize local negative effects of activities under the management exceptions would be positive for the Gunnison sage-grouse and its conservation. Any impacts to individuals or their habitat were projected to be minor and temporary, if they occurred at all, and ameliorated to the extent possible during the project-level planning and evaluations.

There is nothing to suggest that the 2014 listing of the Gunnison sage-grouse under the ESA compromises the 2012 conclusions, or the Colorado Roadless Rule now represents a substantial threat to the grouse or its critical habitat. To the contrary the Colorado Roadless Rule protections, ongoing activity evaluations, and consultations as needed for management activities in the CRAs and North Fork Coal Mining Area, and the ongoing affirmative efforts on the GMUG National Forests under the cooperative Candidate Conservation Agreement all lead to the conclusion that adverse effects of the Colorado Roadless Rule to the Gunnison sage-grouse or its critical habitat are unlikely. The absence of the temporary road exception for the North Fork Coal Mining Area under Alternative A has little bearing on that conclusion or in comparison to the other alternatives with no known birds or critical habitat near that Coal Mining Area. Some impacts may occur from activities in other CRAs as projected in 2012, but they should be minor to unlikely as earlier concluded.

DeBeque phacelia. At the time of the evaluation of the 2012 Colorado Roadless Rule, the DeBeque phacelia was listed as threatened with proposed critical habitat. Later that year on August 3, 2012, the U.S. Fish and Wildlife Service designated final critical habitat, including some units overlapping two "non-upper tier" roadless areas (Sunnyside on the Gunnison National Forest and Housetop Mountain on the adjacent White River National Forest). No critical habitat is near the North Fork Coal Mining Area (Fig. 3-13).

The conclusions for the 2012 Colorado Roadless Rule were that the plant and proposed critical habitat were unlikely to be adversely affected because there was no likely potential for road construction, tree cutting, or oil, gas, or coal development in the few roadless areas where it was known that could impact populations or habitat. However, there might be some risk of indirect effects from invasive plants spreading into these roadless areas from activities should they occur in adjacent areas. Consequently, the determinations were "may affect, not likely to adversely affect" the DeBeque phacelia and "may affect, not likely to adversely modify" its proposed critical habitat.

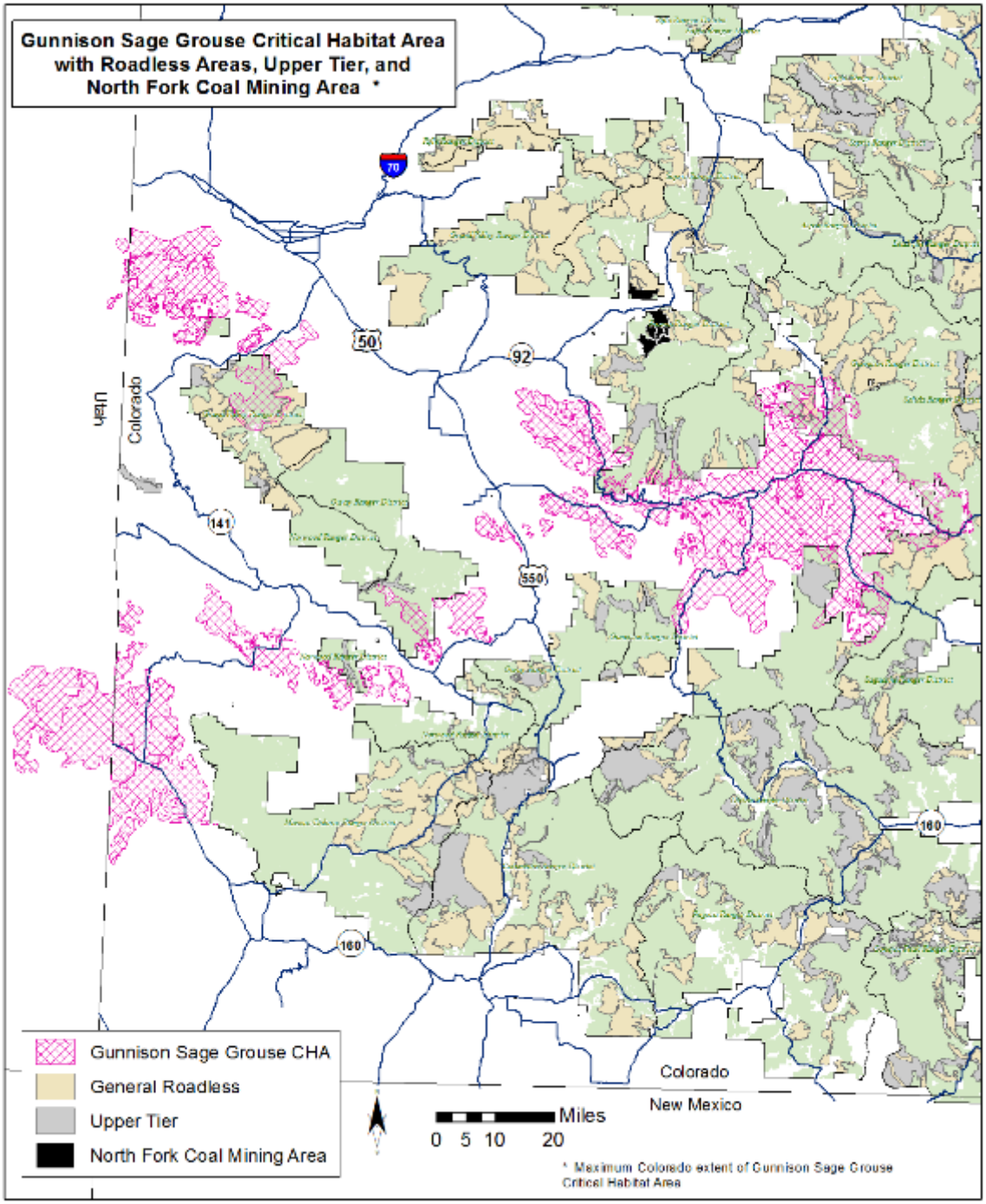

Figure 3-12. *Location of designated critical habitat for the Gunnison sage-grouse in relation to CRAs and the North Fork Coal Mine Area.*

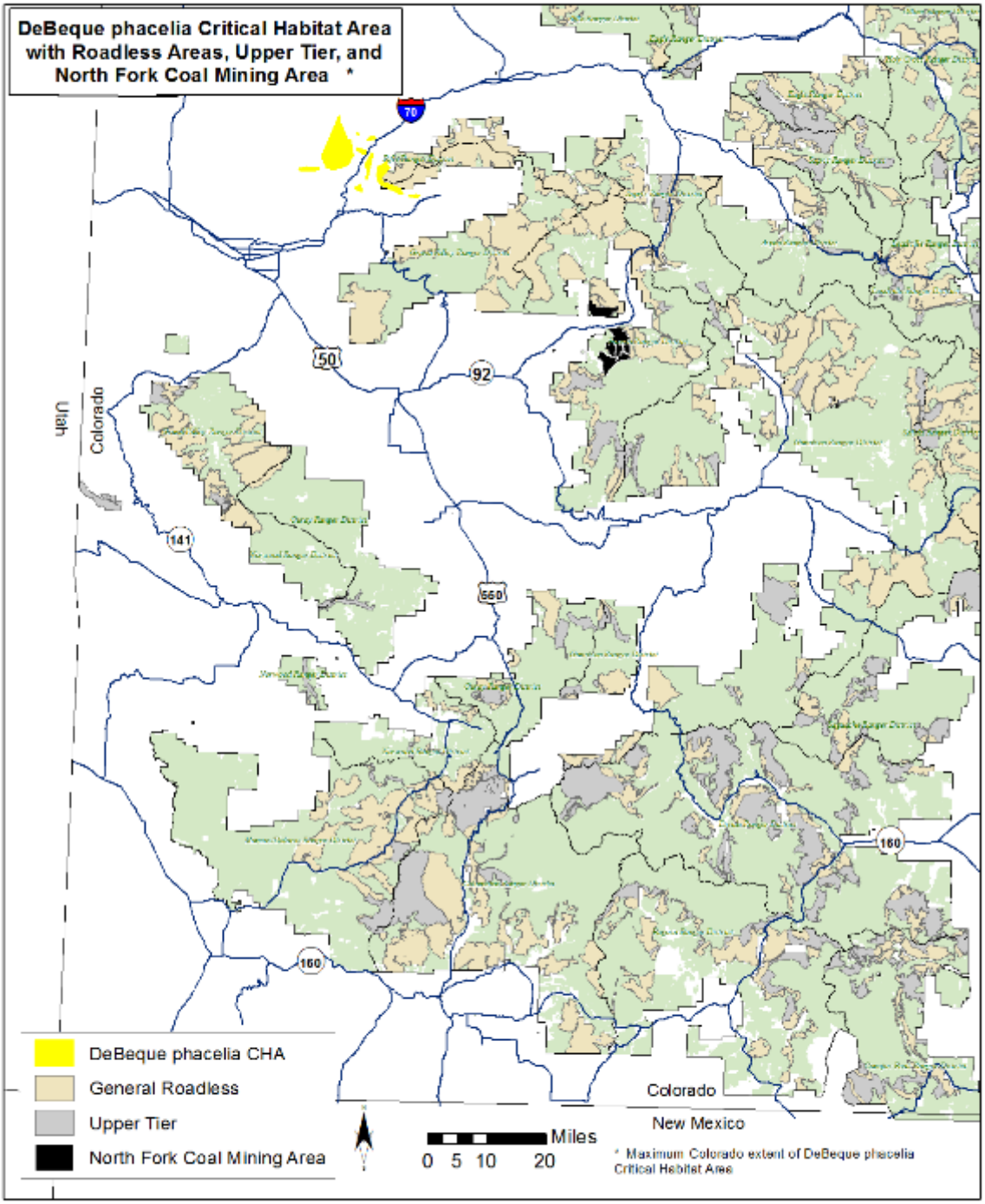

Figure 3-13. *Location of designated critical habitat for DeBeque phacelia in relation to CRAs and the North Fork Coal Mining Area.*

The parcels of final designated critical habitat are located in the same roadless areas and parcels as the proposed habitat in 2012. No new information would indicate that the species and its final critical habitat would now be adversely affected, but there may still be some potential effect as described in 2012 related to implementation of activities under the management exceptions. That is largely speculative at this point and would be subject to future site-specific evaluations and Section 7 consultation, as needed. Because the species or its critical habitat is not known from or near the North Fork Coal Mining Area, Alternative A does not alter these conclusions.

Alternative B

Summary of Alternative

Alternative B is the Forest Service preferred alternative. It designates 19,700 acres of CRAs on the GMUG National Forests as the North Fork Coal Mining Area and restores the North Fork Coal Mining Area exception that was vacated by the 2014 Court decision.

Sensitive Species

Similar to conclusions under Alternative A, the North Fork Coal Mining Area exception under Alternative B by itself does not compromise the 2012 programmatic determinations of "May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward Federal listing" (MAII) for the sensitive species evaluated at that time. This alternative most closely resembles the 2012 FEIS selected alternative and given the relatively short interim period of time, the analyses, rationales, and determinations of effect then largely apply today. Implementation of Alternative A would not result in additional localized conservation value to species overlapping the area affected by the temporary road exception as under Alternative B. However, that difference as discussed also under Alternative A would not disproportionately affect the overall determinations for the 2012 Colorado Roadless Rule and its exceptions, including the one for the North Fork Coal Mining Area under Alternative B. A similar conclusion could be made when comparing against Alternative C that reduces the Mining Area by 36% of its size under Alternatives A and B. Alternative C would also likely have the potential for some localized added conservation value to some species compared to B, without necessarily impacting the overall determinations of effect under B. It is also reasonable to conclude the MAII determinations for the species analyzed in 2012 would also apply to the monarch, western bumblebee, Mancos shale packera, violet milkvetch for similar reasons presented under Alternative A (see Table 3-15).

Notwithstanding the points and conclusions above, newer information for sensitive fishes in and near the North Fork Coal Mining Area has emerged since the 2012 Colorado Roadless Rule. No Forest Service sensitive fish populations were known to occur in the North Fork Coal Mining Area at the time of the 2012 rulemaking. Similarly, no known threatened fish populations were known to occur in the watershed in which the North Fork Coal Mining Area is located. The East Fork of Minnesota Creek and its tributary Hoodoo Creek support a Conservation Population of Colorado River cutthroat trout. Hoodoo Creek is inside the Coal Mining Area and the East Fork of Minnesota Creek is within the same watershed as the southern end of the Coal Mining Area. The total length of habitat occupied within and around the North Fork Coal Mining area by Colorado River cutthroat trout is 2.9 miles. Therefore, erosion occurring in this part of the North Fork Coal Mining Area could result in habitat degradation in these streams. Road-stream crossings could fragment stream habitat isolating trout in Hoodoo Creek from the surrounding watershed. Project-level design features and best management practices will be particularly necessary in this part of the North Fork Coal Mining Area, in order to minimize the chance for substantial negative effects on Colorado River cutthroat trout. While this may not affect the overall determination of impact for this species under the 2012 Colorado Roadless Rule and Alternative B, proper consideration of the Colorado River cutthroat trout in further site-

specific planning of the coal mining-related activities will likely be important in conservation of local individuals and populations.

Threatened and Endangered Species

The 2012 "may affect" determinations and Section 7 consultation for the southwestern willow flycatcher, Mexican spotted owl, Pawnee montane skipper, Uncompahgre fritillary butterfly, Canada lynx, Preble's meadow jumping mouse, greenback cutthroat trout, Penland's alpine fen mustard, Colorado hookless cactus, and DeBeque phacelia reflected the overall Colorado Roadless Rule, network of roadless areas, and allowable activities including the exception for temporary road construction in the North Fork Coal Mining Area. As discussed under Alternative A, the rationales for those determinations did not single out impacts associated with the temporary road exception and any related future mining activities for the North Fork Coal Mining Area that might be connected to new roads. The arguments and determinations largely continue to apply under Alternative B (see Table 3-17), with the exception of the listed fishes as discussed below.

Green lineage cutthroat trout. Twelve "populations" of green lineage cutthroat trout are present in the North Fork watershed. The total length of streams occupied by green lineage cutthroat trout in the watershed is 39 miles (Figure 3-14). These green lineage cutthroat trout populations are analogous to the "conservation populations" in the conservation strategy for the Colorado River cutthroat trout, as these fish were classified before being properly identified as green lineage cutthroat trout. None of these populations of green linage cutthroat trout occupy habitat within or directly downstream of the North Fork Coal Mining Area. Therefore, the determination for the North Fork Coal Mining Area under the proposed action is *"no effect"* to the green lineage cutthroat trout. It is likely that other populations are associated with roadless areas within the larger statewide network and could be affected by allowable management activities under the rulemaking exceptions. In that case, it would be reasonable to come to an analogous determination based on similar rationale as the Forest Service used for the greenback cutthroat trout for the 2012 roadless rulemaking. Even without the North Fork Coal Mining Area exception, the 2012 Colorado Roadless Rule *"may affect"* but is *"not likely to adversely affect"* the green lineage cutthroat trout.

Colorado River listed fishes. The endangered bonytail chub, Colorado pikeminnow, humpback chub, and razorback sucker, are native to the Colorado River and its larger tributaries. The determination of effect for these fishes in 2012 was *"no effect."* The conclusion in the 2012 determinations may have been in error, or at least should have been included in dialogue with the U.S. Fish and Wildlife Service during the interagency consultation on the Colorado Roadless Rule. While temporary road construction permitted in the North Fork Coal Mine Area under this alternative is not expected to deplete water from the watershed, downstream effects to listed fish native to the Colorado River watershed could occur if such temporary road construction led to other mining-related activities that did use water from the Gunnison River Basin. The U.S. Fish and Wildlife Service has previously determined that all water depletions however minor from the Gunnison River Basin could adversely affect Colorado River fishes.

Under Alternative B, water depletions that may occur in the North Fork Coal Mining Area are likely to be sufficiently small to allow for them to be covered by prior programmatic biological opinions by the U.S. Fish and Wildlife Service for depletions affecting the Colorado River listed fishes. A change in the 2012 programmatic determination of effect for the Colorado River listed fishes to "adverse" under this alternative and appropriate oversight of depletions in the North Fork Coal Mining Area will be addressed during the re-initiation of Section 7 consultation with the U.S. Fish and Wildlife Service.

The species that were affected by ESA listing or critical habitat decisions since the 2012 Colorado Roadless Rule and not treated earlier are discussed individually below.

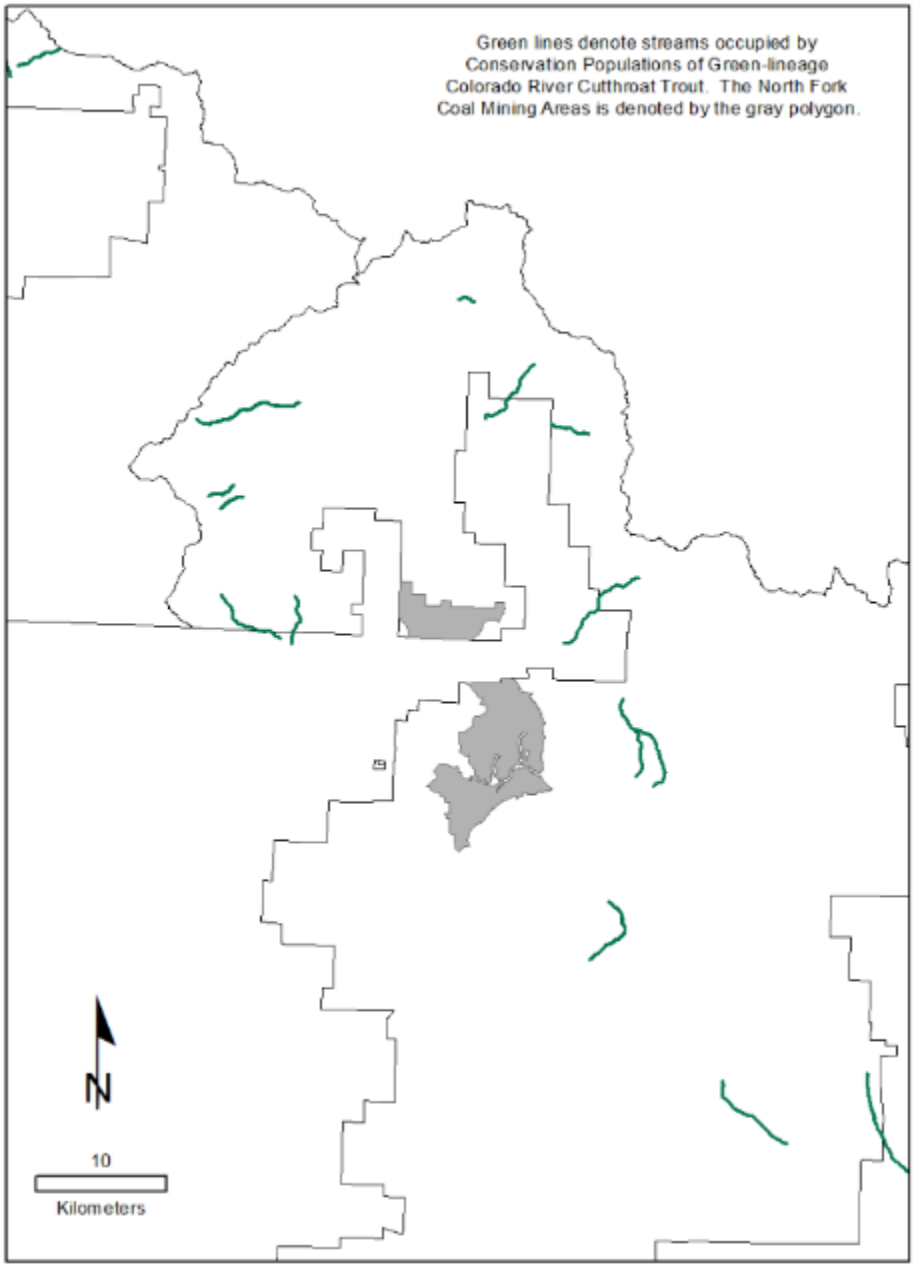

Figure 3-14. *Populations of green lineage cutthroat trout in relation to the North Fork Coal Mining Area.*

Gunnison sage-grouse. The discussion under Alternative A largely applies to Alternative B as well. Although the temporary road exception is reinstated under Alternative B, the Colorado Roadless Rule protections, ongoing activity- and site-specific future NEPA evaluations and interagency consultations for management activities in the roadless areas and North Fork Coal Mining Area, should help ensure that activities associated with Colorado Roadless Rule management exceptions and under this alternative will avoid adverse effects to the Gunnison sage-grouse and its critical habitat. The high level of Colorado Roadless Rule protections compared to non-CRA areas should be overall beneficial to conservation of the species. Some impacts may occur from activities in CRAs when considering the entire network as projected in 2012, but should be minor to unlikely. When considering just the North Fork Coal Mining Area, the sage-grouse and its critical habitat is not in or associated with the Coal Mining Area under any of the Alternatives. Consequently, Alternative B despite having the largest area affected by the temporary road exception among the three alternatives, should not represent an increased threat to the Gunnison sage-grouse.

DeBeque phacelia. As discussed under Alternative A, the evaluations of the 2012 Colorado Roadless Rule indicated that there are no anticipated new roads, tree cutting, or oil, gas, or coal development in the few roadless areas where DeBeque phacelia and its critical habitat is known. Hence, while there may be some potential for indirect impact to populations or habitat from invasive plants spreading from adjacent roadless areas that may be affected by these activities (though even that is uncertain), the likelihood of those effects occurring or being anything other than temporary or minor if they do is small. However, there might be some risk of indirect effects from invasive plants spreading into these roadless areas from activities elsewhere.

The parcels of final designated final critical habitat are located in the same roadless areas and parcels as was proposed at the time of the development of the 2012 FEIS. There is no substantial new information since the 2012 FEIS that suggests that the species and its final critical habitat would now be adversely affected. However, we conclude that there may still be some potential effect as described in 2012 for the Colorado Roadless Rule network. Specific to the North Fork Coal Mining Area, the species and its critical habitat is not known within or even nearby the area. Therefore, any conclusions regarding the effect to the DeBeque phacelia and its critical habitat from implementation of the Colorado Roadless Rule are not changed under Alternative B.

Alternative C

Summary of Alternatives

Alternative C is the same as Alternative B, except the area established as the North Fork Coal Mining Area in the 2012 Colorado Roadless Rule would be reduced in size to 12,600 acres (36%) by excluding areas designated as “wilderness capable” in the draft 2007 GMUG Forest Plan revision.

Sensitive Species

Similar to conclusions under Alternatives A and B, this alternative does not change the overall programmatic determinations of effect for the species evaluated in 2012 and the species added to the sensitive species list since then. The size of the North Fork Coal Mining Area is reduced under this alternative and likely to benefit and enhance local conservation value to species and their habitats compared to Alternative B (see Table 3-15).

Any enhanced species conservation value, or maintenance of values, under Alternative C or any of the other alternatives is an important consideration. As discussed previously for the other alternatives and holds for Alternative C, the 2012 determinations of effect for sensitive plants and animals were based on the entire Colorado Roadless Rule and management exceptions. No single species analyses or determinations of effect were disproportionately affected by the temporary road exception for the

North Fork Coal Mining Area as it was represented in the 2012 Colorado Roadless Rule. Hence, the size of the Coal Mining Area does not appear to greatly swamp or substantially change the expected overall conservation benefits of the Colorado Roadless Rule or affect the determinations. Alternative C would likely add to the conservation value of the Colorado Roadless Rule by improving local conservation value, but not to a degree that would change the overall program determinations for the statewide Colorado Roadless Rule network for the 2012 sensitive species or the new ones. That conclusion is not intended to imply that higher local conservation value for at risk species if realized, is not important or something to consider in the selection of the current alternatives based on all related and non-related legal, policy, and management considerations that may apply. The conclusion does reflect the expectation, as in 2012, that the Colorado Roadless Rule under all of the alternatives will have a mix of potential positive and negative effects to some species under all of the management exceptions, including for a smaller North Fork Coal Mining Area. But the degree of effects as discerned programmatically are considered to be overwhelmingly positive under roadless designation, with some localized or temporary negative effects that should be in reality avoided or minimized by ongoing project-level reviews and project design features and mitigation to benefit species.

As discussed under Alternative B, sensitive fish habitat may be impacted within the North Fork Coal Mining Area and by future activities. Project-level design features and best management practices will be used to evaluate and plan any future activities in order to minimize the chance for substantial effects on sensitive fish habitat. The reduction of the North Fork Coal Mining Area in Alternative C removes the sensitive fish habitat from the exception area, reducing future concerns.

Threatened and Endangered Species

The 2012 “may affect” determinations and Section 7 consultation for the southwestern willow flycatcher, Mexican spotted owl, Pawnee montane skipper, Uncompahgre fritillary, Canada lynx, Preble’s meadow jumping mouse, greenback cutthroat trout, Penland’s alpine fen mustard, Colorado hookless cactus, and DeBeque phacelia were an outcome of considering the entire 2012 Colorado Roadless Rule, network of roadless areas, and management exceptions including the exception for temporary roads in the North Fork Coal Mining Area. The rationales for those determinations did not single out impacts associated with the temporary road exception and related future mining activities for the North Fork Coal Mining Area. Consequently, under Alternative C, the arguments and determinations of *“may affect”* continue to be appropriate under this alternative, with the exception of the listed fishes as discussed under Alternative B (see Table 3-17). Similarly, the two species that were affected by ESA listing or critical habitat decisions since the 2012 Colorado Roadless Rule are discussed under Alternative B.

Cumulative Effects

The cumulative effects analysis considers how other factors might combine with the direct and indirect effects of the alternatives just described to have an additive impact. Past, present, and reasonably foreseeable future actions were evaluated. The following discussion addresses ongoing or expected activities in the next 15 years in Colorado, especially those adjacent to or potentially affecting Roadless areas.

Climate Change

Climate change is treated in this analysis as an existing, ongoing stressor affecting terrestrial and aquatic species and habitats across Colorado and the United States. Currently there is no reliable way scientifically to discern if or how greenhouse gas emissions from a specific action, source, or location influences climate change and can be reliably connected back to impacts to specific species locally, like those protected under the Endangered Species Act (78 FR 11766, U.S. Fish and Wildlife Service,

2013). Some of the broader changes that have been triggered by climate change are unlikely to have a measurable effect over the next 10–15 years, but other changes have already been documented. For example, earlier snowmelt near Crested Butte, Colorado, has been found to result in earlier flowering of some subalpine plants (Inouye, 2008).

Climate change could be expected to alter the distribution of some plants and other species (Hansen et al., 2001; IPCC, 2007). Some species will be more vulnerable to the effects of climate change than others (Millar et al., 2007).

Alpine species may be among those in the most precarious situations. With climate change, tree lines will move higher in elevation. Alpine habitats will contract in size and mountain-top patches will become increasingly isolated. Alpine plants and animals will have little opportunity to migrate to higher terrain; some are already on the highest peaks in Colorado and are isolated from other potentially suitable habitat.

Average annual temperature increases due to increased greenhouse gases such as carbon dioxide will likely lead to reduced spring snowpack, more precipitation falling as rain rather than as snow, and earlier spring peak runoff (CCSP, 2008). For species such as white-tailed ptarmigan and wolverine that rely on cold, snowy environments, warmer temperatures could lead to significant decreases in available habitat and lowered reproduction and survival. More variable flows and temperatures in streams and rivers will profoundly affect aquatic species such as greenback cutthroat trout.

Climate change is affecting the timing of biological events such as pollination, flowering, and migration. For example, pollinators may be capable of shifting northward, but may leave some plant species incapable of producing viable seeds. Earlier flowering dates subject the plants to frost resulting in significantly lower seed production (Inouye, 2008). Reduced seed production can lead to changes in plant community composition, which may alter habitat suitability for some plants, pollinators, and other animals. Bird migration, which formerly was synchronized with maximum food availability, may now occur too late, resulting in lowered reproductive success and survival.

Climate change is likely to exaggerate the scale and intensity of natural disturbances such as wildfire and bark beetle epidemics. Larger and more intense fires and insect outbreaks can be expected in Colorado in the future. While many adult animals are mobile enough to flee burning areas or seek refuge, the young of the year are often vulnerable to injury and mortality from fire (Smith, 2000). Amphibians, insect larvae, small mammals, or ground-nesting birds also may not survive the direct effects of an intense fire. Colorado forests currently are experiencing significant mortality as a result of severe mountain pine beetle and spruce beetle outbreaks. Larger, more severe wildland fires could occur in and around CRAs in the future.

Additional stressors such as competition from invasive species or changes in land use will further challenge the ability of plants and animals to adapt to climate change (National Assessment Synthesis Team, 2001). Despite the potential impacts of climate change to species as discussed here, the actual causal relationship between climate change and impacts to specific special status like those protected under the ESA in an action area are not well understood.

Increasing Human Population Growth and Development

Colorado's residential population in 2006 was 4.8 million and was projected to be 7.3 million by 2030 (DOLA, 2007). The increased demands these residents will place on the lands surrounding Roadless areas will increase the importance of the Roadless areas in providing habitat for wildlife, fish, and rare plants. Increasing population and associated resource demands could also limit options for any future protection of new Roadless acres that might otherwise be possible. Roadless areas will likely continue to provide some of the best aquatic and terrestrial wildlife habitat in Colorado into the future, as well as relatively weed-free habitats for rare plants.

The effects of population growth on fish and wildlife are evident in the amount of habitat that has been converted or fragmented by human development across the State. Much of this development has been in lower elevation areas that have historically provided habitat that allowed species such as bears and ungulates to survive harsh winters. Providing for the intact structure and function of high-value but limited low and middle elevation Roadless areas is important now and will be essential in the future. Human-associated encroachment is expected to continue to erode habitat availability and effectiveness, and increase disturbance and fragmentation.

Increasing demand for water will also present fragmentation as well as quantity and quality of aquatic systems. It is becoming increasingly difficult to "balance" the need for water by municipal users with the requirements of native fish for abundant, clear water, and clean substrate throughout the year.

Colorado's Comprehensive Wildlife Conservation Strategy provides a foundation for sustaining Colorado's wildlife and the habitats upon which they depend (Colorado Division of Wildlife, 2006).

The strategy provides general direction for wildlife conservation and a stimulus to engage partners in conservation of Colorado's wildlife resources. These efforts will increase the probability of terrestrial species' habitats on non- Federal land remaining stable over the long term. However, considering the growth rate of the State and the high demand for resources available in Colorado, some non- Federal lands will continue to experience impacts on natural resources from urbanization and development, resource demands (for example, minerals), and recreation. Some effects that result in lower habitat quality on non- Federal land may increase the importance but also limit the potential effectiveness of habitat conservation and restoration on Federal lands.

Increasing Recreation Demand

The growing population will continue to be drawn to the natural beauty, seclusion, and undeveloped nature of Roadless areas in Colorado for enjoyment of outdoor recreation pursuits. Recreational demand will continue to increase, likely increasing the use of Roadless areas.

Recreational activities can affect the quality and quantity of habitat, displace wildlife from core habitats, create physiological stress, fragment habitats, and increase the establishment and spread of invasive species and pathogens. Habitats previously secluded and undisturbed are likely to experience unpredictable or increasing human presence and the unintentional introduction of invasive species. Thus, increases in recreational use could compound the effects of increased road construction and vegetation treatment on many fish, wildlife, and rare plant species, and introduce additional non-native invasive plants and animals that threaten native populations.

Increasing Energy Demand

Oil, gas, and coal reserves are among the economically important natural resources found within the Roadless areas and surrounding lands in Colorado. The national focus on energy independence combined with the high demand for energy has resulted in a surge of exploration and development of those resources across the State. Energy exploration and development is occurring on both private and Federal lands, including areas within or in proximity to CRAs. Many of the areas where exploration and development are occurring historically have provided valuable habitat for fish, wildlife, or rare plants, and in some cases habitat critical to the survival of individuals and populations of species. Development of non- Federal lands may displace animals onto adjacent NFS lands, accentuating the need to provide effective habitat that is free from disturbance.

Pipelines and other distribution systems needed to transport these products may be routed across the national forests. This development results in direct loss of habitat as well as indirect effects of disturbance during construction and operation, which may become permanent for above-ground structures.

The current interest in wood fiber and biofuels as economical energy sources is anticipated to increase, placing additional demand on NFS resources. It can be anticipated that harvesting wood fiber to meet increasing demand will increase as technology improves. Tree harvest and sale requires road infrastructure, resulting in the associated impacts on wildlife and rare plants that have been thoroughly discussed previously in this document.

Development of wind energy and associated interstate transmission lines are anticipated to receive increasing focus in the nation's effort to become energy independent, and national forests are beginning to receive inquiries about tower placement. Mortality of migrating bats and a variety of birds by striking wind towers has been documented in numerous locations. Like other infrastructure development in previously undisturbed habitats, these structures directly remove habitat and may reduce habitat effectiveness, cause displacement of wildlife, and fragment habitat, thus adding adverse cumulative effects to the activities in the proposed alternatives.

Analysis of Cumulative Effects

The primary cumulative effect of Alternatives B and C is that road density within the North Fork Coal Mining Area could increase. Increased road density leads to fragmentation of terrestrial habitat and could lead to habitat degradation or fragmentation of aquatic habitat. Road construction within the Coal Mining Area would still be subject to project-specific NEPA review and design criteria and best management practices could be implemented at that level to minimize the chance for project-specific negative impacts.

Outside of the North Fork Coal Mining Area, continued implementation of the Colorado Roadless Rule for CRAs would maintain relatively large blocks of undisturbed aquatic and terrestrial habitat. Therefore, the primary cumulative impact of the Colorado Roadless Rule would be beneficial. Future proposals for activity within CRAs would be subject to project-specific NEPA at which time an analysis of how a project could lead to the deterioration of roadless area characteristics within the affected CRA would be completed, as well as mitigation measures to return impacted areas after use to roadless over the long term.

Determinations of Effect for Sensitive Species

The possible determinations of effect for sensitive species are:

- No impact (NI);
- Beneficial impact;
- May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward Federal listing (MAII); and
- Likely to result in a loss of viability in the planning area, or in a trend toward federal listing.

For the Alternatives, the determinations of impact are presented for all of the Regional Forester sensitive species evaluated under the Colorado Roadless Rule. These determinations remain unchanged and continue to apply today across the network, including for those species known or suspected to occur within or adjacent to the North Fork Coal Mining Area. This includes for Alternative A where the road exception is absent, but mining activities under existing leases continue and other exceptions of the Colorado Roadless Rule remain available for use in the area and have potential for some impact to most of the species. However, when the impacts of an alternative are not expected to be substantial and the species and its habitat will remain well distributed, the overall determination of impact is MAII.

Table 3-15. *Summary of determinations of potential effect under the 2012 Colorado Roadless Rule for Regional Forester sensitive species. Species removed from the Regional Forester sensitive species list since 2012 are not included.*

Species	*Alternative A*	*Alternative B*	*Alternative C*
AMPHIBIANS			
Boreal toad	MAII	MAII	MAII
Northern leopard frog*	MAII	MAII	MAII
Wood frog	MAII	MAII	MAII
BIRDS			
American peregrine falcon*	MAII	MAII	MAII
Bald eagle	MAII	MAII	MAII
Black swift	MAII	MAII	MAII
Boreal owl*	MAII	MAII	MAII
Brewer's sparrow	MAII	MAII	MAII
Columbian sharp-tailed grouse	MAII	MAII	MAII
Ferruginous hawk	MAII	MAII	MAII
Flammulated owl*	MAII	MAII	MAII
Greater sage-grouse	MAII	MAII	MAII
Lewis's woodpecker	MAII	MAII	MAII
Loggerhead shrike	MAII	MAII	MAII
Mountain plover	MAII	MAII	MAII
Northern goshawk*	MAII	MAII	MAII
Northern harrier	MAII	MAII	MAII
Olive-sided flycatcher*	MAII	MAII	MAII
Purple martin*	MAII	MAII	MAII
Sage sparrow	MAII	MAII	MAII
White-tailed ptarmigan	MAII	MAII	MAII
FISHES			
Bluehead sucker	MAII	MAII	MAII
Colorado River cutthroat trout*	MAII	MAII	MAII
Flannelmouth sucker	MAII	MAII	MAII
Mountain sucker	MAII	MAII	MAII
Rio Grande cutthroat trout	MAII	MAII	MAII
INVERTEBRATES			
Rocky Mountain capshell snail	MAII	MAII	MAII
Susan's purse-making caddisfly	MAII	MAII	MAII
Hudsonian emerald dragonfly	MAII	MAII	MAII
Monarch butterfly	MAII	MAII	MAII
Nokomis fritillary	MAII	MAII	MAII
Western bumblebee*	MAII	MAII	MAII
MAMMALS			
American hog-nosed skunk	MAII	MAII	MAII
Townsend's big-eared bat	MAII	MAII	MAII
Gunnison's prairie dog	MAII	MAII	MAII
Spotted bat	MAII	MAII	MAII
Hoary bat*	MAII	MAII	MAII
River otter	MAII	MAII	MAII
American marten*	MAII	MAII	MAII
Fringed myotis	MAII	MAII	MAII
Bighorn sheep	MAII	MAII	MAII
Pygmy shrew	MAII	MAII	MAII
Kit fox	MAII	MAII	MAII
Swift fox	MAII	MAII	MAII
PLANTS			
Stonecrop gilia *Aliciella sedifolia*	MAII	MAII	MAII
Rydberg's golden columbine *Aquilegia chrysantha*	MAII	MAII	MAII

Species	*Alternative A*	*Alternative B*	*Alternative C*
Siberian sea thrift *Armeria maritima* ssp. *sibirica*	MAII	MAII	MAII
Missouri, or Archuleta milkvetch *Astragalus missouriensis var. humistratus*	MAII	MAII	MAII
Aztec milkvetch *Astragalus proximus*	MAII	MAII	MAII
Ripley's milkvetch *Astragalus ripleyi*	MAII	MAII	MAII
Smooth northern-rockcress *Braya glabell*	MAII	MAII	MAII
Lesser panicled sedge *Carex diandra*	MAII	MAII	MAII
Livid sedge *Carex livida*	MAII	MAII	MAII
Lesser yellow lady's slipper *Cypripedium parviflorum*	MAII	MAII	MAII
Clawless, or Garys Peak draba *Draba exunguiculata*	MAII	MAII	MAII
Gray's draba *Draba grayana*	MAII	MAII	MAII
Smith's draba *Draba smithii*	MAII	MAII	MAII
English sundew *Drosera anglica*	MAII	MAII	MAII
Roundleaf sundew *Drosera rotundifolia*	MAII	MAII	MAII
Chamisso's bristlegrass, or cottongrass *Eriophorum chamissonis*	MAII	MAII	MAII
Slender bristlegrass, or cottongrass *Eriophorum gracile*	MAII	MAII	MAII
Plains rough fescue *Festuca hallii*	MAII	MAII	MAII
Scarlet gilia *Ipomopsis aggregata* ssp. *weberi*	MAII	MAII	MAII
Fremont's bladderpod *Lesquerella pruinosa*	MAII	MAII	MAII
Colorado tansyaster *Machaeranthera coloradoensis*	MAII	MAII	MAII
Rocky Mountain, budding, or Weber Monkeyflower *Mimulus gemmiparus*	MAII	MAII	MAII
Bill's neoparrya *Neoparrya lithophila*	MAII	MAII	MAII
Pikes Peak, or Rocky Mountain alpineparsley *Oreoxis humilis*	MAII	MAII	MAII
Mancos shale packera *Packera mancosana*	MAII	MAII	MAII
Kotzebue's grass of Parnassus *Parnassia kotzebuei*	MAII	MAII	MAII
Degener's beardtongue *Penstemon degeneri*	MAII	MAII	MAII
Harrington's beardtongue *Penstemon harringtonii*	MAII	MAII	MAII
Rock, or Rocky Mountain cinquefoil *Potentilla rupincola*	MAII	MAII	MAII
Greenland primrose *Primula egaliksensis*	MAII	MAII	MAII
Porter's false needlegrass *Ptilagrostis porteri*	MAII	MAII	MAII
Ice cold buttercup *Ranunculus karelinii* (formerly *grayi*)	MAII	MAII	MAII
Dwarf raspberry	MAII	MAII	MAII

Species	Alternative A	Alternative B	Alternative C
Rubus arcticus ssp. acaulis			
Sageleaf, or sage willow *Salix candida*	MAII	MAII	MAII
Autumn willow *Salix serissima*	MAII	MAII	MAII
Sphagnum *Sphagnum angustifolium*	MAII	MAII	MAII
Baltic sphagnum *Sphagnum balticum*	MAII	MAII	MAII
Cathedral Bluff meadow-rue *Thalictrum heliophilum*	MAII	MAII	MAII
Lesser bladderwort *Utricularia minor*	MAII	MAII	MAII
Selkirk's violet *Viola selkirkii*	MAII	MAII	MAII

*Species known or suspected to occur within or adjacent to the North Fork Coal Mining Area.

Table 3-16. *Determinations of effect for species designated as Regional Forester sensitive species since the 2012 Colorado Roadless Rule*

Species	Alternative A	Alternative B	Alternative C
Monarch butterfly*	MAII	MAII	MAII
Western bumblebee*	MAII	MAII	MAII
Mancos shale packera* *Packera mancosana*	MAII	MAII	MAII
Violet milkvetch* *Astragalus iodopetalus*	MAII	MAII	MAII
Plains topminnow	NI	NI	NI

* Species known or suspected to occur (based on habitat potential) within or adjacent to CRAs and possibly the North Fork Coal Mining area.

Determinations of Effect for Threatened and Endangered Species and Critical Habitats

The possible determinations of effect for Threatened and Endangered Species are

- No effect (NE);
- May affect, not likely to adversely affect (NLAA);
- May affect, wholly beneficial; and
- May affect, likely to adversely affect (LAA).

Table 3-17. *Determinations of potential effect for threatened and endangered species and critical habitats under the 2012 Colorado Roadless Rule, roadless area network, and specific North Fork Coal Mining Area alternatives*

Species	*Alternative A*	*Alternative B*	*Alternative C*
BIRDS			
Mexican spotted owl	NLAA (species & critical habitat)	NLAA (species & critical habitat)	NLAA (species & critical habitat)
Southwestern willow flycatcher	NLAA (species) NE (critical habitat)	NLAA (species) NE (critical habitat)	NLAA (species) NE (critical habitat)
Yellow-billed cuckoo (western Distinct Population Segment)	NE (species & proposed critical habitat)	NE (species & proposed critical habitat)	NE (species & proposed critical habitat)
Whooping crane	NE	NE	NE
Piping plover	NE	NE	NE
FISHES			
Greenback cutthroat trout	NE	NE	NE
Green lineage cutthroat trout[1]	NLAA	NLAA	NLAA
Bonytail chub	NE	LAA[2]	LAA
Humpback chub	NE	LAA[2]	LAA
Razorback sucker	NE	LAA[2]	LAA
Colorado pikeminnow	NE	LAA[2]	LAA
Pallid sturgeon	NE	NE	NE
INVERTEBRATES			
Uncompahgre fritillary butterfly	NE	NE	NE
Pawnee montane skipper	NLAA	NLAA	NLAA
MAMMALS			
Canada lynx[1]	NLAA	NLAA	NLAA
Preble's meadow jumping mouse	NLAA (species & critical habitat)	NLAA (species & critical habitat)	NLAA (species & critical habitat)
Grizzly bear	NE	NE	NE
Gray wolf	NE	NE	NE
Black-footed ferret	NE	NE	NE
New Mexico meadow jumping mouse	NE	NE	NE
PLANTS			
Penland alpine fen mustard *Eutrema penlandii*	NLAA	NLAA	NLAA
Colorado hookless cactus *Sclerocactus glaucus*	NLAA	NLAA	NLAA
Ute ladies'-tresses *Spiranthes diluvialis*	NE	NE	NE
Osterhout milkvetch *Astragalus osterhoutii*	NE	NE	NE
Penland beardtongue *Penstemon penlandii*	NE	NE	NE
Colorado butterfly plant *Gaura neomexicana ssp. coloradensis*	NE	NE	NE
North Park phacelia *Phacelia formosula*	NE	NE	NE

[1]Species known or suspected to occur within or adjacent to the North Fork Coal Mining Area.
[2]Determination based solely on the potential for future minor water depletions from the Gunnison Basin due to new mining activities in the North Fork Coal Mining Area.

Table 3-18. *Summary of determinations of potential effect for "newly designated" (since the 2012 Colorado Roadless Rule) ESA species and critical habitats under the 2012 Colorado Roadless Rule, roadless area network and specific North Fork Coal Mining Area alternatives*

Species	*Alternative A*	*Alternative B*	*Alternative C*
BIRDS			
Gunnison sage-grouse	NLAA (species & critical habitat)	NLAA (species & critical habitat)	NLAA (species & critical habitat)
Lesser prairie-chicken	NE	NE	NE
Southwestern willow flycatcher	NLAA (species) NE (critical habitat)	NLAA (species) NE (critical habitat)	NLAA (species) NE (critical habitat)
Yellow-billed cuckoo (western Distinct Population Segment)	NE (species & proposed critical habitat)	NE (species & proposed critical habitat)	NE (species & proposed critical habitat)
MAMMALS			
NM meadow jumping mouse	NE	NE (species & critical habitat)	NE
PLANTS			
DeBeque phacelia *Phacelia submutica*	NLAA (species) NE (critical habitat)	NLAA (species) NE (critical habitat)	NLAA (species) NE (critical habitat)
Pagosa skyrocket *Ipomopsis polyantha*	NLAA (species) NE (critical habitat)	NLAA (species) NE (critical habitat)	NLAA (species) NE (critical habitat)

Economics

This section supplements the 2012 FEIS economic analysis to address new information and changed circumstances that have occurred since the Colorado Roadless Rule became effective on July 12, 2012. The sections that follow describe the economic study area, the methods used to analyze economic effects, the affected environment, and the potential economic effects that could result under the three alternatives. There are two distinct economic effects analyses presented in this section:

- Impact or distributional analysis, which estimates employment and income effects to the local study area and
- Efficiency analysis, which estimates the value of benefits and costs to society as a whole.

The results of these two distinct analyses are presented separately because they serve different purposes, as described above. They are neither interchangeable nor can they be aggregated.

Many uncertainties exist regarding the potential for future coal extraction. Because this decision will not authorize any ground-disturbing activities, any additional coal-related development on unleased lands would need to be authorized under a subsequent decision that would require additional NEPA analysis. It is not known when or how much development might occur, particularly when considering activities that might occur well into the future. In order to estimate possible economic effects, many assumptions about future development activities were made that may not come to fruition. Therefore, the economic analysis presented here should be considered estimates based on best available data to compare between alternatives, not predictions of what will actually occur.

Study Area for Economic Analysis

The study area for the 2012 FEIS included five western slope counties in the study area: Delta, Garfield, Mesa, Montrose, and Rio Blanco. Gunnison County, while it contains coal mines potentially affected by this action, was not included in the 2012 FEIS study area for economic impacts because mine operations and employee spending occur down valley from the mines. Garfield and Rio Blanco counties are unlikely to be affected by coal operations, but were originally included because of potential effects to oil and gas activity in the FEIS. Continuation of these five counties would have facilitated comparability of economic analysis between the 2012 FEIS and this supplement. But due to public comments, Gunnison County has been added to the study area for the affected environment in the supplemental analysis. A map of the economic study area is shown in Figure 3-15.

Figure 3-15. *Colorado Roadless Supplemental: Economic Study Area.*

The boundaries for the supplemental evaluation of benefits and costs varies as noted in the *Methodology* section, and extend beyond the boundaries of the economic study area.

Analysis Methods and Assumptions

Scope of Analysis

The focus of this economic analysis is on the deficiencies outlined by the District Court of Colorado in *High Country Citizens Alliance v. U.S. Forest Service*, changes in economic trends and information

related to those deficiencies, meeting the requirements of NEPA, and substantive scoping comments (see Chapter 1).

As already highlighted in Chapter 1, the scope of this analysis is specific to the North Fork Coal Mining Area as defined in the Colorado Roadless Rule. The economic evaluations in this SEIS address economic impacts (production value, employment, and earnings) to the local study area and net benefits (or efficiency analysis) as separate analyses. Employment is not considered a measure of benefits (in this supplement, nor the 2012 FEIS), but instead is offered as a descriptor of distributional impacts of the decision on local or regional economies and populations, consistent with Office of Management and Budget Circular A–4, as well as Forest Service Manual 1970 and Forest Service Handbook 1909.17. Discussions of benefit and cost analysis are provided to respond to questions associated with Court-identified deficiencies associated with the original rulemaking; benefit and cost analysis discussions extend the scope and methodology of this economic study well beyond the traditional scope of benefit and cost analysis performed for public land-use decisions and are not required by NEPA (40 CFR 1502.23). Presentation of benefit and cost analysis for this programmatic action is not intended to establish precedence for the general application of these approaches to mineral leasing or other project-level decisions.

The timeframe of the economic impact analysis is a 15-year period, consistent with Forest Service planning efforts, and the timeframe used in the 2012 FEIS. The timeframe extends to 2054 for discussions of benefits and costs, which is a separate analysis. The potential mining of recoverable coal from the North Fork Coal Mining Area is the focus of this economic analysis of the supplement.

The other resources discussed in the economic analysis of the 2012 FEIS do not require supplemental analysis.

Existing Conditions and Gross North Fork Coal Production

The following analysis and discussion of both economic impacts to the local area and the benefits and costs to society begin with assumptions about future schedules of coal mine production. These projections determine the extent to which temporary road construction or reconstruction could be permitted, but make no determinations about coal activity on specific NFS lands. However, this supplemental analysis assumes that temporary road construction permissions could result in changes in coal resources accessible under leases, and changes in future production of coal from NFS lands. In reality, any coal activity would require additional project-level decisions based on additional project-specific NEPA analysis.

Data sources include Colorado Department of Local Affairs; State Demography Office, U.S. Census Bureau; Energy Information Administration; Colorado Division of Reclamation, Mining and Safety; Headwaters Economics Human Dimension Toolkit; IMPLAN (IMpact Analysis for PLANning) model; and from the IPM model.

The most recent economic data available for this analysis are from 2013. Economic conditions in the local study area have changed since that time and therefore may not fully reflect conditions in 2016. This supplemental analysis focuses on the relative differences so that alternatives can be compared using the best available datasets.

Production of recoverable coal has been estimated using the low, average, and permitted production scenarios of coal output based on production data from past mine activity, existing permits, and estimates of recoverable coal resources (see *Coal Resources* section for details). While future mining activity is not known, the three production scenarios have been projected to serve as reasonable estimates. Annual outputs within each of the three scenarios are kept consistent over time until coal resources are exhausted, so the ending year varies across the three scenarios. The 2012 FEIS assumed three coal mines would be operating in the North Fork Coal Mining Area. For this supplemental

analysis, past and current data are being used from existing mines, but no assumption is made of the number of mines that may be operating or could bid on future leases within the North Fork Coal Mining Area.

Aggregate annual coal production rates are assumed to be constrained by any individual mine operation and permitted capacity, implying that the period of time to extract the coal within the North Fork Coal Mining Area would vary as a function of the amount of coal resources made available under each alternative. The projected schedules of gross North Fork Coal Mining Area coal mine production under the low, average, and permitted production scenario, necessary to exhaust accessible reserve amounts under each alternative, are shown in Table 3-19.

Table 3-19. *Estimated schedule of gross North Fork Coal Mining Area extraction (millions of short tons)*

Production Rate	Beginning Year (Production)	Ending Year (Production)	Total Years	Total Production (millions of tons)
Alternative A				
Low Scenario	2016 (5)	2018 (0.8)	2	11
Average Scenario	2016 (10)	2017 (1)	1	11
Permitted Scenario	2016 (11)	---	1	11
Alternative B				
Low Scenario	2016 (5)	2051 (2)	35	184
Average Scenario	2016 (10)	2034 (4)	18	184
Permitted Scenario	2016 (15)	2027 (13)	11	184
Alternative C				
Low Scenario	2016 (5)	2036 (2)	20	106
Average Scenario	2016 (10)	2026 (6)	10	106
Permitted Scenario	2016 (15)	2022 (13)	6	106

Economic Impact Analysis Methodology

Economic impact analysis is defined as "the net change in economic activity associated with an industry, event, or policy in an existing regional economy" (Watson et al., 2007). An input-output analysis is a means of examining production, supply-chain, and employment relationships within an economy, both between businesses and between businesses and final consumers. An input-output model captures all monetary market transactions of production in a given time period. IMPLAN is a proprietary input-output modeling system composed of both software and data (MIG, 2013). The system, developed by the Forest Service in the 1970s, is widely used today by academic, government, non-profit, and private researchers and practitioners because it is a reliable and reasonable portrayal of regional economies and economic impacts. IMPLAN has been used and cited in hundreds of academic publications and presentations since its inception.

By using Forest Service expenditure data, resource output data, and other economic information, IMPLAN can estimate, among other things, the jobs and income that are supported by NFS

management activities. Direct employment and labor income accrue to mine employees and their families. Additional employment and income in the economy is generated by mine purchases in the local supply-chain (indirect effects) and household spending of employee earnings (induced effects). Together the direct, indirect, and induced effects compose the total economic impact to the local economy.

To estimate the potential economic impacts of activities by alternative in the North Fork Coal Mining Area, an input-output model was developed using the IMPLAN modeling system. The IMPLAN model was then customized using employment data provided by the Colorado Department of Local Affairs, State Demography Office. Model production value, employment, and labor income was further customized to capture economic conditions and interactions in the coal mining industry using a variety of sources (see Appendix C). The IMPLAN model includes Delta, Garfield, Mesa, Montrose, and Rio Blanco Counties. Gunnison County is not included in the IMPLAN model. Opportunities for business and household spending in Gunnison County are located in the Gunnison-Crested Butte corridor, which is more distant and difficult to reach compared with down-valley counties. Crested Butte and Gunnison are 2-hour drives from the mines, while Delta is well under an hour and Grand Junction—a major urban center—is 1.5 hours. Kebler Pass, the primary route between the mines and Crested Butte, is closed in the winter. In addition, rail lines from the mines do not pass through the Crested Butte-Gunnison corridor, but down the North Fork Valley. Thus, although the mines and some employees are physically located in Gunnison County, they are economically connected with communities in Delta, Montrose, and Mesa Counties.

As with the model developed for the 2012 FEIS, coal mines located just east of the Delta-Gunnison county line were incorporated into the final models. This customization resulted in industry interactions with sectors and households located in the five-county area. Other Gunnison County industries were not included for the reasons described earlier. This customizing included techniques identical to those used for the 2012 FEIS (U.S. Forest Service, 2010).

Production for the coal sector within the mining industry was based on average prices for 2013 reported by the Energy Information Administration (EIA, 2013), Colorado Division of Reclamation, Mining, and Safety (DRMS, 2015), and Colorado Mining Association (2014).

Benefits and Social Costs Methodology

Unlike the economic impact analysis, which estimates the regional job and income impacts, this section considers domestic (i.e., U.S.) benefits from coal and the potential costs or damages of GHG emissions and climate change at the global scale. It was not feasible to quantify the global benefits of coal consumption for global populations (only domestic populations).

This analysis assesses the benefits and costs of offering additional coal leases in the North Fork Coal Mining Area if the exception is reinstated allowing access (see *Coal Resources* section for details about specific mining operations and production). The *Existing Conditions and Gross North Fork Coal Production* section of the *Economics* section contains assumptions about the schedule and magnitude of annual coal production and continued mine production.

Overview of Benefit-Cost Framework

This discussion of potential benefits and costs focuses on estimating the discounted PNV of increased accessibility of North Fork Coal Mining Area bituminous coal (via temporary road construction/reconstruction) through the Federal mineral leasing program. PNV is used as an indicator of financial efficiency, or a partial economic efficiency of a project; it represents one factor to be used in conjunction with many other factors in the decision-making process. Note that it is Forest Service policy (FSM 1970 and FSH 1909.17) to define “Present Net Value” as “the present benefit value (PVB) of the stream of benefits less the present cost value (PVC) of the schedule of

costs. It can be expressed in the following equation: PNV = PVB – PVC" (FSH 1909.17, Chapter 10). As such, this definition (PNV) is analogous to the term "Net Present Value." PNV combines a project's benefits and costs that occur throughout the life of the project and discounts them into an amount that is equivalent to all economic activity in a single year. According to traditional Forest Service terminology, a positive PNV indicates that the alternative is financially efficient. A PNV analysis is not intended to be a comprehensive analysis that incorporates all known market and non-market benefits and costs. Many of the values associated with a natural resource management project are best handled apart from, but in conjunction with, a limited PNV framework. The non-market benefits and costs associated with this project are discussed throughout the various resource sections of the SEIS and 2012 FEIS.

The remaining text in this section describes how benefits and social costs are characterized in the monetized benefit-cost analysis. The *Non-monetized social costs* section describes other social costs not accounted for in the monetized benefit-cost analysis. Chapter 2 summarizes effects to all resources, including resources such as wildlife that are not included in the monetized benefit-cost analysis.

This analysis assumes that increased accessibility to North Fork Coal Mining Area coal resources could result in continued production and consumption (electricity generation) of North Fork Coal Mining Area coal over an extended period of time that varies across alternatives. Estimates of net benefits (represented by the term PNV) in this benefit-cost analysis are assumed to be based on the benefits (i.e., net coal value to producers; changes in efficiency of electric power provision to consumers) and the social costs (i.e., potential damages of carbon dioxide and methane emissions from changes in production, transportation, consumption, and export of coal) of continued production and consumption of North Fork Coal Mining Area coal.

Traditional benefit and cost analysis for Forest Service actions concentrates on the benefits and costs to the public of making lands or resources available for alternative uses. These analyses customarily characterize benefits and costs of resource use or extraction within NFS lands, where the Forest Service has the regulatory ability to manage and mitigate activities and effects (both beneficial and adverse). Benefits can be described in terms of willingness-to-pay for use of, or access to resources (e.g., minerals, forage, timber stumpage) on NFS lands. Likewise, costs can be described for ancillary adverse effects or damages that occur as a direct result of actions taken to use or access the forest.

It is rare that the Forest Service would incorporate indirect benefits and social costs of downstream uses of resources extracted or derived from National Forest lands as a result of the permitted activity, into a benefit-cost analysis because:

- The efficiency or effectiveness of downstream resource use (and therefore the benefits and costs of downstream use) will vary, is driven by complex markets, and is beyond the administrative control of the Forest Service, and
- Other non-Forest Service rules, regulations, policy, or institutions are in place to manage and mitigate potential social damages of downstream uses, in the interest of public welfare.

For example, the Forest Service relies on estimates of the stumpage value of timber removed from a National Forest for analyses of the benefits of timber harvests, but does not attempt to incorporate the value of finished wood products into benefit and cost analysis. To incorporate downstream wood product values would require the agency to make assumptions about types and efficiency of mills. Stumpage values may be calculated from information about downstream revenue and anticipated harvest costs (e.g., residual value stumpage appraisal method); however, those downstream revenues are not used to represent benefits in benefit-cost analyses.

Likewise, the Forest Service does not estimate the potential damages of wastewater effluent from downstream wood processing facilities; to do so would require the agency to assume that existing

rules and policy put in place by other institutions (water quality standards and effluent guidelines) are *not sufficient* to mitigate the damages of wastewater in the interests of the public. For example, a decision to not allow a timber sale based on perceived downstream damages from increased wastewater effluent from processing plants, even if those plants are in compliance with existing wastewater regulations, implies that the Forest Service assumes additional wastewater controls (i.e., not allowing timber sale) are needed to adequately mitigate downstream damages. The same situation applies in the case of downstream coal-fired electric generation facilities, with air emissions that are in compliance with existing regulations, and using coal extracted from NFS lands. Even if existing rules and policy are perceived as being inadequate, it is difficult for the Forest Service to adopt an implicit regulatory role for mitigating downstream damages or beneficial uses for which it has limited or no legal basis.

In order to address Court-identified deficiencies in the 2012 FEIS, GHG emissions from combustion of coal under this programmatic action have been examined in this analysis, including benefits and social costs for downstream uses of resources. The boundaries of the analysis are therefore expanded beyond that of the typical Forest Service benefit and cost analysis (described in Forest Service Handbook for economic analysis FSH 1909.17, 10) to address downstream benefits and costs. This analysis is presented for informational purposes and results need to be carefully considered within the context of the uncertainty and assumptions necessary to estimate benefits and costs for this particular decision.

This analysis monetizes the value of the estimated GHG impacts using estimate of the social cost of carbon (SCC) recommended by the Interagency Working Group (IWG) on the Social Cost of Greenhouse Gases for use in regulatory benefit-cost analysis. SCC estimates were first published in a 2010 technical support document (IWG, 2010) after the initial DEIS and Regulatory Impact Analysis for the Colorado Roadless Rule, including a temporary road construction exemption for the North Fork Coal Mining Area, was published in July 2008 but before release of the revised DEIS in April 2011.

The SCC is a metric that estimates the monetary value of future worldwide impacts associated with marginal changes in carbon dioxide emissions in a given year. It includes a wide range of anticipated climate impacts, such as net changes in agricultural productivity and human health, property damage from increased flood risk, and changes in energy system costs, such as reduced costs for heating and increased costs for air conditioning. The IWG SCC estimates were developed to promote consistency in the SCC values used by federal agencies to assess the benefits of rulemakings that have an incremental impact on cumulative global carbon dioxide emissions. Later in this document, the *Social Costs of Greenhouse Gas Emissions* section provides more discussion on the development of the IWG estimates. Social costs of methane emissions (SCM) have been developed and published in a manner similar to SCC; SCM values have been incorporated into this analysis as outlined in the *Discounted Benefits, Social Costs, and Present Net Values Incorporating Social Cost of Carbon (from Carbon Dioxide and Methane)* section.

In order to assess 'net cumulative' emissions, it is necessary to consider how production and consumption of coal and natural gas in other supply and electricity demand regions outside of the larger North Fork area (or the 'Colorado – Uinta' supply region) will change (i.e., decrease) in response to changes in production of North Fork Coal Mining Area coal. Accounting for these market substitution effects will provide a more reliable estimate of net cumulative changes in GHG emissions from overall production and consumption of energy beyond the boundary of the GMUG National Forests (and the North Fork Coal Mining Area). The IWG SCC values reflect damages to global populations, not just the U.S. public, implying an additional atypical expansion or dimension to traditional benefit and cost analysis for Forest Service actions.

The steps for conducting the benefit-cost analysis to estimate the ranges of PNVs for increasing North Fork coal resources under Alternatives B and C, relative to Alternative A, are summarized in the following steps:

1 - Gross Changes in North Fork Coal Mining Area Production: Project changes (i.e., increases) in annual coal production from the North Fork Mining Area, by year, over a period of years necessary to exhaust available North Fork coal resources.

> The maximum period of time estimated to exhaust North Fork coal resources is estimated to be 2015 to 2054 (see *Net Energy Production, Consumption, and Exports – Accounting for Market Substitution* section and Appendix C for details).
> Schedules of annual coal production are estimated under three production rate assumptions: Low, Average, and Permitted (maximum) (see *Existing Conditions and Gross North Fork Coal Production* section).

2 - Net Changes in Domestic (National) Coal and Gas Production: Project net change in annual national production of (i) underground-mined coal, (ii) surface-mined coal, and (iii) natural gas, resulting from increased production of North Fork coal and accounting energy market substitution. Projected net changes are calculated by multiplying projected annual North Fork Coal Mining Area production for each year from 2016 to 2054 (from Step 1) by 'substitution response factors' (e.g., change in tons of surface coal produced nationally per ton increase in North Fork production).

> 'Substitution response factors' are estimated for Alternatives B and C by calculating:

$$= \frac{Total\ change\ in\ National\ coal\ or\ gas\ production\ (2016-2054)}{Total\ change\ in\ North\ Fork\ Coal\ Mining\ Area\ coal\ production\ (2016-2054)}$$

> Changes in national production are modeled using the IPM framework and changes in North Fork Coal Mining Area coal production are estimated in Step 1. See the *Net Energy Production, Consumption, and Exports – Accounting for Market Substitution* section for details. See Appendix C (Response coefficients and other factor assumptions for 'Reserves Added' scenario using the SDEIS (IPM v5.13); Table C-22) for examples of substitution response factors and an application of using response factors to calculate decreases in substitute fuel production, in response to increases in North Fork Coal Mining Area production.
>
> Net decreases in renewable fuel production are also modeled, but substitution response factors are not necessary because GHG emissions from renewable fuel production and use are conservatively assumed to be zero. As a consequence, any portion of gross increases in GHG emissions from North Fork Coal Mining Area coal production that substitute for renewable energy (i.e., result in a decrease in renewable energy production) are therefore assumed to be net or cumulative increases in GHG emissions for the purposes of calculating GHG damages.
>
> Increases in North Fork Coal Mining Area coal production are estimated to result in decreases in national surface coal and natural gas production, due to market substitution, as modeled using the IPM framework. As a consequence, substitution response factors for surface coal and natural gas are negative. Substitution response factors for underground coal production are positive, reflecting increases in North Fork Coal Mining Area production under Alternatives B and C.
>
> Substitution response factors are assumed to be the same for Low, Average, and Permitted North Fork Coal Mining Area production scenarios.

3 - Net Changes in Domestic (National) Electricity Production from Coal and Gas: Project net changes in annual national electricity generation from combustion of (i) underground and surface coal combined and (ii) natural gas, resulting from electricity market responses to increased supply of

North Fork Coal Mining Area coal. Projected net changes are calculated by multiplying projected annual North Fork Coal Mining Area production for each year from 2016 to 2054 (from Step 1) by 'substitution response factors' (e.g., change in GWh (gigawatt hour) electricity from coal (or gas) per ton increase in North Fork Coal Mining Area production). See Appendix C (Response coefficients and other factor assumptions for 'Reserves Added' scenario (IPM v5.13); Table C-22) for examples of substitution response factors and an application of using response factors to calculate decreases in electricity generation from substitute fuel sources, in response to increases in North Fork Coal Mining Area production. This analysis projects changes in the mixture of fuels types used to generate electricity, not changes in total electricity generation across all fuel sources. Total electricity generation across all fuel sources, by year, is assumed to remain the same across alternatives,

'Substitution response factors' are estimated for Alternatives B and C by calculating:

$$= \frac{Total\ change\ in\ National\ Electricity\ (GWh)\ from\ coal\ (or\ gas)\ (2016-2054)}{Total\ change\ in\ North\ Fork\ Coal\ Mining\ Area\ coal\ production\ (2016-2054)}$$

Changes in national electricity generation from coal and gas are modeled using the IPM framework and changes in North Fork Coal Mining Area coal production are estimated in Step 1. See the *Net Energy Production, Consumption, and Exports – Accounting for Market Substitution* section for details.

Net decreases in electricity from renewable fuel are also modeled, but substitution response factors are not necessary because GHG emissions from use of renewable fuel are conservatively assumed to be zero. As a consequence, any portions of gross increases in GHG emissions from increases in electricity generation from added North Fork coal that substitute for electricity generated from renewable energy (i.e., result in a decrease in electricity generated from renewable energy) are therefore assumed to be net or cumulative increases in GHG emissions for the purposes of calculating GHG damages.

Increases in North Fork coal production are estimated to result in decreases in national electricity generation from gas, due to market substitution, as modeled using the IPM framework. As a consequence, the substitution response factors for natural gas is negative. The substitution response factor for coal is positive, reflecting increases in availability of North Fork Coal Mining Area coal to electricity sector under Alternatives B and C.

Substitution response factors are assumed to be the same for Low, Average, and Permitted North Fork Coal Mining Area production scenarios.

<u>4 - Net Changes in Coal Exports:</u> Project net change in annual national coal exported. Projected net changes are calculated by multiply projected annual North Fork Coal Mining Area production for each year from 2016 to 2054 (from Step 1) by 'substitution response factors' (e.g., change in tons coal exported per ton increase in North Fork Coal Mining Area production).

The calculation procedures in Steps 2 and 3 are also applied for changes in coal exports. Substitution response factors are positive. 'Substitution response factors' are estimated for Alternatives B and C by calculating:

$$= \frac{Total\ change\ in\ Coal\ Exports\ (tons) from\ IPM\ output\ (2016-2054)}{Total\ change\ in\ North\ Fork\ Coal\ Mining\ Area\ coal\ production\ (2016-2054)}$$

<u>5 - Net Changes in Domestic Carbon Dioxide and Methane Emissions from Coal and Gas Production and Consumption</u>: Estimate net changes in carbon dioxide emissions by multiplying carbon dioxide emission factors for production, consumption, and coal transportation by annual net coal and gas production and consumption from Steps 2 and 3, for each year from 2016 to 2054. Examples of

emission factors, as well as carbon dioxide emission calculations using emission factors are provided in Table C-22 in Appendix C.

> Coal transportation emission coefficients are estimated based on an 1,800 mile roundtrip (900 mile one-way) distance domestically, and a 10,000 roundtrip (5,000 mile one-way) for exported coal. Domestic distance is derived from projected locations of coal consumed, as modeled using the IPM framework. Exported coal is assumed to be consumed for electricity generation using the same emission factor as used for domestic coal consumption.

Methods for estimating methane emissions are similar to methods for carbon dioxide and are based on net changes in underground and surface coal production, as well as net changes in natural gas production. Transportation is accounted for as part of coal and gas production as described in the *Air Resources and Greenhouse Gas Emissions* section. Changes in methane emissions associated with net changes in coal and natural gas production and transportation are accounted for in net methane emission calculations; however, not the combustion of coal and natural gas, nor the transportation of exported coal.

<u>6 – Global Social Costs of Net Changes in Carbon Dioxide Emissions:</u> Estimate social costs of annual net changes in carbon dioxide emissions by multiplying aggregated net carbon dioxide emissions by SCC values, by year (recalling that real SCC values increase with time). Similar process accounting for the net changes in methane emissions is also carried out using SCM values (IWG, 2016b). For details about SCC values, see the *Social Costs of Greenhouse Gas Emissions* section.

> SCC and SCM values as presented by the IWG Technical Support Document are considered, resulting in a range of social costs, for each of the three North Fork Coal Mining Area production scenarios. See the *Social Costs of Greenhouse Gas Emissions* section for details.

<u>7 – Domestic Benefits of Electricity Generation:</u> Annual domestic benefits are assumed equal to annual domestic power generation cost savings. Annual cost savings are calculated by multiplying annual gross changes in North Fork Coal Mining Area coal production by 'cost saving response factors' (e.g., change in national electricity generation cost per ton increase in North Fork Coal Mining Area production). Response factors are derived from IPM modeling results as detailed in the *Benefits of Coal Resources* section.

> Global benefits from increases in consumer surplus for non-U.S. populations, associated with consumption of increased U.S. coal exports resulting from availability of North Fork Coal Mining Area coal resources could not be estimated and are therefore assumed to be zero

<u>8 – Discounted Benefits, Social Costs, and Present Net Values:</u> OMB Circular A-4 for Regulatory Impact Analysis directs analysts to use discount rates of 3% and 7%. However, to remain consistent with discount rates used to derive ranges of SCC and SCM values (IWG, 2015), annual social costs and benefits from steps 6 and 7 above were discounted at rates consistent with rates assumed for SCC and SCM values (i.e., 2.5%, 3%, and 5%). SCC and SCM values based on a 7% discount rate are not used within the IWG technical direction. The values used for the SCC and SCM analyses were the Average Scenario for 2.5% rate, the Average Scenario for 3% rate, the 95th percentile for 3% rate, and the Average Scenario for 5% rate. The *Social Costs of Greenhouse Gas Emissions* section includes a description of these values presented in this analysis. Some benefit-cost results from the SDEIS incorporated the use of 10th percentile values for the 3% rate for the SCC analysis. Those have been carried over into this document only for disclosure purposes to demonstrate changes between the SDEIS and the SFEIS. The 10th percentile applies only to IPM® v5.13-based results in the SDEIS, and 10th percentile values only affected the upper estimates of SDEIS PNV under the global stance (see Appendix C for details). All results in the SFEIS rely on IPM v5.15 and do not consider the 10th percentile values to maintain consistency with the TSD and its application by other federal agencies.

Discounted costs and benefits are summed for 2016 to 2054 to estimate PNVs for different combinations of North Fork Coal Mining Area production scenarios and SCC and SCM values, thereby generating a range of PNV results for each Alternative. Details about these steps are provided in sections below, as well as in Appendix C, which includes a discussion about the uncertainty and sensitivity associated with some of the key assumptions.

Benefit and Social Cost Accounting Stances

This analysis focuses on evaluating social costs at the global level and benefits at the national or domestic level. This analysis also models net changes in national coal and natural gas production as well as consumption (for electric power generation) to account for market substitution responses to increases in Colorado-Uinta coal production. This analysis assumes:

- Benefits are represented by (i) domestic power generation cost savings resulting from increased North Fork Coal Mining Area coal resources (accounting for substitution), and (ii) the net value of coal exports resulting from North Fork Coal Mining Area production (accounting for domestic substitution, but not foreign substitution). No effort was made to capture the benefits of potential power generating efficiency gains in foreign countries.
- Social costs are calculated by applying SCC values to the aggregate carbon dioxide emissions from (i) net coal and natural gas production, coal transportation, and domestic coal and natural gas consumption (accounting for substitution), and (ii) coal exported, including overseas transport and consumption for electric power (accounting for domestic substitution but not foreign substitution effects). The benefits of coal consumption include electricity generated as a result of that consumption; however, for this analysis, the amount of electricity generated is assumed to remain constant across alternatives (see discussion of IPM modeling framework in Appendix C). Changes in electricity generation are therefore not used to characterize benefits; instead, reductions in cost to achieve fixed levels of electricity demand are the basis for describing benefits.

The SCC and SCM estimates applied in this analysis reflect the worldwide damages from climate change. Current guidance contained in OMB Circular A-4 indicates that analysis of economically significant proposed and final regulations from the domestic perspective is required, while analysis from the international perspective is optional. However, the IWG (including OMB) determined that a modified approach is more appropriate in this case because the climate change problem is highly unusual in a number of respects. Anthropogenic climate change involves a global externality: emissions of most greenhouse gases contribute to damages around the world even when they are emitted in the United States, and conversely, greenhouse gases emitted elsewhere contribute to damages in the United States. Consequently, to address the global nature of the problem, estimates of the social cost of greenhouse gases must incorporate the full (global) damages caused by emissions. In addition, climate change presents a problem that the United States alone cannot solve. Other countries will also need to take action to reduce GHG emissions if significant changes in the global climate are to be avoided. Furthermore, adverse impacts on other countries can have spillover effects on the United States, particularly in the areas of national security, international trade, public health, and humanitarian concerns. Thus, the IWG concluded that a global measure of the benefits from reducing U.S. CO2, CH4 (and N2O) emissions is preferable. See IWG (2010, 2016a) for more discussion.

Net Energy Production, Consumption, and Exports—Accounting for Market Substitution

Changes in gross production and consumption of coal from the North Fork Coal Mining Area are expected to have an effect on production and consumption of other fuel sources, including alternative

supplies of coal, natural gas, and other energy supplies such as renewables, especially in later years of the analysis. As a consequence, this supplemental analysis attempts to characterize market responses and substitution effects in order to estimate net changes in energy production and consumption. Net changes will provide a more reliable basis for estimating cumulative net GHG emissions, and subsequent social costs.

This supplemental analysis uses the IPM of U.S. energy supply and power generation (IPM, 2015; ICF, 2015a; see Appendix C) to predict how production and consumption of other sources of coal and natural gas, as well as alternative sources of energy (e.g., renewables, bio/waste fuel) respond to, substitute, or offset for changes in the supply of low sulfur bituminous coal from the North Fork Coal Mining Area. The IPM model predicts the mixture of non-renewable fuels (e.g., bituminous coal, subbituminous coal, other coal, natural gas, petroleum-based) and alternative fuels (e.g., renewables, nuclear, biomass, landfill gas) that will minimize the cost of achieving a given or pre-established schedule of annual power (e.g., electricity) demand over time (this analysis looks at the period 2016 to 2054). The IPM model is used to project the least-cost mixture of fuel types, by supply region and/or State, to meet a given amount of power demand. Based on data regarding fraction of coal coming from underground versus surface mines, by coal supply sub-region (MSHA, 2015; ICF, 2015b) it is possible to extrapolate percentage of coal production that comes from underground and surface mines (thereby providing the basis to estimate GHG emissions, by mine type). IPM uses dynamic linear programming to model how electricity demand is met through a mix of generation and transmission in each region, as well as transmission between regions. The North American version of IPM includes international coal demand and coal supply regions to forecast global coal production and movement (i.e., IPM models domestic production and consumption of coal, as well as coal imports and exports). IPM relies on sets of coal and other forms of energy supply (e.g., natural gas) curves, for specific types of energy and specific supply sub-regions.

The IPM framework is used to establish a baseline mixture of fuel supplies that satisfy demand, based on EPA's v5.15 base case along with other modifications made by the Forest Service summarized in Appendix C; these baseline conditions are assumed to reflect the baseline mixture of fuels under Alternative A (i.e., without increasing the availability of North Fork Coal Mining Area coal resources). EPA uses IPM to analyze the impact of air emission policy on the U.S. electric power sector. As part of those analyses, EPA publishes its assumptions and other information regarding its use of IPM. This supplemental analysis uses EPA's coal supply curves from EPA's v5.15 IPM base case, which is documented on EPA's website (EPA, 2015f) with some adjustments and augmentations (ICF, 2015a; Appendix C) to represent baseline coal/energy production and consumption for the Nation under Alternative A. The Forest Service used many of the EPA assumptions as described in more detail in Section 1.2 of documentation available in the planning record (ICF, 2015a). Because of these similarities, this analysis uses IPM nomenclature (5.13 and 5.15) similar to EPA. Use of this nomenclature is not meant to indicate that the Forest Service has used IPM in the exact manner as EPA. See Appendix C for more detail regarding the Forest Service's use of IPM.

The IPM baseline conditions can be modified to simulate the effects of increasing North Fork Coal Mining Area coal resources under Alternatives B and C. The IPM framework relies on a set of energy supply curves that describe how much of each energy type is available and at what cost, for different supply sub-basins around the country. Within the Colorado-Uinta supply region, there is a supply curve for low-sulfur bituminous coal which includes the available coal resources for the individual coal mines within the North Fork Valley, as well as expected supply or mining costs for those mines.

To simulate the effects of Alternative B, the available coal resources for the North Fork Coal Mining Area were increased, allowing the IPM framework to re-calculate the least cost mixture of fuels needed to generate the given (fixed) amount of power demand. The results indicate that overall electricity generation remains the same, relative to baseline conditions, as expected given that the

IPM framework assumes no change in demand. However, the mixture of fuels shifts, including increases in production and consumption of underground coal, and decreases in production and consumption of substitute fuel sources such as surface coal, natural gas, and renewable energy. As a consequence, added electrical generation from North Fork Coal Mining Area underground coal sources is offset by reductions in electrical generation by substitute fuel sources under Alternative B (and C).

IPM modeling results also provide estimates of aggregate costs of electricity production; electricity generation costs are lower under Alternative B, compared to A, as expected, given the increased availability (and flexibility) of fuels that electricity generators can select from to minimize costs. These cost savings, or cost reductions, are the basis for estimating benefits under Alternative B, compared to A.

To predict substitution responses associated with increased North Fork Coal Mining Area coal production under Alternative B (and C), the available coal resources for the supply curve that includes the relevant mines currently operating within the study area is increased by 172 million short tons. This IPM modeling scenario is referred to as the "add reserves" scenario. Details about this, as well as other IPM modeling scenarios are provided in Appendix C.

IPM output demonstrates how production and consumption of other coal supplies, as well as natural gas and renewable energy supplies change in response to increases in North Fork Coal Mining Area coal resources under Alternative B. IPM results indicate that the added 172 million short tons of coal resources are exhausted by 2054. IPM results are used to estimate aggregate change in production (or consumption) of alternative energy sources from 2016 to 2054 as well as aggregate change in Colorado-Uinta basin coal production over the same period as described above. Changes in Colorado-Uinta basin coal production are assumed to represent changes in North Fork Coal Mining Area coal production (since the only change made to the model was a change in coal resources for North Fork Coal Mining Area coal).

IPM modeling results used to calculate 'substitution' response factors for energy production are calculated by dividing aggregate changes in national underground coal, surface coal, and natural gas production by aggregate change in Colorado-Uinta basin production (e.g., +0.5 million tons in total national underground coal production/million tons of Colorado-Uinta basin coal production; -0.5 million tons of total national surface coal production/million tons of Colorado-Uinta coal production).

Response factors are negative for surface coal and natural gas because these are substitutes, in part, for underground coal. As the availability of underground coal increases (under Alternative B), electricity generators are expected to respond by consuming greater amounts of underground coal and reduced amounts of substitute sources of energy. See the summary of benefit-cost analysis steps outlined in the *Overview of Benefit-Cost Framework* section.

Substitution response factors for energy consumption (i.e., power generation) are calculated in a similar manner by dividing aggregate changes in national power generation from coal and natural gas by aggregate change in Colorado-Uinta basin coal production (e.g., 500 GWh from coal combustion/million tons of Colorado-Uinta basin coal production). Substitution response factors are multiplied by projected changes in gross North Fork Coal Mining Area coal production to estimate net national changes in coal and natural gas production and consumption, in preparation for estimating changes in carbon dioxide emissions. Examples of substitution response factors for the "add reserves" scenario are provided in Appendix C.

Net Cumulative Carbon Dioxide Emissions

Net cumulative carbon dioxide emissions are estimated by multiplying carbon dioxide emission factors by estimates of net coal and natural gas production and consumption levels for each year,

production schedule, and alternative. The carbon dioxide emission factors for production (e.g., metric tons carbon dioxide /short ton underground coal produced; metric tons carbon dioxide /billion cubic feet gas) and for consumption (e.g., metric tons carbon dioxide /GWh generated from coal; metric tons of carbon dioxide /GWh generated from gas) were obtained from the same sources as those used to estimate emissions in the *Air Resources and Greenhouse Gas Emissions* section. See Appendix C for additional discussion.

Benefits of Coal Resources

Domestic power generation cost savings for the are estimated by calculating aggregate cost for generating electricity from all sources (including transportation and transmission costs) for the Nation from 2016 to 2054 for the IPM v5.13 base case and 'add reserves' scenario. The *Net Energy Production, Consumption, and Exports – Accounting for Market Substitution* section and Appendix C provide details about IPM modeling scenarios. Given that substitution and market response modeling under the IPM framework assumes electricity demand is fixed at pre-established levels, benefits from increases in electricity generation resulting from increased availability of coal resources cannot be calculated. Benefits are therefore based on estimated reductions in costs of meeting fixed electricity demand. Benefits are therefore based on changes in cost (i.e., cost savings) associated with shifts in mixtures of fuels used to generate electricity, while social costs are based on changes in the social cost of carbon (from carbon dioxide emissions) associated with those same shifts in mixtures of fuels.

The difference in aggregate costs for these scenarios is assumed to be aggregate cost savings resulting from the additional North Fork Coal Mining Area coal resources. Total aggregate cost savings are divided by total aggregate change in Colorado-Uinta basin coal production (also from the difference in the IPM baseline and 'add reserves' scenarios) to obtain a cost savings response factor. Response factors are multiplied by annual differences in North Fork Coal Mining Area coal production between Alternatives B and A (and Alternatives C and A) to estimate costs savings for each year of North Fork Coal Mining Area production for Alternatives B and C, relative to Alternative A, for each of the three production scenarios. Due to the nature of these calculations, benefits based on domestic power generation cost savings are estimated only for differences between alternatives, not individual alternatives.

Social Costs of Greenhouse Gas Emissions

This analysis demonstrates the application of SCC and SCM values to smaller-scale GHG emissions from potential expansion of coal production from the North Fork Coal Mining Area coal leases that could be the indirect result of this rulemaking: reinstating an exception that could allow for temporary road construction that could enable future expansion of coal mine operations.

The SCC and SCM estimates applied in this analysis reflect the avoided worldwide damages from climate change. Current guidance contained in OMB Circular A-4 indicates that analysis of economically significant proposed and final regulations from the domestic perspective is required, while analysis from the international perspective is optional. However, the IWG (including OMB) determined that a modified approach is more appropriate in this case because the climate change problem is highly unusual in a number of respects. Anthropogenic climate change involves a global externality: emissions of most greenhouse gases contribute to damages around the world even when they are emitted in the United States, and conversely, greenhouse gases emitted elsewhere contribute to damages in the United States. Consequently, to address the global nature of the problem, estimates of the social cost of greenhouse gases must incorporate the full (global) damages caused by emissions. In addition, climate change presents a problem that the United States alone cannot solve. Other countries will also need to take action to reduce GHG emissions if significant changes in the global climate are to be avoided. Furthermore, adverse impacts on other countries can have spillover effects on the United States, particularly in the areas of national security, international trade, public

health, and humanitarian concerns. Thus, the IWG concluded that a global measure of the benefits from reducing U.S. CO2, CH4 (and N2O) emissions is preferable. See IWG (2010, 2016a) for more discussion.

Social costs for this analysis are estimated using the average SCC at three discount rates (2.5%, 3.0%, and 5.0%) as well as the 95th percentile of the SCC frequency distribution using a 3% discount rate, presented in the 2016 SCC technical support document, Table 3-20. SCC estimates for several discount rates are included because the literature shows that the SCC is sensitive to assumptions about the discount rate, and because consensus does not exist on the appropriate rate to use in an intergenerational context (where costs and benefits are incurred by different generations). The SCC values increase over time because future emissions are expected to produce larger incremental damages as physical and economic systems become more stressed in response to greater climate change and because GDP is growing over time and many damage categories are modeled as proportional to GDP. Note that the growth rate of the SCC is estimated directly within the three integrated assessment models rather than by assuming a constant annual growth rate. This helps to ensure that the estimates are internally consistent with other modeling assumptions.

Table 3-20. *Social cost of carbon (SCC), 2010–2050 (2007$/metric ton CO_2)*

Year	Discount Rate			
	5.0%	3.0%	2.5%	High Impact
	Average			95th Percentile at 3%
2010	10	31	50	86
2015	11	36	56	105
2020	12	42	62	123
2025	14	46	68	138
2030	16	50	73	152
2035	18	55	78	168
2040	21	60	84	183
2045	23	64	89	197
2050	26	69	95	212

Source: IWG, 2016.

In order to estimate the dollar value of emissions impacts, the SCC estimate for each emissions year was applied to changes in carbon dioxide emissions for that year, and then discounted back to the analysis year using the same discount rate used to estimate the SCC. An analogous approach was used to monetize the climate impact associated with SCM emissions changes. See the *Air Resources and Greenhouse Gas Emissions* section for discussions on other non-CO_2 emission.

The 2010 SCC Technical Support Document noted a number of limitations to the SCC analysis, including the incomplete way in which the integrated assessment models capture catastrophic and non-catastrophic impacts, their incomplete treatment of adaptation and technological change, uncertainty in the extrapolation of damages to high temperatures, and assumptions regarding risk aversion. Current integrated assessment models do not assign value to all of the important physical, ecological, and economic impacts of climate change recognized in the climate change literature due to a lack of precise information on the nature of damages and because the science incorporated into these models understandably lags behind the most recent research. The limited amount of research linking climate impacts to economic damages makes the modeling exercise even more difficult.

Another source of uncertainty are gaps in the ability of current SCC estimates to account for the ripple or compounding effects that projected damages to some goods and services may have on indirect production of other goods and services, or the overall productivity of global economies. These individual limitations do not all work in the same direction in terms of their influence on the SCC estimates, though taken together they suggest that the SCC estimates are likely conservative. The Intergovernmental Panel on Climate Change, Fourth Assessment Report (IPCC, 2007) concluded that "It is very likely that [SCC estimates] underestimate the damage costs because they cannot include many non-quantifiable impacts."

The current SCC estimates and the discussion of their limitations currently represents the best available compilation of information about the social benefits of carbon dioxide reductions to inform regulatory impact analysis for actions that directly affect or change cumulative global GHG emissions (IWG, 2016). This SEIS demonstrates the application of these SCC estimates to smaller-scale land management decisions that indirectly affect GHG emissions. The new versions of the models used to estimate the values for this supplemental analysis offer some improvements in these areas, although work in this area is ongoing. EPA and other agencies continue to engage in research on modeling and valuation of climate impacts with the goal to improve these estimates. Additional details are provided in Appendix C.

The social costs of climate change presented in this supplemental analysis are associated with changes in carbon dioxide and methane emissions. If coal leases were processed and mining did take place in the future, it could also have an impact on the emissions of other pollutants that affect the climate. The *Air Resources and Greenhouse Gas Emissions* section includes potential emissions of methane and nitrous oxide. The social costs of methane emissions have been included in the PNV estimate using a protocol from the updated Technical Support Document from the IWG.

The social costs of CO_2 emissions from action alternatives are estimated using the SCC values presented in the most current SCC Technical Support Document (IWG, 2016a) and Addendum on non-CO2 GHGs (IWG 2016b). The SCC estimates cited in the technical support document are used to represent global damages. The SCC Technical Support Document and Addendum provide values through 2050. Given that the analysis period for monetizing benefits and costs extends to 2054, SCC and SCM values for the years 2051 to 2054 are extrapolated using the percent change in SCC and SCM values from 2049 to 2050.

Non-Monetized Social Costs

Other benefits and costs are not monetized in this analysis. Due to current data and modeling limitations, estimates of the costs from CO_2 emissions do not include impacts like ocean acidification or potential tipping points in natural or managed ecosystems. Unquantified costs may also include climate effects from emissions of GHGs other than carbon dioxide and methane and ancillary impacts from carbon emissions on ecosystem (see *Climate Change* section).

Damages associated with GHGs other than carbon dioxide and methane and damages to other goods and services that may not be directly addressed in the same methods used to derive SCC estimates are discussed qualitatively.

Affected Environment

The existing economic conditions in the economic impact study area necessary to set context for comparison of alternatives and consideration of the decision are described below. The six counties included in the study area include Delta, Garfield, Gunnison, Mesa, Montrose, and Rio Blanco as the counties most likely to be directly or indirectly affected by any of the alternatives.

Population of Study Area

Long-term, steady growth of a population is generally an indication of a healthy, prosperous economy. Population growth can benefit the general population of a place, especially by providing economic opportunities. The population trends and forecasted growth of the study area produced by the Colorado Department of Local Affairs, Demography Office are shown in Figure 3-15. Population estimates (2000, 2005, and 2010) are produced annually with the most recent estimate available for the year 2013. Population forecasts (2015, 2020, 2025, 2030, 2035, and 2040) are produced annually by the Demography Office with the most recent forecasts shown in Figure 3-16 produced in October 2014 (DOLA, 2015a).

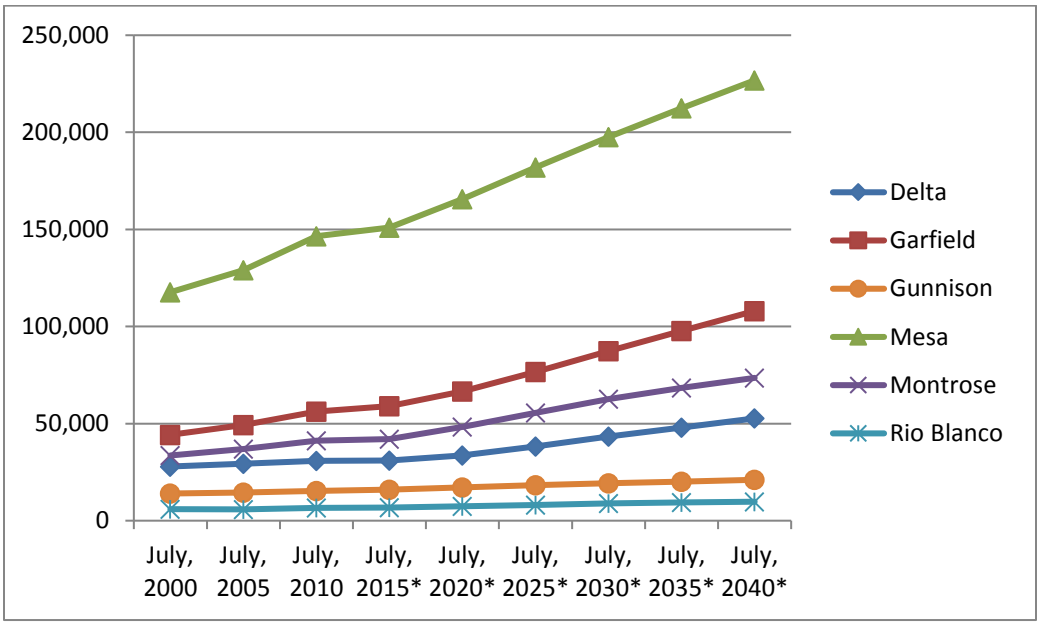

Figure 3-16. *Estimated and forecasted population totals for the study area, 2000–2040.*
**Years forecasted.*
Source: DOLA, 2015a.

All six counties in the study area grew between 2000 and 2010, and are forecasted to continue to grow over the next several decades. Mesa County, the largest county in the study area, continues to grow at the highest rate of the six counties. Garfield County is also forecasted to show steady increase in population in future years. Delta and Montrose Counties show similar patterns. Gunnison and Rio Blanco Counties show limited growth throughout the time period. Currently, much of the growth in the study area is from domestic migration (about 68% for the study area)—people from within the United States moving to the study area. This migration rate is much higher than the domestic rate of the State, about 51% of total State growth, indicating that the area is a place people are interested in relocating to, especially Mesa County.

2013 population counts for each of the study area counties from the Colorado Demography Office are (DOLA, 2015a):

Delta County	30,299 people
Garfield County	57,298 people
Gunnison County	15,454 people
Mesa County	147,811 people
Montrose County	40,754 people
Rio Blanco County	6,778 people

Employment and Income in the Economic Study Area

Understanding which industries are responsible for the employment and income in an area is important for grasping the type of economy that exists. Total employment and labor income for the study area in 2013 for major industry sectors is highlighted in Table 3-21. The table also highlights the average labor income (labor income per job) for the study area and for the State of Colorado for comparison. The overall average labor income in 2013 in the study area was $41,431 compared to the State average of $55,427. Industry average labor income for mining, construction, manufacturing, information, transportation and government (not including estimated industries) all show higher average labor income than both the State and the study area total employment averages. The largest study area industries in terms of employment (not including estimated industries) include construction, retail trade, real estate/rental/leasing, accommodation/food services, and government.

The data in Table 3-21 are the latest (2013) available and do not include the most recent events within the study area that would impact the mining sector. Layoffs have occurred within the study area in the coal mining industry, as well as in oil/gas, and dairy production. The impact of the loss of direct jobs within any sector would be followed by changes to other sectors as the ripple effects of lost wages work their way through the economy. All data presented in this analysis represents a snapshot in time of the study area. Hiring, layoffs, and restructuring in any industry occur, and will continue to occur in the study area economy. Data presented here are best available, knowing that industries will continue to change with trends and markets and the larger economy.

Any new layoffs within a community can be difficult. Some areas work to diversify, with people finding or creating other opportunities in the same area. Layoffs from an industry can impact everything from real estate to the school system if people choose to leave the area. For example, the school district in Paonia is making adjustments to the coal industry layoffs as enrollment has dropped from 5,500 in 2009 to 4,800 in 2015 (Webb, 2015).

Unemployment within the study area has been higher than the State average for several years. The most recent monthly unemployment rates available for 2015 for both the State of Colorado and the study area from the Bureau of Labor Statistics are shown in Table 3-22.

Table 3-21. *Total employment and labor income by industry for the study area for Colorado, 2013*

Sector	Employment (Jobs)	Labor Income (1000's of 2013$s)	Labor income/job (2013 dollars)	
	2013 Study Area		***Study Area***	***Colorado***
Total Employment/Labor Earnings	176,431	7,309,689	41,431	55,427
Non-services related	~37,116	~1,933,688	~52,099	70,126
Farm	5,930	45,741	7,713	32,851
Forestry, fishing, & related activities	~1,316	~34,019	~25,850	27,206
Mining (including fossil fuels)	9,502	871,168	91,683	129,103
Construction	14,322	705,570	49,265	57,853
Manufacturing	6,046	277,189	45,847	76,550
Services related	~115,054	~3,937,186	~34,220	49,743
Utilities	~809	~84,865	~104,901	148,982
Wholesale trade	~4,453	~270,070	~60,649	86,963
Retail trade	19,423	574,568	29,582	32,895
Transportation and warehousing	5,330	330,277	61,966	66,888
Information	1,866	85,711	45,933	124,948
Finance and insurance	7,107	251,905	35,445	59,215
Real estate and rental and leasing	10,330	131,884	12,767	16,650
Professional and technical services	8,760	370,766	42,325	78,163
Management of companies and enterprises	1,268	47,799	37,696	129,107
Administrative and waste services	8,270	235,722	28,503	36,223
Educational services	~1,777	~34,565	~19,451	34,071
Health care and social assistance	~17,257	~867,300	~50,258	54,608
Arts, entertainment, and recreation	4,530	66,126	14,597	25,916
Accommodation and food services	13,651	297,331	21,781	25,388
Other services, except public administration	10,223	351,290	34,363	38,207
Government	24,084	1,357,331	56,358	66,003

The employment and income data presented here was obtained from the U.S. Department of Commerce, Bureau of Economic Analysis (BEA, 2014) Regional Economic Information System and represents the latest data that are currently available for counties in the United States (2013). Regional Economic Information System data were used because it provides estimates of all employment in a region, those who are wage and salary employees and those who are self-employed. Some data are withheld by the Federal government to avoid the disclosure of potentially confidential information. Headwaters Economics uses supplemental data from the U.S. Department of Commerce to estimate these data gaps. These values are indicated with tildes (~).

Sources: U.S. Department of Commerce, Bureau of Economic Analysis (BEA, 2014); Headwaters Economics (2015).

Table 3-22. *2015 monthly unemployment rates for Colorado and study area*

	January	*February*	*March*	*April*	*May*	*June*	*July*
Colorado	4.7%	4.7%	4.5%	4.4%	4.3%	4.5%	4.0%
Study area	5.8%	5.9%	5.8%	5.6%	5.5%	5.8%	5.1%

Source: U.S. Department of Labor, Bureau of Labor Statistics (2015).

The average earnings per job measure is the compensation of the average job, total earnings divided by total employment. Full-time and part-time jobs are counted at equal weight. Employees, sole proprietors, and active partners are included. Per capita income is an important measure of economic well-being. Per capita income is total personal income divided by population. Because total personal income includes non-labor income sources (dividends, interest, rent, and transfer payments), it is possible for per capita income to be relatively high due to the presence of retirees and people with investment income. Because per capita income is calculated using total population and not the labor force as in average earnings per job, it is possible for per capita income to be relatively low when there are a disproportionate number of children and/or elderly people in the population.

For the study area, per capita income was $37,830 in 2013, compared to Colorado's State per capita income of $47,647. The study area labor earnings were about 59% of personal income, compared to the State average of 66%. The unearned income in the study area, which accounts for 41% of total personal income, consists of dividends, rent, and interest (23% of total personal income) and government transfer payments, such as Social Security (18%), payments often associated with retirees. These payments are consistent with the presence of a population of people/retirees who are living in the study area by choice, for reasons not related to the need for employment. Retirees bringing their investment income into a community demand a variety of services from medical/health care to housing, entertainment, and services. Such demands can create a new source of economic opportunity for communities.

Federal Revenues (Coal Royalties) of the Study Area

Royalty rates for coal are managed by the BLM, and the required minimum royalty rate for underground mines is 8%. For all types of coal leases, BLM is authorized to reduce the royalty for the purpose of encouraging the recovery of Federal coal, and in the interest of conservation of Federal coal and other resources, whenever it is necessary to promote development, or when the lease cannot be successfully operated under its terms, but in no case can the royalty on a producing Federal lease be reduced to zero 43 C.F.R. §§3473.3-2(e), 3485(c)(1) (2013). The BLM may approve royalty rate reductions for new leases; in Colorado for 2012 the effective royalty rate was 5.6% for underground mines.

Mineral royalties collected by the Federal government are disbursed to a variety of funds. About half (49%) of the royalties of onshore lease revenue go to the State in which the lease is located. Forty percent of the total is disbursed to the National Reclamation Fund (used to fund water resource management projects in the United States), and the remaining 10 percent goes to the U.S. Treasury. Of the royalties paid to Colorado, 50% goes to State public school funding, and 10% funds the Water Conservation Board. The remaining 40% is put into local impact programs with half going directly to the counties and town or local mining area districts and the other half is available through a grant program for local governments (DOLA, 2015b). In addition, Section 402 of the Department of Interior's Abandoned Mine Reclamation Program requires coal operators to pay 13.5 cents per ton or 10% of the value of non-lignite coal produced (underground), whichever is less, and 50% of the reclamation fees collected are returned to the States where is was collected (30 U.S.C. 1232).

Coal Production and Markets

Coal provided to the U.S. economy from any source, including roadless areas in Colorado, has national as well as local implications. This section briefly describes the economic context within which coal from the North Fork Coal Mining Area may be provided to the nation in the future. Additional information is provided in the *Coal Resources* section of this SFEIS and in Appendix C.

North Fork Area Coal Characteristics

The North Fork area includes coal from the area around the North Fork of the Gunnison River in west central Colorado. The North Fork Coal Mining Area of Colorado is part of the larger Uinta Basin, which includes western Colorado and eastern Utah. See the *Coal Resources* section for a description of North Fork coal.

Disposition of North Fork Coal and Potential for Substitution

Annual production of low sulfur bituminous coal from the Rocky Mountain coal region (Colorado and Utah) was about 40 million tons in 2012 (EIA, 2015b). Average annual production for the Rocky Mountain coal region is projected to be about 28.3 million tons on average over a 15-year period from 2013 to 2027, a 36% decrease in production, as estimated using projected production from the Annual Energy Outlook 2014 Reference case (EIA, 2014). Increases in average annual production from the North Fork area under Alternatives B and C over the next 15 years (2016–2030) are about 15–40% of the projected Annual Energy Outlook annual coal production from the Rocky Mountain region. For the United States as a whole, bituminous coal is projected to decrease by 1.4%, while low-sulfur coal production is estimated to decrease by 8.9% over that same period. Projected production from the North Fork area is estimated to be 0.45–1.1% of all coal and 1–2.4% of all bituminous coal produced in the United States in 2013 (EIA, 2015b).

The minemouth price of North Fork Coal Mining Area is less than coal of similar characteristics from Central Appalachia and the low sulfur content is important for meeting air emissions requirements. The minemouth price of Uinta Basin coal over 2008 to 2014 has been in the $30 to $40/ton range, except for late 2008 and early 2009 when Uinta Basin coal prices were between $50 and $70/ton during a general commodity price surge (Bloomberg, 2015). In contrast, Central Appalachian coal prices have been in the range of $50 to $80/ton in the same period, and surged to over $120/ton in 2008 (Bloomberg, 2015).

Based on coal consumption data for 2008–2014 compiled from Energy Information Administration form 923, 31 coal-fired power plants have been identified as potential consumers of North Fork Coal Mining Area coal (see Appendix C). These plants have received Uinta basin coal in 2013–14 and are not fully retiring. They are located across the Southeast (Alabama, Florida, Georgia, Maryland, and Mississippi), Central/Appalachian region (Kentucky and Tennessee), Midwest (Michigan and Wisconsin), Intermountain and Southwest region (Arizona, Colorado, and Utah), and California. At least one plant in each of these states, except Maryland, has received North Fork Coal Mining Area coal.

Some North Fork Coal Mining Area coal may be consumed at industrial facilities, but the amount is significantly less than amounts used for power generation; all North Fork Coal Mining Area coal is assumed to be consumed for power generation for the purposes of this supplement.

Uinta basin coal exports between 2008 and 2014 are estimated to range from 5 to 10 million tons per year, which is 10–20% of total coal production from the Uinta basin (analysis of emissions in the *Air Resources and Greenhouse Gas Emissions* section assumed 12% export based on recent data, which is within the range of 10–20%). As demand for coal in Asia is expected to increase, it is likely that

exports from Uinta basin, including the North Fork Coal Mining Area, will continue to occur, or even increase if U.S. coal demand declines in the long-run.

Change in consumption of fuels by power generating facilities in response to changes in fuel prices varies by supply region (e.g., natural gas-coal elasticity ranges from 0.05 to 0.38; -0.14 to -0.22 for coal's own price elasticity), as expected given differing market, technology, policy, and demand conditions across regions (see Appendix C). However, consumption of coal is generally, relatively unresponsive to prices (inelastic). This variation may increase when smaller sub-regions are considered, as the characteristics and impacts of smaller numbers of (or even individual) power generating facilities become more dominant.

The possible substitutes for North Fork Coal Mining Area coal at coal-fired power plants depend on a number of factors. At one extreme, only coal that has the same characteristics as the North Fork Coal Mining Area coal might be considered possible substitutes. However, other factors such as coal plant location, boiler design, coal handling and grinding equipment, air permit requirements, and environmental controls, all play an important role in determining the types of coal that might be substitutes for North Fork coal. Finally, other fuels may substitute for the consumption of North Fork Coal Mining Area coal for the production of electric power. These fuels include biomass, hydro, natural gas, nuclear, solar, or wind.

Eleven of the plants that are potential consumers of North Fork Coal Mining Area coal use a mixture of both bituminous and subbituminous coal, and thus could be able to substitute both types of coal for North Fork Coal Mining Area coal (see Appendix C). For coal plants that consume North Fork Coal Mining Area and other bituminous coal exclusively, the substitution options will be limited to other sources of bituminous coal, subject to the limitations of location as discussed above. These plants also may be able to substitute higher sulfur coal, such as from the Illinois Basin, depending on their air permit requirements and installed environmental controls. Coal plants consuming only bituminous coal can make modifications to use subbituminous coal, although this is not an option for all plants. Coal plants with environmental controls, such as sulfur dioxide (SO_2) scrubbers, bag houses, and NO_X controls, have more options for the types of coal that they can consume and still meet their emissions limits versus coal plants without these controls. Over the last 15 years, there has been a slow erosion of demand for low-sulfur Central Appalachian coal as more and more plants install sulfur dioxide scrubbers and are able to switch to higher sulfur alternatives from Northern Appalachia and the Illinois Basin. For coal plants with sulfur dioxide scrubbers, substitutes for North Fork Coal Mining Area coal might include lower sulfur coal from Central Appalachia and the Uinta Basin as well as higher sulfur coal from the Illinois Basin (see Appendix C).

Environmental Effects

Whether the estimated economic impacts or benefits and costs of each alternative actually occur depends on many variables, some within the Forest Service control, such as approval of surface activities during leasing activities, and many outside Forest Service control, such as the future of coal prices, continued environmental regulatory trends, or natural gas prices. Such uncertainties are why it is difficult to predict the potential impacts of a programmatic plan. The following section estimates the economic effects to serve as a comparison between alternatives and a reasonable portrayal of the potential impacts.

Economic Impacts

Economic impacts, sometimes called distributional effects, include consequences to jobs and labor income within the economic study area. Jobs and income estimates for the economic impact area were completed using an IMPLAN model of estimated coal outputs by alternative. The economic impacts of each alternative are based on estimates of coal that may be leased and produced within the

North Fork Coal Mining Area over the 15-year period. All recoverable coal within the North Fork Coal Mining Area was assumed to be economically viable. The coal resources are located in Gunnison County adjacent to the existing Elk Creek and West Elk mines. For the purpose of this analysis, the past production data for these two mines was used, but no assumptions are made that in the future new or different mines may operate in the area.

Analysis for the 2012 FEIS included the Bowie mine, as the scope of analysis for the 2012 FEIS was at a statewide scale, and the alternatives included consideration of an alternative to manage roadless areas according to existing forest plans. In addition, the North Fork Coal Mining Area (as outlined in Chapter 1) changed from the DEIS, the revised DEIS, and the 2012 FEIS, with some original areas included within the North Fork Coal Mining Area being of concern to the Bowie Mine. The boundaries of the North Fork Coal Mining Area have been decreased and those areas of interest to Bowie remain within CRAs, but are no longer within the North Fork Coal Mining Area. In this supplemental analysis, only past production data for Elk Creek and West Elk mines are included, as the Bowie mine is no longer affected by the North Fork Coal Mining Area; data for Bowie mine has not been included in this supplemental analysis.

Output, employment, and labor income impacts in the economic impact area from estimated coal production within the North Fork Coal Mining Area are shown in Tables 3-23 through 25. All indicators are expressed on an average annual basis over a 15-year analysis period (2016–2030). Only those impacts associated with potential development and production from the North Fork Coal Mining Area are included. The three tables highlight a range of production that may occur within the North Fork Coal Mining Area: Table 3-23 shows the low scenario of 5.2 million tons/year, Table 3-24 shows the average scenario of 10 million tons/year, and Table 3-25 shows the permitted scenario of 15 million tons/year (see Table 3-19 for details of each scenario).

Estimates of the direct, indirect, and induced effects for the output (production value), employment, and labor income by alternative are contained in Tables 3-23 through 3-25. Direct effects are realized by the extraction and sale of coal. Indirect effects are realized by local companies that provide goods and services to coal mining operations. Induced effects result from local spending of employee income paid by the companies directly and indirectly affected by mining activities.

The tables display an annual average impact. It should be noted that with only current leases, coal production would cease in 1 to 3 years under alternative A; with no additional lease opportunities, production would end with current leased coal. Coal production under alternative B could continue if leases were obtained; production could continue for an additional 12–36 years depending on the scenario. Alternative C displays the same annual average impacts as alternative B, but the timeframes under all three scenarios are shorter due to the decreased size of the North Fork Coal Mining Area. Under the scenarios in Alternative C, coal could be available for an additional 7 to 21 years.

Employment for the action alternatives may range between about 1,000 total jobs (direct, indirect, and induced) to 2,300 total jobs, depending on the production level (low, average, permitted). The impact could likely last over more years under alternative B than alternative C due to the overall amount of coal available over time with a larger coal mining area. Similar output estimates are shown for the value of production and labor income.

Table 3-23. *Average annual economic impacts estimated by alternative for North Fork Coal Mining Area coal 2016–2030 (2013 dollars), coal production – Low scenario*

Activity/ Effects	*Value of Production ($ millions)*			*Employment (jobs)*			*Labor Income ($ millions)*		
	Alt A	**Alt B**	**Alt C**	**Alt A**	**Alt B**	**Alt C**	**Alt A**	**Alt B**	**Alt C**
Direct	27	190	190	68	475	475	8	55	55
Indirect	5	32	32	24	165	165	1	10	10
Induced	5	32	32	50	346	346	2	12	12
Total	**37**	**254**	**254**	**142**	**986**	**986**	**11**	**78**	**78**

Table 3-24. *Average annual economic impacts estimated by alternative for North Fork Coal Mining Area coal 2016–2030 (2013 dollars), coal production – Average scenario*

Activity/ Effects	*Value of Production ($ millions)*			*Employment (jobs)*			*Labor Income ($ millions)*		
	Alt A	**Alt B**	**Alt C**	**Alt A**	**Alt B**	**Alt C**	**Alt A**	**Alt B**	**Alt C**
Direct	27	366	366	68	913	913	8	107	107
Indirect	5	61	61	24	318	318	1	20	20
Induced	5	62	62	50	665	665	2	24	24
Total	**37**	**489**	**489**	**142**	**1,897**	**1,897**	**11**	**150**	**150**

Table 3-25. *Average annual economic impacts estimated by alternative for North Fork Coal Mining Area coal 2016–2030 (2013 dollars), coal production – Permitted scenario*

Activity/ Effects	*Value of Production ($ millions)*			*Employment (jobs)*			*Labor Income ($ millions)*		
	Alt A	**Alt B**	**Alt C**	**Alt A**	**Alt B**	**Alt C**	**Alt A**	**Alt B**	**Alt C**
Direct	27	448	448	68	1,117	1,117	8	130	130
Indirect	5	74	74	24	389	389	1	24	24
Induced	5	76	76	50	814	814	2	29	29
Total	**37**	**598**	**598**	**142**	**2,320**	**2,320**	**11**	**183**	**183**

Federal mineral royalties have been estimated (8% for all new leases) using total production. Current leases (alternative A) would continue under the BLM's negotiated rate of 5.6%. Royalty payments, not including rents or bonus payments, at 8% to Colorado (49% of the total) from coal from the North Fork Coal Mining Area are estimated at $0 for Alternative A (no new leases), about $6.8 million for Alternative B and $0.5 million for Alternative C. It is likely that any new leases could undergo negotiations with the BLM and result in a lower rate, but that is not known at this time. Economic impacts to the local study area shown in Tables 3-23 through 3-25 do not include government spending of Federal mineral payments to the State or local jurisdictions.

Summary of Economic Impacts

Alternative A – under the no action alternative, without the temporary road construction exception within the North Fork Coal Mining Area, no additional coal production is likely. Depending on production rates, current operations within CRAs would be completed in 1 to 3 years. About 140 total jobs and associated labor income would be lost with no additional production associated with the North Fork Coal Mining Area would be likely. Such declines within the coal mining industry would likely create job losses to secondary businesses and additional social impacts to community structure. Although not all communities within the economic study area would be affected the same, some communities have diversified economies, attracted retiree populations, or are less dependent on coal mining. Those communities that are still dependent on coal mining would be most directly affected.

Alternatives B and C – under either of the action alternatives, future coal production is likely within the North Fork Coal Mining Area with the reinstatement of the temporary road construction exception. Depending on production rates, additional coal production could be completed in 7 to 36 years. Potential effects would be relatively short-term to the economic study area. Continued opportunities for coal development in the North Fork Coal Mining Area under Alternative B or C could result in production for a stable workforce over the production time, as well as continued royalty payments to the State of Colorado. These economic impacts are estimated for gross North Fork Coal Mining Area coal production. External forces and trends may still have a greater impact in the future in terms of coal prices and natural gas substitution.

Benefits, Social Costs, Substitution, and Present Net Value Results

Results from the SDEIS, based on IPM v5.13 and accounting only for CO_2 social costs, are repeated in this section and then compared to new results based on IPM v5.15 and accounting for a combination of CO_2 and methane social costs. These comparisons demonstrate how results have changed from the SDEIS.

Net Energy Production, Consumption, Exports, and Carbon Dioxide Emissions

Changes in net energy production and consumption, as well as carbon dioxide emissions associated with production and consumption that occurs between 2016 and 2054 (see Table 3-19) under IPM® v5.13, is summarized in Table 3-26. These results demonstrate the substitution that could occur across supply and demand regions in response to increased production of coal within the North Fork Coal Mining Area under alternatives B and C using IPM v.5. 13. The Forest Service used IPM v5.13 to model the proposed Clean Power Plan by adopting prices on CO_2 in order to proxy the proposed regulation that covers CO_2 emissions (ICF 2015a).

The assumption that total gross production of underground coal from the North Fork Coal Mining Area increases by 172 million short tons from 2016 to 2054 for Alternative B, compared to Alternative A, is shown in Table 3-26. Production from other substitute sources of underground coal around the Nation are likely to decrease, in many cases, in response to this increases in North Fork Coal Mining Area underground coal production. These decreases offset, in part, some of the 172 million short tons of underground coal production from the North Fork Coal Mining Area, resulting in net domestic underground coal production of 91 million short tons over the entire analysis period. These results are estimated using response coefficients derived from IPM modeling results; see the *Overview of Benefit-Cost Framework* section for a description of how those coefficients were calculated.

Table 3-26. *Changes in the mixture of energy production, electricity generation, and CO_2 emissions for Alternatives B and C, compared to Alternative A (totals for 2016–2054) under IPM® v5.13 (SDEIS results)*

	Alternatives	
	B-A	*C-A*
Change in Gross North Fork Coal Production (1)		
Total Coal Production – million short tons	172	95
Change in Net Domestic Energy Production (2)		
National Underground Coal – million short tons	91	50
National Surface Coal (million short tons)	-23	-13
Total National Coal (million short tons)	68	37
National Natural Gas (billion cubic feet)	-271	-149
Change in Net Domestic Electricity Generation by Fuel Type (3)		
Electricity from Coal (GWh)	112,168	61,585
Electricity from Natural Gas (GWh)	-71,677	-39,354
Electricity from Renewable Energy (GWh)	≈-40,000	≈-22,000
Total Electricity Generation (GWh)	≈0	≈0
Change in Coal Exports (shipped and consumed) (4)		
Coal Exports (million short tons)	17	9
Change in Net CO_2 Emissions (Million metric tons)		
From Production of Coal and Natural Gas	1.1	0.6
From Domestic Consumption of Coal	118	65
From Domestic Consumption of Gas	-43	-24
From Domestic Consumption of Coal and Gas	75	41
From Transportation of Coal	10	5
From Exported Coal Transport plus Combustion	45	25
Total CO_2 Emissions	131	72

(1) Based on schedules of North Fork Production, by Alternative (see Table 3-19).
(2) Net energy production reflects decreases in production of substitute sources of fuel, including sources of underground coal from other supply regions, in response to increases in North Fork underground coal production.
(3) Changes in aggregate electricity generation across energy sources are assumed to be zero, reflecting IPM modeling assumptions of fixed demand across alternatives.
(4) Changes in net carbon dioxide emissions in this table are used to estimate social costs of carbon dioxide emissions for the global accounting stance in Table 3-29 (see the "*Overview of Benefit-Cost Framework* section" for calculation steps).

Similarly, production of substitute sources of surface coal and natural gas across the country are estimated to decrease by 23 million short tons and 271 billion cubic feet respectively, in response to increases in North Fork Coal Mining Area coal production. Total electricity generation is assumed to remain constant across alternatives, so change in total electricity generation is equal to zero for Alternative B, compared to A. However, the mix of energy sources used to generate the electricity changes, in response to increases in North Fork Coal Mining Area coal production. Electricity generated from coal (underground and surface mined) is estimated to increase by about 112,000

GWh, while electricity generation from natural gas decreases by about 72,000 GWh. Decreases in electricity generation from renewable energy sources makes up the remaining balance of about 40,000 GWh. Electricity generation from renewables decreased by a total of 41,000 GWh under v5.13, as a result of adding North Fork coal mining area supplies. Under v5.15, electricity generation from renewables decreased by 12,000 GWh (i.e., North Fork coal mining area had less impact on renewables under v5.15.

These shifts in the mixtures of energy used to generate electricity, as well as the production of different types of energy will change carbon dioxide emissions. Total carbon dioxide emissions increase by 131 million metric tons under Alternative B, compared to A (Table 3-26). Changes in carbon dioxide emissions are estimated by multiplying changes in net energy production, net electricity generation, and coal exports by respective carbon dioxide emission factors, as explained in benefit-cost steps outlined in the *Overview of Benefit-Cost Framework* section. More details are provided in Appendix C.

Net Energy Production, Consumption, Exports, and Carbon Dioxide Emissions Modeled under Final Colorado Roadless Rule with IPM v5.15

In the newer IPM v5.15 that the Forest Service is using for this analysis, a number of changes have been made from the analysis for the proposed North Fork coal mining area exception, including:

- Accounting for implementation of the final Clean Power Plan (40 CFR Part 60) rather than using a carbon price proxy to account for the proposed Clean Power Plan.
- Electricity demand has been revised downward, consistent with more recent Energy Information Administration, Annual Energy Outlook forecasts. This revision has implications for projections and future demand for electricity among competing sources.
- Natural gas supply assumptions have been updated, such that gas prices are lower than thev5.13.
- Coal supply adjustments have also been made, leading to lower prices overall.
- Coal transportation assumptions in v.5.13 reflect a much higher diesel outlook rather than the price forecast expected today.

Some of these factors are reflected in the different base case modeling assumptions the Forest Service adopted from EPA's IPM modeling for the final and proposed rule (i.e., EPA Base Case v5.13 and v5.15). See Appendix C for detailed descriptions of changes in baseline modeling assumptions between the proposed rule and final rule analysis. Overall, these factors affect the competitiveness of coal-fired power generation in the domestic marketplace, consequently influencing the projected market substitution of coal production resulting from the proposed action. Because the carbon price proxy under IPM v5.13 was based on the proposed Clean Power Plan rule and not the final rule, the preceding analysis (shown in Table 3-26) is updated using v5.15 IPM Base Case that also accounts for the final Clean Power Plan. Changes in net energy production, consumption, and CO_2 emissions under IPM® v5.15 are summarized in Table 3-27.

Table 3-27. *Changes in the mixture of energy production, electricity generation, and CO2 emissions for Alternatives B and C, compared to Alternative A (totals for 2016–2054) under IPM® v5.15 (SFEIS results)*

	Alternatives	
	B-A	*C-A*
Change in Gross North Fork Coal Production (1)		
Total Coal Production – million short tons	172	95
Change in Net Domestic Energy Production (2)		
National Underground Coal – million short tons	102	56
National Surface Coal (million short tons)	-115	-63
Total National Coal (million short tons)	-13	-7
National Natural Gas (billion cubic feet)	-24	-13
Change in Net Domestic Electricity Generation by Fuel Type		
Electricity from Coal (GWh)	12,618	6,928
Electricity from Natural Gas (GWh)	-3,445	-1,892
Electricity from Renewable Energy (GWh)	≈-9,000	≈-5,000
Total Electricity Generation (GWh)	≈0	≈0
Change in Coal Exports (shipped and consumed)		
Coal Exports (millions short tons)	0.00017	0.00009
Change in Net CO_2 Emissions (Million metric tons)		
From Production of Coal and Natural Gas	1.7	0.9
From Domestic Consumption of Coal	13	7
From Domestic Consumption of Gas	-2	-1
From Domestic Consumption of Coal and Gas	11	6
From Transportation of Coal	4	2
From Exported Coal Transport plus Combustion	0.00045	0.00024
Total CO_2 Emissions	17	9

*All assumptions are the same as those used in Table 3-26, except the IPM generated response coefficients. See Table 3-26 for assumptions about these values.

Much like Table 3-26, results contained in Table 3-27 are also based on the assumption that total gross production of underground North Fork Coal Mining Area coal increases by 172 million short tons from 2016 to 2054 for Alternative B, compared to Alternative A. The differences in net domestic energy production and electricity generation transpire from the abovementioned changes in assumptions or conditions between IPM v.5.13 and v5.15—which influenced the energy market's responses to the increases in North Fork Coal Mining Area underground coal production.

Under IPM v.5.15, nationally, the available supply of substitute underground coal decreased as compared with IPM v.5.13, therefore less underground coal is available as substitute to offset portion of the 172 million short tons of North Fork Coal Mining Area coal. With fewer supplies of substitute

coal, the change in net domestic underground coal production under Alternative B therefore increases slightly from 91 million short tons under IPM v5.13, to 102 million short tons of underground coal under IPM v5.15. However, total coal production (i.e., domestic underground and surface coal) decreases slightly by 13 million short tons for Alternative B under IPM v5.15, compared to an increase of 68 million short tons under IPM v5.13. This is due, in large part, to substantially greater substitution between underground and surface coal production under IPM v5.15. Surface coal production decreases by 115 million tons under IPM v5.15 but decreases by only 23 million short tons under IPM v5.13, in response to expansion of North Fork Coal Mining Area supplies. Under v5.15, there exists much greater substitution between surface and underground coal production but less between coal and natural gas. Substitution between underground coal and natural gas production is comparatively minor, due to the lower natural gas prices and greater supply available; coal is therefore less competitive as a substitute for natural gas under IPM v5.13.

Similar to coal production, electricity generation from coal increases by only 12,618 GWh under IPM v5.15, 90 percent less than an increase of 112,168 GWh under IPM v5.13. Changes in electricity production from natural gas, as well as renewable energy are also smaller under IPM v5.15, demonstrating reduced substitution between coal and those sources of energy under revised market and regulatory conditions represented by IPM v5.15.

Total net coal production and consumption are substantially less responsive to changes in North Fork coal resources under v5.15's response coefficients. Again, lower natural gas prices under the modified IPM modeling assumptions (v5.15) help drive the decrease in responsiveness under the revised coefficients, as the electricity generating sector finds it more cost effective to stick with natural gas rather than shift to using newly available coal resources. Correspondingly, increases in the use of the low sulfur bituminous coal from North Fork are offset by large decreases in use of other types of coal, rather than decreases in natural gas.

Although under IPM v.5.15 there are nearly 80 million short tons of exports annually in 2030 and later, over the life of project, very little exports are attributed to increases in North Fork Coal Mining Area coal production—about 170 short tons and 90 short tons for Alt B-A and Alt C-A, respectively. Note that export response coefficients, used in calculation of changes in CO_2 emissions, differ from percent of coal exported—see *Overview of Benefit-Cost Framework* section and Appendix C for details. Increases in percentage of North Fork Coal Mining Area exports can be offset by decreases in exports of coal from other sources and regions, resulting in export response coefficients that are less than gross coal export percentages.

These shifts in the mixtures of energy production and electricity generation also affect net carbon dioxide emissions. Total carbon dioxide emissions are estimated to increase by 17 million metric tons under Alternative B, compared to A, based on IPM v5.15 (Table 3-27). In contrast, carbon dioxide emissions increased by 131 metric million tons for Alternative B under IPM v5.13.

Differences illustrated thus far refer to Alternative B, compared to Alternative A (Alt. B-A). Net changes in the mixture of energy production, electricity generation, and CO_2 emissions for Alternative C, compared to Alternative A (Alt. C-A), encounter similar or proportional shifts under IPM® v5.15.

Substitution Methane

The three alternatives could result in differences in the estimated methane emissions from future coal mining. The IPM modeling produced estimates of future changes in the mix of energy used to create electrical grid power under each of the alternatives. These results were used to estimate changes in methane emissions from the estimates of surface and subsurface coal needed to generate electricity. The model-predicted changes in net coal production above and below ground as well as changes in natural gas production were multiplied by average emissions factors obtained from the Department of

Energy's Upstream Dashboard tool to estimate changes in methane emissions. The emissions factors chosen included transportation by rail (for coal) or pipeline (for natural gas). The rail round trip transport distance was assumed to be 4,000 miles for consistency with the air and GHG analysis. For natural gas, the Upstream Dashboard default transport distance of 603 miles by pipeline was chosen.

To obtain an emissions factor for methane emissions for typical surface mining operations, the Powder River profile was selected and the Upstream Dashboard default of 51 cubic feet of methane per short ton of coal was used. The methane emissions factor from the Dashboard in mass of methane per short ton of coal produced was then multiplied by the net change in surface coal mining for each year of the economic model results for all three alternatives and all three annual coal production scenarios. The methane emissions factor for subsurface coal operations (in mass of methane per ton of short coal produced) was also obtained from the Upstream Dashboard using the Illinois Number 6 coal mine as a profile and 403 cubic feet of methane per short ton of coal as an input to the dashboard. The process used to derive the estimate of methane emissions in cubic feet per ton of coal using data for underground mining operations using data from mines in the North Fork Coal Mining Area was described earlier in the *Air Resources and Greenhouse Gas Emissions* section. An emissions factor for natural gas production was also obtained from the Upstream Dashboard. The emissions factor for the 2010 national average was chosen, using default dashboard parameters for production and flaring. Differences in methane emissions were converted to CO_2e using 25 for the global warming potential.

Results for alternatives B and C are shown in Table 3-28. Positive values indicate increases in methane emissions (due to net increases in production), and negative values indicate decreases in methane emissions (due to net decreases in production). Annual changes were summed for all years in the analysis period and total net emissions changes for above and below ground coal production over the period are reported in the table.

Table 3-28. *Total net change in methane emissions due to changes in surface and underground coal mining for Alternatives B and C in millions of metric tons of CO_2e*

Alternative A minus Action Alternative	*Change in methane emissions due to changes in underground coal mining*	*Change in methane emissions due to changes in surface coal mining*	*Changes in methane emissions due to changes in natural gas extraction*	*Total net change in methane emissions*
A - B	20	-3.2	-0.15	16.7
A - C	11	-1.8	-0.08	9.2

Cumulative Effects

Cumulative benefits, costs, and net benefits are first presented for CO_2 emissions only, and then methane emissions are included with CO_2 emissions in the analysis results.

Discounted Benefits, Social Costs, and Present Net Values for Carbon Dioxide (Excluding Methane Emissions)

The ranges of benefits and social costs of alternatives evaluated in this supplemental analysis are shown in Table 3-29 for IPM version v5.13. Calculations and discounting are described under the *Benefit and Social Cost Accounting Stances* section, as well as the *Overview of Benefit-Cost Framework* sections above. In summary, discounted benefits are the domestic power generation cost savings resulting from estimated changes in the mixture of fuels used to generate electricity under Alternative B.

Discounted social costs are based on IWG's SCC values (IWG, 2016) and carbon dioxide emissions summarized in Table 3-26. Details are provided in Appendix C.

Due to the use of electric power generation cost savings as a proxy for benefits, results are provided only for Alternatives B and C, relative to Alternative A (i.e., cost savings cannot be characterized for stand-alone alternatives). Ranges are shown to account for the variation across production schedules (low, average, permitted) and SCC value assumptions.

Table 3-29. *Summary of discounted benefits and social costs results (million 2014$) under IPM® v5.13 (SDEIS results)*

	*Alternative B - Alternative A**		*Alternative C - Alternative A**	
	Discounted Benefits	Discounted Social Costs	Discounted Benefits	Discounted Social Costs
Global Boundary				
Lower Estimate (a)	$1,284	-$13,751	$792	-$7,652
3% Discount Avg. (Lower) (b)	$1,284	-$4,646	$792	-$2,611
3% Discount Avg. (Upper) (b)	$2,410	-$4,034	$1,609	-$2,420
Upper Estimate (a)	$1,781	-$931	$1,310	-$596

** The sum of discounted benefits and discounted social costs may not be exactly equal to PNV results in Table 3-31 due to rounding. Results are drawn from the full set of individual results obtained from each combination of assumptions regarding social cost values (2.5% to 5% discount rates), and coal production rates (low, average, permitted).*
(a) Lower and upper estimates are drawn from results from all production schedules (low, average, permitted) and reflect all discount rates: 2.5%, 3%, and 5%.
(b) Ranges for average SCC values for 3% discount rates are singled out as representative of mid points.

As shown in Table 3-27, changes in the mixture of energy production, electricity generation, and CO_2 emissions under IPM® v5.15 are different than those modeled under IPM® v5.13 (Table 3-26). Correspondingly, discounted benefits and costs results under IPM® v5.15—as shown in Table 3-30—reflect those differences.

Discounted benefits and costs decreased across alternatives under IPM® v5.15 compared to v5.13. This reflects the substantial reductions in net domestic energy production, electricity generation from coal and associated CO_2 emissions under IPM® v5.15, relative to IPM v5.13 as shown and explained in Tables 3-29 and 3-30.

Discounted benefits and costs are added to estimate PNVs in Table 3-31 for IPM version v5.13.

PNV results are primarily negative, with values as low as negative $12 billion in net damages to positive $850 million in net benefits for Alternative B, compared to A. PNV ranges from negative $6.8 billion to positive $714 million for Alternative C, relative to A. Midpoint PNV estimates range from negative $0.8 to negative $3.4 billion in net damages for alternative B and C, compared to A.

Table 3-30. *Summary of discounted benefits and social costs results (million 2014$) under IPM® v5.15 (SFEIS results)*

	*Alternative B - Alternative A**		*Alternative C - Alternative A**	
	Discounted Benefits	Discounted Social Costs	Discounted Benefits	Discounted Social Costs
Global Boundary				
Lower Estimate (a)	$413	-$1,808	$255	-$1,006
3% Discount Avg. (Lower) (b)	$413	-$611	$255	-$343
3% Discount Avg. (Upper) (b)	$784	-$530	$522	-$318
Upper Estimate (a)	$579	-$122	$425	-$78

** The sum of discounted benefits and discounted social costs may not be exactly equal to PNV results in Table 3-32 due to rounding. Results are drawn from the full set of individual results obtained from each combination of assumptions regarding social cost values (2.5% to 5% discount rates), and coal production rates (low, average, permitted).*
(a) Lower and upper estimates are drawn from results from all production schedules (low, average, permitted), and reflect all discount rates: 2.5%, 3%, and 5%.
(b) Ranges for average SCC values for 3% discount rates are singled out as representative of mid points.

Table 3-31. *Present Net Values under IPM® v.5.13 (million 2014$) (SDEIS results)*

	*Alternative B - Alternative A**	*Alternative C - Alternative A**
	(millions of 2014 dollars)	
Global Boundary		
Lower Estimate (a)	-$12,468	-$6,861
3% Discount Avg. (Lower) (b)	-$3,363	-$1,819
3% Discount Avg. (Upper) (b)	-$1,624	-$811
Upper Estimate (a)	$850	$714

**PNV results may not be exactly equivalent to the sum of discounted benefits and costs from Table 3-29 due to rounding. Results are drawn from the full set of individual results obtained from each combination of assumptions regarding social cost values (2.5% to 5% discount rates), and coal production rates (low, average, permitted).*
(a)Lower and upper estimates are drawn from results from all production schedules (low, average, permitted), and reflect all discount rates: 2.5%, 3%, and 5%.
(b) Ranges for average SCC values for 3% discount rates are singled out as representative of mid points.

Discounted benefits and costs modeled under IPM® v5.15 (Table 3-30) are also summed to estimate PNVs in Table 3-32. PNVs remain negative for results in the lower end of the range, but midpoint PNVs, as represented by average SCC values (based on 3% discount rate) now include a mix of negative and positive results under IPM v5.15. Midpoint values are entirely negative under IPM v5.13. The overall range of PNV results is narrower under IPM v5.15 due to the substantial decreases in both benefits and social costs (see Table 3-32).

Table 3-32. *Present Net Values under IPM® v.5.15 (million 2014$) (SFEIS results)*

	*Alternative B - Alternative A**	*Alternative C - Alternative A**
	(millions of 2014 dollars)	
Global Boundary		
Lower Estimate (a)	-$1,394	-$750
3% Discount Avg. (Lower) (b)	-$197	-$88
3% Discount Avg. (Upper) (b)	$253	$204
Upper Estimate (a)	$457	$347

**PNV results may not be exactly equivalent to the sum of discounted benefits and costs from Table 3-30 due to rounding. Results are drawn from the full set of individual results obtained from each combination of assumptions regarding social cost values (2.5% to 5% discount rates), and coal production rates (low, average, permitted).*
(a) Lower and upper estimates are drawn from results from all production schedules (low, average, permitted, and reflect all discount rates: 2.5%, 3%, and 5%.
(b) Ranges for average SCC values for 3% discount rates are singled out as representative of mid points.

Discounted Benefits, Social Costs, and Present Net Values (Incorporating Social Costs from both Carbon Dioxide and Methane Emissions)

Methane emissions were considered in the SDEIS using the SCC values and CO_2e as proxy for methane emissions, as part of the sensitivity analysis (SDEIS pp. E-24 to E-25). Due to public comments and newly available information, SCM values are incorporated here in order to demonstrate the potential for incremental differences in discounted social costs and PNV results that could be attributed to methane emissions associated with coal mining.

The IWG recently issued damage estimates for two other GHGs: methane and nitrous oxide. These estimates are based on a study by Marten et al. (2015) that provided the first set of published estimates of the social cost of methane and nitrous oxide emissions that are consistent with the methodology and modeling assumptions underlying the IWG SCC estimates. The 2016 Addendum to the SCC Technical Support Document summarizes the methodology and presents the social cost estimates from Marten et al. (2015) as a way for agencies to improve analysis of actions that are projected to influence emissions of methane and nitrous oxide in a manner that is consistent with how CO_2 emission changes are valued (IWG, 2016b). Examples of the IWG SCM estimates used in this analysis are contained in Table 3-33 for the year 2020; social cost calculations in this analysis make use of the full schedule of SCM values, similar to SCC values. The IWG presented the estimates of the social cost of these gases with an acknowledgement of the limitations and uncertainties involved and with a clear understanding that they should be updated over time to reflect increasing knowledge of the science and economics of climate impacts, just as the IWG committed to do for SCC.

The results including SCM are shown in Tables 3-30 and 3-32 are augmented with the estimated SCM emission changes and shown in Tables 3-34, 3-35, and 3-36, as well as 3-37 below. The method of applying the SCM estimates and calculating discounted costs of methane emission is analogous to that used in the SCC-only calculation, as explained in this SFEIS (see *Overview of Benefit Cost Framework* section). Specifically, net changes in methane emissions are estimated, accounting for substitution as explained previously for Table 3-28, and multiplied by IWG SCM values for each year (U.S. Forest Service, 2016a).

Table 3-33. *Examples of the social cost of GHGs in 2007$/metric tons, 2020*

	Discount Rate			
Gas	5.0% mean	3.0% mean	2.5% mean	3% 95th percentile
CO_2	12	42	62	123
CH_4	540	1,200	1,600	3,200
N_2O	4,700	15,000	22,000	39,000

Source: IWG, 2016b.

Table 3-34. *Discounted social costs of net carbon dioxide (CO_2) and methane (CH_4) emissions (in millions of 2014 dollars) under IPM® v5.15 (SFEIS)*

	Alternative B – Alternative A			Alternative C – Alternative A		
	CO_2	CH_4	CO_2+CH_4	CO_2	CH_4	CO_2+CH_4
Global Boundary						
Lower Estimate (a)	-$1,808	-$2,046	-$3,853	-$1,006	-$1,127	-$2,133
3% Discount Avg. (Lower) (b)	-$611	-$766	-$1,377	-$343	-$419	-$762
3% Discount Avg. (Upper) (b)	-$530	-$733	-$1,263	-$318	-$418	-$736
Upper Estimate (a)	-$122	-$251	-$373	-$78	-$157	-$235

Results are drawn from the full set of individual results obtained from each combination of assumptions regarding social cost values (2.5% to 5% discount rates), and coal production rates (low, average, permitted). See Appendix C (Economic Analysis) for list of all PNV results and the corresponding assumptions for results in this table.
(a) Lower and upper estimates are drawn from results from all production schedules (low, average, permitted), and reflect all discount rates: 2.5%, 3%, and 5%.
(b) Ranges for average SCC values for 3% discount rates are singled out as representative of mid points.

Table 3-35. *Summary of discounted benefits and social costs results (millions of 2014 dollars) under IPM® v5.15 accounting for both Social Cost of Carbon and Methane (SFEIS)*

	Alternative B – Alternative A		Alternative C – Alternative A	
	Discounted Benefits	Discounted Social Costs	Discounted Benefits	Discounted Social Costs
Global Boundary				
Lower Estimate (a)	$413	-$3,853	$255	-$2,133
3% Discount Avg. (Lower) (b)	$413	-$1,377	$255	-$762
3% Discount Avg. (Upper) (b)	$784	-$1,263	$522	-$736
Upper Estimate (a)	$579	-$373	$425	-$235

Results are drawn from the full set of individual results obtained from each combination of assumptions regarding social cost values (2.5% to 5% discount rates), and coal production rates (low, average, permitted). See Appendix C (Economic Analysis) for list of all PNV results and the corresponding assumptions for results in this table.
(a) Lower and upper estimates are drawn from results from all production schedules (low, average, permitted), and reflect all discount rates: 2.5%, 3%, and 5%.

(b) Ranges for average SCC values for 3% discount rates are singled out as representative of mid points.

Table 3-36. *Annualized benefits and social costs of net carbon dioxide and methane emissions (millions of 2014 dollars) under IPM® v5.15 (SFEIS)*

	Alternative B – Alternative A		*Alternative C – Alternative A*	
	Benefits	Social Costs	Benefits	Social Costs
Global Boundary				
Lower Estimate	$19	-$177	$12	-$98
3% Discount Avg. (Lower)	$19	-$63	$12	-$35
3% Discount Avg. (Upper)	$36	-$58	$24	-$34
Upper Estimate	$35	-$23	$26	-$14

Annualized values apply over 36 year period (based on the longest period of time needed to exhaust North Fork coal mining area supplies under the 'low' production scenario. A 3% discount range is assumed, consistent with SCC and SCM values associated with these results; exception being rate of 5% for the upper estimate.

Net benefits or PNV results for Alternatives B and C, relative to Alternative A, accounting for both $CO_2$and methane, assuming IPM® v5.15 are presented in Table 3-37. When compared to PNV results from the SDEIS (i.e., not accounting for methane and assuming IPM v5.13) (see Table 3-31 of this section), revised PNV results in Table 3-37 demonstrate that PNV results remain negative for all lower and midpoint PNV estimates, and positive for upper estimates. Revised ranges of PNV are narrower (e.g., -$3,400 to +$200 million compared to -12,000 to +850 million, for Alternative B-A).

Table 3-37. *Present Net Value under IPM® v5.15 accounting for both Social Cost of Carbon and Methane (millions of 2014 dollars) (SFEIS)*

	Alternative B - Alternative A	*Alternative C - Alternative A*
Global Boundary		
Lower Estimate (a)	-$3,440	-$1,878
3% Discount Avg. (Lower) (b)	-$964	-$506
3% Discount Avg. (Upper) (b)	-$479	-$214
Upper Estimate (a)	$206	$190

Results are drawn from the full set of individual results obtained from each combination of assumptions regarding social cost values (2.5% to 5% discount rates), and coal production rates (low, average, permitted). See Appendix C (Economic Analysis) for list of all PNV results and the corresponding assumptions for results in this table.
(a) Lower and upper estimates are drawn from results from all production schedules (low, average, permitted), and reflect all discount rates: 2.5%, 3%, and 5%.

(b) Ranges for average SCC values for 3% discount rates are singled out as representative of mid points.

These results indicate that some changes to PNV estimates have occurred as a result of aggregate consideration of revised response coefficients based on IPM v5.15 and social cost of methane, compared to PNV results presented in the SDEIS. However, minimal differences in signs of PNV results, coupled with relatively small changes in midpoint estimates, suggests that PNV results presented in the SDEIS remain viable for summarizing the environment effects of this decision.

There exist substantial uncertainties associated with efforts to characterize net benefits of the alternatives under consideration. It is important to stress that while the concept of PNV attempts to compare the benefits and costs of decision to society; the analysis presented in this SFEIS is illustrative in nature, portraying possible cumulative effects of rulemaking, based on available information and technical support. Because reinstating an exception that could allow for temporary road construction—that could enable future expansion of coal mine operations—does not directly result in costs or benefits, numerous assumptions and scenarios were necessary in order to approximate any indirect economic effects. As such, estimates under each alternative stemmed from three possible production schedules and multiple series of SCC and SCM values (from different discount rates). A complete listing of benefits, costs, and PNV results for each combination or permutation of assumptions is provided in Appendix C (Economic Analysis); that list includes flags indicating which sets of assumptions are the source of results in Table 3-37. Understandably, this gave rise to an expansive range of results. That range of PNV results narrows when using response coefficients derived from revised assumptions about baseline energy market and regulatory conditions as represented by IPM v5.15, compared to conditions as represented by IPM v5.13.

The comparative results presented in this SFEIS demonstrate the sensitivity of PNV results to the potential dynamics of evolving energy markets and regulatory and policy developments. These results also demonstrate how potential market responses and effects triggered by shifts in supply of specific types of coal (e.g., low sulfur bituminous coal), from individual supply regions, within specific time frames, can be difficult to project, and may deviate from expectations based on broader interpretations of market conditions and trends. Plausibly, additional PNV estimates exist by further adjusting variables, thus adding to the permutations of scenarios. Therefore, it could be misleading to draw any inferences regarding the ‘likelihoods’ of any given net benefit value(s) based solely on results presented above. Ultimately, calculations used—and associated benefit-cost results—in this cumulative economic analysis are not intended to be probabilistic in nature, but illustrative.

Chapter 4 Preparers, Distribution, and Consultation

List of Preparers

Primary contributors were those who were primarily responsible for preparing the SEIS, preparing significant background material, or managing the process.

Table 4-1. *Primary contributors to the SEIS*

Name	Organization	SEIS Contribution	Education	Years of Relevant Experience
Archibald, Jeffrey	ICF International	Economics Modeling	M.S. Engineering M.B.A B.A. Physics	20
Cleary, Dennis	U.S. Forest Service, Rocky Mountain Regional Office	GIS Analysis and maps	M.S. Soil Science/Agronomy B.S. Watershed Science/Hydrology	25
Dare, Matt	U.S. Forest Service, Grand Mesa, Uncompahgre, and Gunnison National Forests	Threatened and Endangered Species	Ph.D. Zoology and Physiology M.S. Biology B.S. Biology	14
Gaugush, Sam	U.S. Forest Service, Washington Office	Process Management	J.D. Environmental and Natural Resources Law B.A. Sociology	8
Geschiere, Aaron	ICF International	Economics Modeling	B.S. Economics B.S Environmental Science	4
Hardy, Ellen	U.S. Forest Service, Rocky Mountain Regional Office	Writer/Editor	M.S. Park and Resource Management B.S. Geology	30
Janowsky, Bill	U.S. Forest Service, Rocky Mountain Regional Office	Threatened and Endangered Species	M.S. Fisheries Management B.S. Forest Biology	24
Johnson, Tyler	U.S. Forest Service, Rocky Mountain Regional Office	Threatened and Endangered Species	M.S. Forest Ecology B.S. Biology	10
Lo Porto, Tasha	U.S. Forest Service, Washington Office	Process Management	B.S. Conservation Education B.A. Political Science	8
Lujan, Lawrence	U.S. Forest Service, Rocky Mountain Regional Office	Public Affairs	Masters Public Admin B.A. Business Admin / Communications	15
Mattson, Liane	U.S. Forest Service, Washington Office	Coal Resource and Management	B.S. Geological Engineering	24

Name	*Organization*	*SEIS Contribution*	*Education*	*Years of Relevant Experience*
McBride, Alexandria	U.S. Forest Service, Enterprise T.E.A.M.S	Comment Analysis	A.D. Environmental Science B.S. Environment Science	2
McDonald, Peter	U.S. Forest Service, Rocky Mountain Regional Office	Threatened and Endangered Species	M.S. Biology B.S. Agriculture	25
Miller, Debra	U.S. Forest Service, Rocky Mountain Regional Office	Air Quality	M.S. Forest Sciences B.S. Aerospace Engineering	15
Mortenson, Niccole	U.S. Forest Service, Grand Mesa, Uncompahgre, and Gunnison National Forests	Process Management Comment Analysis	B.S. Natural Resource Conservation	23
Pooler, Jason	U.S. Forest Service, Rocky Mountain Regional Office	Process Management	M.S. Natural Resources B.S. Biology	4
Reed, Christina	BLM, Colorado State Office	Coal Resources and Management	J.D. Environmental and Natural Resources Law B.A. Political Science	6
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Westby, Molly	U.S. Forest Service, Rocky Mountain Regional Office	Cultural Resources	M.A. Anthropology	15

Other Contributors to the SEIS

The following people contributed to the SEIS by providing oversight, guidance, document reviews, or other information. They are Forest Service employees, except where otherwise noted.

Table 4-2. *Other SEIS contributors*

Name	Primary Contribution	Office
Abing, Tim	Leasable Minerals-Oil and Gas/Geothermal	Washington Office
Bedwell, Jim	Process Management	Rocky Mountain Regional Office
Carlson, Joan	Water	Rocky Mountain Regional Office
DeSenze, Phil	Public Affairs	Rocky Mountain Regional Office
Dressler, Don	Ski Areas	Rocky Mountain Regional Office
Dyer, Desty	Mineral Resource Consultation	Bureau of Land Management
Fracasso, Mike	Paleontological Resources	Washington Office
Free, Kyle	Mineral Resource Consultation	Bureau of Land Management
Hamilton, Cherie	Soils	Rocky Mountain Regional Office
Johnson, Tyler	Threatened, Endangered, and Sensitive Plants	Rocky Mountain Regional Office
Liu, Karen	Economic Review	EMC, Ecosystem Management Coordination
Ludwig, Scott	Abandoned Mines and Public Safety	Rocky Mountain Regional Office
Magwire, Craig	Process Management	Rocky Mountain Regional Office
McClure, Tom	Rangeland Management	Rocky Mountain Regional Office
Miller, Chris	Economic Analysis	Washington Office
Ng, Kawa	Economic Analysis	Rocky Mountain Regional Office
Pearce, Hal	Invasive Plants	Rocky Mountain Regional Office
Randall, Bob	Colorado Department of Natural Resources Consultation	Colorado Department of Natural Resources
Retzlaff, Mike	Economic Modeling	Economic Insights of Colorado, LLC
Ryon, Deb	Lands, Special use Areas	Rocky Mountain Regional Office
Sorkin, Jeff	Air Resources	Rocky Mountain Regional Office
Sporl, Chris	Scenic Quality, Dispersed/Developed Recreation	Rocky Mountain Regional Office
Stearly, Mike	U.S. Forest Service, Rocky Mountain Regional Office	Public Affairs
Strebig, Chris	U.S. Forest Service, Rocky Mountain Regional Office	Public Affairs
Swain, Ralph	Established and Recommended Wilderness/Wilderness Study Areas, Roadless Areas	Rocky Mountain Regional Office
Thompson, Bob	Saleable/Locatable Minerals	Washington Office
Truex, Rick	Terrestrial Species and Habitat	Rocky Mountain Regional Office

Name	Primary Contribution	Office
Underhill, Jeff	Forest Health, Timber Management	Rocky Mountain Regional Office
Verde, Ann Marie	Transportation-Roads	Rocky Mountain Regional Office
Walters, Carmel	Geological Resources	Washington Office
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Winter, Susan	Economic Modeling	WO - Ecosystem Management Coordination
Yankoviak, Brenda	Congressionally Designated Trails	Rocky Mountain Regional Office
Zornes, Jim	Process Management	Rocky Mountain Regional Office

Consultation

The following organizations and agencies assisted in this process, or were contacted for information in identifying issues and developing aspects of the SFEIS.

- **Colorado Department of Natural Resources:** The Colorado Department of Natural Resources worked closely with the Forest Service as a cooperating agency to develop the proposed rule revisions.
- **Colorado State Historic Preservation Office:** The Forest Service notified the Colorado State Historic Preservation office of the proposed rule and the agency determined that the proposed rule would have no potential to affect historic properties.
- **Office of Surface Mining Reclamation and Enforcement:** The Office of Surface Mining Reclamation and Enforcement worked closely with the Forest Service as a cooperating agency for their expertise in coal mining and permitting process.
- **U.S. Bureau of Land Management:** The BLM worked closely with the Forest Service as a cooperating agency for their expertise in coal resources and lease management.
- **U.S. Department of Energy, National Energy Technology Laboratory**: The Forest Service contacted the National Energy Technology Laboratory (NETL) for assistance in estimating greenhouse gas emissions associated with extraction and transportation of coal. The NETL provided guidance in the use of their Upstream Dashboard tool and in estimating lifecycle greenhouse gas emissions.
- **U.S. Fish and Wildlife Service:** In May of 2015 the Forest Service met with U.S. Fish and Wildlife Service Acting Colorado Field Supervisor to agree on a strategy for initiation of Section 7 consultations, as the Forest Service began the SEIS in response to the 2012 Court decision. Also in May of 2015, the Forest Service submitted a proposed species list for analysis in a supplemental Biological Assessment (Appendix B) for the SEIS.
- **U.S. Environmental Protection Agency:** The Forest Service contacted the EPA early on in the process to gain a better understanding of the issues involved with the SCC model and then again during the comment analysis phase. During the comment analysis phase the Forest Service consulted with the EPA regarding the methane capture and flaring mitigation measure. EPA submitted a comment letter to the Forest Service on the SDEIS; the letter is included for review in Appendix D.

Tribal Consultation

The United States has a unique relationship with Indian Tribes, as provided in the Constitution of the United States, treaties, and Federal statutes. This relationship extends to the Federal government and its management of public lands. The Forest Service strives to ensure that its consultation with Native American Tribes is meaningful, and in good faith. Information applying to the proposed Colorado Roadless Rule was mailed to the Ute, Ute Mountain Ute, and Southern Ute Indian Tribes during release of the Notice of Intent. An introductory letter with background information on the proposed Colorado Roadless Rule was sent to Tribes based on their current proximity to the action area, their current use of lands in the action area, and their historic use of lands within the action area with information; on how to access the Notice of Intent online, and an offer for additional information or consultation meetings. No responses from any of the Tribes were received.

With the publication of the Notice of Availability, additional letters and the SDEIS were provided to the three Tribes with an offer for additional information or presentations as needed. In addition, the Tribal attorneys for the Southern Ute Indian Tribes and the Ute Mountain Ute, the Federally Recognized Tribes in Colorado, were contacted and offered additional information, meetings, or other opportunities to discuss the rulemaking effort.

No specific requests from any tribes were made for additional information or meetings during the scoping or comment periods. No letters or issues from the tribes were received concerning the rulemaking.

National Historic Preservation Act Consultation

In accordance with the National Historic Preservation Act, the Forest Service put forth a finding of no potential to cause effects to historic properties in September 2011 to the Colorado State Historic Preservation Office for the Colorado Roadless Rule. The Forest Service informed the Colorado State Historic Preservation Office in May 2015 of the SEIS to consider reinstating the North Fork Coal Mining Area exception. Because the rule establishes broad policy and does not include site-specific undertakings, concerns of cultural resources findings remain the same, a finding of no potential to cause effects to historic properties. As is standard protocol with findings of no potential to cause effects, no response from the State Historic Preservation Office was received or expected.

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Appendix A 2005 GMUG Evaluation of Roadless Areas for Recommended Wilderness

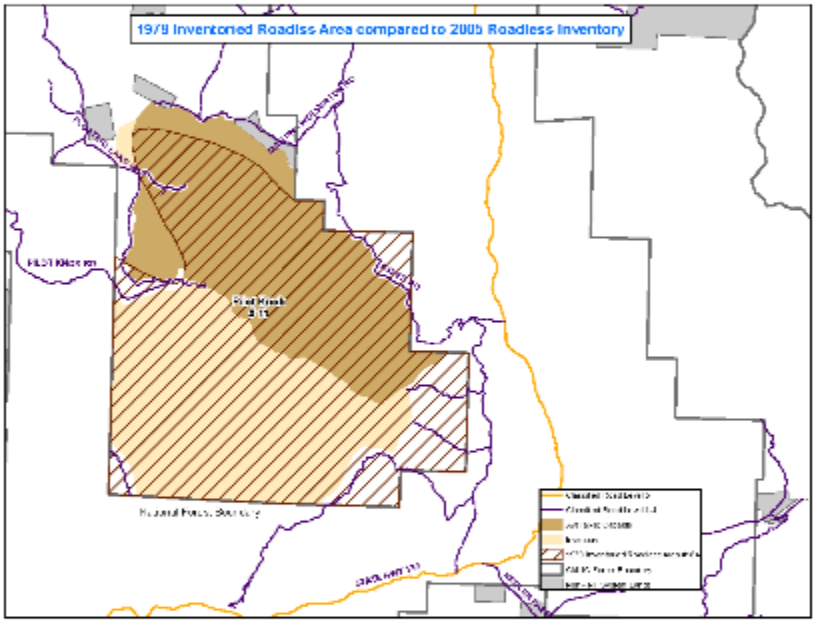
Pagination for this appendix follows that of the original documents.

Rare II # 184 Springhouse Park

RARE II History – This area was identified in 1979 as roadless area #184; 16,000 acres were identified as roadless yet not recommended for wilderness in the RARE FEIS. Lands altered by road construction and gas well development have been removed from the inventory. The remaining acreage is carried forward in the **2005 inventory as Pilot Knob #20411.**

Resource Activities which removed lands of RARE 184 from 2005 inventory:

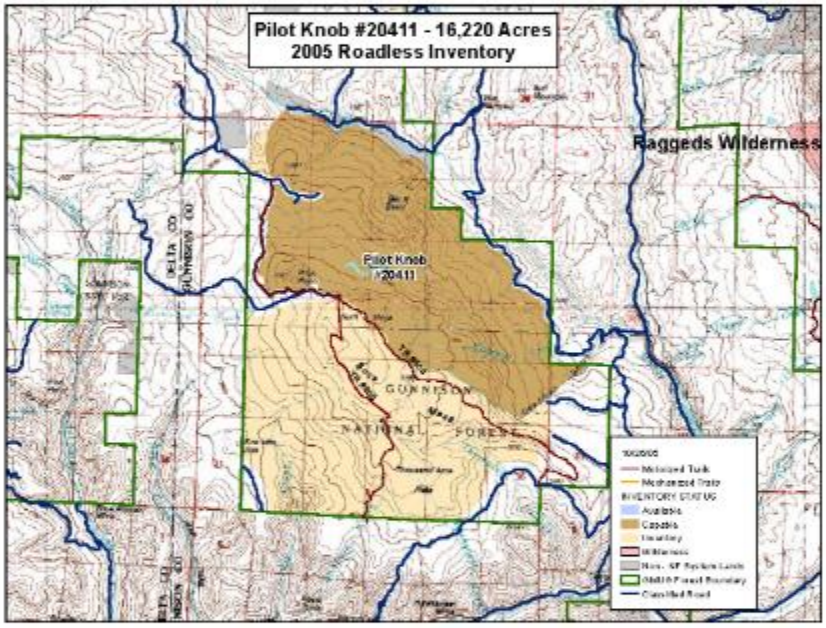
- Eight miles of road
- Two gas wells



2005 Inventory Descriptions:

Pilot Knob #20411 – 16,220 Acres – Delta County

General Description: The area is located approximately two miles north of Somerset. Springhouse Park is in the geographic center of the area. The west boundary is formed by the National Forest boundary and Springhouse Park Trail #704.4D. Private land is adjacent to the National Forest boundary. The east boundary is bordered by roads #783, Coal Gulch; and #849, Aspen. The northern boundary is bordered by private land inholdings and various roads. The southern boundary is along the National Forest boundary which is adjacent to BLM land.



Elevation Range – 6,700' – 9,800'

Eco-Section – M33IH – Northern-Central Highlands and Rocky Mountain

Vegetation – The Potential Natural Vegetation is predominately 16% spruce-fir-aspen, 57% aspen, 17% shrub, and 4% sagebrush.

Land Type –

52% 50IH – Montane climate zone; interbedded sandstone and shale geology.

24% 30IH – Lower Montane climate zone; interbedded sandstone and shale geology.

14% 60IH – Montane and Subalpine climate zone; interbedded sandstone and shale geology.

Resource Activities:

Current & Ongoing:

- The Condemit Park and Hotchkiss sheep allotments are within this unit.
- There are existing and pending oil and gas leases. The area has a high potential for oil and gas.
- The area south of Buck Mesa Trail #804, contains recoverable coal reserves. There are existing coal exploration licenses for the area.
- Forest Service radio site is located approximately one mile west of Springhouse Park.
- Motorized trails:
  #806 – Thousand Acre Flat
  #804 – Buck Mesa Trail

Wilderness Potential:

Capability:

Environment –

- Naturalness – Roads surround the area. Road #503.1 intrudes into the area. Motorized trails bisect the landscape. A solar powered Forest Service radio site is located within the area, approximately one mile west of Springhouse Park. The southern portion of the area has road scars from coal exploration and methane drainage gas wells. The area north of the Buck Mesa Trail (#804) retains a higher degree of naturalness than the southern portion.
- Solitude – The proximity to roads and motorized trails reduces opportunities for solitude and a sense of remoteness. The lands north of the Buck Mesa Trail possess greater opportunity for a sense of solitude and remoteness.

Challenge – The area north of Buck Mesa Trail offers a moderate degree of challenge. The mixed conifer vegetation type shields from sights and sounds of the roads and trails providing some opportunity for self-reliance. The area to the south of Buck Mesa Trail offers a low degree of challenge as it is an oak brush community with a low screening capacity from sights and sounds of existing travelways.

Manageability/Boundaries –

- Size/Shape – The area is of sufficient size and shape to manage its roadless character.
- Boundaries – Manageability of the southern boundary would be enhanced by using the Buck Mesa Trail.

Special Features/Activities – The area south of the Buck Mesa Trail contains recoverable coal reserves.

Evaluation: The northern portion of the unit, above the Buck Mesa Trail, meets the criteria for wilderness **capability** (approximately 8,160 acres). The southern portion does not because of low levels of naturalness and lack of opportunities for remoteness, solitude, and challenge.

Availability (of Capable Lands):

Recreation – The Buck Mesa motorized trail forms the southern boundary for the lands being evaluated for Availability.

Water – No known water facilities.

Timber – There are approximately 4,200 acres within the capable portion that are tentatively suitable for producing timber for wood fiber production. Another 3,300 acres of suitable timber land are within the inventory portion.

Minerals – The area has a high potential for oil and gas and has existing and pending oil/gas leases plus a coal exploration license.

Management Considerations – Current stipulations for oil and gas developments are Controlled Surface Use, Standard Lease Terms, and No Surface Occupancy.

Evaluation – This area is **not available** for wilderness consideration due to existing mineral activities.

Need:

Nearby Wilderness – approximate distance away:

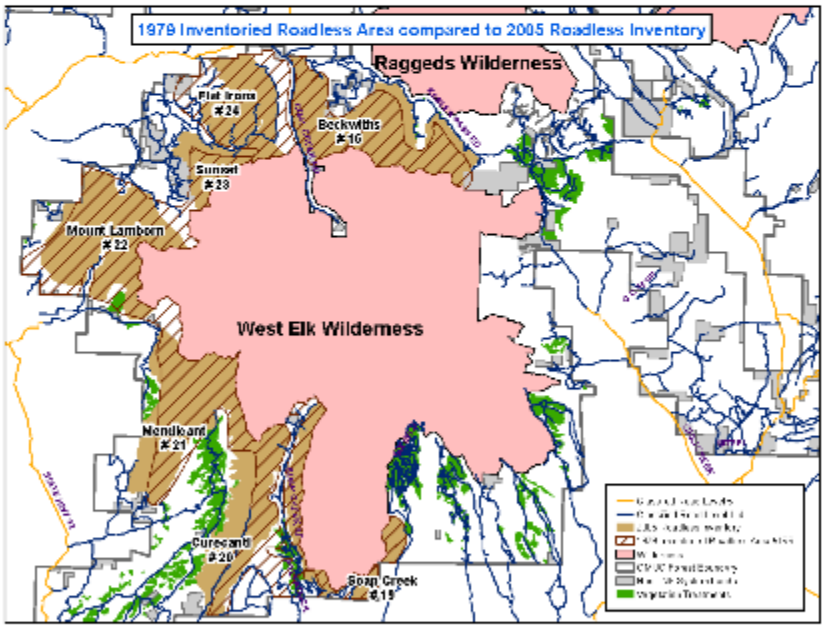
- Raggeds Wilderness – 5 miles
- Maroon Bells/Snowmass Wilderness – 15 miles
- West Elk Wilderness – 10 miles
- Black Canyon of Gunnison Wilderness – 30 miles
- Collegiate Peaks Wilderness – 40 miles
- Fossil Ridge Wilderness – 40 miles
- Flattops Wilderness – 60 miles

Rare II # 196 West Elk

RARE II History – This area was identified in 1979 as roadless area #196; 121,680 acres were recommended for Wilderness in RARE II and an additional 85,260 acres were identified as roadless yet not recommended. The 1980 Colorado Wilderness Act, Public Law 96-560, designated a portion of the area as part of the West Elk Wilderness. Lands altered by road construction and timber harvest along with non-National Forest System lands were removed from the inventory. The remaining acreage is carried forward in the **2005 inventory as Beckwiths #20416, Flatirons #20424, Sunset #20423, Mt Lamborn #20422, Mendicant #20421, Curecanti #20420 and Soap Creek #20419.**

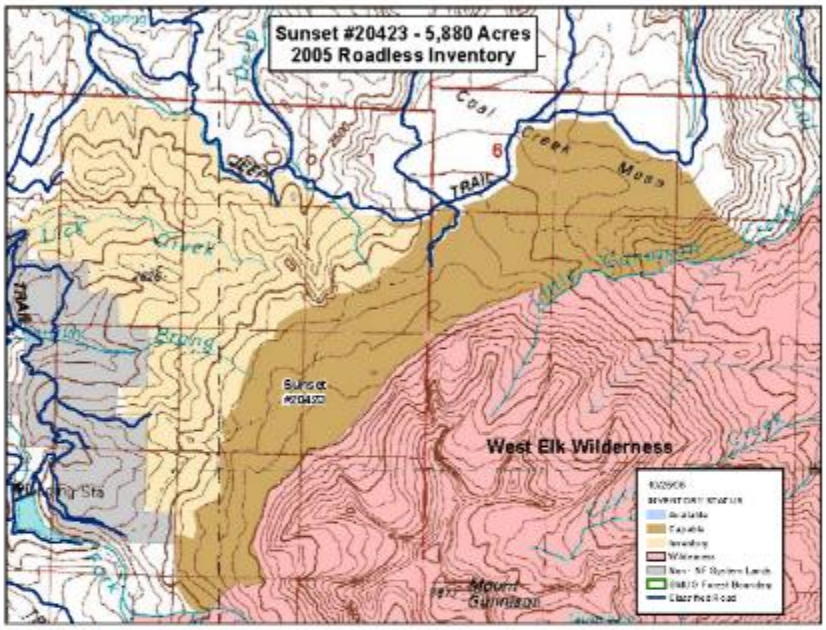
Resource Activities which contributed to non-roadless status of RARE 196:

- 51 miles of roads
- 515 acres of vegetation harvest treatments
- Coal leases
- Private land inholdings



Sunset #20423 – 5,880 Acres – Gunnison County

General Description: The Sunset unit is located approximately nine miles east of Paonia. The area is north and contiguous to the West Elk Wilderness and is bounded by private land in-holdings to the west and roads to the north. It is separated from the Flatirons Unit #20424 by Road #711, Dry Fork of Minnesota Creek Road.



Elevation Range – 6,300' – 12,000'

Eco-Section – M33IH – Northern-Central Highlands and Rocky Mountain

Vegetation – The Potential Natural Vegetation is predominately 6% Douglas-fir, 16% spruce-fir, 36% spruce-fir-aspen, 9% aspen, 18% shrub, and 7% bare ground.

Land Type –

52% 50IH – Montane climate zone; interbedded sandstone and shale geology.

24% 30IH – Lower Montane climate zone; interbedded sandstone and shale geology.

14% 60IH – Montane and Subalpine climate zone; interbedded sandstone and shale geology.

Resource Activities:

Current & Ongoing:

- The Dry Fork cattle allotment is within this unit and is currently vacant.
- Although the area was outside the area of analysis and not made available for oil and gas lease, there area currently has oil and gas leases pending.
- Application for coal exploration license.

Wilderness Potential:

Capability:

Environment –

- Naturalness – The lands directly adjacent to the Wilderness boundary offer a high degree of naturalness
- Solitude – Opportunities for remoteness and solitude are present in the vicinity of the wilderness boundary.

Challenge – The area offers a moderate-high degree of challenge. The terrain is rugged; however, proximity to trails and roads diminishes opportunities of self-reliance and adventure.

Manageability/Boundaries –

- Size/Shape – The area is small, yet adjoins the West Elk Wilderness.
- Boundaries – The boundary would be more difficult to identify and manage than the existing boundary. The existing boundary follows the slope of the mountain and is highly defensible. Moving the boundary would not improve management of the wilderness.

Special Features/Activities – The Deep Creek Slide area exhibits a striking geologic feature.

Evaluation: The portion of the unit immediately adjacent to the wilderness retains the roadless qualities that make it **capable** of wilderness.

Availability (of Capable Lands):

Recreation – The area is heavily used during hunting season.

Water – No known water facilities.

Timber – There are approximately 1,500 acres within the capable portion that are tentatively suitable for producing timber for wood fiber production. Another 100 acres of suitable timber land are within the inventory portion.

Minerals – Under the 2004 RFD, the area was identified as high potential for oil and gas. There is currently an application for coal exploration license.

Management Considerations – Boundary management would not be improved; the existing boundary is highly defensible.

Evaluation – The capable lands are **not available** for wilderness due to mineral values. Additionally, boundary management of the area would be difficult.

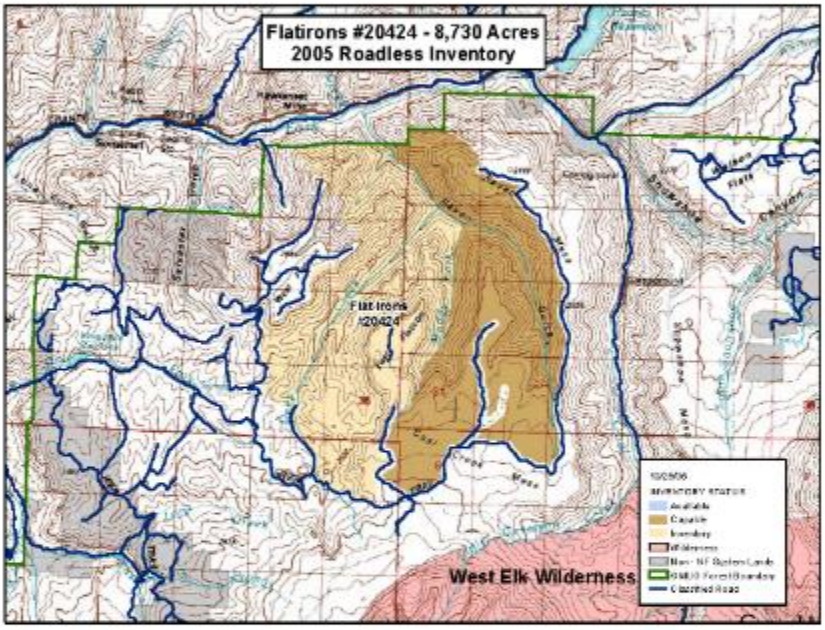
Need:

Nearby Wilderness – approximate distance away:

- West Elk Wilderness –1 mile
- Raggeds Wilderness – 10 miles
- Maroon Bells/Snowmass Wilderness – 20 miles
- Black Canyon of Gunnison Wilderness – 30 miles
- Collegiate Peaks Wilderness – 40 miles
- Fossil Ridge Wilderness – 40 miles
- Uncompahgre Wilderness – 45 miles
- Powderhorn Wilderness – 50 miles
- Holy Cross Wilderness – 55 miles

Flatirons #20424 – 8,730 Acres – Gunnison County

General Description: This area is located approximately nine miles east of Paonia, and north of, although not contiguous to, the West Elk Wilderness. The National Forest boundary is to the north which is checker-boarded ownership pattern of BLM and private lands. Road #711, Dry Fork of Minnesota Creek, borders the area to the east. The area between Road #711 and Road #709 was too narrow to be considered as part of the inventory.



Elevation Range – 6,300' – 12,000'

Eco-Section – M33IH – Northern-Central Highlands and Rocky Mountain

Vegetation – The Potential Natural Vegetation is predominately 6% Douglas-fir, 16% spruce-fir, 36% spruce-fir-aspen, 9% aspen, 18% shrub, and 7% bare ground.

Land Type –

52% 50IH – Montane climate zone; interbedded sandstone and shale geology.

24% 30IH – Lower Montane climate zone; interbedded sandstone and shale geology.

14% 60IH – Montane and Subalpine climate zone; interbedded sandstone and shale geology.

Resource Activities:

Current & Ongoing:

- The Dry Fork cattle allotment is within this unit and is currently vacant.
- The area currently has oil and gas leases pending and existing coal leases. The area is predominately covered by Controlled Surface Use stipulation for oil and gas.
- There is one water facility adjacent to the southern boundary of the unit.

Wilderness Potential:

Capability:

Environment –

- Naturalness – The area is bounded by roads. The western portion of the area shows evidence of multiple temporary roads previously used for mineral exploration and development. The eastern portion retains its naturalness once away from Roads #711 and #711.3C.
- Solitude – Opportunities for remoteness and solitude are limited due to the motorized access into the area. The influence of State Hwy 133 can be seen and heard from within portions of the area.

Challenge – The area provides a moderate degree of challenge. The steep terrain provides opportunities for self-reliance, however, the close proximity to roads and sights and sounds of development detract from a sense of adventure.

Manageability/Boundaries –

- Size/Shape – The area is approximately 7,500 acres.
- Boundaries – The western boundary runs along a series of roads. Portions of this boundary would be difficult to identify and manage on the ground.

Special Features/Activities – None identified.

Evaluation: The portion of the area that retains a high degree of naturalness is located between the Muddy Fork Creek and Road #711, Dry Fork of Minnesota Creek Road. **The segment that meets criteria for capability is less than 5,000 acres.** The area west of Muddy Fork has been altered by temporary road construction; even though the roads have been closed, the remnants of those roads are of such a density that the area does not retain its naturalness nor a sense of remoteness.

Availability (of Capable Lands):

Recreation – The area is heavily used during the hunting season.

Water – There are no water facilities within the roadless unit, however, one facility is adjacent to the southern boundary.

Timber – There are approximately 1,200 acres within the capable portion that are suitable for producing timber for wood fiber production. Another 300 acres of suitable timber land are within the inventory portion.

Minerals – The area has a high potential for oil and gas and has existing and pending leases. The area has recoverable coal reserves.

Management Considerations – Boundary management of this area would be difficult. Oil and gas stipulations for this area is Controlled Surface Use.

Evaluation – The area mapped as capable is less than the 5,000 acre minimum for wilderness, therefore ,this area is **not available** for wilderness.

Need:

Nearby Wilderness – approximate distance away:

- West Elk Wilderness – 1 mile
- Raggeds Wilderness – 10 miles
- Maroon Bells/Snowmass Wilderness – 20 miles
- Black Canyon of Gunnison Wilderness – 30 miles
- Collegiate Peaks Wilderness – 40 miles
- Fossil Ridge Wilderness – 40 miles
- Uncompahgre Wilderness – 45 miles
- Powderhorn Wilderness – 50 miles
- Holy Cross Wilderness – 55 miles

Appendix B **Biological Assessment and Biological Opinion**

Page B-2 Supplemental Biological Assessment, March 29, 2016
Note: Attachments 1, 2, and 3 are contained in the project record

Page B-63 Addendum to the Forest Service's March 29, 2016, Supplemental Biological Assessment for the Colorado Roadless Rule, Supplemental Environmental Impact Statement, Proposed Action

Page B-69 Biological Opinion, May 19, 2016

United States Department of Agriculture

Forest Service

Rulemaking for Colorado Roadless Areas

Supplemental Biological Assessment

March 2016

For The Following National Forests in Colorado:
Arapaho-Roosevelt National Forests;
Grand Mesa, Uncompahgre, and Gunnison National Forests;
Manti-La Sal National Forest (the portion in Colorado);
Pike-San Isabel National Forests;
Rio Grande National Forest;
Routt National Forest;
San Juan National Forest; and
White River National Forest.

Preparers

Peter McDonald _____ Date: 3/29/16
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Assistant Regional Fisheries Program Leader

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Regional Botanist

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I. Introduction

Section 7(a)(1) of the Endangered Species Act (ESA) requires federal agencies to use their authorities to further the conservation and recovery of listed species. Section 7(a)(2) requires that federal agencies ensure any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of federally-listed species, or destroy or adversely modify designated critical habitat. This biological assessment serves as the basis for the Forest Service's request to the U.S. Fish and Wildlife Service for reinitiation of the section 7 consultation on the 2012 Colorado Roadless Rule (Rule), where new effects may be projected to species and critical habitats protected under the Endangered Species Act.

The current federal action is a proposed restoration of the North Fork Coal Mining Area (NFCMA) temporary road exception to the Rule, an exception that was evaluated and considered fully in the 2012 interagency consultation on the Rule against the then-baseline 2001 Roadless Area Conservation Rule. The scope of the current evaluation includes consideration of new information, and reconsideration of information from the earlier analyses, related to the Endangered Species Act, the overall Rule and roadless network, and specifically the North Fork Coal Mining Area.

Substantial new information has emerged since the 2012 Rule in the form of new species listings and critical habitat designations under the ESA that need to be evaluated. The current proposal for the NFCMA which is very clearly and directly related to the 2012 Rule also provided an opportunity to reconsider internally and based on early feedback from the U.S. Fish and Wildlife Service, the earlier effect determinations for some of the species evaluated by the Forest Service for the 2012 Rule. As a general rule, we do not expect routine or broad changes to those 2012 determinations in the absence of substantial new information since then that would alter our 2012 conclusions. We request affirmation of this conclusion from the U.S. Fish and Wildlife Service. There are a few exceptions to this conclusion that are addressed further later in this assessment. For some species evaluated for the 2012 Rule and others the subject of ESA actions since 2012, we evaluate which ones may need to be included in the request for reinitiation of consultation in the event that the new information (listings and critical habitat designations), or new reconsideration of previous information, suggests effects that are now different, not previously considered, or are new and could not be previously disclosed.

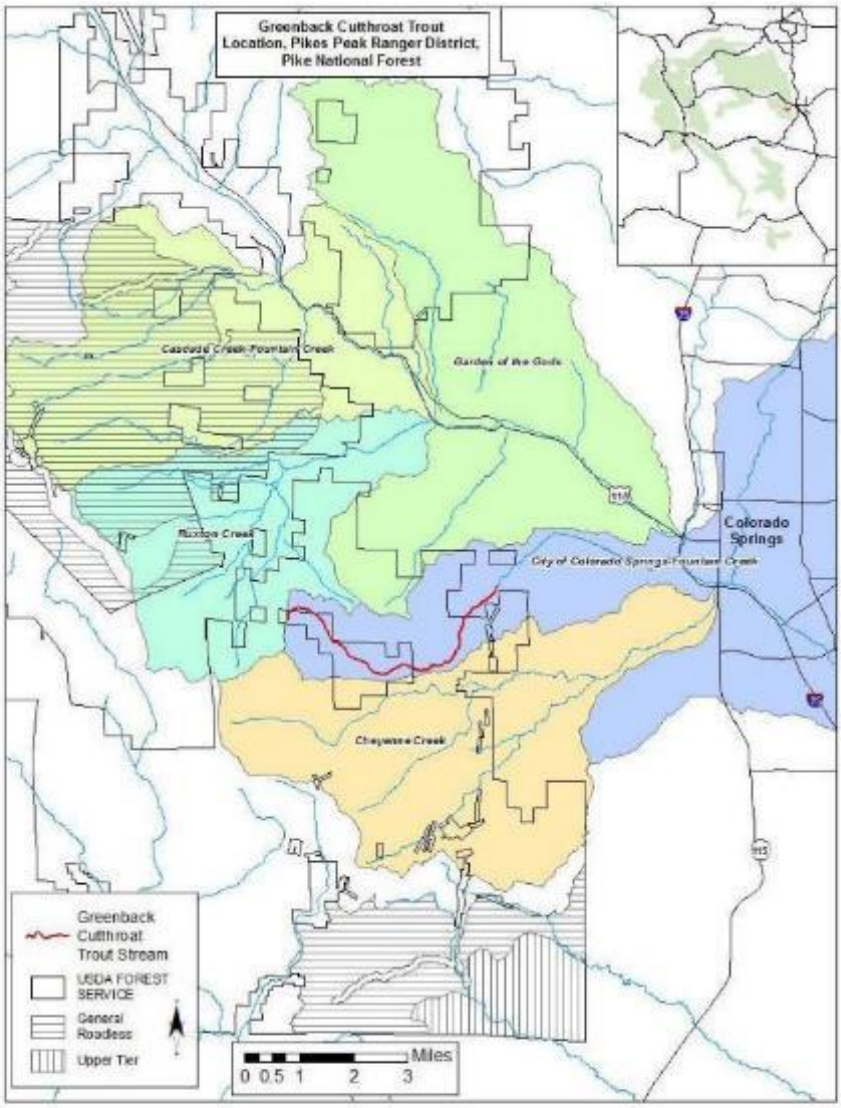
There is also new information concerning cutthroat trout genetics in the southern Rockies that redefines the evolutionary relationships among native cutthroat trout species recognized in Colorado (Metcalf et al. 2012). The best available science now suggests that the species called greenback cutthroat trout is native only to the South Platte River drainage, in eastern Colorado. The only remaining native population of

this federally threatened species is located in a stream near Bear Creek in the Arkansas River drainage. Greenback cutthroat trout were also recently transplanted from Bear Creek stock into Zimmerman Lake in the Poudre River drainage by the state of Colorado in cooperation with the U.S. Fish and Wildlife Service and Forest Service. Given the new understanding of the narrow occurrence of greenback cutthroat trout and lack of overlap or association with roadless areas (Figure 1), we change our 2012 determination of *"may affect, not likely to adversely affect"* to *"no effect"* for the greenback cutthroat trout.

Metcalf et al. (2012) used the term "green-lineage" to identify one variety of cutthroat trout native to the Western Slope of Colorado, which is a substantial change from the naming convention for native cutthroat trout in that part of the state. Their recent research revealed that the green lineage is a newly identified variety of cutthroat trout previously considered Colorado River cutthroat trout. Until the U.S. Fish and Wildlife Service, which has adopted the naming conventions proffered by Metcalf et al. (2012), completes a status review for green lineage cutthroat trout, they have concluded that ESA protections extend to the green lineage of cutthroat trout in addition to the greenback cutthroat trout. We evaluate the new information on the green lineage cutthroat trout in the vicinity of North Fork Coal Mining Area under that ESA status, and also consider potential for effects from implementation of the larger rulemaking.

This report supplements the Forest Service's February 27, 2012, revised biological assessment prepared for the consultation with the U.S. Fish and Wildlife Service on the Colorado Roadless Rule (Attachment 1).

Figure 1. Bear Creek location of greenback cutthroat trout in relation to Colorado roadless areas.



II. Background

2012 Colorado Roadless Rule

In January 2001, the Roadless Area Conservation Rule (2001 Roadless Rule) was adopted into regulations at Title 36 of the Code of Federal Regulations Part 294 (36 CFR 294), Subpart B (66 FR 3244). Nationally, the 2001 Roadless Rule identified about 49.2 million acres of National Forest System (NFS) lands (about 30%) as Inventoried Roadless Areas (IRAs). The stated intention of the 2001 Roadless Rule was to provide "lasting protection for IRAs within the context of multiple-use management" (Fed. Reg. Vol. 66, No.9, pp. 3243-3273). The 2001 Roadless Rule prohibits road construction and reconstruction and timber cutting, sale, or removal in IRAs, with certain exceptions.

The U.S. Forest Service administers approximately 14,518,000 acres of public lands in Colorado, designated within eight National Forests and National Grasslands. There were about 4.2 million acres of IRAs (about 30% of total acres) on national forests within the State.

The 2001 Roadless Rule had been through extensive litigation. In response to a Court ruling, the State Petitions Rule was promulgated in May 2005, wherein Governors had until November 13, 2006 to petition the Secretary of Agriculture to propose state-specific direction for managing roadless areas within their state. Ongoing uncertainty about the future of the 2001 Roadless Rule was a key factor that influenced Colorado Governor Bill Owens to initiate a state-specific petition to manage "Colorado Roadless Areas" (CRAs) in 2005. The Colorado State Legislature passed Senate Bill 05-243 (C.R.S. 36-7-302) to form a 13-person, bipartisan task force to recommend management direction for CRAs. This task force was informed by a comprehensive public participation process that included nine public meetings throughout Colorado. The task force received more than 40,000 comments regarding development of a formal petition to the Secretary of Agriculture for a state-specific roadless rule.

On September 20, 2006, the United States District Court for the Northern District of California set aside the 2005 State Petition Rule and reinstated the 2001 Roadless Rule. However, the Forest Service determined that new regulations based on state petitions could be developed under the Administrative Procedures Act. In November 2006, Colorado Governor Bill Owens used the task force's recommendations as the basis for petitioning the Secretary of Agriculture to undertake state-specific roadless rulemaking for Colorado. After Governor Bill Owens submitted the State's petition to the Department, Bill Ritter, Jr. was elected Governor of Colorado. In April 2007, Governor Ritter resubmitted the petition with minor modifications. The State's petition requested several things:

- Roadless area boundaries be updated to include additional areas that are roadless;
- Congressionally designated lands and private lands be excluded from the inventory; and
- Acres of IRAs that have been substantially altered be excluded.

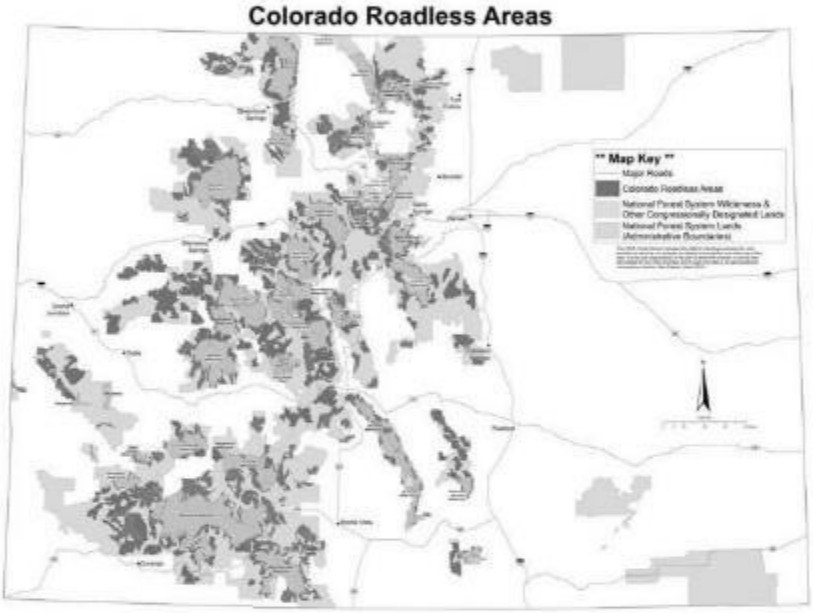
Compared to the IRAs, the CRAs corrected some mapping errors, excluded areas that have been Congressionally-designated as Wilderness or special protection areas, excluded substantially altered areas (459,100 acres) and areas allocated for ski area development (8,300 acres), and added about 409,500 acres of un-roaded NFS lands that were not included in the inventory of IRAs.

In June 2007, the State and the Forest Service presented a petition to the Department's Roadless Area Conservation National Advisory Committee. The Secretary of Agriculture accepted the State's petition in August 2007, and directed the Forest Service to work in cooperation with the State of Colorado to initiate rulemaking. The Forest Service published a proposed rule and Draft Environmental Impact Statement to establish direction for conserving CRAs on national forests in Colorado on July 25, 2008 (73 FR 43544).

Based on the public comments on the DEIS, the State and the Forest Service revised the petition and held another comment period from August 3 to October 3, 2009, receiving approximately 22,000 comments. The resulting petition of April 6, 2010 was submitted to the Secretary of Agriculture. The revised proposed Colorado Roadless Rule and a Revised DEIS were published on April 15, 2011. About 56,000 comments were received on the Revised DEIS. All of the comments received were considered in the development of the Final EIS and rulemaking.

In July 2012, the U.S. Department of Agriculture promulgated the final Colorado Roadless Rule, a state-specific regulation for management of Colorado CRAs on National Forest System lands in the state. This Rule addressed State-specific concerns while conserving roadless area characteristics. It applies to about 4.19 million acres of National Forest System lands in Colorado, distributed among 363 separate CRAs (Figure 2). There are no CRAs within the two national grasslands in Colorado: Pawnee and Comanche. The Forest Service web page for the Colorado Roadless Rule provides more extensive background information including the supporting documents from the 2012 Environmental Impact Statement and rulemaking and development of a supplemental EIS (www.fs.usda.gov/roadmain/roadless/coloradoroadlessrules).

Figure 2. Roadless Areas in Colorado under the 2012 Colorado Roadless Rule.



In September 2014, the District Court of Colorado found against the Forest Service on a challenge to the Rule, based on analysis deficiencies under the National Environmental Policy Act for the North Fork Coal Mining Area on the Grand Mesa, Uncompahgre, and Gunnison National Forests that was established by the 2012 rulemaking. On April 7, 2015, the Forest Service on behalf of the USDA, initiated a supplemental environmental impact statement (SEIS) to correct the deficiencies identified by the court and to evaluate reinstatement of the mining exception into the Rule in light of the new analyses. The goal is to have a new final Rule published in 2016. Until then, the current Rule remains in effect but without the road exception for the region of the North Fork Coal Mining Area.

Characteristics and Management of CRAs

Colorado CRAs range in elevation from approximately 7,000 to 14,000 feet above sea level. Compositionally, the predominant vegetation cover types are spruce-fir, aspen, lodgepole pine, and Douglas-fir, with smaller amounts of ponderosa pine, pinyon-juniper woodlands and oak brush at lower elevations. Habitat structural stages ranging from grass/forb and shrub/sapling through late successional forest are represented. Mature and old forest conditions are currently predominant in spruce-fir forests. Extensive stands of mature lodgepole pine are now dead due to a recent mountain pine beetle epidemic and are converting to an early successional stage.

The final 2012 Colorado Roadless Rule applies to approximately 4.2 million acres. Within those acres, the final rule was applied to 409,500 acres that were not covered in the 2001 Roadless Rule. Further, it did not establish roadless management direction for 459,100 acres of lands that were associated with the 2001 Roadless Rule and determined to now be substantially altered. It also did not include 8,300 acres for ski area management.

Overall, the final rulemaking for roadless areas in Colorado provided a higher level of conservation value for the designated CRA lands than management direction under either the forest plans or the 2001 Roadless Rule. Of the 4.2 million acres of CRAs, the final rule designated 1,219,200 acres of those as "upper tier," which are acres where exceptions to road construction and tree cutting are more restrictive and limiting than the 2001 Roadless Rule. Upper tier designations were designed to offset the limited exceptions for Colorado-specific concerns, so that overall the final 2012 rulemaking on balance was more protective than the 2001 Roadless Rule. The use of Linear Construction Zones (LCZ) is restricted under the final rule, unlike the 2001 Roadless Rule. The LCZ provisions of the final Colorado rule are designed to encourage placement of linear facilities outside of roadless areas to conserve the large tracts of undisturbed lands that roadless areas provide. The final rule also encouraged collocating facilities if they must be constructed within a CRA. Collocating facilities within CRAs would minimize overall impacts by concentrating infrastructure and

associated human activities in previously disturbed areas. Although it is difficult to directly compare the level of protection afforded by the final rule and the 2001 Roadless Rule, the final rule clearly offered a higher level of conservation of roadless area characteristics within the upper tier acres. In addition, the 2001 Roadless Rule allowed management activities to occur on more acres of roadless areas than the final Colorado rule did due to the upper tier designation in the latter.

Road construction, tree cutting, oil and gas development, and Linear Construction Zone development can occur at a low level and intensity within "non-upper tier" acres. Where or when activities allowable under exceptions may occur is largely unforeseeable, but expected to be at a low frequency and amplitude when considering the entire roadless network. All future proposed management activities remain subject to project- and site-specific NEPA evaluations, forest plan consistency reviews, and section 7 consultation with the U.S. Fish and Wildlife if effects to species or critical habitat are projected by the Forest Service. Activities such as the use of prescribed fire, motorized use of trails, and livestock grazing can continue unchanged under the Rule. More detailed discussion of the roadless area tiered management exceptions is provided in the 2012 Biological Assessment (Attachment 1).

III. Proposed Federal Action: Colorado Roadless Rule with North Fork Coal Mining Area Temporary Road Exception

The proposed action is to reinstate the North Fork Coal Mining Area temporary road exception as written in 36 CFR 294.43(c)(1)(ix). Specifically, the following clause would be reinstated to the 2012 Colorado Roadless Rule:

> *A temporary road is needed for coal exploration and/or coal-related surface activities for certain lands within Colorado Roadless Areas in the North Fork coal mining area of the Grand Mesa, Uncompahgre, and Gunnison National Forests as defined by the North Fork coal mining area displayed on the final Colorado Roadless Areas map. Such roads may also be used for collecting and transporting coal mine methane. Any buried infrastructure, including pipelines, needed for the capture, collection, and use of coal mine methane, will be located within the rights-of-way of temporary roads that are otherwise necessary for coal-related surface activities including the installation and operation of methane venting wells.*

The proposed action would apply to an area similar to the North Fork Coal Mining Area described in the 2012 Final Environmental Impact Statement (FEIS) for the Rule. The only difference would be changes from an administrative correction to the North Fork Coal Mining Area boundary as described below.

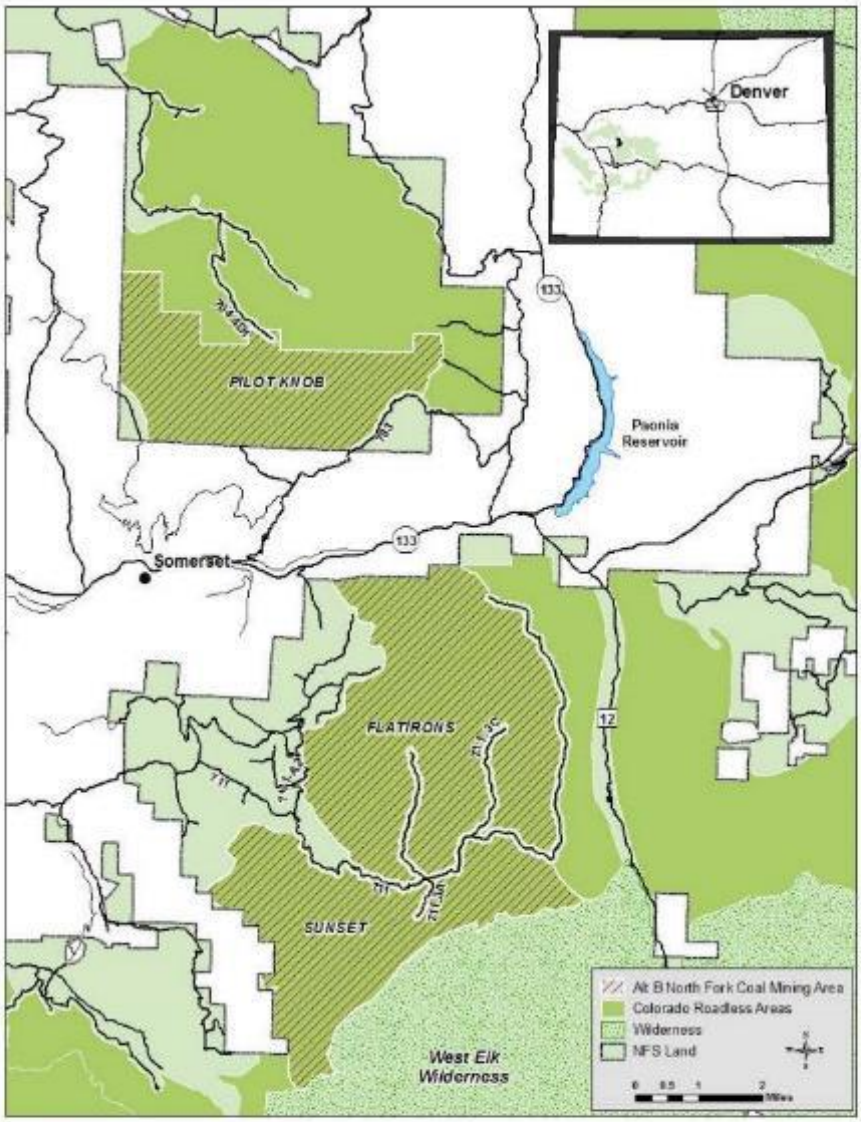
North Fork Coal Mining Area Boundary Correction

The proposed action includes administratively correcting the North Fork Coal Mining Area boundary and associated CRA boundaries to resolve three errors that occurred during the development of the 2012 FEIS (Figure 3). These errors included:

Changes to CRAs between the Draft Environmental Impact Statement (DEIS) and Revised Draft Environmental Impact Statement (RDEIS) – specifically the CRA boundaries were updated but the corresponding match between the CRA boundary and North Fork Coal Mining Area boundary was not made, resulting in numerous "slivers" along the boundary.

Due to an error while calculating acres made during the preparation of the 2012 FEIS, an area of about 470 acres was removed from the North Fork Coal Mining Area twice. With this error the final North Fork Coal Mining Area acreage was reported as the 19,100 acres in the FEIS but should have correctly been reported as 19,500 acres. The

Figure 3. The North Fork Coal Mining Area proposed to be restored to the 2012 Colorado Roadless Rule under Alternative B, the Forest Service's proposed action.



correction of this error does not physically change the North Fork Coal Mining Area, but increases the reported total acres.

A more accurate inventory of roads existing prior to 2012 in the North Fork Coal Mining Area made through global positioning system (GPS) technology which allows for more accurate boundary location of CRAs and the North Fork Coal Mining Area. The boundaries of the CRAs would be adjusted to match the actual location of roads on the ground.

The proposed administrative corrections to CRAs are:

- Add 65 acres based on the more accurate inventory of roads,
- Subtract 35 acres based on the more accurate inventory of roads.

The proposed administrative corrections to the North Fork Coal Mining Area are:

- Add 409 acres to align the North Fork Coal Mining Area with CRA boundaries,
- Subtract 254 acres to align the North Fork Coal Mining Area with CRA boundaries.
- Threatened and Endangered Species and Critical Habitats Considered in this Supplemental Evaluation

This supplemental biological assessment includes a consideration of the conclusions of effect for federally-listed and proposed species and critical habitats evaluated previously for the 2012 Rule to ensure those conclusions still hold today. Currently there are no species proposed for listing under the ESA that affect the national forests, roadless area network, or NFCMA in Colorado. Critical habitat has been proposed for the western yellow-billed cuckoo, but none of those proposed units overlap National Forest System lands in Colorado. Table 1 provides a summary of the determinations of effect for the species and critical habitats analyzed in 2012. The U.S. Fish and Wildlife Service concurred on all of the Forest Service "may affect, not likely to adversely affect" determinations, and the consultation remained informal throughout (March 28, 2012, letter of concurrence to Regional Forester; Attachment 2).

Additionally, species that were the subject of ESA listing or critical habitat decisions since the 2012 Rule are presented in Table 2. With one exception, these species were designated Regional Forester sensitive species at the time of the 2012 Rule and were included in the biological evaluations at that time. The lone exception is the New Mexico meadow jumping mouse that was listed as Endangered in 2014 and critical habitat was proposed for it in 2015. None was proposed for any National Forest System lands in Colorado. On March 16, 2016, the USFWS designated final critical habitat for the jumping mouse. Suitable habitat for the mouse may occur on one or more of the southern forests in the Rocky Mountain Region, but individuals or populations of the mouse have not been confirmed to-date in the Region despite past

Table 1. Summary of earlier Forest Service effect determinations and rationales for listed species and critical habitat under the 2012 Colorado Roadless Rule.

Species	Determination	Summary of rationale
whooping crane, piping plover, least tern, humpback chub, bonytail chub, Colorado pikeminnow, razorback sucker, pallid sturgeon, Osterhout milkvetch (*Astragalus osterhoutii*), Penland beardtongue (*Penstemon penlandii*), North Park phacelia (*Phacelia formosula*), Colorado butterfly plant (*Oenothera coloradensis* ssp. *coloradensis* / *Gaura neomexicana* ssp. *coloradensis*), Ute ladies'-tresses orchid (*Spiranthes diluvialis*), and Pagosa skyrocket (*Ipomopsis polyantha*)	No effect	Not known or likely to occur in CRAs, no suitable habitat exists within CRAs, nor will management of CRAs affect them or their habitat
Grizzly bear, gray wolf, black-footed ferret	No effect	Extirpated from NFS lands in the state of Colorado
Southwestern willow flycatcher, Mexican spotted owl, Pawnee montane skipper, Uncompahgre fritillary butterfly, Canada lynx, Preble's meadow jumping mouse, and greenback cutthroat trout	Not likely to adversely affect	Overall high level of protection within CRAs; exceptions for road construction, oil and gas development, coal mining, and tree cutting could have local short term impacts but project design is likely to minimize the effects

Species	Determination	Summary of rationale
Critical habitat for the Mexican spotted owl and Preble's meadow jumping mouse	Not likely to adversely modify[1]	Overall high level of protection within CRAs; limited development could have local short term impacts but project design is likely to minimize the effects
Penland alpine fen mustard (*Eutrema penlandii*), Colorado hookless cactus (*Sclerocactus glaucus*), and DeBeque phacelia (*Phacelia submutica*)	Not likely to adversely affect	No new roads, tree cutting, or oil, gas or coal developments are likely, but there may be a risk of indirect effects, especially from activities that may facilitate the spread of invasive plants.
Proposed critical habitat for DeBeque phacelia (*Phacelia submutica*)	Not likely to adversely modify	No new developments are likely, but there may be a risk of indirect effects, especially from activities that may facilitate the spread of invasive plants.

[1]This determination language was likely improperly used by the Forest Service in 2012. This determination is usually the purview of the U.S. Fish and Wildlife Service when an action agency like the Forest Service concludes critical habitat may be affected in some way by a project. An exception is when critical habitat has been proposed but not yet finalized. This was not the case for the Mexican spotted owl and Preble's meadow jumping mouse that did have designated final critical habitat in 2012. The correct determination by the Forest Service more likely should have been "Not likely to adversely affect." This has little bearing on the actual effect to these critical habitats and the error is simply acknowledged here to avoid further confusion.

Table 2. Species listing and critical habitat decisions under the Endangered Species Act affecting or potentially affecting National Forests in Colorado since the 2012 Colorado Roadless Rule.

Species	ESA Listing Action Since the 2012 CRR	2012 Status	2012 USFS Determination*	2012 Rationale
DeBeque phacelia	Final Critical Habitat 8/3/2012	ESA Threatened with Proposed Critical Habitat	MA, NLAM	Not known to occur in CRAs but might be affected by invasive spread from CRA mgmt
Pagosa skyrocket	Final Critical Habitat 8/3/2012	ESA Endangered with Proposed Critical Habitat	NE	Not known or likely to occur in CRAs, or to be affected by their management
Gunnison sage-grouse	Threatened 11/20/2014 Final Critical Habitat 11/20/2014	Regional Forester Sensitive	MII	Rule including exceptions may have some beneficial and minor adverse impacts

Species	ESA Listing Action Since the 2012 CRR	2012 Status	2012 USFS Determination*	2012 Rationale
Yellow-billed cuckoo (western DPS)	Threatened 10/3/2014 Proposed Critical Habitat 8/15/2014	Regional Forester Sensitive	NI	Habitat not expected to occur in CRAs
Lesser prairie chicken	Threatened 4/10/2014[1]	Regional Forester Sensitive	NI	Habitat not expected to occur in CRAs
NM meadow jumping mouse	Endangered 6/10/2014 Final Critical Habitat 2/27/2015	Regional Forester Sensitive	NI	Habitat not expected to occur in CRAs
Southwestern willow flycatcher	Final Revised Critical Habitat 1/2/2013	ESA Endangered	MA, NLAA (species); Proposed Critical Habitat was not evaluated	No CH proposed or designated on NFS lands in Colorado
Green lineage cutthroat trout	ESA protections[2]	None	None	n/a

Species	ESA Listing Action Since the 2012 CRR	2012 Status	2012 USFS Determination*	2012 Rationale
Greater sage-grouse	Not warranted 9/22/15	Regional Forester Sensitive	MII	Rule including exceptions may have some beneficial and minor negative impacts

*For species with ESA status at the time of the 2012 Rule, the FS determinations of effect are NE = *No Effect* (species or critical habitat), or MA, NLAM – *"May Affect, Not Likely to Adversely Modify"* (proposed critical habitat), MA, NLAA = *"May Affect, Not Likely to Adversely Affect"* (species or final critical habitat). For species with Regional Forester sensitive status in 2012, the roughly equivalent FS determinations are NI = *No Impact*, or MAII – *"May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing."*

[1]The federal threatened status for the lesser prairie-chicken was vacated by a Texas district court decision in late 2015. The U.S. Fish and Wildlife Service is currently evaluating the situation. The prairie-chicken reverted back to Regional Forester sensitive species status in the Rocky Mountain Region with this court decision and remains in that status for the time being.

[2]The "green lineage" cutthroat trout was first described by Metcalf et al. in 2012 and not in time to be included in the effects analyses and section 7 consultation for the 2012 Colorado Roadless Rule. Given its close genetic relationship to the federally listed greenback cutthroat trout, as a precautionary step the U.S. Fish and Wildlife Service has extended ESA protections to the green lineage fish until they can complete a full status review of it.

dedicated surveys for the mouse on the Rio Grande and San Juan National Forests (Frey 2011, Schorr 2015).

Most of the *"no effect"* determinations and rationales in Table 1 continue to apply today. Some exceptions are explained in more detail below. No substantial new information about most of these species, their management or occurrence related to CRAs, has emerged that we are aware of since 2012 that would invalidate our earlier conclusions. The earlier analyses and determinations also did not single out the North Fork Coal Mining Area and temporary road exception as playing a disproportionate role in any of the effect determinations in 2012. Consequently, restoration of that exception in itself should not affect our earlier determinations of *"no effect"* for the following species: grizzly bear, gray wolf, black-footed ferret, whooping crane, piping plover, least tern, pallid sturgeon, Osterhout milkvetch (*Astragalus osterhoutii*), Penland beardtongue (*Penstemon penlandii*), North Park phacelia (*Phacelia formosula*), and Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*). Our determination also continues to be *"may affect, not likely to adversely affect"* the southwestern willow flycatcher, Mexican spotted owl, Pawnee montane skipper, Uncompahgre fritillary butterfly, Canada lynx, Preble's meadow jumping mouse, Penland alpine fen mustard, and Colorado hookless cactus. We discuss our determinations for the DeBeque phacelia and its final designated critical habitat in more detail later in this assessment. Our determination also continues to be *"may affect, not likely to adversely affect"* critical habitat for the Mexican spotted owl and Preble's meadow jumping mouse. Figure 4 and Figure 5 show the locations of Mexican spotted owl and Preble's meadow jumping mouse critical habitats, respectively, in relation to the Colorado roadless areas and the North Fork Coal Mining Area.

In their September 9, 2015, letter to the Regional Forester in response to his proposed species list for the biological assessment (Attachment 3), the U.S. Fish and Wildlife Service singled out several species they requested the Forest Service take a closer look at: Pagosa skyrocket (*Ipomopsis polyantha*), Ute ladies'-tresses (*Spiranthes diluvialis*), western yellow-billed cuckoo, New Mexico meadow jumping mouse, and the four endangered fish of the Upper Colorado River (humpback chub, bonytail chub, Colorado pikeminnow, razorback sucker). The following discussion addresses these species.

Pagosa Skyrocket

In August 2012 shortly after the Secretary of Agriculture's issuance of the Colorado Roadless Rule, the U.S. Fish and Wildlife Service designated final critical habitat for the Pagosa skyrocket (*Ipomopsis polyantha*). We used some of the information in that final listing rule to do additional mapping of soils and potential habitat for the species in relation to roadless areas in Colorado. We have concluded from this mapping exercise that soils derived from Mancos Shale and habitat potential for the Pagosa

Figure 4. Mexican spotted owl critical habitat in relation to Colorado roadless areas. There is no association of critical habitat units with the North Fork Coal Mining Area.

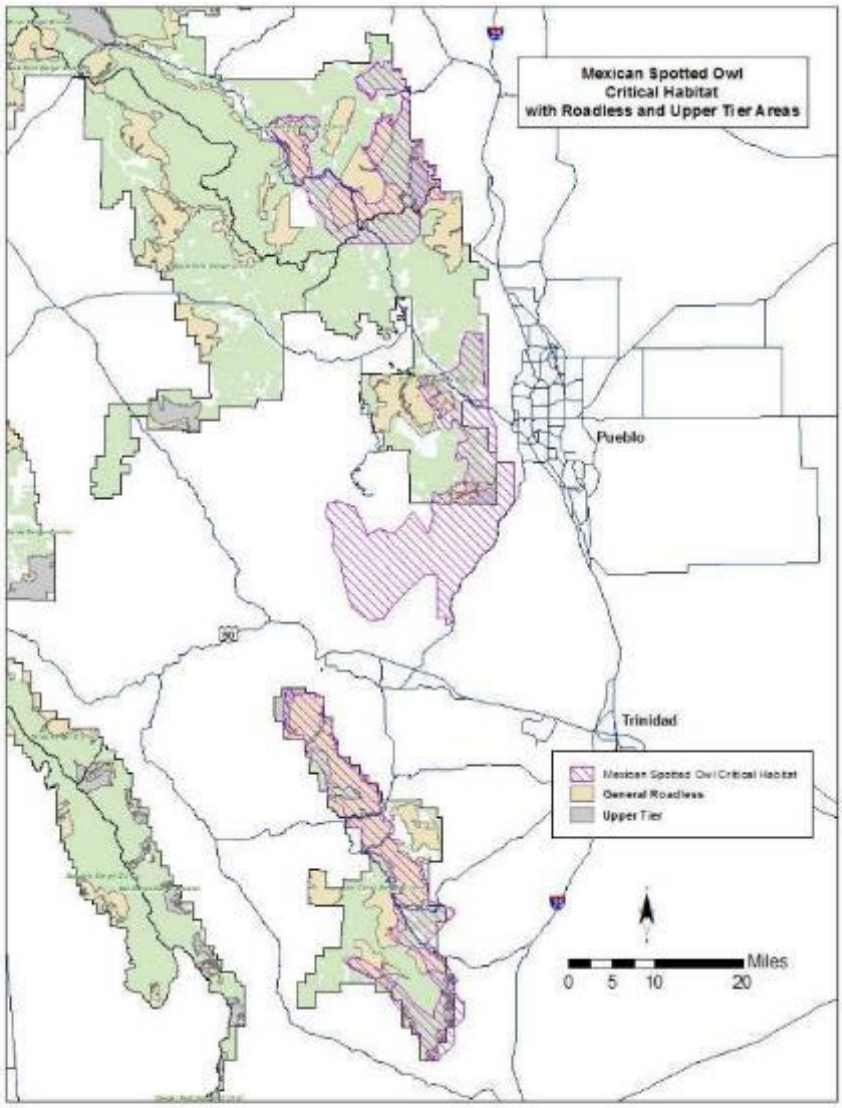
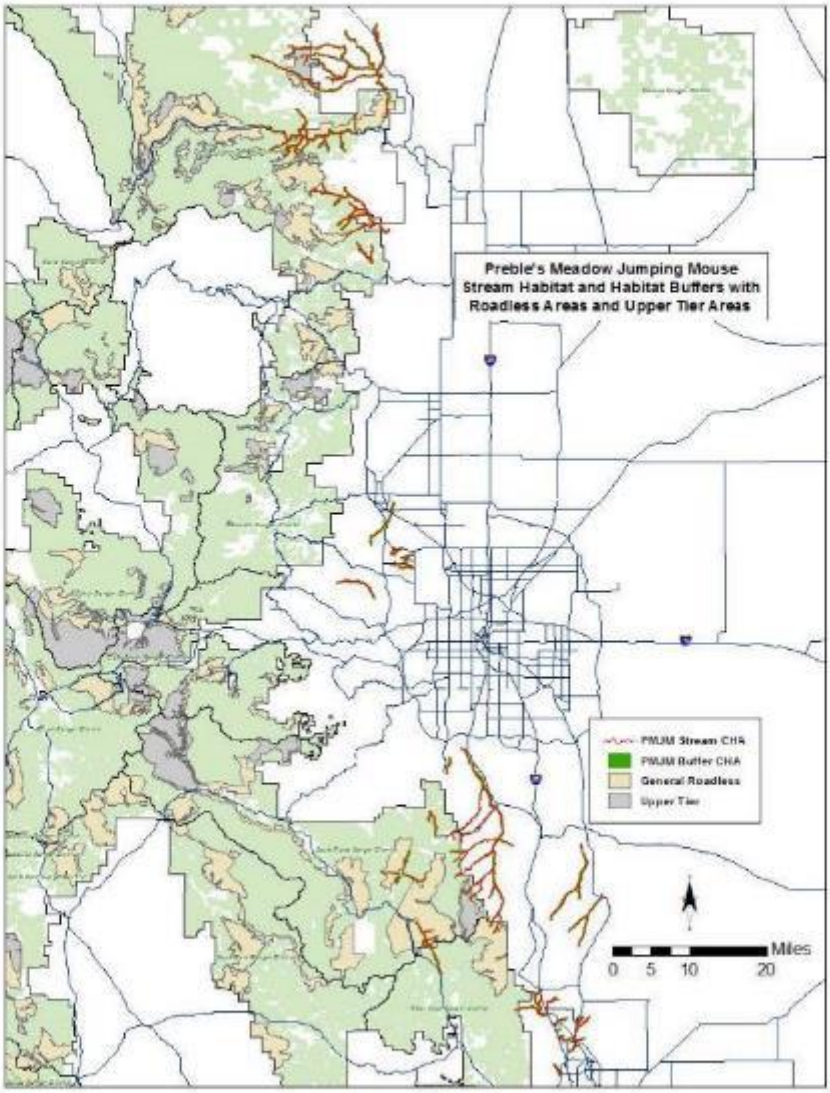


Figure 5. Preble's meadow jumping mouse critical habitat in relation to Colorado roadless areas and the North Fork Coal Mining Area.



skyrocket exists in the Winter Hills / Serviceberry Mountain CRA (Figure 6 and Figure 7).

This is not related to the North Fork Coal Mining Area, but is within the larger CRA network. For similar reasons, we also believe potential habitat exists within one mile of the Eight Mile Mesa critical habitat unit for this species.

No designated critical habitat for the Pagosa skyrocket overlaps any of the roadless areas in Colorado. However, due to the proximity of critical habitat to a roadless area and occurrence of potential habitat within one of the roadless areas, we now update our 2012 determination of effect for the Pagosa skyrocket from *"No effect"* to *"May affect, not likely to adversely affect"* when considering the overall roadless network and potential impacts of implementation of the 2012 Colorado Roadless Rule. This is regardless of the proposal to reinstate the North Fork Coal Mining Area temporary road exception. Based on projections of foreseeable activities as described in the 2012 documents, we anticipate little potential for new roads, tree cutting, or oil, gas or coal development to occur in the habitat and affect the Pagosa skyrocket. However, there may be some potential that unknown individuals of Pagosa skyrocket are present in at least one CRA based on habitat potential and could be affected by activities permitted under the Roadless Rule. Exposing this concern now should help avoid this possibility in future project design and evaluations, though we cannot rule it out entirely.

There may also be some additional risk of direct or indirect effects should any of these activities in adjacent roadless areas inadvertently promote spread of invasive plants into areas and habitats where they skyrocket may occur, or due to displacement of Linear Construction Zones to adjacent areas in order to avoid impacts to roadless areas. Therefore, we believe under consideration of new information that a "may affect" call for the species is appropriate. Because designated critical habitat for the Pagosa skyrocket does not occur in any of the roadless areas, our determination for the designated critical habitat remains *"No effect."* Specific to the North Fork Coal Mining Area, Mancos shale does not occur there. Additionally, the North Fork Coal Mining Area is more than 100 miles distant from the nearest known location of Pagosa skyrocket and is extremely unlikely to have individuals present (Figure 8). Therefore, the proposed action of reinstating the North Fork Coal Mining Area temporary road exception should not affect the species or its critical habitat. This concludes the further evaluation of the Pagosa skyrocket. Given our change to our 2012 determination of effect for the species, the Forest Service will include the Pagosa skyrocket in the request to the U.S. Fish and Wildlife Service for section 7 consultation.

Figure 6. Designated critical habitat areas of Pagosa skyrocket near Pagosa Springs, Colorado. Also shown are the name and location of Roadless areas as well as Mancos Shale geology which is the basis of Pagosa skyrocket habitat. None of the roadless areas overlap with any of the four critical habitat areas. Mancos shale geology overlaps with the Winter Hills / Serviceberry Mountain roadless area.

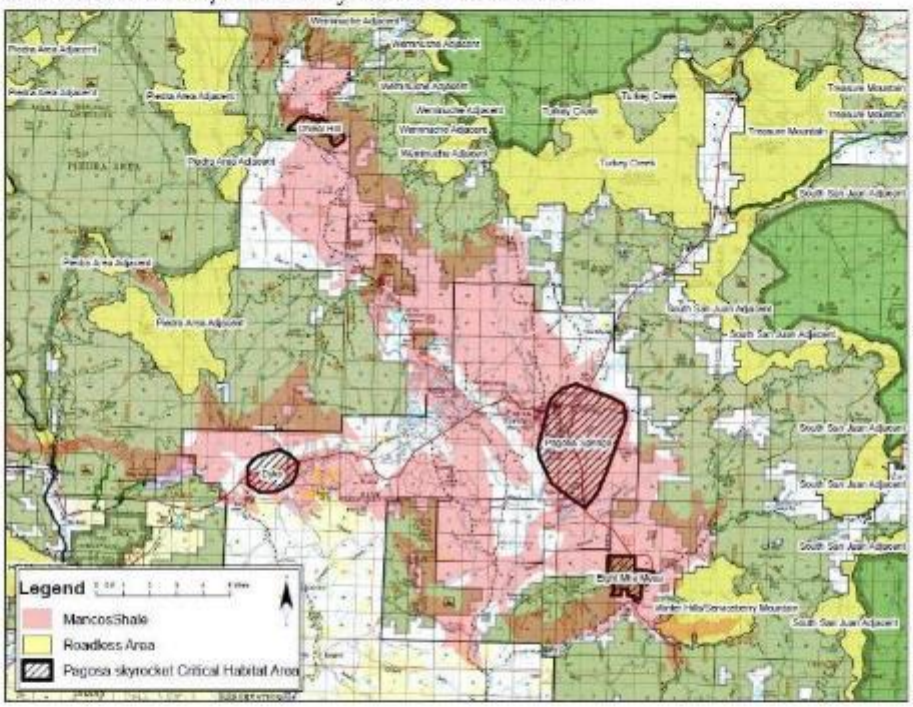


Figure 7. The location of Eight Mile Mesa designated critical habitat of Pagosa skyrocket south of Pagosa Springs in the proximity of the Winter Hills / Serviceberry Mountain roadless area. The incursion of Mancos Shale geology, which is the basis of Pagosa skyrocket habitat, in the southern part of the roadless area is approximately 1,000 acres.

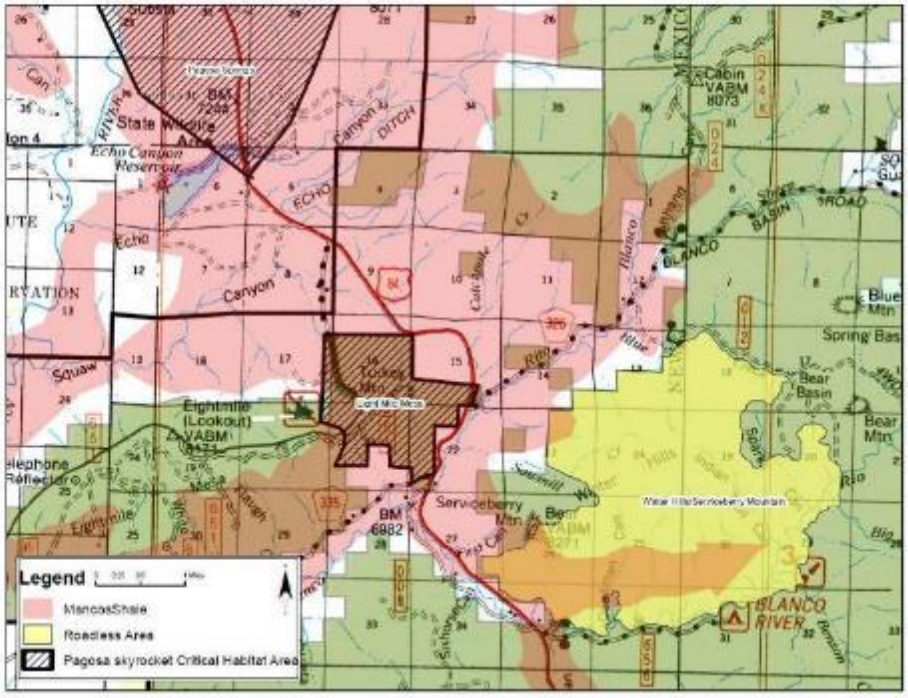
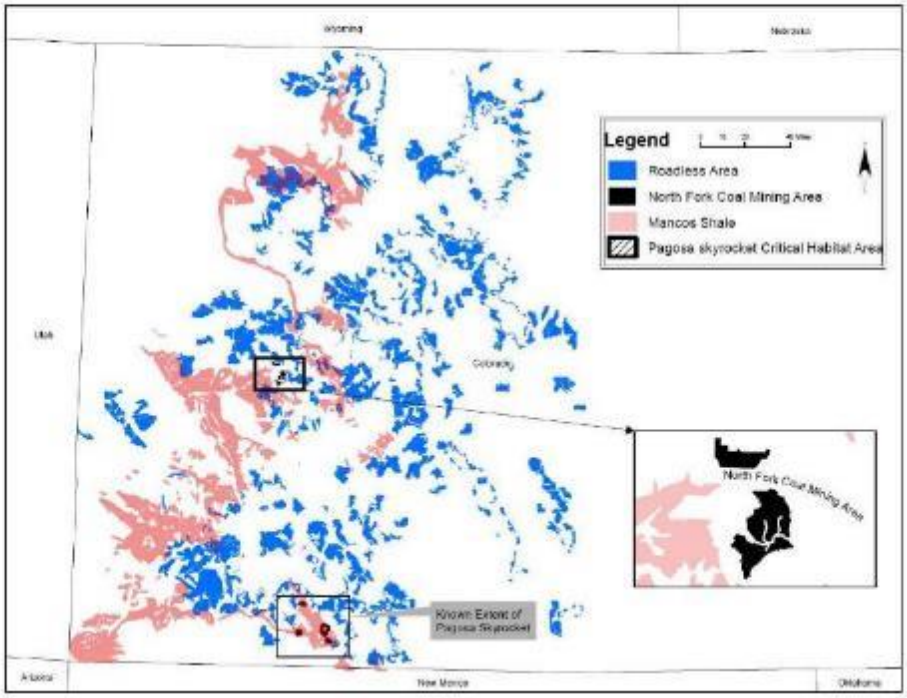


Figure 8. Designated critical habitat of Pagosa skyrocket is shown in southwestern Colorado. The North Fork Coal Mining Area is shown in inset and is not known to contain Mancos Shale geology, which is the basis of Pagosa skyrocket habitat. The North Fork Coal Mining Area is approximately 100 miles north of the known extent of Pagosa skyrocket.



Ute Ladies'-tresses

We earlier assigned a *"no effect"* determination to the Ute ladies'-tresses orchid (*Spiranthes diluvialis*) in the 2012 Environmental Impact Statement and Biological Assessment. Figure 9 and Figure 10 show the known locations of Ute ladies'-tresses orchid in the proximity of roadless areas and the North Fork Coal Mining Area. There are no known instances where Ute ladies'-tresses orchids occur in any roadless area or expected to be affected by activities there, including the two roadless areas in the proposed coal mining area. Therefore, we conclude the 2012 *"no effect"* determination for Ute ladies'-tresses orchid remains valid today, due to the lack of known individuals or their habitat in or near any roadless area or potentially affected by activities in them, including those associated with the North Fork Coal Mining area. The species is not further addressed in this assessment, nor do we believe there is a need for the Forest Service to include this species in our request to the U.S. Fish and Wildlife Service for reinitiation of section 7 consultation.

Yellow-billed cuckoo (western DPS)

The U.S. Fish and Wildlife Service in their letter in response to the Regional Forester's proposed species list, asked the Forest Service to consider again the western yellow-billed cuckoo given its similarity in riparian habitat with the southwestern willow flycatcher. Our 2012 determinations for these species were *"no effect"* and *"may affect, not likely to adversely affect,"* respectively. Despite the habitat similarities, this difference in determinations of effect at that time was derived from differences in known habitat potential in roadless areas in Colorado. Fifteen CRAs were identified in 2012 as providing habitat potential for the flycatcher, whose known occurrences were established as below 8,500 feet in Colorado. Conversely, the habitat for the cuckoo was identified as occurring in low elevation, valley bottom riparian habitats that lie below the elevational ranges of CRAs above 7,000 feet (earlier discussion in "Characteristics and Management of CRAs"). Proposed critical habitat for the yellow-billed cuckoo also does not occur in or near CRAs, including those in the North Fork Coal Mining Area (Figure 11). Therefore, our determination for the western yellow-billed cuckoo and its proposed critical habitat remains *"no effect."* The species is not further addressed in this assessment, nor do we believe there is a need for the Forest Service to include this species or its proposed critical habitat in our request to the U.S. Fish and Wildlife Service for reinitiation of section 7 consultation.

Figure 9. The known locations of Ute ladies'-tresses orchids in Colorado from Forest Service and Colorado Natural Heritage Program data. Location data on non-federal lands is displayed as the sections in which individuals occur.

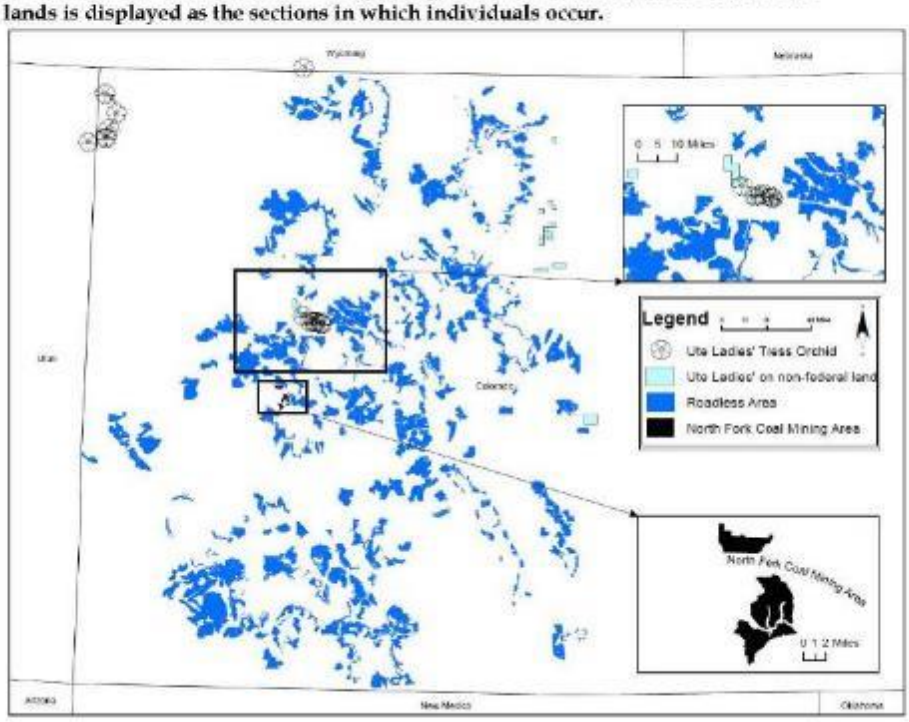


Figure 10. The known locations of Ute ladies'-tresses orchid along the Roaring Fork River south of Glenwood Springs, Colorado. None of the known occurrences overlap with roadless areas. Known locations on non-federal lands are shown only at the section scale.

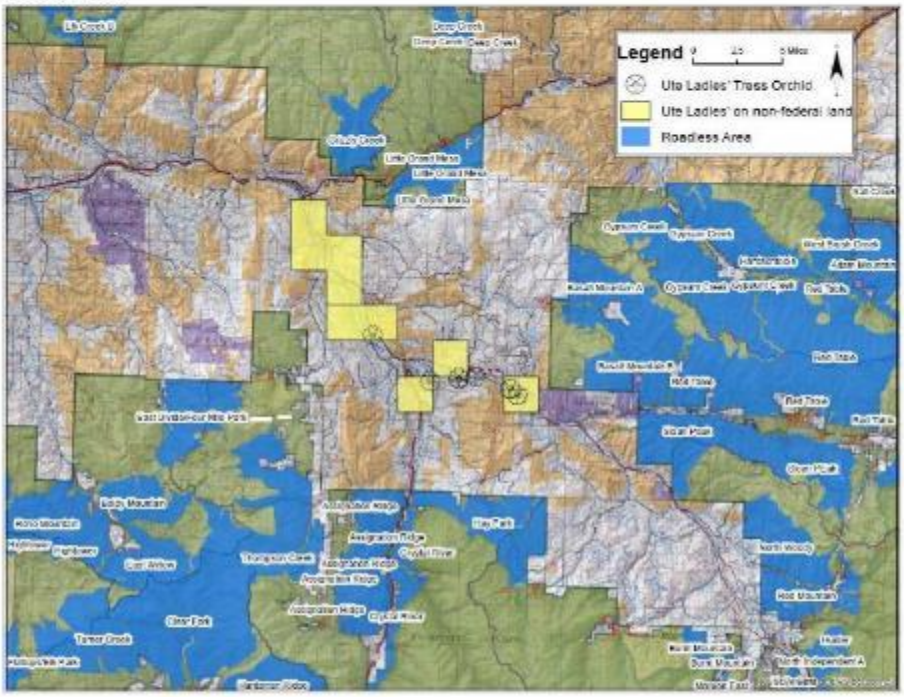
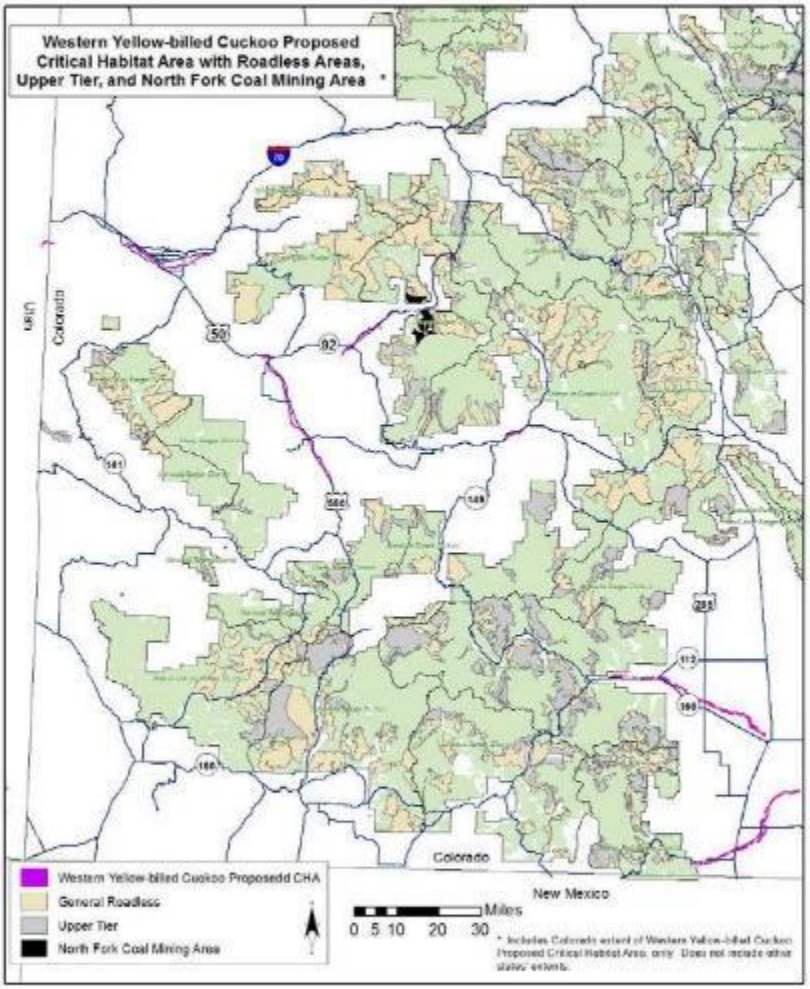


Figure 11. Location of proposed critical habitat for the western yellow-billed cuckoo in relation to CRAs and the North Fork Coal Mining Area.



New Mexico meadow jumping mouse

The U.S. Fish and Wildlife Service in their letter reminded the Forest Service that surveys are ongoing in Colorado for the jumping mouse and it could be yet discovered on National Forest System lands in the state. The Forest Service is helping to fund some of these surveys on the San Juan and Rio Grande National Forests. To-date the jumping mouse has not been confirmed in apparently suitable habitat that has been surveyed on these forests (Frey 2011, Schorr 2015). The Forest Service determination for the New Mexico meadow jumping mouse as a Regional Forester sensitive species in 2012, was *"no effect,"* based on similar rationale as the western yellow-billed cuckoo. The habitat for the mouse was identified as occurring in low elevation, valley bottom riparian habitats that do not overlap with roadless areas in Colorado that range in elevation from approximately 7,000 to 14,000 feet. Designated critical habitat for the New Mexico meadow jumping mouse also does not occur in or near CRAs including those in the North Fork Coal Mining Area, regardless of elevational differences (Figure 12). Therefore, our determination for the New Mexico meadow jumping mouse and its critical habitat remains *"no effect."* The species is not further addressed in this assessment, nor is the Forest Service requesting section 7 consultation with the U.S. Fish and Wildlife Service for this species.

Upper Colorado River fishes

Based on re-consideration of the 2012 effects analysis for the Colorado River endangered fishes (humpback chub, bonytail chub, Colorado pikeminnow, razorback sucker) and the exception for the North Fork Coal Mining Area that could lead to minor water depletions within the Gunnison Basin, our conclusion is that these fishes should be carried forward for further analysis and discussed in more detail in this assessment.

For the remaining species that were the subject of ESA actions since the 2012 roadless rulemaking for Colorado (Table 2 earlier), the change in ESA status had little bearing on the rationale for the no effect/impact determinations at that time for the lesser prairie chicken (which has recently been de-listed due to a September 2015 court order). That species will not be further addressed in this assessment. In September 2015, the U.S. Fish and Wildlife Service determined that the greater sage-grouse did not warrant ESA protections. It remains a Regional Forester sensitive species in both the Rocky Mountain and Intermountain regions and evaluated as such in the environmental impact statement for the proposed action. Finally, the final revised critical habitat for the southwestern willow flycatcher does not overlap CRAs in Colorado, or even close to any roadless area, including those in the North Fork Coal Mining Area (Figure 13). Therefore, with no change in determination of effect for

Figure 12. Location of designated critical habitat for the New Mexico meadow jumping mouse in relation to CRAs and the North Fork Coal Mining Area.

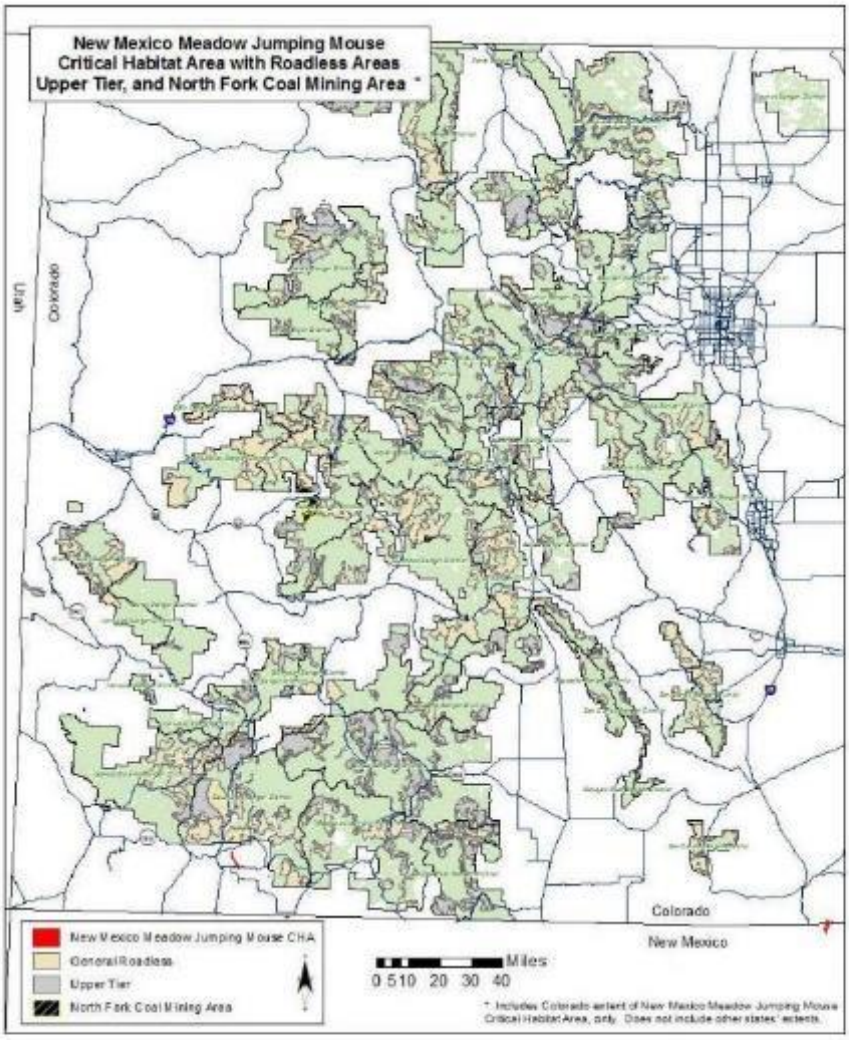
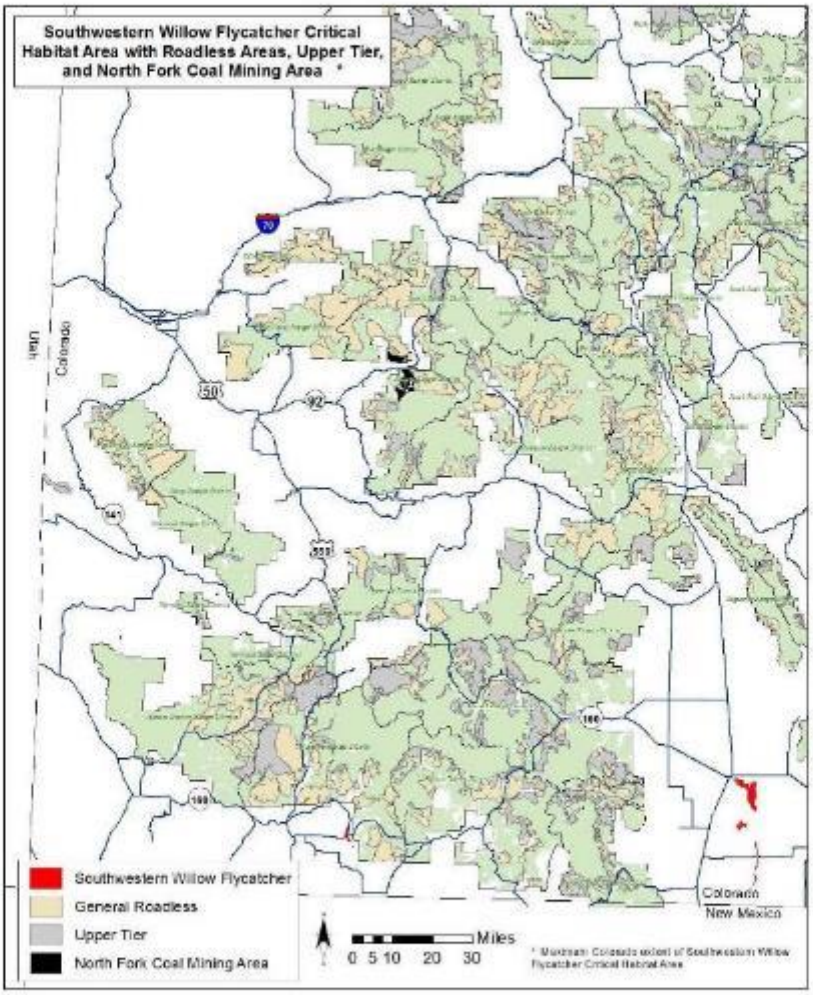


Figure 13. Location of designated critical habitat for the southwestern willow flycatcher in relation to CRAs and the North Fork Coal Mining Area.



the species and a new *"no effect"* determination for its critical habitat, we will not be further considering this species in this assessment or including it in our request to the U.S. Fish and Wildlife Service for reinitiation of section 7 consultation.

This leaves for further evaluation in this assessment from the Table 2 species, the DeBeque phacelia and Gunnison sage-grouse and their critical habitats. We also assess for the first time the green lineage cutthroat trout in the context of the Colorado Roadless Rule network and related to the North Fork Coal Mining Area.

IV. Consultation History

For the 2012 Colorado Roadless Rule and the current supplemental environmental impact statement and rulemaking:

March 26, 2008	FS submitted list of threatened and endangered species for analysis and section 7 consultation on the Colorado Roadless Rule (CRR) to the Colorado Field Office, U.S. Fish and Wildlife Service (FWS) for concurrence.
June 26, 2008	FWS concurred with the species list.
September 20, 2011	After development of a Draft EIS and Revised Draft EIS, FS began preparations of the Final EIS and sent a letter to the FWS requesting they reconfirm the list of species to be analyzed in the final Biological Assessment.
September 29, 2011	FS completed the Biological Assessment and sent to the FWS for concurrence.
October 2011	FS project consultation lead contacted the FWS lead by phone to make them aware further changes were being made to the CRR and requested the consultation be put on hold until the changes could be finalized.
January 30, 2012	FS submitted amended Biological Assessment to the FWS for concurrence.
February 8, 2012	FWS sent letter of concurrence to the FS, concluding ESA section 7 interagency consultation on the 2012 CRR.
March 14, 2012	FS submitted a revised Biologist Assessment to the FWS for "information and review," following a recent court decision that changed the environmental baseline but not the earlier effect determinations.
March 28, 2012	FWS reaffirmed their concurrence on the revised Biological Assessment.
May 15, 2015	FS (McDonald, Tu) met with the Acting Colorado Field Supervisor, FWS, and staff fish and wildlife biologist to discuss strategy for reinitiation of section 7 consultation, as needed, as the FS prepares a Supplemental EIS to the 2012 CRR.
May 29, 2015	Regional Forester submitted by letter to the acting Colorado

	Field Office Supervisor a proposed species list for analysis in a supplemental Biological Assessment.
September 9, 2015	FWS sent concurrence letter on the species list.
September 24, 2015	FS regional TES program leader met again with FWS COFO staff fish and wildlife biologist to discuss 1) potential FS change in determination of effect for the Colorado River listed fishes, and 2) consultation strategy for species for which FS determination of effect does not change between the 2012 consultation and current reinitiation of that consultation.
February 9, 2016	FS reps and current acting Colorado Field Supervisor, FWS, met to discuss current SEIS and consultation schedules and emerging ESA issues.
February 12, 2016	Conference call between FS and FWS representatives to further discuss potential change in determination of effect for the Colorado River listed fishes and options to address in the consultation.

V. Environmental Baseline: 2012 Colorado Roadless Rule with no Temporary Road Exception for the North Fork Coal Mining Area

The 2012 Biological Assessment discussed the environmental baseline for the Colorado Roadless Rule (CRR), including the temporary road exception for the North Fork Coal Mining Area (Attachment 1). At that time, it was the 2001 Roadless Area Conservation Rule, its protections and allowable activities for roadless areas. Since the 2014 court decision against the Forest Service, the agency has continued to implement the 2012 Colorado Roadless Rule but without the temporary road exception for the NFCMA. Currently, the North Fork Coal Mining Area is being managed the same as "non-upper tier" roadless areas. Valid existing coal leases can continue to operate in the mining area in accordance with the terms of the leases. Current management continues, with the general prohibitions on tree cutting, sale, and removal; road construction/ reconstruction; and use of linear construction zones within CRAs, with some of those activities permitted under certain exceptions. More details about the management exceptions that remain available for "non-upper tier" roadless areas including those in the North Fork Coal Mining Area are available in the Forest Service's 2012 biological assessment (Attachment 1).

Further, the following features are consistently applied across all roadless areas under the baseline and proposed action:

Roadless Area Boundary Correction

For both the baseline condition and proposed action, the Forest Service proposes to administratively correct roadless area boundaries associated with the North Fork Coal Mining Area. Roads that existed prior to 2012 in the vicinity of the North Fork Coal Mining Area were re-inventoried with global positioning system technology which allows for more accurate boundary location of CRAs. The boundaries of the roadless areas would be adjusted to match the actual location of roads on the ground. The administrative correction to roadless areas associated with the North Fork Coal Mining Area would entail:

- Adding 65 acres based on a more accurate mapping of the national forest boundary along the Pilot Knob CRA and more accurate inventory of forest roads 711, 711.3B, and 711.3c.
- Subtracting 35 acres based on a more accurate inventory of forest roads 711, 711.3B, and 711.3c.

The Colorado Roadless Rule recognized that roadless area boundaries would need to be corrected to remedy errors and account for improvements in mapping technology. Procedures for correcting roadless area boundaries require public notice and a 30-day comment period. No associated environmental documentation process pursuant to NEPA is required for administrative corrections. This is due to the recognition that these corrections are minor, such as the proposed corrections associated with the North Fork Coal Mining Area.

Federal and State Requirements

Management of NFS lands in Colorado are governed by a variety of federal statutes, regulations, executive orders, and the U.S. Forest Service directive system (manuals and handbooks). In addition, some state laws and regulations apply on NFS lands within the State. The applicability of any federal or state requirements is not compromised under the current baseline or the proposed action.

Forest Plans

The National Forest Management Act and its implementing regulations at 36 CFR 219, obligate the U.S. Forest Service to develop, amend, or revise plans for each national forest. Forest plans provide guidance for management activities on a national forest, including establishing forest-wide management requirements and direction applicable to the entire forest or to specific management areas. When guidance in a forest plan is more restrictive than direction in the Colorado Roadless Rule for roadless areas, actions must be consistent with the more restrictive direction. For example, if a forest plan standard prohibits road construction where it is allowed under a roadless rule alternative, road construction cannot occur.

Under the current baseline or the proposed action, the U.S. Forest Service is not compelled in any way to amend or revise any forest plan. In addition, no authority of a responsible official to amend or revise a forest plan is limited. However, a responsible official would not be able to modify or reduce the restrictions of the Rule under the current situation or proposed action through a forest plan amendment or revision.

Project-Specific Environmental Analysis

No projects or other ground-disturbing activities are authorized to occur. Specific projects that include the leasing, exploration or development of coal, or other resources, must undergo site-specific environmental analysis required by NEPA and required permitting conducted by the Colorado Division of Reclamation, Mining and Safety. The Forest Service would request ESA section 7 consultation with the U.S. Fish

and Wildlife Service for any proposals that the Forest Service determines "may affect" ESA-protected species and critical habitats.

Reserved and Outstanding Rights

The reasonable exercise of reserved or outstanding rights for access, occupancy, and use of NFS lands within roadless areas would not be affected. The rights include those that exist by law, by treaty, or by other authority. They include, but are not limited to, the right to provide reasonable access across NFS lands to private property, mining claims for locatable minerals under the 1872 Mining Law, and land uses protected by Native American treaty rights.

Existing Land Use Authorizations

"Authorizations" refer to land uses allowed under a special use permit, contract, or similar legal instrument. Numerous types of lands and recreation-related authorizations are issued for occupancy and use of NFS lands. All of the alternatives allow for the continuation, transfer, or renewal of existing land use authorizations for activities in roadless areas. "Existing authorizations" are those that are issued before the effective date of the final rule. Private recreational activities do not require an authorization and are not affected by any alternative.

Existing coal leases would continue pursuant to the terms and stipulations of the lease. None of the alternatives revoke, suspend or modify any existing coal leases within the North Fork Coal Mining Area (36 CFR 294.48(a)).

Other Forest Activities

Activities that are otherwise not prohibited (other than tree cutting, sale, or removal; road construction and reconstruction; and use of linear construction zones) are permissible in roadless areas including those in the North Fork Coal Mining Area, if not restricted by other law, regulations, and policies. These activities include, but are not limited to, the following:

- Motorized and non-motorized trail construction or maintenance;
- Public hunting, fishing, camping, or other dispersed recreational uses;
- Use of a motorized vehicle on a trail open to motorized use;
- Mountain biking on a trail open to mechanized use;
- Prescribed burning, including tree cutting for fireline construction to manage a prescribed fire; and
- Livestock grazing.

VI. Assumptions for the Effects Analysis

Key assumptions underlying this supplemental programmatic evaluation are:

Management of National Forest System lands is governed by a variety of federal land management statutes (laws), regulations, Executive Orders, and the Forest Service Directive System (Forest Service Manual (FSM) and Handbooks (FSH)). These would remain in effect. The Colorado Roadless Rule is a state-specific rule that superseded the 2001 Roadless Rule and has precedence over less-protective Forest Plan direction for TEPS species. None of the current alternatives change that.

The proposed action would not authorize any individual ground-disturbing actions, nor would they have direct effects on listed species or critical habitats. The indirect effects of continuing to implement the regulation with the restored North Fork Coal Mining Area, that are later in time are estimated based on projections of probable actions, and are evaluated primarily in qualitative and comparative terms.

The estimates of effects of the management direction and potential future activities are broadly programmatic in nature. Future management actions in CRAs, in or out of the North Fork Coal Mining Area, would continue to be subject to their own site-specific analysis, ESA Section 7 consultation, forest plan consistency reviews, and decision-making procedures. Site-specific design criteria or mitigation measures would be incorporated into future project planning and implementation as needed to avoid or minimize adverse effects to species and critical habitats protected under the ESA to the extent possible.

VII. Effects on Federally-listed Species

Summary of General Effects

Road construction and vehicular travel removes and fragments habitat, may reduce habitat effectiveness due to avoidance behavior, may increase fish and wildlife mortality, and creates opportunities for invasive species introduction, establishment and spread. Under this alternative, most roads within CRAs would be temporary, used only for the permitted activity, and decommissioned immediately after completion of the activity. However, temporary roads would be available to foot traffic, bicycles, horseback riding, and other activities which can have negative effects on wildlife and introduce weeds. In addition, unauthorized use of closed or restricted roads has historically been difficult to control and may continue for some period of time following decommissioning. This may increase the duration of effects on wildlife.

The estimated amount of new road construction within CRAs under the Colorado Roadless Rule is about 16.9 miles/year. An additional 2.8 miles/year would occur in other roadless areas (not included in the CRA inventory, i.e. substantially altered areas) that would be managed according to their respective forest plan. Most of these would be temporary roads. The purpose for the majority of the roads that may be constructed within CRAs would be to access existing oil and gas leases or for coal mining operations. The amount of road construction and reconstruction within CRAs is slightly higher than under the 2001 Rule, and substantially lower than under the existing forest plans.

Tree cutting would be allowed to reduce hazardous fuels, to maintain or restore ecosystem structure and function, and to improve habitat for threatened, endangered and sensitive species in non-upper tier acres; these exceptions would not be allowed in upper tier acres. Tree cutting would be allowed in upper tier only for incidental removal and personal/administrative use. The overall estimated acreage to be treated within the CRAs would be about 4,900 acres/year to reduce hazardous fuels, about 930 acres/year for ecosystem restoration and maintenance, and about 60 acres/year for threatened, endangered and sensitive species habitat improvement. Other roadless areas that were included in IRAs but removed from CRAs (substantially altered acres), tree-cutting projections are about 1,350 acres/year, mostly to reduce hazardous fuels and for ecosystem restoration and maintenance.

Vegetation management involving tree-cutting could be beneficial for species that inhabit lower elevation forests with frequent low-intensity fire regimes. Removal of diseased, dead, and down materials could have negative impacts on primary cavity

nesters, although Forest Plan requirements for retention of snags and down logs would help limit negative effects.

Prescribed fire is the most common method currently used for wildlife habitat improvement. The Colorado Roadless Rule would not restrict its use within CRAs. Prescribed fire would likely continue to be the primary tool used to improve terrestrial wildlife habitat.

The Colorado Roadless Rule would prohibit linear construction zones (LCZs) within CRAs, subject to limited exceptions. In all of the exceptions, the decision as to the type of road constructed or the use of an LCZ will be that which meets the purpose and has the shortest duration on the land. The rule would require that LCZs be co-located within road rights-of-way where possible and would require decommissioning when no longer needed. Annual miles of LCZs projected to occur would be about 3.3 miles in CRAs and about 1.4 miles in substantially altered acres. This prohibition would be beneficial for aquatic and terrestrial wildlife, and any adverse effects related to the exceptions would be local and minor and continue to be subject to all applicable forest plan management direction and requirements.

2016 Determinations for ESA Species Evaluated in 2012

The 2012 *"may affect"* determinations and section 7 consultation for the southwestern willow flycatcher, Mexican spotted owl, Pawnee montane skipper, Uncompahgre fritillary, Canada lynx, Preble's meadow jumping mouse, greenback cutthroat trout, Penland's alpine fen mustard, Colorado hookless cactus, and DeBeque Phacelia were an outcome of considering the entire Colorado Roadless Rule, network of roadless areas, and management exceptions including the exception for temporary roads in the North Fork Coal Mining Area. The rationales for those determinations did not single out impacts associated with the temporary road exception and any related future mining activities there might be for the North Fork Coal Mining Area. Consequently, many of the determinations of effect continue to be appropriate, with the exception of examples like the Pagosa skyrocket and greenback cutthroat trout discussed earlier and further consideration of the Upper Colorado River listed fishes and a potential new lineage of cutthroat trout receiving ESA protections.

The following is additional discussion and updates specific to ESA-protected fishes and the current proposed action:

Green lineage cutthroat trout

There are 12 "populations"[2] of green lineage cutthroat trout present in the watershed in which the North Fork Coal Mining Area is located (Figure 14). The total length of habitat occupied by these populations in the surrounding watershed is 39 miles.

None of these populations occupy habitat within or directly downstream of the North Fork Coal Mining Area. Therefore, our determination for the North Fork Coal Mining Area under the proposed action is *"no effect"* to the green lineage cutthroat trout.

It is likely that other populations of green lineage cutthroat trout are associated with roadless areas within the larger statewide roadless area network and could be affected by allowable management activities under the rulemaking's exceptions. In that case, it would be reasonable to come to an analogous determination based on similar rationale as we did for the greenback cutthroat trout for the 2012 roadless rulemaking. Hence, we conclude that the 2012 Colorado roadless rule even without the North Fork Coal Mining Area exception *"may affect"* but is *"not likely to adversely affect"* the green lineage cutthroat trout. We include this entity in our request for reinitiation of ESA section 7 consultation with the U.S. Fish and Wildlife Service.

Colorado River listed fishes

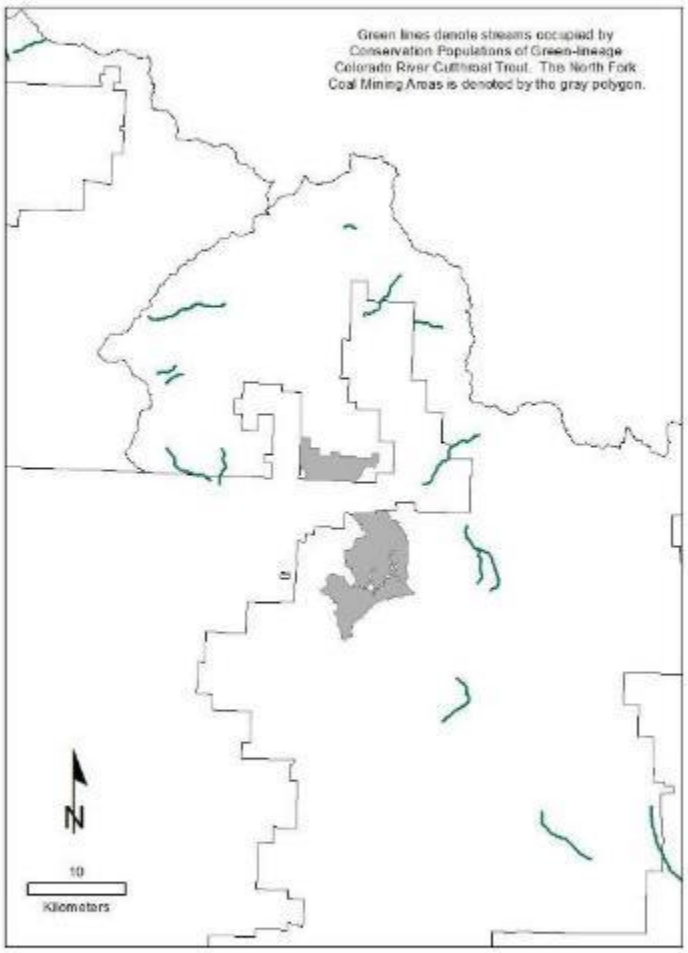
The endangered bonytail chub, Colorado pikeminnow, humpback chub, and razorback sucker, are native to the Colorado River and its larger tributaries. The determination of effect for these fishes in 2012 was "no effect." Our conclusion is that the 2012 determinations may have been in error, or at least should have been included in dialogue with the U.S. Fish and Wildlife Service during the interagency consultation on the 2012 2012 Colorado Roadless Rule. Water depletions in the Gunnison River basin have the potential to negatively affect downstream all four of these fishes native to the Colorado River watershed. Water depletions are likely to occur from mining activities that may be facilitated by the proposed action to restore the temporary road exception to the North Fork Coal Mining Area. The U.S. Fish and Wildlife Service has previously determined that all water depletions in the Gunnison River basin could adversely affect Colorado River fishes. Therefore, our determination for the four Colorado River listed fishes is changed from *"no effect"* in 2012 to now *"may affect, likely to adversely affect."*

The Forest Service expects that any water depletions associated with future activities in the North Fork Coal Mining Area will be well within annual depletion thresholds established under existing programmatic Biological Opinions from the U.S. Fish and Wildlife Service for the Upper Colorado River recovery program (i.e., U.S. Fish and

[2] Analagous to "Conservation Populations" identified in the conservation strategy for the Colorado River cutthroat trout, which these fish were known as before identification of a green lineage cutthroat trout.

Wildlife Service 2009). Water depletions would be quantified at the project stage and consultation would occur on that quantity at that time. Given the automatic adverse effect of any water depletions potentially affecting the listed fishes in the Upper Colorado River, the Forest Service request for reinitiation of section 7 consultation with the U.S. Fish and Wildlife Service will be a formal one.

Figure 14. Populations of green lineage cutthroat trout in relation to the North Fork Coal Mining Area.



2016 Determinations for Species Affected by ESA Decisions Since 2012

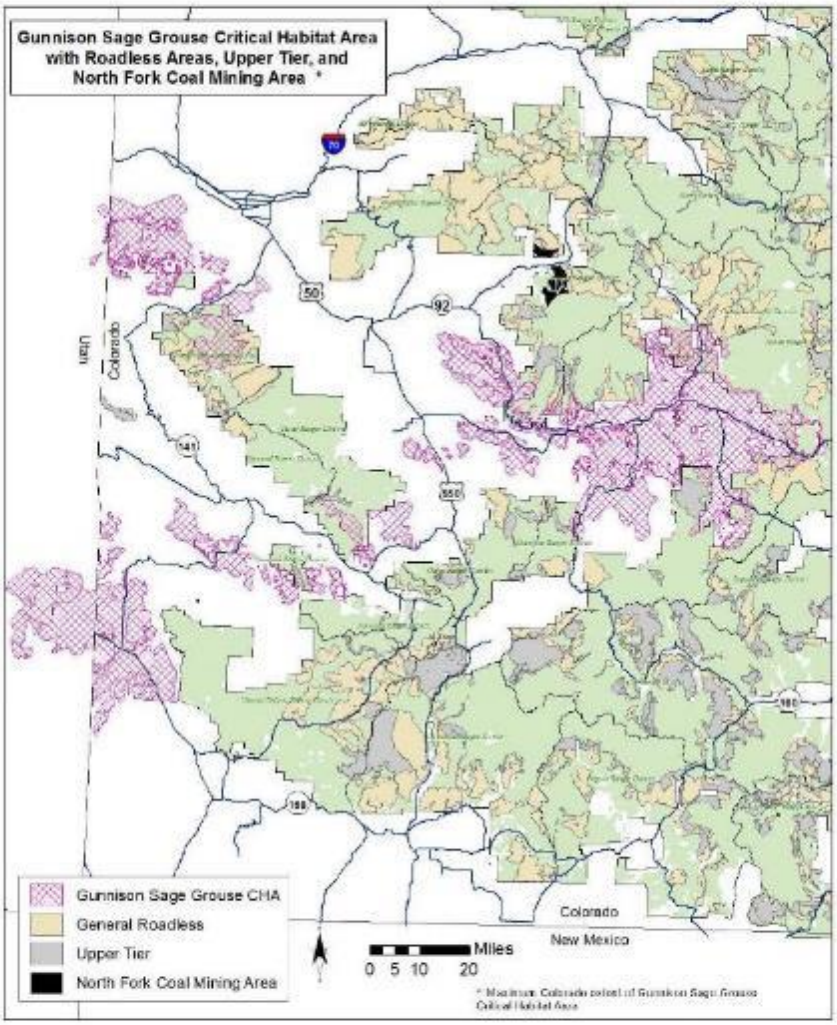
Gunnison Sage-grouse

At the time of the 2012 CRR, the Gunnison sage-grouse was a Forest Service sensitive species. Within a few weeks of the 2012 roadless rulemaking, the Grand Mesa, Uncompahgre and Gunnison (GMUG) National Forests entered into a cooperative Candidate Conservation Agreement (CCA) with the U.S. Fish and Wildlife Service and several other federal and state agencies and local governments for the Gunnison Basin that contains 87% of the known remaining population of the Gunnison sage-grouse rangewide. In July 2013 the Service issued a Conference Opinion on the Agreement. On November 20, 2014, the U.S Fish and Wildlife Service listed the species as threatened and designated final critical habitat for it. Some of that critical habitat overlaps CRAs on the GMUG, though not in the North Fork Coal Mining Area (Figure 15). On December 8, 2014, the Service adopted the 2013 Conference Opinion as a final Biological Opinion.

The 2012 effects analysis for the Gunnison sage-grouse concluded that adoption of the Colorado Roadless Rule "May adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing." This is the appropriate determination when there is potential for a mix of beneficial and minor negative impacts to a Regional Forester sensitive species. The rationale at the time was that overall the high level of protections to roadless areas under the Colorado Roadless Rule and ongoing project-level evaluations, would be positive for the Gunnison sage-grouse and its conservation. Any impacts to individuals or their habitat were projected to be minor and temporary, if they occurred at all, and ameliorated to the extent possible during the project-level planning and evaluations.

There is little to suggest that the 2014 listing of the Gunnison sage-grouse under the ESA or critical habitat designation compromises the 2012 conclusions and underlying rationale, or the Colorado Roadless Rule and restoration of the temporary road exception for the North Fork Coal Mining Area now represents a substantial threat to the sage-grouse or its critical habitat. To the contrary, the Colorado Roadless Rule protections, ongoing requirements for NEPA evaluations, Forest Plan consistency evaluations, and section 7 consultations as needed for management activities in the CRAs and North Fork Coal Mining Area, and the ongoing affirmative efforts on the GMUG National Forests under the CCA, all lead to our conclusion that adverse effects of the Colorado Roadless Rule to the Gunnison sage-grouse or its critical habitat are unlikely. Now that the bird is listed and has designated critical habitat under the ESA and there is some overlap with CRAs and adjacent areas, we cannot entirely rule out some potential for temporary and minor effects. Consequently, we determine *"may affect, not likely to adversely affect"* the Gunnison sage-grouse and

Figure 15. Location of designated critical habitat for the Gunnison sage-grouse in relation to CRAs and the North Fork Coal Mining Area.



determine the same for its critical habitat when considering the Colorado roadless network. When considering just the North Fork Coal Mining Area, the sage-grouse and its critical habitat are not in or associated with the Coal Mining Area. Therefore, specific to the North Fork Coal Mining Area, we determine *"no effect"* to critical habitat. However, we will include the species and its critical habitat in the request for reinitiation of consultation based on the determination for the entire Rule.

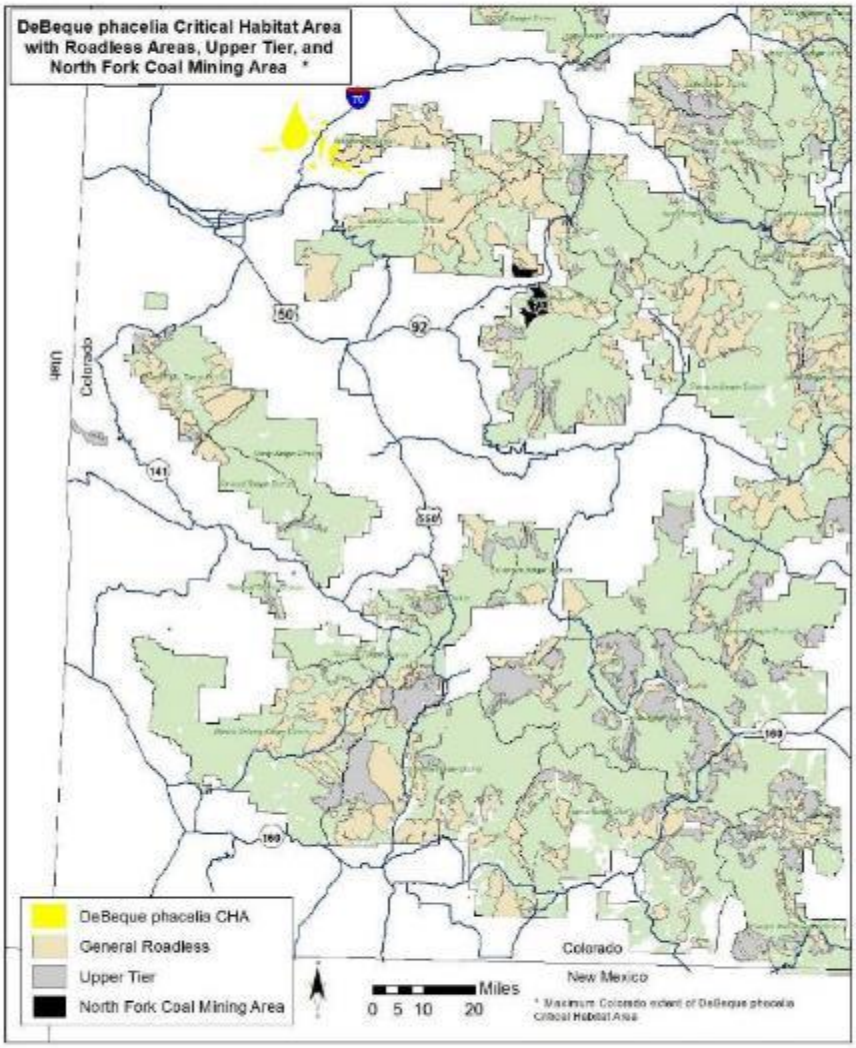
DeBeque Phacelia

At the time of the evaluation of the 2012 Colorado Roadless Rule, the DeBeque phacelia was listed as threatened with proposed critical habitat. Later that year on August 3, 2012, the U.S. Fish and Wildlife Service designated final critical habitat, including some units overlapping two "non-upper tier" roadless areas (Sunnyside on the Gunnison National Forest and Housetop Mountain on the adjacent White River National Forest). No critical habitat is in or near the North Fork Coal Mining Area (Figure 16).

The conclusions for the 2012 Colorado Roadless Rule were that the plant and proposed critical habitat were unlikely to be adversely affected, because there was no likely potential for new roads, tree cutting, or oil, gas or coal development in the few roadless areas where it was known that could impact populations or habitat. However, there might be some risk of indirect effects from invasive plants spreading into these roadless areas from any management activities if they occurred in adjacent areas. Consequently, the determinations were "may affect, not likely to adversely affect" the DeBeque phacelia and "may affect, not likely to adversely modify" its proposed critical habitat.

The parcels of final designated critical habitat for DeBeque phacelia are located in the same roadless areas and parcels as the proposed habitat in 2012. No new information would indicate that the species and its final critical habitat would now be adversely affected, but there may still be some potential effect as described in 2012 related to implementation of activities under the management exceptions. That is largely speculative at this point and would be subject to future site-specific evaluations and section 7 consultation, as needed. We retain our determination of *"may affect, not likely to adversely affect"* for the species and determine the same for its critical habitat when considering the Colorado roadless network. Specific to the North Fork Coal Mining Area, we determine "no effect" to either the species or its critical habitat. Given the "may affect" determination for the new final designated critical habitat when considering the larger roadless area network, the Forest Service includes this species in our request to the U.S. Fish and Wildlife Service for reinitiation of section 7 consultation.

Figure 16. Location of designated critical habitat for DeBeque phacelia in relation to CRAs and the North Fork Coal Mining Area.consultation.



Cumulative Effects

The cumulative effects analysis considers how other factors might combine with the direct and indirect effects of the alternatives just described, to have an additive impact. Past, present, and reasonably foreseeable future actions were evaluated. The following discussion addresses ongoing or expected activities in the next 15 years in the Colorado, especially those adjacent to or potentially affecting Roadless areas.

Climate Change

Climate change is treated in this analysis as an existing, ongoing stressor affecting terrestrial and aquatic species and habitats across Colorado and the U.S. Currently there is no reliable way scientifically to discern if or how greenhouse gas emissions related to a specific federal action, source, or location influences climate change and can be reliably connected back directly or indirectly to impacts to specific species locally, like those protected under the Endangered Species Act (78 FR 11766, U.S. Fish and Wildlife Service 2013). Some of the changes that have been triggered are unlikely to have a measurable effect over the next 10-15 years, but other changes have already been documented. For example, earlier snowmelt near Crested Butte, Colorado, has been found to result in earlier flowering of some subalpine plants (Inouye 2008).

Climate change can be expected to alter the distribution of plants and other species (Hansen et al. 2001, Intergovernmental Panel on Climate Change 2007). Some species will be more vulnerable to the effects of climate change than others (Millar et al. 2007).

Alpine species may be among those in the most precarious situations. With climate change, tree lines will move higher in elevation. Alpine habitats will contract in size and mountain-top patches will become increasingly isolated. Alpine plants and animals will have little opportunity to migrate to higher terrain; some are already on the highest peaks in Colorado and are isolated from other potentially suitable habitat.

Average annual temperature increases due to increased greenhouse gases such as carbon dioxide will likely lead to reduced spring snowpack, more precipitation falling as rain rather than as snow, and earlier spring peak runoff ((Backlund, et al., 2008). For species such as white-tailed ptarmigan and wolverine that rely on cold, snowy environments, warmer temperatures could lead to significant decreases in available habitat and lowered reproduction and survival. More variable flows and temperatures in streams and rivers will profoundly affect aquatic species such as greenback cutthroat trout and green lineage cutthroat trout.

Climate change is affecting the timing of biological events such as pollination, flowering, and migration. For example, pollinators may be capable of shifting northward, but may leave some plant species incapable of producing viable seeds. Earlier flowering dates subject the plants to frost resulting in significantly lower seed

production (Inouye 2008). Reduced seed production can lead to changes in plant community composition, which may alter habitat suitability for some plants, pollinators, and other animals. Bird migration, which formerly was synchronized with maximum food availability, may now occur too late, resulting in lowered reproductive success and survival.

Climate change is likely to exaggerate the scale and intensity of natural disturbances such as wildfire and bark beetle epidemics. Larger and more intense fires and insect outbreaks can be expected in Colorado in the future. While many adult animals are mobile enough to flee burning areas or seek refuge, the young of the year are often vulnerable to injury and mortality from fire (Smith 2000). Amphibians, insect larvae, small mammals, or ground-nesting birds also may not survive the direct effects of an intense fire. Colorado forests currently are experiencing significant mortality as a result of severe mountain pine beetle and spruce beetle outbreaks. Larger, more severe wildland fires could occur in and around Roadless areas in the future.

Additional stressors such as competition from invasive species or changes in land use will further challenge the ability of plants and animals to adapt to climate change (USDA Global Change Program Office 2001).

Increasing Human Population Growth and Development

Colorado's residential population in 2006 was 4.8 million and was projected to be 7.3 million by 2030 (Colorado DOLA State Demography Office 2007). The increased demands these residents will place on the lands surrounding Roadless areas will increase the importance of the Roadless areas in providing habitat for wildlife, fish and rare plants. Increasing population and associated resource demands could also limit options for any future protection of new Roadless acres that might otherwise be possible. Roadless areas will likely continue to provide some of the best aquatic and terrestrial wildlife habitat in Colorado into the future, as well as relatively weed-free habitats for rare plants.

The effects of population growth on fish and wildlife are evident in the amount of habitat that has been converted or fragmented by human development across the state. Much of this development has been in lower elevation areas that have historically provided habitat that allowed species such as bears and ungulates to survive harsh winters. Providing for the intact structure and function of high-value but limited low and middle elevation Roadless areas is important now and will be essential in the future. Human-associated encroachment is expected to continue to erode habitat availability and effectiveness, and increase disturbance and fragmentation.

Increasing demand for water will also present fragmentation as well as quantity and quality of aquatic systems. It is becoming increasingly difficult to "balance" the need

for water by municipal users with the requirements of native fish for abundant, clear water and clean substrate throughout the year.

Colorado's Comprehensive Wildlife Conservation Strategy provides a foundation for sustaining Colorado's wildlife and the habitats upon which they depend (Colorado Division of Wildlife 2006).

The strategy provides general direction for wildlife conservation and a stimulus to engage partners in conservation of Colorado's wildlife resources. These efforts will increase the probability of terrestrial species' habitats on non-federal land remaining stable over the long term. However, considering the growth rate of the state and the high demand for resources available in Colorado, some non-federal lands will continue to experience impacts on natural resources from urbanization and development, resource demands (for example, minerals), and recreation. Some effects that result in lower habitat quality on non-federal land may increase the importance but also limit the potential effectiveness of habitat conservation and restoration on federal lands.

Increasing Recreation Demand

The growing population will continue to be drawn to the natural beauty, seclusion, and undeveloped nature of Roadless areas in Colorado for enjoyment of outdoor recreation pursuits. Recreational demand will continue to increase, likely increasing the use of Roadless areas.

Recreational activities can affect the quality and quantity of habitat, displace wildlife from core habitats, create physiological stress, fragment habitats, and increase the establishment and spread of invasive species and pathogens. Habitats previously secluded and undisturbed are likely to experience unpredictable or increasing human presence and the unintentional introduction of invasive species. Thus, increases in recreational use could compound the effects of increased road construction and vegetation treatment on many fish, wildlife and rare plant species, and introduce additional non-native invasive plants and animals that threaten native populations.

Increasing Energy Demand

Oil, gas, and coal reserves are among the economically important natural resources found within the Roadless areas and surrounding lands in Colorado. The national focus on energy independence combined with the high demand for energy has resulted in a surge of exploration and development of those resources across the state. Energy exploration and development is occurring on both private and federal lands, including areas within or in proximity to Roadless areas. Many of the areas where exploration and development are occurring historically have provided valuable habitat for fish, wildlife or rare plants, and in some cases habitat critical to the survival of individuals and populations of species. Development of non-federal lands

may displace animals onto adjacent NFS lands, accentuating the need to provide effective habitat that is free from disturbance.

Pipelines and other distribution systems needed to transport these products may be routed across the national forests. This development results in direct loss of habitat as well as indirect effects of disturbance during construction and operation, which may become permanent for above-ground structures.

The current interest in wood fiber and biofuels as economical energy sources is anticipated to increase, placing additional demand on NFS resources. It can be anticipated that harvesting wood fiber to meet increasing demand will increase as technology improves. Tree harvest and sale requires road infrastructure, resulting in the associated impacts on wildlife and rare plants that have been thoroughly discussed previously in this document.

Development of wind energy and associated interstate transmission lines are anticipated to receive increasing focus in the nation's effort to become energy independent, and national forests are beginning to receive inquiries about tower placement. Mortality of migrating bats and a variety of birds by striking wind towers has been documented in numerous locations. Like other infrastructure development in previously undisturbed habitats, these structures directly remove habitat and may reduce habitat effectiveness, cause displacement of wildlife, and fragment habitat, thus adding adverse cumulative effects to the activities in the proposed alternatives.

Analysis of Cumulative Effects

The primary cumulative effect of the preferred alternative is that road density within the North Fork Coal Mining Area could increase from the current baseline. Increased road density leads to fragmentation of terrestrial habitat and could lead to habitat degradation or fragmentation of aquatic habitat. Road construction within the North Fork Coal Mining Area would still be subject to project-specific NEPA review and design criteria and Best Management Practices could be implemented at that level to minimize the chance for project-specific negative impacts.

Outside of the North Fork Coal Mining Area, continued implementation of the 2012 Colorado Roadless Rule for CRAs would maintain relatively large blocks of undisturbed aquatic and terrestrial habitat. Therefore, the primary cumulative impact of the 2012 Colorado Roadless Rule would be beneficial. Future proposals for activity within CRAs would be subject to project-specific NEPA at which time an analysis of how a project could lead to the deterioration of roadless characteristics within the affected CRA.

While difficult to say conclusively for most species and situations, we do not foresee new, or newer levels of intensity, of negative effects to the ESA-protected species and designated critical habitats from these additional stressors. To the contrary, we

anticipate the high levels of protections to vast acreages across the Colorado roadless network should ameliorate the effects of some of these additional stressors.

Summary of Determinations of Effect (unchanged from 2012 and new determinations)

Table 3 and Table 4 summarize the Forest Service determinations of effect. The possible determinations of effect for Threatened and Endangered Species are

- No effect (NE)
- May affect, not likely to adversely affect (NLAA)
- May affect, wholly beneficial
- May affect, likely to adversely affect (LAA)

Table 3. 2012 and current (2016) determinations of effect for threatened and endangered species and critical habitats for the Colorado Roadless Rule and roadless area network under the rulemaking's management exceptions. The far right column identifies whether the 2016 determination of effect represents a change or not from the 2012 determination for the Colorado Roadless Rule, or a new determination altogether. 2016 determinations specific to the North Fork Coal Mining Area may or may not be the same than presented here for the Rule. This is discussed further in more detail in the narrative of this assessment report. NE = No effect; NLAA = May affect, not likely to adversely affect; LAA – May affect, likely to adversely affect; NLAM = may affect, not likely to adversely modify.

Species	2012 ESA Determination	2016 ESA Determination	Unchanged, changed, or new?
BIRDS			
Mexican spotted owl	NLAA (species & critical habitat)	NLAA (species & critical habitat)	Unchanged
southwestern willow flycatcher	NLAA (species)	NLAA (species)	Unchanged
whooping crane	NE	NE	Unchanged
piping plover	NE	NE	Unchanged
FISHES			
greenback cutthroat trout	NLAA	NE	Changed
pallid sturgeon	NE	NE	Unchanged
bonytail chub	NE	LAA[1]	Changed

Species	2012 ESA Determination	2016 ESA Determination	Unchanged, changed, or new?
humpback chub	NE	LAA[1]	Changed
razorback sucker	NE	LAA[1]	Changed
Colorado pikeminnow	NE	LAA[1]	Changed
INVERTEBRATES			
Uncompahgre fritillary butterfly	NE	NE	Unchanged
Pawnee montane skipper	NLAA	NLAA	Unchanged
MAMMALS			
Canada lynx*	NLAA	NLAA	Unchanged
Preble's meadow jumping mouse	NLAA (species & critical habitat)	NLAA (species & critical habitat)	Unchanged
grizzly bear	NE	NE	Unchanged
gray wolf	NE	NE	Unchanged
black-footed ferret	NE	NE	Unchanged
New Mexico meadow jumping mouse	None	NE (species & critical habitat)	New
PLANTS			
Pagosa skyrocket *Ipomopsis polyantha*	NE (species)	NLAA (species)	Changed (species)
DeBeque phacelia *Phacelia submutica*	NLAA (species)	NLAA (species)	Unchanged
Penland alpine fen mustard *Eutrema penlandii*	NLAA	NLAA	Unchanged
Colorado hookless cactus *Sclerocactus glaucus*	NLAA	NLAA	Unchanged
Ute ladies'-tresses *Spiranthes diluvialis*	NE	NE	Unchanged

Species	2012 ESA Determination	2016 ESA Determination	Unchanged, changed, or new?
Osterhout milkvetch *Astragalus osterhoutii*	NE	NE	Unchanged
Penland beardtongue *Penstemon penlandii*	NE	NE	Unchanged
Colorado butterfly plant *Gaura neomexicana* ssp. *coloradensis*	NE	NE	Unchanged
North Park phacelia *Phacelia formosula*	NE	NE	Unchanged

[1]Determination based solely on the potential for future minor water depletions from the Gunnison Basin due to new mining activities in the North Fork Coal Mining Area.

Table 4. Determinations of effect under the entire 2012 CRR and roadless area network for species affected by ESA listing or critical habitat decisions since the 2012 rulemaking.

Species	2012 ESA Determination	2016 ESA Determination	Unchanged, changed, or new?
DeBeque phacelia *Phacelia submutica*	NLAM (proposed critical habitat)	NE (critical habitat)	New
Pagosa skyrocket *Ipomopsis polyantha*	NE (proposed critical habitat)	NE (critical habitat)	Unchanged
green lineage cutthroat trout*	None	NLAA	New
Gunnison sage-grouse	None	NLAA (species & critical habitat)	New (species & critical habitat)
lesser prairie-chicken	None	NE	New
NM meadow jumping mouse	None	NE (species and critical habitat)	New
southwestern willow flycatcher	None (proposed critical habitat)	NE (critical habitat)	New (critical habitat)
yellow-billed cuckoo (western DPS)	None	NE (species & proposed critical habitat)	New

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Attachment 1

Biological Assessment for the Rulemaking for Colorado Roadless Areas
(February 2012)

Atttachment 2

U.S. Fish and Wildlife Service's March, 28, 2012, Letter of Concurrence on the Forest Service's Biological Assessment and Effects Determinations for the 2012 Colorado Roadless Rule

Attachment 3

U.S. Fish and Wildlife Service's September 9, 2015, Letter of Response to the Rocky Mountain Regional Forester's Proposed Species List for the Supplemental Environmental Impact Statement and Biological Assessment of the Colorado Roadless Rule and Proposed Reinstatement of the North Fork Coal Mining Area Temporary Road Exception

Addendum to the Forest Service's March 29, 2016, Supplemental Biological Assessment for the Colorado Roadless Rule, Supplemental Environmental Impact Statement, Proposed Action

The U.S. Fish and Wildlife Service has requested additional information from the Forest Service specific to the North Fork Coal Mining Area (NFCMA), in order to successfully complete their review of the Forest Service's biological assessment and conclude the ESA section 7 consultation on the proposed action. Specifically the Service has requested more detailed information concerning: 1) baseline lynx habitat condition for the Mount Gunnison Lynx Analysis Unit containing the NFCMA, 2) the estimated amount of lynx habitat that could be lost over time due to new activities permitted by restoration of the temporary road exception for the NFCMA, and 3) estimated water depletions from the Gunnison River Basin that may occur annually due to new mining activities at NFCMA under the rulemaking and restoration of the temporary road exception.

1. Baseline-related status of lynx habitat overall by LAU and within the NFCMA

Three roadless areas (Flatirons, Pilot Knob, Sunset) and two Lynx Analysis Units (Beckwith Mountain, Mount Gunnison) are associated with the NFCMA (Figure 1). Table 1 provides the total acres and acres of lynx habitat by LAU and the acres of that habitat occurring within the NFCMA. Mount Gunnison is the primary LAU associated with the NFCMA. All habitat acres reported in Table 1 are considered to be currently suitable, and there are no additional habitat acres in a currently unsuitable condition occurring in these LAUs. There are also no lynx landscape linkages in or near the NFCMA, the closest one being the McClure Pass linkage almost 10 miles as the crow flies to the northeast.

Colorado Roadless Rule, Supplemental BA addendum,
April 27, 2016

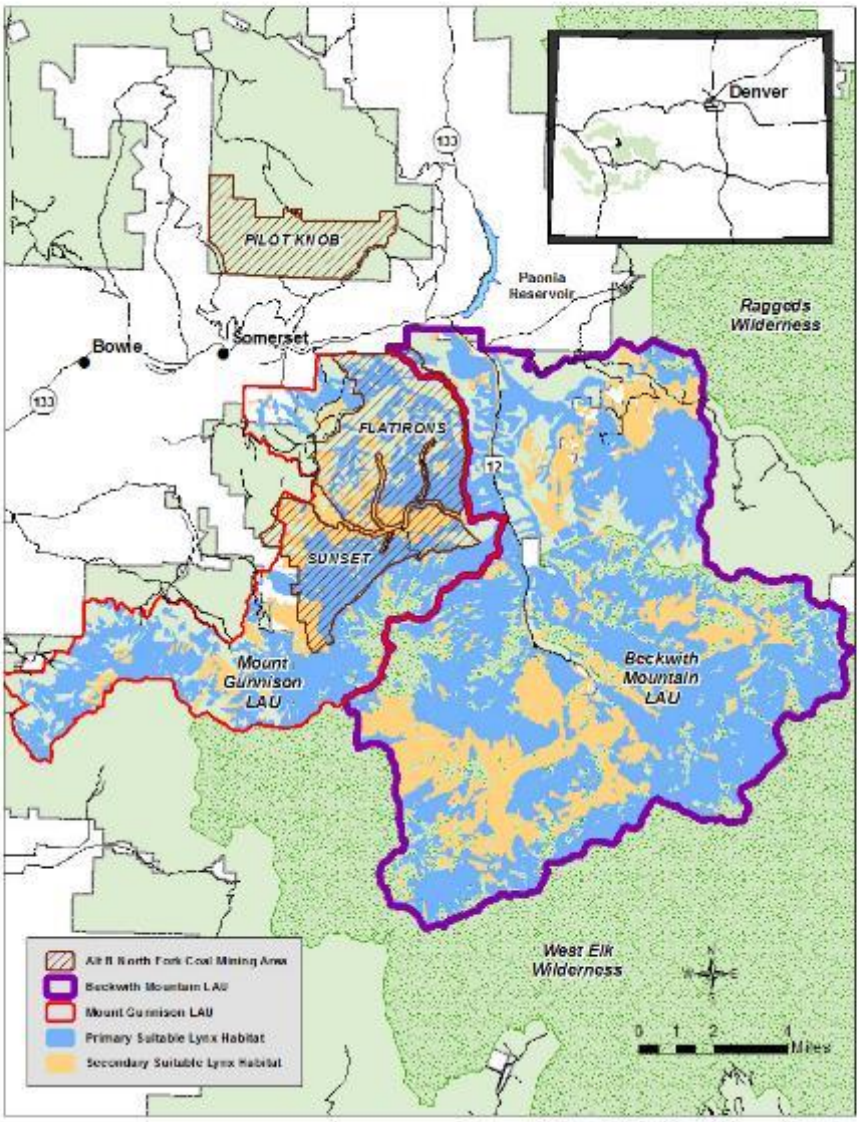

Figure 1. Roadless areas (Pilot Knob, Flatirons, Sunset), Lynx Analysis Units (Mount Gunnison, Beckwith), and mapped Canada lynx habitat associated with the North Fork Coal Mining Area under the Forest Service proposed action (Alternative B; see full Biological Assessment).

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Colorado Roadless Rule, Supplemental BA addendum,
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Table 1. Mapped lynx habitat associated with the North Park Coal Mining Area (NPCMA).

LAU	Total LAU Acres (habitat+ non-habitat/ in and outside the NFCMA)	LAU Acres of *Primary*[1] Suitable Lynx Habitat (in and outside the NFCMA)	LAU Acres of *Secondary*[2] Suitable Lynx Habitat (in and outside the NFCMA)	Total Lynx Habitat Acres by LAU (Primary + Secondary)	Acres of LAU *Primary* Suitable Lynx Habitat Occurring Within the NFCMA	Acres of LAU *Secondary* Suitable Lynx Habitat Occurring Within the NFCMA	Acres of LAU Mapped Lynx Habitat Occurring Within the NFCMA (Primary + Secondary)	% of LAU Lynx Habitat Acres Occurring Within the NFCMA
Mount Gunnison	38,230	17,607	4,720	22,417	6,556	2,468	9,084	40.5
Beckwith Mountain	79,416	39,080	14,339	53,369	75	0	75	0.1
TOTAL	**117,646**	**56,727**	**19,059**	**75,786**	**6,671**	**2,488**	**9,159**	**12.1**

[1] Primary habitat can include the spruce-fir cover type; aspen/lodgepole pine cover type on subalpine fir habitat types; other moist conifer cover types, such as Douglas-fir, white fir or blue spruce that currently dominate subalpine fir habitat type sites; and aspen mix where 10% spruce-fir tree component.
[2] Secondary habitat occurs within 300 m of primary habitat and may include pure aspen stands (<10% conifer tree component); moist Douglas-fir or other moist conifer cover types such as white fir or blue spruce; riparian willow; and mountain shrub and sagebrush.

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2. Potential Loss of Lynx Habitat From New Activities at the NFCMA

Due to the programmatic nature of the rulemaking and analysis of it including the NFCMA temporary road exception, there are no direct effects to species like the Canada lynx that can be determined for the proposed action to reinstate the NFCMA exception. As discussed in the full Biological Assessment for the 2012 rulemaking and current proposal to reinstate the NFCMA exception back into the 2012 roadless rule, there is potential for indirect effects from implementation of new activities in the future made possible by the rulemaking and its exceptions that may not have been permissible in associated roadless areas under the 2001 roadless rulemaking. If and to what extent those are actually realized will be determined by the future NEPA and ESA evaluations of project proposals based on the nature of information available at that time about the proposed activities and any protected species or habitats in the action areas.

Specific to the NFCMA and reinstatement of the temporary road exception, we estimated the potential surface and habitat disturbance associated with development of new temporary roads in the NFCMA. We used estimates from the environmental impact statement of potential production and associated temporary road construction at the NFCMA as follows:

- 17 years of production under an average rate of production scenario (range 12 – 36 years)
- 108 miles of new temporary road (36 miles for exploration; 72 miles for development) under a total production scenario

To estimate maximum potential surface disturbance from new temporary roads under a total production scenario at the NFCMA, we used the following standard formula used on the GMUG forest for similar activities:

- (X miles x 5,280 ft x 40) ÷ 43,560 = acres; where 5,280 is number of feet in 1 mile; 40 is the clear width in feet including the constructed road bed + additional clearing each side; 43,560 is the number of square feet per acre
- Estimated maximum surface disturbance from new temporary roads = 524 acres

To estimate potential disturbance to lynx habitat, we assumed the maximum (total) production scenario at the NFCMA. Because we have no way of knowing at this time where new roads and production will actually occur and to what extent at the NFCMA, we further assumed that 100% of that maximum new surface disturbance from temporary roads would affect lynx habitat and therefore equals the maximum acres of habitat that could be disturbed under the scenario.

- Estimated maximum habitat disturbance from new temporary roads = 524 acres

Table 2 provides a summary of the surface and habitat disturbance calculations.

Colorado Roadless Rule, Supplemental BA addendum,
April 27, 2016

Table 2. Potential maximum disturbance to Canada lynx habitat over time in the North Fork Coal Mining Area (NFCMA) under a maximum/total production scenario associated with application of the temporary road exception that is currently being proposed to be restored to the Colorado Roadless Rule by the Forest Service. The figures here are applied only to the Mount Gunnison LAU that represents the primary LAU and vast majority of lynx habitat associated with the NFCMA.

LAU	Total Amount of Lynx Habitat (acres)	Habitat Amount Occurring Within the NFCMA (acres)	Estimated Maximum Disturbance of Habitat (acres)	Proportion of Total LAU Habitat That Could Be Disturbed (%)	Proportion of LAU Habitat in the NFCMA That Could Be Disturbed (%)
Mount Gunnison	22,417	9,084	524	2.3	5.8

3. Estimated Water Depletions From New Activities at the NFCMA

Based on recent annual depletion data from the GMUG national forests for related activities, we project average annual depletions attributable to new mining-related activities in the NFCMA (primarily associated with methane drilling and road dust abatement) to be ≤ 5 acre-feet per year. This will be validated by ongoing annual depletions monitoring and reporting as agreed to between the agencies.

Discussion

Canada lynx. Our March 29, 2016, Biological Assessment to the U.S. Fish and Wildlife Service carried over our 2012 *"may affect, not likely to adversely affect"* programmatic determination for the Canada lynx. While some indirect effects to the Canada lynx could not be ruled out from implementation of the roadless rule and limited management exceptions, the potential for substantial adverse effects are minimized given the overall beneficial aspects of the roadless rulemaking and the fact that all future proposed management activities remain subject to project- and site-specific NEPA evaluations, forest plan consistency reviews, and section 7 consultation with the U.S. Fish and Wildlife Service if effects to species or critical habitat are projected by the Forest Service. The NFCMA exception also was not singled out for the 2012 rule as being of disproportionate concern for effects to the Canada lynx within the larger rulemaking and its implementation.

Additionally, while the data presented earlier in this addendum to our Biological Assessment provide a more detailed picture of the potential maximum disturbance to lynx habitat from applying the temporary road exception at the NFCMA, even under the worst case scenario it represents relatively small proportions of all habitat available to lynx in the NFCMA and larger

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LAU and regional context in which the mining area lies. Further, while the realized rate of production and associated habitat disturbance could happen at a somewhat faster (or slower) rate than the average production scenario presented (12 vs. 17 years; section 2 above), this should not substantially alter the potential for effects to the Canada lynx or our determination of effect. Any site-specific potential for more serious effects than could be contemplated in the 2012 Biological Assessment, or the current Biological Assessment and this addendum, should be resolved during the project-level NEPA and ESA evaluations and section 7 consultation. Overall, we expect that the beneficial aspects of the Colorado Roadless Rule together with ongoing implementation of forest plan direction and project-level evaluations and consultations as needed, will ensure negative effects to the Canada lynx are minimized and conservation value maximized consistent with our management direction for the lynx and many other special status species in Colorado. Our determination for the Canada lynx remains *"may affect, not likely to adversely affect."*

Water depletions. We concluded in our March 29th Biological Assessment that the NFCMA road exception could lead to additional minor water depletions that adversely affect the Colorado River listed fishes. We qualitatively established that these depletions, despite the required adverse conclusion, should be well within established thresholds under existing programmatic Biological Opinions and would be validated through appropriate annual reporting mechanisms agreed to between the agencies as an outcome of the current section 7 consultation. In hindsight, we should have put a number to what "well within established thresholds" meant. We have done that in this addendum and provided a more quantitative basis for further discussion and ongoing validation in our implementation of the roadless rule. Our adverse determinations for the four Colorado River listed fishes and their designated critical habitat are unchanged.

/s/ Peter M. McDonald April 27, 2016

Peter McDonald Date
FWS Species Program Leader

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
445 West Gunnison Ave, Suite 240
Grand Junction, Colorado 81501-5711

IN REPLY REFER TO:
ES/GJ-6-CO-09-T-001-GP030
TAILS 06E24100-2016-F-0194

May 19, 2016

Daniel J. Jiron, Regional Forester
U.S. Forest Service
Rocky Mountain Region
740 Simms Street
Golden, Colorado 80401

Dear Daniel Jiron:

This responds to your March 31, 2016, request for reinitiation of section 7 consultation on the ongoing implementation of the Colorado Roadless Rule (CRR) and your proposed reinstatement to the Rule of the North Fork Coal Mining Area (NFCMA) temporary road exception ("project"). We first completed consultation on the CRR, including the NFCMA exception, in 2012. However, in September 2014 the District Court of Colorado found against the Forest Service on a challenge to the rulemaking, based on analysis deficiencies associated with the NFCMA. The court vacated the NFCMA exception while leaving the CRR otherwise intact.

Since 2012 several new species have been listed in Colorado, and critical habitats designated, under the Endangered Species Act of 1973 (Act), as amended (16 U.S.C. 1531 *et Seq.*). You are requesting reinitiation of consultation on the effects of the project on these newly listed species and critical habitats, and on revised determinations for a few species that were addressed in the 2012 consultation.

We received your request for consultation and biological assessment (BA) for this project, dated March 31, 2016, on April 1, 2016 (Forest Service 2016a). We requested additional information and received an addendum to the BA (BA addendum) on April 27, 2016 (Forest Service 2016b). As stated in the BA, your current, final determinations of effect are listed below. Our response to your consultation request is for the entire CRR, including the NFCMA exception, but not restricted to the NFCMA exception.

You have determined that the project would have no effect on the following species (Table 1):

Table 1

Grizzly bear	*Ursus arctos horribilis*
Gray wolf	*Canis lupus*
Black-footed ferret	*Mustela nigripes*
New Mexico meadow jumping mouse	*Zapus hudsonius luteus*
Whooping crane	*Grus americana*
Piping plover	*Charadrius melodus*
Least tern	*Sternula antillarum*
Western yellow-billed cuckoo, and proposed critical habitat	*Coccyzus americanus*
Southwestern willow flycatcher--critical habitat only	
Lesser prairie chicken	*Tympanuchus pallidicinctus*
Pallid sturgeon	*Scaphirhynchus albus*
Greenback cutthroat trout	*Oncorhynchus clarkii stomias*
Osterhout milkvetch	*Astragalus osterhoutii*
Penland beardtongue	*Penstemon penlandii*
North Park phacelia	*Phacelia formosula*
Colorado butterfly plant	*Gaura neomexicana* ssp. *coloradensis*
Ute ladies'-tresses orchid	*Spiranthes diluvialis*
Pagosa skyrocket--critical habitat only	

We acknowledge your determination of no effect for these species (Table 1). Neither 7(a)(3) of the Act, nor implementing regulations under section 7(a)(2) of the Act require the U.S. Fish and Wildlife Service (Service) to review or concur with this determination; therefore the Service will not address these species further. However, we do appreciate you informing us of your analyses for these species.

As stated in the BA (Attachment 1), you determined in 2012 that the project may affect, but is not likely to adversely affect the following species (Table 2):

Table 2

Canada lynx	*Lynx canadensis*
Preble's meadow jumping mouse, and its critical habitat	*Zapus hudsonius preblei*
Mexican spotted owl, and its critical habitat	*Strix occidentalis lucida*
Southwestern willow flycatcher	*Empidonax traillii extimus*
Pawnee montane skipper	*Hesperia leonardus montana*
Uncompahgre fritillary butterfly	*Boloria acrocnema*
Penland alpine fen mustard	*Eutrema penlandii*
Colorado hookless cactus	*Sclerocactus glaucus*
DeBeque phacelia	*Phacelia submutica*

We concurred in 2012 with your determination that these species are not likely to be adversely affected by the project. Since that time you have considered any relevant, new information and reviewed your effects analyses. For the species above (Table 2), your determination of effects remains unchanged due to the lack of any substantial new information since 2012. You are not

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requesting re-initiation of consultation for these species, but would appreciate the courtesy of our affirmation that our conclusions for these species have not changed.

Of the species in Table 2, only the Canada lynx (lynx) can reasonably be expected to occupy habitat within the NFCMA. After reviewing the information in the BA, and information specific to the lynx in the BA addendum, we affirm that our 2012 conclusions for these species (Table 2), including the lynx, remain unchanged.

There are a few species that have been listed, and final critical habitats designated, since completion of consultation in 2012. You have made new determinations that the project may affect, but is not likely to adversely affect these species (Table 3). You have also changed your determination for a few species that were included in the 2012 consultation; you now have determined that the project may affect, but is not likely to adversely affect these species (Table 3). You are requesting reinitiation of consultation for the species in Table 3, which includes both new determinations and changed determinations, and you are requesting our concurrence that the project may affect, but is not likely to adversely these species and critical habitats:

Table 3

Gunnison sage-grouse, and its critical habitat	*Centrocercus minimus*
Green-lineage cutthroat trout[1]	*Oncorhynchus clarkii*
DeBeque phacelia, and its critical habitat	*Phacelia submutica*
Pagosa skyrocket species only	*Ipomopsis polyantha*

[1]Due to unsettled taxonomy, the Service has advised Federal agencies to conduct section 7 consultations for actions that may affect the greenback cutthroat trout as well as the green lineage cutthroat trout (Lineage GB) (Service 2012).

We concur with your determination that these species (Table 3) may be affected, but are not likely to be adversely affected, by the project. As stated in the BA, you anticipate generally high levels of protection to be provided to Colorado roadless areas from ongoing implementation of the CRR. Under your proposed project, no exceptions to the CRR are anticipated or proposed, except for the NFCMA exception. None of these species or their critical habitats are found within the NFCMA.

As stated in the BA, you have determined that the following endangered fish species and their critical habitats are likely to be adversely affected by the project (Table 4):

Table 4

Colorado pikeminnow	*Ptychocheilus lucius*
Razorback sucker	*Xyrauchen texanus*
Humpback chub	*Gila cypha*
Bonytail	*Gila elegans*

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Your determination of effect for these fishes in 2012 was "no effect." You have now concluded that your 2012 determination may have been in error due to the possibility of water depletions that are likely to occur from mining activities that may be facilitated by the proposed action to restore the temporary road exception to the NFCMA. You have now determined that the project may affect, and is likely to adversely affect, these four endangered fish, due solely to probable future water depletions (Forest Service 2016a, 2016b, 2016c). As stated in the BA addendum, you estimate that new water depletions associated with future activities in the NFCMA will be no more than 5 acre-feet per year (AF/yr). This quantity would come from the Gunnison River Basin, adversely affecting these endangered fish and their critical habitats downstream.

A Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin was initiated on January 22, 1988. The Recovery Program was intended to be the reasonable and prudent alternative to avoid jeopardy to the endangered fishes from impacts of water depletions to the Upper Colorado River Basin. In order to further define and clarify the process in the Recovery Program, a section 7 agreement was implemented on October 15, 1993, by the Recovery Program participants. Incorporated into this agreement is a Recovery Implementation Program Recovery Action Plan (RIPRAP) which identifies actions currently believed to be required to recover the endangered fishes in the most expeditious manner.

The Service and the Recovery Program track all water depletions that are covered under the 15 Mile Reach and Gunnison Programmatic Biological Opinions (PBOs) on a quarterly basis. A summary of those depletions are available at: http://www.coloradoriverrecovery.org/documents-publications/section-7-consultation/consultation-list.html . Also, in accordance with the Section 7, Sufficient Progress, and Historic Projects Agreement, the U.S. Fish and Wildlife Service (Service) reviews cumulative accomplishments and shortcomings of the Recovery Program in the upper Colorado River basin. Per that Agreement, the Service uses the following criteria to evaluate whether the Recovery Program is making "sufficient progress" toward recovery of the four listed fish species:

- actions which result in a measurable population response, a measurable improvement in habitat for the fishes, legal protection of flows needed for recovery, or a reduction in the threat of immediate extinction;
- status of the fish populations;
- adequacy of flows;
- and magnitude of the impact of projects.

Through these bi-annual Sufficient Progress reviews the Service evaluates the best available and current information to determine if the Recovery Program continues to offset depletion effects identified in existing Section 7 consultations including the depletions covered by these programmatic biological opinions. In the most recent assessment (dated October 7, 2015), the Service determined that sufficient progress has been made towards recovery. Sufficient Progress reports can be found at: http://www.coloradoriverrecovery.org/documents-publications/section-7-consultation/sufficient-progress-letters.html .

The Service issued the final Gunnison River Basin PBO on December 4, 2009 (this document is available for viewing at the following internet address:

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http://www.coloradoriverrecovery.org/documents-publications/section-7-consultation/GUPBO.pdf) (Service 2009). The Service has determined that projects that fit under the umbrella of the Gunnison River PBO would avoid the likelihood of jeopardy and/or adverse modification of critical habitat for depletion impacts to the Gunnison River basin. For projects involving water depletions less than 100 AF/yr to fit under the umbrella of the Gunnison River PBO, the Federal agency requesting consultation must document the project location, the amount of the water depletion, identify if the depletion is new or historic, and provide the information to the Service when consultation is initiated. This information was provided in your consultation request, therefore, the requirements have been met for the subject project to fit under the umbrella of the Gunnison River PBO. The Service requests that the Forest Service retain discretionary Federal authority for the subject project in case reinitiation of section 7 consultation is required.

This concludes consultation for the subject project. If you have any questions regarding this consultation or would like to discuss it in more detail, please contact Creed Clayton of our Grand Junction Ecological Services Field Office at (970) 628-7187.

Sincerely,

Ann Timberman
Western Colorado Supervisor

cc: FWS/UCREFRP, Lakewood

Literature Cited

U.S. Fish and Wildlife Service (Service). 2009. Final Gunnison River Basin Programmatic Biological Opinion. TAILS 65413-2009-F-0044. Denver, Colorado. 108 pp. + Appendices.

U.S. Forest Service. 2016a. Rulemaking for Colorado Roadless Areas, Supplemental Biological Assessment. March 2106. 57 pp. + Attachments.

U.S. Forest Service. 2016b. Addendum to the Forest Service's March 29, 2016, Biological Assessment for the Colorado Roadless Rule, Supplemental Environmental Impact Statement, Proposed Action. 6 pp.

U.S. Forest Service. 2016c. Electronic mail sent from Peter McDonald (USFS) to Creed Clayton (Service) on May 2, 2016.

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Appendix C Economic Analysis Methodology

This Appendix further highlights the methods, assumptions, and detailed information and models used for the economic analysis. Additional information is also available in the planning record for those with specific interests in the analysis process.

Study Area Assumptions

The Forest Service included Gunnison County in the economic impact analysis. In support of the SEIS, a 2013 IMPLAN model was customized using techniques similar to those used for the IMPLAN model employed for the 2012 FEIS. Fundamentally, coal mines located in Gunnison County, just east of the county line with Delta County, were added to the model of the economic impact study area. The reason for the adding the mines is that all labor and local material/service inputs to the Gunnison County mines flow from counties to the west and not from within Gunnison County. The mines are located in the far northwestern corner of the county, which is not easily accessible from the central business corridor of Gunnison County. Economic linkages of these coal mines extend west down the North Fork Valley to Montrose and Grand Junction, not east to the cities of Gunnison and Crested Butte.

Analysis Methods and Assumptions

North Fork Coal Production

North Fork Coal Mining Area Coal Substitutes—Characteristics

North Fork Coal Mining Area coal is a bituminous coal that is characterized by low sulfur content and a heat content of about 12,000 Btu/lb. Other coal with similar characteristics includes coal from Utah, the Green River area of Colorado and Wyoming, Central Appalachia, and Colombia. The heat and sulfur contents of these coals is shown in Table C-1. Note that other coal characteristics also play a role in determining suitability for consumption at a particular coal-fired plant, but rank, sulfur content, and heat content are the primary determinants. The other characteristics include chlorine and mercury content, percent ash, and the percentage of other trace metals and minerals.

Table C-1. *Comparison of coal characteristics*

Basin	*State*	*Sulfur Content (lb. sulfur dioxide/MMBtu)*	*Heat Content (MMBtu/ton)*
Uinta	Colorado	0.8	24.0
Uinta	Utah	0.6	23.4
Green River	Colorado	0.9	22.7
Green River	Wyoming	1.1	22.0
Central Appalachia	Kentucky (eastern)	1.0	25.0
Central Appalachia	Virginia	1.0	25.9
Central Appalachia	West Virginia (southern)	1.1	24.4
Colombia	Imported	0.6	21.6

Source: IPM, 2015.

Economic Impact Analysis Methods and Assumptions

The Forest Service used the IMPLAN modeling system to conduct economic impact analysis:

- IMPLAN is a proprietary economic modeling system that includes both input-output modeling software and accompanying data sets based on publicly available secondary sources. The system was initially designed and developed by the Forest Service in the 1970s, then privatized in the 1990s. Agency tools and protocols have been designed to fully utilize the IMPLAN modeling system.
- The Forest Service is one of several Federal agencies that make data available to the IMPLAN Group, LLC owner of the IMPLAN modeling system, for development of the annual IMPLAN dataset.
- The Forest Service utilizes detailed protocols for editing and adjusting IMPLAN to work with agency resource data/corporate databases. IMPLAN is built on a Microsoft Access database that allows Forest Service economists and contractors to complete analysis with specific data sets, such as using employment data from the Colorado Demography Office for IMPLAN modeling when working on projects in the State of Colorado.

The U.S. Forest Service/Economic Insights of Colorado, LLC customized IMPLAN for the impact analysis:

- The Forest Service provided Economic Insights of Colorado, LLC with a 2013 model for Delta, Garfield, Mesa, Montrose, and Rio Blanco counties in Colorado using only IMPLAN data sets.
- The Forest Service received access to 2013 confidential employment data from the Colorado Department of Local Affairs, State Demography Office for the five counties. (This data set includes confidential employer information that cannot be released without approval by State Demography Office. The data set was returned to State Demography Office after use.)
- Economic Insights of Colorado, LLC updated the State Demography Office-IMPLAN customization procedure used for the 2012 FEIS because the IMPLAN sector scheme changed from 440 sectors in the 2012 FEIS data set to 536 sectors in the 2013 data set. The primary task accomplished by the procedure was to crosswalk employment data from State Demography Office sector definitions to 2013 IMPLAN sector definitions.
- Economic Insights of Colorado, LLC acquired additional county-specific 2013 coal mining data on production, employment, payroll, and prices from the Colorado Division of Reclamation, Mining, and Safety; Colorado Mining Association; and Energy Information Administration. Data for the coal mining sector in Gunnison County were added to the five-county aggregation. Thus, coal-mining data assembled and used for the analysis include both proprietary and confidential information that cannot be released without approval by the IMPLAN Group, LLC and Colorado State Demography Office. Using these data, Economic Insights of Colorado, LLC made final estimates of production value, employment, and labor income for the entire coal mining sector (IMPLAN Industry #22) throughout the study area, including Gunnison County, and further customized the IMPLAN model.
- The resulting updated model was returned to the Forest Service for final calculation of study area multipliers, and then returned to Economic Insights of Colorado, LLC for analysis. At the two-digit NAICS level, there are no confidentiality disclosures with the model. Individual IMPLAN sectors with small employment totals were reviewed by the Forest Service and State Demography Office for confidentiality disclosures before releasing to the public.

Benefits and Social Costs Methods and Assumptions

Net Energy Production, Consumption, and Exports – Accounting for Market Substitution

The IPM framework is used to model energy market response and substitution effect resulting from projected increases in availability of North Fork Coal Mining Area coal supplies (ICF, 2015a and 2015b). IPM modeling results are used to estimate substitution response factors (e.g., response per million tons Colorado-Uinta coal produced) for the following:

- National underground coal production (million tons)
- National surface coal production (million tons)
- National natural gas production (billion cubic feet)
- National coal consumption (GWh from coal)
- National natural gas consumption (GWh from gas)
- Coal exports (million tons)
- National power-generation cost savings (in dollars)

IPM is an engineering and economic model of the coal and power sectors, supported by an extensive database of coal and power data parameters. The model has the ability to add new electricity-generating capacity in response to demand growth and policies, such as renewable portfolio standards. It is widely used to assess domestic and international coal production, transportation, and consumption, and the operations and economics of the U.S. electric power industry. The model also characterizes the U.S. natural gas industry. IPM is a multiregional model in terms of electricity demand regions, fuel demand regions, and coal supply regions that provides detailed results on a plant, regional, or national level. ICF International has maintained IPM since the mid-1970s.

In order to gain access to the IPM model, the Forest Service contracted with ICF International, a private, for-profit company that has several General Services Administration contracts with the Federal government in place. The model is proprietary, but the assumptions, methods, documentation, and results are available in this appendix and with additional detail, in the planning record for those interested.

Coal Demand, Supply, and Substitution – IPM Modeling

IPM does not extrapolate from historical conditions. Rather, it provides a least-cost forecast for a given set of current and future conditions that determine how the industry will function. The optimization routine that IPM uses has dynamic effects—it looks ahead at future years and simultaneously evaluates decisions over an entire specified time horizon, typically 20 to 40 years.

IPM uses a dynamic linear programming structure to model how electricity demand is met through a mix of generation and transmission in each region, as well as the transmission between regions. The North American version of IPM is divided into roughly 110 power demand regions, including eight Canadian provinces. The North American version of the model also includes international coal demand and coal supply regions to forecast global coal production and movement. A complete accounting of the all IPM model assumptions and methods is available in the planning record.

EPA uses IPM to analyze the impact of air emissions policies on the U.S. electric power sector. As part of this analysis, EPA publishes its assumptions and other information regarding its use of IPM on its website. Although this documentation provides insight into EPA's assumptions, the data and assumptions used by the Forest Service in this analysis are not necessarily the same as used by EPA. However, the Forest Service did use many of the EPA assumptions as described in more detail in Section 1.2 of documentation available in the planning record (ICF, 2015a). The Forest Service adopts IPM 5.13 and 5.15 nomenclature because of these similarities for ease of reference. However,

use of this nomenclature is not meant to indicate that the Forest Service has used IPM in the exact manner as EPA.

For this analysis, ICF is using EPA's coal supply curves from EPA's v5.13 IPM base case (EPA, 2015f). Because EPA only models the United States and does not include international representation beyond coal imports from Colombia and coal production from Canada, ICF has developed coal supply curves for each of the international supply regions used in the model, except for Canada. These international coal supply curves were adjusted over time at the average rate that the EPA domestic supply curves were adjusted. On average, the domestic EPA supply curves increase in cost by 1.5% annually. Thus the international supply curve costs were also increased by 1.5% per year.

The coal prices that the EPA coal supply curves produce in the IPM v5.13 base case are shown in Table C-2a for Wyoming, Montana, Colorado, and Utah, which are regions from which coal might be supplied if North Fork Coal Mining Area coal was not available. Coal prices in 2016 for Wyoming Powder River Basin 17.6 MMBtu/ton coal are expected to be around $10.3/ short ton (2012$) and rising to $11.6/ short ton by 2018 (SNL Financial, 2015). Thus, the EPA supply curves for Wyoming Powder River Basin coal result in prices somewhat higher than market expectations for 2016 and close to market expectations for 2018, as of mid-2015. Coal prices in 2016 for Utah coal are expected to be $40.8/short ton (2012$) and rising to $41.2 by 2018.

EPA's coal supply curves were most likely developed in 2013, at which time the Uinta Basin coal prices were in the $35/ short ton range. Thus, the EPA supply curves result in Uinta Basin coal prices that are below market expectations for the next few years. Since 2013, coal prices in general have declined by 10–20%, although some prices started declining in 2012 and others, such Powder River Basin coal fell 20–30% in 2012 and have been gradually increasing. Coal prices have decreased recently due to lower demand because of milder weather and because of being displaced by natural gas, which has been at historically low prices. In the mid- to long term, which is the focus of this analysis, coal prices are expected to increase above the low prices observed in 2015.

Modeling the Final Clean Power Plan Rule under IPM® v5.15

The EPA estimated that the Clean Power Plan as proposed could lead to the reduction of power sector greenhouse gas emissions to 30 percent below 2005 levels by 2030. EPA's Regulatory Impact Analysis for the proposed Clean Power Plan estimated that the plan will reduce coal-fired electricity generation by 16–22% in 2020 and by 25–27% in 2030. While the IPM v5.13 base case did not endogenously account for the final Clean Power Plan rule, the SDEIS considered the likely effects of a proposed carbon policy for the domestic energy sector through a future carbon price schedule. The majority of assumptions were obtained from EPA's IPM v5.13 base case. Although the Clean Power Plan was not finalized and the newer v5.15 was not available at the time of the SDEIS analysis, the proposed Clean Power Plan rule and its likely effects were recognized and integrated into ICF's modeling runs. Specifically, IPM® has the capability to model carbon polices as a price on carbon. In the SDEIS, ICF modeled a price on carbon from all electric generating sources as a proxy for the proposed Clean Power Plan. The modeled carbon price reflects the proposed rule, which covers CO_2 emissions only from the power sector (ICF, 2015a).

The New Source Performance Standards for CO_2 for new and modified sources are reflected in the model by requirements that any new coal units, other than those named by EPA as exceptions, would have to be constructed with partial carbon capture and sequestration (ICF, 2016). Because the carbon price proxy used in the SDEIS was based on the proposed Clean Power Plan rule and not the final rule, IPM v5.15 base case was considered in the SFEIS to provide further understanding regarding the final Clean Power Plan rule's implication on the energy market. In the SFEIS analysis, ICF models the EPA's final Clean Power Plan using the mass-based individual state approach.

The IPM v.5.15 base case is a projection of electricity sector activity that takes into account Federal and State air emission laws and regulations whose provisions were either in effect or enacted and clearly delineated at the time the base case was finalized. Besides the incorporations of updated rules and regulations, a major force behind the changes under IPM v5.15 came from the 2015 update of Energy Information Administration's Annual Energy Outlook (EIA, 2015c).

In sum, under IPM v5.15 a number of changes have occurred, including:

- Electricity demand has been revised downward, consistent with Energy Information Administration's Annual Energy Outlook forecasts. This revision has implications for projections and future demand for electricity among competing sources.
- Natural gas supply assumptions have been updated, such that gas prices are slightly lower than the v5.13.
- Coal supply adjustments have also been made, leading to lower prices overall.
- Coal transportation assumptions in v.5.13 reflect a much higher diesel outlook rather than recent price forecasts. Also, there have been some substantial changes in western rail rates that EPA is in the process of updating.
- Updates or incorporations of several rules and regulations, such as
    - Cross-State Air Pollution Rule, a Federal regulatory measure for achieving the 1997 National Ambient Air Quality Standards for ozone and fine particles
    - Mercury and Air Toxics Rule, which was finalized in 2011. Mercury and Air Toxics Rule establishes National Emissions Standards for Hazardous Air Pollutants for the "electric utility steam generating unit" source category
    - EPA Base Case v.5.15 also reflects the final actions EPA has taken to implement the Regional Haze Rule. This regulation requires states to submit revised State Implementation Plans that include (1) goals for improving visibility in Class I areas on the 20% worst days and allowing no degradation on the 20% best days and (2) assessments and plans for achieving Best Available Retrofit Technology emission targets for sources placed in operation between 1962 and 1977. Since 2010, EPA has approved State Implementation Plans or, in a very few cases, put in place regional haze Federal Implementation Plans for several states. The Best Available Retrofit Technology limits approved in these plans (as of August 2014) that will be in place for EGUs are represented in the EPA IPM v.5.15 base case.
    - EPA IPM v.5.15 base case also includes two non-air Federal rules effecting electric generating units: Cooling Water Intakes (316(b)) Rule and Combustion Residuals from Electric Utilities, both promulgated in 2014 (EPA, 2015d)
- Added additional power generating resources such as New Powered Dams and New Stream Development
- Added new Emission Control Technologies such as added description of CO_2 from Flue Gas Desulfurization and Duct Sorbent Injection Systems and Retrofit updates to reflect 2014 behavior in 27 units
- Assumption changed regarding the Immediate Retirement of Hardwired Coal-to-gas Converting Plants
    - Hardwired coal-to-gas retrofits are prevented from retiring based on an exogenous ramp rate. The limits are calculated based on the assumption that none of the units can retire in 2014 and all of them can retire in 2030.
- Other updates as documented in EPA (2015d)

These factors affect the competitiveness of coal-fired power generation in the domestic marketplace, consequently influencing the projected market substitution of coal production resulting from the proposed action. Based on these potential implications, public comments and newly available information, additional IPM® modeling was conducted by ICF using IPM v.5.15 base case in order to

evaluate changes to market response factors under proposed actions. Specific changes to market responses from the mixture of energy production, electricity generation, and CO_2 emissions based on IPM v5.15 are shown in Table 3-27.

It is important to note that the Clean Power Plan provides states with flexibility in implementation, including the option to adopt various rate-based and mass-based trading programs to reduce CO_2 emissions. Due to this flexibility, ongoing legal challenges, as well as potential differences in the implicit stringency of the finalized state goals from the proposed Clean Power Plan, the generalized market responses projected above contain substantial uncertainties. That said, the timing and implementation of CPP is but one factor among many policy and market uncertainties that influence the baseline of this analysis. Other federal and state policies (such as state renewable portfolio standards or the extension of the federal production and investment tax credits for certain renewable energy technologies) as well as changes in the availability and production cost of various generating types and fuels as well as electricity demand may also be anticipated to importantly affect the electricity generation mix over the time frame of the analysis for the SFEIS.

Table C-2a. *Coal prices in the IPM v5.13 base case no action alternative (2012$/short ton) (SDEIS)*

Year	Wyoming Powder River Basin 18 MMBtu/short ton	Montana Powder River Basin 18 MMBtu/short ton	Colorado Uinta Basin 24 MMBtu/short ton	Utah Uinta Basin 23 MMBtu/short ton
2016	11.17	11.48	27.38	25.01
2018	11.73	12.08	28.53	25.91
2020	12.33	12.75	30.15	27.03
2025	13.95	14.56	33.02	29.77
2030	15.74	17.87	36.53	33.13
2040	20.20	21.54	42.90	40.07
2050	25.86	28.69	56.06	49.88

Source: SNL Financial (2015).

However, of equal importance is that a cohesive view of the coal markets and coal prices is used in the analysis. Such a cohesive approach is obtained by using the EPA coal supply curves in their entirety. Coal prices used in the SFEIS using the newer IPM® v.5.15 are contained in Table C-2b.

Table C-2b. *Coal prices in the IPM v.5.15 no action alternative (2012$/short ton) (SFEIS)*

Year	Wyoming Powder River Basin 18 MMBtu/short ton	Montana Powder River Basin 18 MMBtu/short ton	Colorado Uinta Basin 24 MMBtu/short ton	Utah Uinta Basin 23 MMBtu/short ton
2016	11.17	12.39	27.75	26.00
2018	11.73	13.06	28.93	26.99
2020	12.33	14.23	30.60	28.25
2025	13.95	16.10	34.47	31.25
2030	15.74	18.59	38.52	35.07
2040	20.20	24.35	49.14	43.63
2050	25.98	31.82	66.30	55.72

Source: SNL Financial (2015).

Coal and Natural Gas Consumption

The reason that there is more coal consumption and less natural gas consumption under IPM v.5.15 is because under v.5.13 a carbon price was used as a proxy for the proposed Clean Power Plan and that carbon price continued to increase over time. As the carbon price increased it caused coal-fired generation to be less and less economic compared to natural gas-fired generation. In contrast, in the SFEIS (under IPM v.5.15), the final Clean Power Plan is modeled. The Clean Power Plan has increasingly stringent performance requirements over the implementation period of 2022 through 2030; however, those performance requirements do not change after 2030 and do not become more stringent. Because the Clean Power Plan performance requirements do not change after 2030, while the carbon price in the SDEIS continued to increase after 2030, natural gas consumption is higher and coal consumption is lower in the SDEIS compared to the SFEIS in the period after 2030. In fact, under IPM v.5.15 in the SFEIS 13% more coal is consumed over the entire analytical timeframe from 2016 through 2050, as shown Table C-2c.

Table C-2c. *Coal consumption for generation of electricity (TBtu)*

	2016	2018	2020	2025	2030	2040	2050
Under IPM v5.13	15,879	16,253	14,744	14,032	12,184	8,340	6,652
Under IPM v5.15	13,812	13,450	13,670	12,308	11,599	11,342	11,301

Natural Gas

This analysis incorporates the natural gas module that EPA used in its IPM v5.13 base case. Using the natural gas module allows natural gas prices to adjust to changes in demand. The natural gas prices at Henry Hub, which is a major natural gas pricing point in Louisiana, are shown in Table C-3.

Table C-3. *Natural gas prices in the no action alternative (2012$/MMBtu)*

Year	*Henry Hub (2012$/MMBtu)*
2016	4.79
2018	5.77
2020	5.18
2025	5.75
2030	5.84
2040	7.17
2050	9.11

Source: IPM, 2015.

Under IPM v.5.15, where natural gas prices are relatively lower, the elasticity of the coal demand is much lower at about 0.05. In all but 2020 and 2030 the natural gas prices are lower in the SFEIS. In 2020 and 2030 the natural gas prices under IPM v.5.15 are within 5% ($0.27/MMBtu 2012$) of the SDEIS's (with v.5.13) gas prices. However, even though the gas prices are less than or close to those presented in the SDEIS, the natural gas production in the SFEIS through 2030 is higher on average by 2,038 TBtu—nearly 20% of the total natural gas used for electric power generation. It is this large amount of additional natural gas at lower prices that results in the coal to coal switching in the SFEIS

under v.5.15 as compared to the SDEIS. The differences in natural gas prices and production projections during 2016–2050 under IPM v.5.13 and IPM v.5.15 are shown in Tables C-4 and C-5 and Figure C-1.

Table C-4. *Natural gas prices (2012$/MMBtu) under IPM v.5.13 (SDEIS) and IPM v.5.15 (SFEIS)*

Model	Natural Gas Prices, in 2012 dollars/MMBtu						
	2016	2018	2020	2025	2030	2040	2050
Under IPM v5.13	4.79	5.77	5.18	5.75	5.84	7.17	9.11
Under IPM v5.15	4.05	4.54	5.45	5.01	6.00	5.57	6.22

Source: IPM, 2015.

Table C-5. *Natural gas production (TBtu) under IPM v.5.13 (SDEIS) and IPM v.5.15 (SFEIS)*

Model	Natural Gas Production, in TBtu						
	2016	2018	2020	2025	2030	2040	2050
Under IPM v5.13	25,927	26,378	27,504	29,610	32,066	39,387	43,789
Under IPM v5.15	28,055	28,888	29,967	31,463	33,300	37,378	41,099

Source: IPM, 2015.

International Coal Demand

International coal demand in the model is represented by a forecast of a region's or country's total thermal coal demand. ICF used the most recent Energy Information Administration forecast available, which was Energy Information Administration's 2013 International Energy Outlook for the international demand forecast (EIA, 2013). The Energy Information Administration data was used because it is a publicly available source and because it provides coal demand forecast data in sufficient detail for the countries of interest. The demand forecast for selected Asian countries is shown in Table C-6.

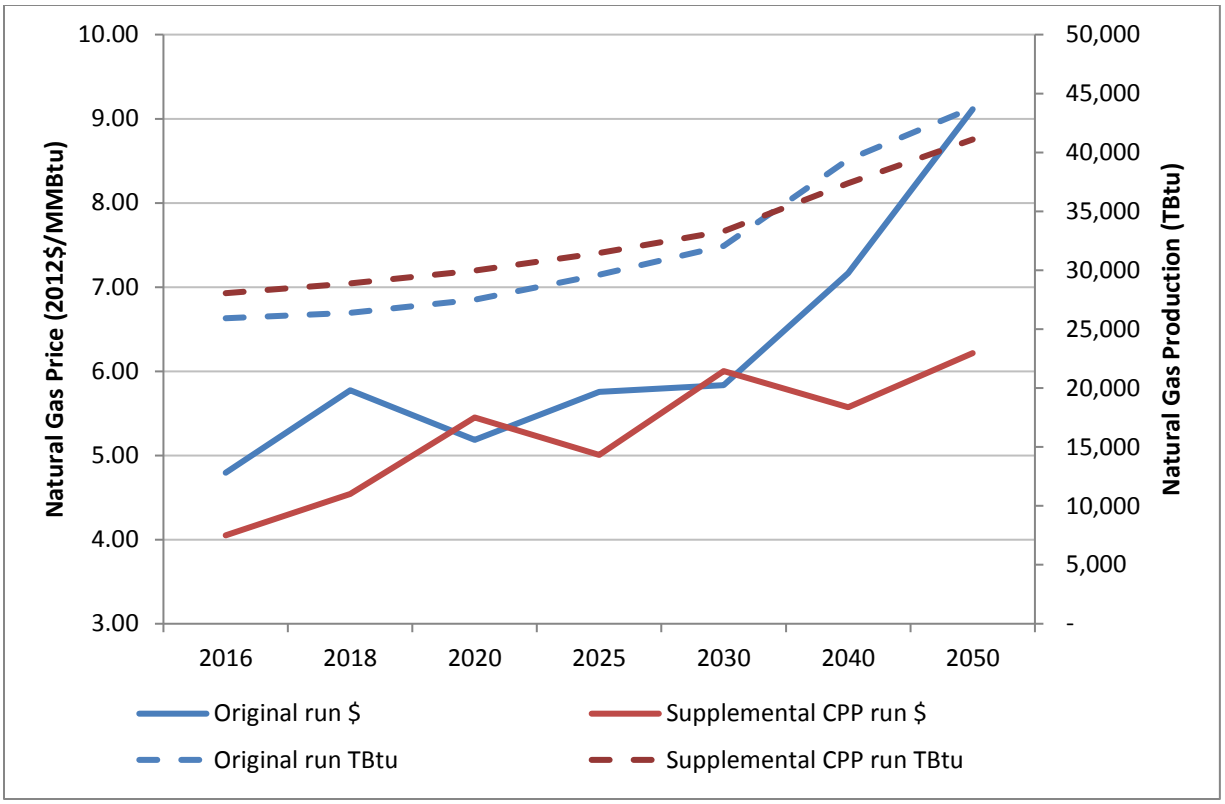

Figure C-1. *Natural gas prices and production under IPM v5.13 and v5.15.*

**Note that "original run" refers to SDEIS analysis using IPM v5.13; while "supplemental Clean Power Plan run" refers to SFEIS analysis using IPM v5.15. ICF modeled and documented the source of differences between the two runs: The scenario differs from the scenarios analyzed for the SDEIS and documented in the September 2015 report in two primary ways. First, this scenario explicitly models the Clean Power Plan. Second, the assumptions used in this scenario are based on IPM v5.15, whereas the previous scenarios were based on IPM v5.13. (ICF, 2016).*

Table C-6. *Demand forecast for selected Asian countries*

Year	China	India	Japan	South Korea	Taiwan
	(trillions of BTUs)				
2016	76,248	11,841	3,190	2,013	1,633
2017	79,543	12,111	3,190	1,992	1,641
2018	81,449	12,325	3,182	1,977	1,650
2019	83,174	12,675	3,188	1,961	1,658
2020	84,961	13,109	3,190	1,945	1,666
2021	87,254	13,482	3,190	1,947	1,675
2022	89,458	13,821	3,184	1,939	1,683
2023	91,682	14,187	3,173	1,927	1,691
2024	94,198	14,592	3,164	1,919	1,700
2025	96,410	14,904	3,151	1,899	1,708
2026	97,989	15,251	3,142	1,873	1,717
2027	99,672	15,641	3,131	1,843	1,725
2028	101,448	15,965	3,119	1,814	1,734
2029	103,146	16,280	3,105	1,781	1,743
2030	104,764	16,591	3,089	1,751	1,751
2031	106,167	16,951	3,077	1,754	1,760
2032	107,315	17,306	3,063	1,757	1,769
2033	108,297	17,659	3,042	1,757	1,778
2034	109,033	18,010	3,022	1,760	1,787
2035	109,484	18,346	3,001	1,761	1,796
2040	110,921	20,018	2,857	1,715	1,841
2050	117,440	24,153	2,642	1,680	1,935
2016–2019 CAGR	2.94%	2.29%	-0.02%	-0.87%	0.50%
2020–2029 CAGR	2.18%	2.44%	-0.30%	-0.97%	0.50%
2030–2050 CAGR	0.57%	1.90%	-0.78%	-0.21%	0.50%
2016–2050 CAGR	1.28%	2.12%	-0.55%	-0.53%	0.50%

CAGR = cumulative average growth rate.

Export

While the coal export response coefficient for Alternatives B and C was estimated to be 0.1 in the SDEIS, the domestic coal consumption estimated under IPM v.5.15 (in SFEIS) is higher, which results in less coal being exported, partly due to the higher domestic demand. Modified IPM modeling results indicate that coal exports from the Rockies coal supply region (UT, CO, WY-Green River), as a percentage of total coal production from the Rockies region, range from 9% to 13% under Alternative A (baseline) and from 9% to 18% under Alternative B, reflecting an increase in exports

from the Rockies, triggered by increases in North Fork reserves. These values are consistent with a range of 10% to 20% reported for the Colorado Uinta Basin coal exports in the SDEIS (pg. E-11). However, increased exports from the Rockies under Alternative B are almost completely matched by decreases in exports from the Powder River supply region, implying essentially no change in total coal exports under Alternative B or C. As a result, revised coal export response coefficients are zero under the modified modeling assumptions and SCC calculations (Table 3-27 in SFEIS). Under those export response coefficients generated with IPM v5.15, decreases in coal exports from other supply regions were estimated to be lower than increases in coal exports from the Rockies supply region, implying net increases in coal exports under Alternative B (and C).

These results demonstrate how export response coefficients, used in SCC calculations, differ from coal export percentages. The percentage of North Fork coal exported (e.g., 9–20%) may vary or even remain the same across alternatives; however, the change in aggregate coal exports across all supply regions may be zero if increases in exports from North Fork are offset by decreases in exports from other supply regions.

Coal Reserves

Coal reserves both domestically and internationally are an important companion input to annual coal production capacity in the coal supply curves. Over time as the reserves on a step on the coal supply curve are exhausted the solved equilibrium price must solve higher on the coal supply curve, thus generally pushing prices higher over time, all else equal.

The domestic coal reserve estimates used in this analysis are included in the EPA coal supply curves adopted from EPA's v5.13 IPM documentation. International reserve data is generally of lower quality and can be inconsistent between sources. If multiple sources of reserve estimates were available, the analysis used the higher estimates, as technological improvements tend to make resources available that might have been un-economic previously.

Modeling Coal Production (ICF, 2015b)

The IPM framework optimizes coal production, transportation, and consumption to meet given levels of demand. For this purpose, the model uses coal supply curves developed for EPA, which provide supply curves for 34 different domestic coal supply basins. The international coal supply curves for 25 international supply basins were developed by ICF and added to the domestic supply curves to allow for global coal modeling. Coal supply curves are developed for 15 coal types distinguished by rank and sulfur content. There are multiple coal supply curves for each supply basin corresponding to the major coal quality types in that region. The supply curves consist of a series of supply "steps" that consist of a production cost, annual production capacity, and a coal resource limit. These supply curves are then incorporated into IPM. Each coal power plant in IPM is assigned to its own coal demand region in the model.

Coal varies by heat content, sulfur dioxide content, hydrogen chloride content**,** and mercury content among other characteristics. To capture differences in the sulfur and heat content of coal, a two-letter "coal grade" nomenclature is used. The first letter indicates the "coal rank" (bituminous, subbituminous, or lignite) with their associated heat content ranges (Table C-7). The second letter indicates their "sulfur grade," i.e., the SO_2 ranges associated with a given type of coal (Table C-8).

Table C-7. *Coal rank heat content range*

Coal Type	*Heat Content (Btu/lb)*	*Classification*
Bituminous	>10,260–13,000	B
Subbituminous	>7,500–10,260	S
Lignite	Less than 7,500	L

Table C-8. *Coal-grade sulfur dioxide content range*

Sulfur Dioxide Grade	*Sulfur Dioxide Content Range (lbs/MMBtu)*
A	0.00–0.80
B	0.81–1.20
D	1.21–1.66
E	1.67–3.34
G	3.35–5.00
H	> 5.00

Note: MMBtu = pounds per million metric BTU.

IPM includes integrated U.S. and international coal market modeling. The domestic and international coal supply regions are shown in Figures C-2 and C-3. The modeling platform captures terminal capacity limits, international shipping costs, steam coal supply, and demand from both electricity and non-electricity sectors.

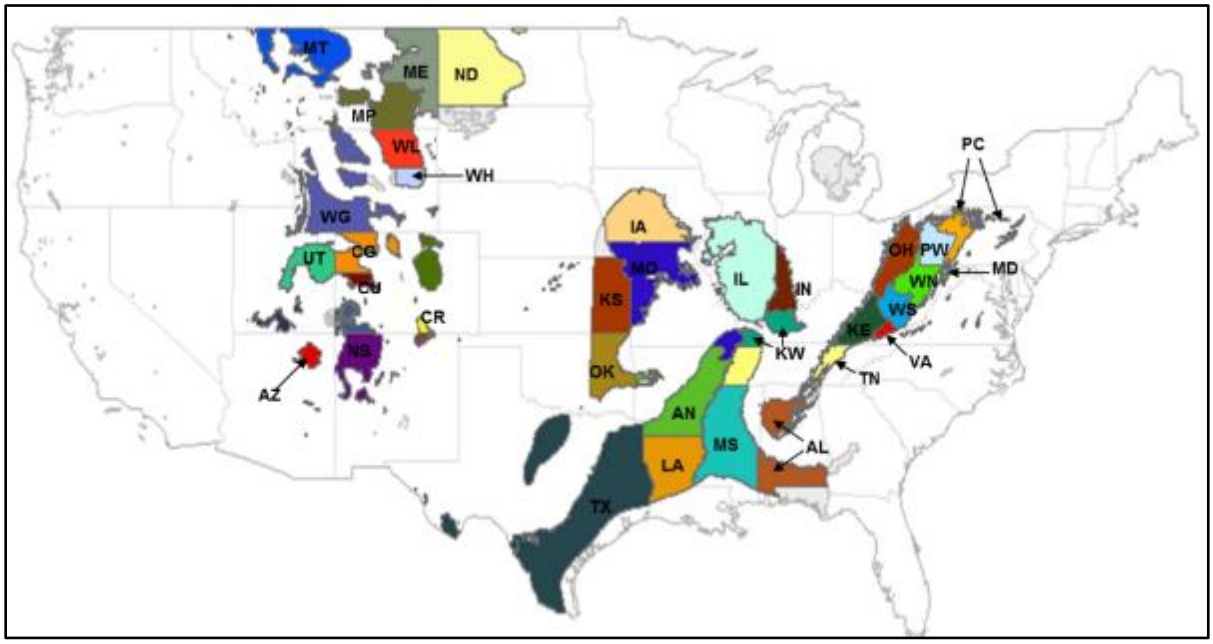

Figure C-2. *Domestic coal supply regions.*

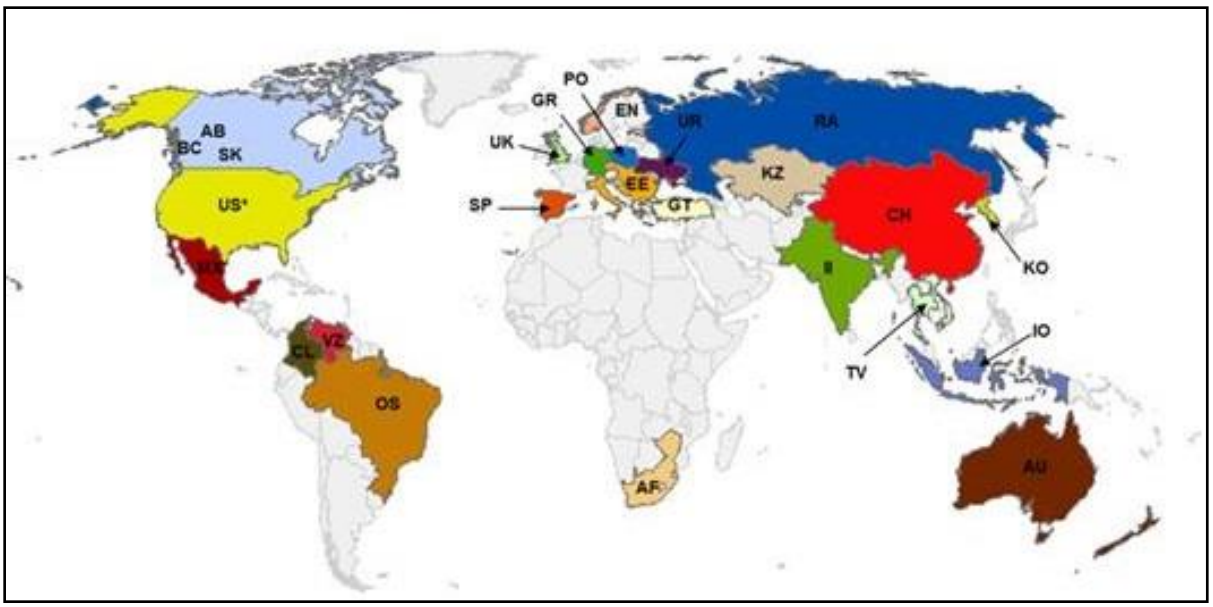

Figure C-3. *International coal supply regions.*

Modeling Coal Demand (ICF, 2015b)

Using IPM, coal demand is determined in the United States and Canada by the dispatch of existing coal-fired power plants, and elsewhere by projections of coal demand by country. Within a model run, IPM calculates thermal coal consumption for each coal-fired electricity generation plant in the United States and Canada. Thermal coal consumption and coal prices are determined by the supply and demand economics of meeting the electricity demand in each electric demand region and nationally. The plant specific coal consumption and coal supply region price projections result in an integrated and consistent analysis in IPM of the electricity demand; natural gas supply and prices; air emissions regulations for nitrogen oxides, sulfur dioxide, hydrogen chloride, and mercury; carbon dioxide policy alternatives, and renewable portfolio standards and explicit modeling of renewable generation options.

If the future electricity demand cannot be met by existing power plants, IPM will determine the type and amount of new generating capacity required to meet the electricity demand on a least-cost basis. The different types of capacity that can be added consist of combustion turbines, combined cycles, nuclear units, wind plants, coal-fired units, solar PV and thermal, geothermal, biomass, landfill gas, and hydro. Thus, if IPM determines that new coal plants in the United States and Canada are necessary, it will increase coal demand. IPM can also determine that it is most economical to retire existing coal plants, which would decrease coal demand. This is only applicable in the United States and Canada, as coal plants are modeled explicitly in only these countries. Using this structure, IPM is able to model explicitly the shifts in coal demand related to environmental mandates, natural gas prices, and coal production and transportation costs. For example, if natural gas prices are low, more electricity will be generated by natural gas-fired combined cycles, and coal consumption will be lower than in a case with higher natural gas prices. Outside of the United States and Canada, coal demand is estimated using historical coal consumption data, expected coal plant construction, and economic growth on a country-by-country basis.

The coal demand forecast for China, the rest of the Pacific Basin, and the United States is shown in Table C-9. As the forecast shows, China will continue to be the largest thermal coal consumer through 2038.

Table C-9. *Coal demand forecast for China, the rest of the Pacific Basin, and the United States*

Year	China[a]	Hong Kong[a]	India[a]	Japan[a]	South Korea[a]	Taiwan[a]	United States[b]
	(trillions of BTUs)						
2018	81,449	339	12,325	3,182	1,977	1,650	17,423
2025	96,410	351	14,904	3,151	1,899	1,708	15,237
2030	104,764	360	16,591	3,089	1,751	1,751	13,386
2040	110,921	379	20,018	2,857	1,715	1,841	9,604
2050	117,441	398	24,153	2,642	1,680	1,935	7,919

Notes:

[a] International total coal demand obtained from Energy Information Agency International Energy Outlook 2013 and metallurgical coal demand was subtracted to obtain the thermal coal demand.

[b] The U.S. demand is from the base case scenario of this analysis.

In terms of non-electricity sector demand for thermal coal, IPM includes domestic and international forecasts that serve as the demand for this coal. IPM has an international coal supply and demand representation that enables it to project coal exports out of and imports into the United States and other countries. The overall U.S. electricity demand forecast is summarized in Table C-10.

Table C-10. *Energy demand forecast for the United States*

Year	Energy Demand (TWh)
2016	4,048.7
2018	4,134.6
2025	4,390.0
2030	4,535.1
2040	4,887

Notes: Source: IPM v5.13 documentation.
TWh = terawatt hours.

Comparison of Assumptions

This section provides a comparison of assumptions used in this analysis and the analysis conducted for the SDEIS. A comparison of natural gas prices is shown in Table C-11. In general the gas prices using the EPA v5.15 data results in lower gas prices, except for 2020 and 2030. In those 2 years the gas prices are somewhat higher. Natural gas demand is higher through 2030 before dropping below the demand levels seen in the analysis for the SDEIS (Table C-12). In the following tables and comparison, ‘Supplemental analysis’ refers to the updated results in the SFEIS under IPM® v5.15.

***Table C-11**. Natural gas prices – Henry hub spot price (2012$/MMBtu)*

Year	Analysis for SDEIS	Analysis for SFEIS	Difference = SFEIS minus SDEIS
2016	4.79	4.05	-0.74
2018	5.77	4.54	-1.23
2020	5.18	5.45	0.27
2025	5.75	5.01	-0.74
2030	5.84	6.00	0.16
2040	7.17	5.57	-1.6
2050	9.11	6.22	-2.89

***Table C-12.** U.S. electric power natural gas demand (TBtu) – No action alternative*

Year	Analysis for SDEIS	Analysis for SFEIS	Difference = SFEIS minus SDEIS
2016	8,655	10,038	1,382
2018	8,271	9,782	1,511
2020	8,553	9,305	752
2025	8,365	9,527	1,162
2030	9,308	9,666	359
2040	14,841	10,844	-3,997
2050	19,765	13,949	-5,815

Coal prices are shown in Tables C-13 and C-14. In general the coal prices in the supplemental analysis are higher than the prices in the analysis for the SDEIS, due to increased demand for coal. U.S. coal demand between the two analyses is shown in Table C-15. Through 2030 the supplemental analysis has lower coal demand, while in later years it has higher coal demand. This is due in part to the structure of the carbon policy in each case. In the analysis for the SDEIS, a carbon price was used as a proxy for the proposed Clean Power Plan. That proxy price increased over time and continued to make coal less competitive than natural gas, especially in the out years. Other differences between baseline scenarios may also be account for changes in coal prices.

***Table C-13**. Coal minemouth prices for the SDEIS (2012$/short ton) – No action alternative*

Year	Wyoming Powder River Basin 18 MMBtu/short ton	Montana Powder River Basin 18 MMBtu/short ton	Colorado Uinta Basin 24 MMBtu/short ton	Utah Uinta Basin 23 MMBtu/short ton
2016	11.17	11.48	27.38	25.01
2018	11.73	12.08	28.53	25.91
2020	12.33	12.75	30.15	27.03
2025	13.95	14.56	33.02	29.77
2030	15.74	17.87	36.53	33.13
2040	20.20	21.54	42.90	40.07
2050	25.86	28.69	56.06	49.88

Table C-14. *Coal minemouth prices for the SFEIS (2012$/short ton) – No action alternative*

Year	Wyoming Powder River Basin 18 MMBtu/short ton	Montana Powder River Basin 18 MMBtu/short ton	Colorado Uinta Basin 24 MMBtu/short ton	Utah Uinta Basin 23 MMBtu/short ton
2016	11.17	12.39	27.75	26.00
2018	11.73	13.06	28.93	26.99
2020	12.33	14.23	30.60	28.25
2025	13.95	16.10	34.47	31.25
2030	15.74	18.59	38.52	35.07
2040	20.20	24.35	49.14	43.63
2050	25.98	31.82	66.30	55.72

Table C-15. *U.S. thermal coal demand (TBtu) – No action alternative*

Year	Analysis for SDEIS	Analysis for SFEIS	Difference = SFEIS minus SDEIS
2016	17,049	14,972	-2,077
2018	17,423	14,583	-2,840
2020	15,883	14,804	-1,079
2025	15,237	13,579	-1,658
2030	13,386	12,903	-483
2040	9,604	12,779	3,175
2050	7,919	12,741	4,822

U.S. electric demand is shown in Table C-16. This table shows that the electric demand forecast in the IPM v5.15 is lower than the forecast in v5.13.

Table C-16*. U.S. electric demand (TWh) – No action alternative*

Year	Analysis for SDEIS	Analysis for SFEIS	Difference = SFEIS minus SDEIS
2016	4,048.7	4,050.9	2.2
2018	4,134.6	4,134.1	-0.5
2025	4,390.0	4,327.7	-62.3
2030	4,535.1	4,465.3	-69.8
2040	4,887	4,740.5	-146.5

Source: IPM v5.13 and v5.15 documentation.

Disposition of North Fork Coal and Potential for Substitution (ICF, 2015b)

The current consumers of Uinta Basin coal, as determined by those plants that have used Uinta Basin coal in 2013 or 2014, are 31 of the 45 plants identified as potential consumers of Uinta Basin coal. The 31 coal plants that have received some Uinta Basin coal during 2013 and 2014 and that are not fully retiring are shown in Table C-17. This exhibit also shows the amount of Uinta Basin coal and other coal that each plant has consumed. Plants that have used Uinta Basin coal are indicated by an asterisk (*).

Table C-17. *Coal plants that have consumed Uinta Basin coal – coal consumption*

Plant Name	*Plant State*	*Average Annual Coal Consumption 2008-2014 (short tons)*			*Total Average Annual Coal Consumption 2008-2014 (short tons)*
		Uinta Basin	*Other Bituminous Coal*	*Other Subbituminous Coal*	
E C Gaston*	AL	45,023	3,571,188	0	3,616,211
Apache Station*	AZ	156,718	0	1,047,626	1,204,344
Coronado	AZ	8,313	48,584	3,400,349	3,457,246
Argus Cogen Plant*	CA	650,050	0	0	650,050
Cherokee*	CO	1,646,617	0	0	1,646,617
Craig	CO	4,650,659	0	0	4,650,659
Hayden*	CO	1,489,825	0	0	1,489,825
Valmont*	CO	424,559	0	0	424,559
Crystal River*	FL	19,182	2,053,076	0	2,072,258
Bowen*	GA	11,116	6,842,178	0	6,853,295
Shawnee*^	KY	2,129,996	54,367	1,773,102	3,957,465
Herbert A Wagner^	MD	1,761	676,870	23,650	702,280
Escanaba Mill*	MI	26,671	3,777	0	30,448
James De Young*^	MI	35,202	6,438	15,262	56,901
TES Filer City Station*	MI	41,513	112,386	0	153,899
Wyandotte	MI	8,949	44,439	18,566	71,954
Jack Watson^	MS	76,529	1,346,555	0	1,423,085
Victor J Daniel Jr*^	MS	763,347	372,054	787,880	1,923,281
North Valmy*	NV	646,764	0	751,374	1,398,138
Bull Run*	TN	112,220	999,191	0	1,111,410
Cumberland*	TN	762,999	4,092,146	0	4,855,455
Gallatin*	TN	10,165	4,227	1,063,052	1,077,444
Kingston*	TN	17,544	1,206,530	1,160,087	2,384,161
Bonanza	UT	1,912,214	0	0	1,912,214
Hunter	UT	4,274,184	0	0	4,274,184
Huntington	UT	2,745,725	0	0	2,745,725
Intermountain Power Project*	UT	5,097,421	0	0	5,097,421
Kennecott Power Plant	UT	104,790	0	0	104,790
Sunnyside Cogen Associates	UT	237,139	0	0	237,139
Elm Road Generating Station*	WI	7,065	865,985	210,489	1,083,540
Green Bay West Mill*	WI	93,649	141,637	0	235,286
Totals		**28,207,909**	**22,441,628**	**10,251,747**	**60,901,284**

Source: Energy Information Administration Form 923.
** Plant has consumed North Fork coal during at least one year between 2008 and 2014.*
^ Plant was not scrubbed as of 2015.

Over the next few years, power plants that do not have sulfur dioxide scrubbers may be potential customers for North Fork Coal Mining Area coal, due to the low sulfur content of this coal. The low sulfur content of the North Fork Coal Mining Area coal allows these plants to meet their air permit requirements without the use of scrubbers. However, all of these plants are expected to retire or add scrubbers by 2018, and thus do not represent a long-term source of demand for North Fork Coal Mining Area coal.

Some North Fork Coal Mining Area coal also may be consumed at industrial facilities, although the quantity is significantly less than the amount used for power generation. The Energy Information Administration provides data on the amount of coal consumed for industrial purposes in Colorado. These data show that on average 310,000 tons of coal were consumed by industrial users in Colorado in 2012 and 2013 out of a total of 19,330,000 tons consumed for all purposes in Colorado, including power generation.

Some North Fork Coal Mining Area coal may also be exported to Asian countries through ports in California and to Europe via ports in the Gulf Coast. Although the amount of North Fork Coal Mining Area coal currently exported is not available, the amount of total Uinta Basin coal exports can be estimated based on the difference between production, as reported to the Mining Safety and Health Administration, and deliveries, as reported in the Energy Information Administration Form 923 data. Using this method shows that Uinta Basin coal exports between 2008 and 2014 have been in the range of 5 to 10 million tons per year, which is about 10–20% of total coal production from the Uinta Basin. As demand for coal in Asia is expected to continue to increase, especially in China and India, it is likely that exports of North Fork Coal Mining Area coal and other Uinta Basin coal will continue in the future. If U.S. coal demand declines in the long term, the relative percentage of North Fork Coal Mining Area and Uinta Basin coal that is exported will likely increase.

Coal Elasticity

Electricity generation is typically price inelastic because many power plants are designed to operate with a particular fuel type and must operate within certain ranges because of reliability and environmental restrictions (compliance). The estimated U.S. natural gas-coal elasticity of substitution is 0.14 (Table C-18), ranging from 0.05 to 0.38, suggesting lower potential for natural gas as a substitute for coal (i.e., displacing coal) if the affordability or availability of coal were to change. The regional elasticity is lower (0.05) for the Western Electric Coordinating Council (includes all states west of and including Montana, Wyoming, Colorado, and New Mexico), indicating lower ability to switch between coal and natural gas, due in part to coal being the dominating fuel used in power generation in the mountain states, while California and the Pacific Northwest currently satisfy energy demand through hydropower and natural gas fueled plants. The Western Electric Coordinating Council elasticity is lower than that of the Southeastern States Reliability Corporation (southeastern states and Illinois) where current generating and transmission infrastructure favors plants fueled by lower cost energy sources (i.e., flexibility exists for generating energy among plants that use different fuels).

Table C-18. *Estimated elasticities of substitution (cross-price) for gas and coal for relevant national energy modeling system regions*

NERC Region	*States and Provinces*	*Gas-Coal Elasticity; Coal Own Price Elasticity (2)*	*Notes*
Midwest Reliability Organization	ND, SD, MN, NE, WI, Saskatchewan, Manitoba	0.08; -0.11 (not significant at 90% confidence level)	Generation capacity in Midwest Reliability Organization heavily skewed toward coal.
Southeastern States Reliability Corporation	Southeast states (not FL) and includes IL, MO, KY,TN, MS and VA (1)	0.38; -0.22 **	Infrastructure favors plants fueled by lowest cost energy (flexibility).
Western Electric Coordinating Council	All west of and including MT, WY, CO, UT, NM; Alberta, BC	0.05; -0.14**	Low flexibility. Generation dominated by coal in mountain states; hydro and natural gas dominates in Pacific NW and CA.
United States	All	0.14; -0.11**	

*** = Significant at 95% confidence level.*

Source: "Fuel Competition in Power Generation and Elasticities of Substitution" Energy Information Administration (EIA, 2012).

(1) Midwest Reliability Organization excludes the southeast corner of Wisconsin near Chicago; Southeastern States Reliability Corporation includes portions of Missouri, Arkansas, and Louisiana west of Mississippi River; it excludes Florida, Nebraska, Illinois (Chicago), and eastern/western portions of Kentucky and Virginia.

(2) Gas and Coal Elasticity = percent change in ratio of natural gas consumed (X1) to coal consumed (X2) in response to percent change in price of coal to natural gas: %dif(Xg/Xc)/%dif(Pc/Pg). C Elasticity = %d(Xc)/%Pc.

Energy Information Administration (2012) estimates of 'own price elasticity of demand for each fuel type (e.g., likelihood that power generators will change their demand for coal in response to a change in coal price) are also shown in Table C-10 The coal price elasticity in the Western Electric Coordinating Council region, similar to that of the United States, is equally not very responsive to changes in coal prices. Relatively low coal price elasticity values indicate that increases in the availability and corresponding decreases in prices may not trigger significant changes in production and consumption of coal.

Substitution may differ when looking at smaller sub-areas of electricity generation, including subsets of facilities consuming coal from North Fork mines.

Potential fuel substitutes for North Fork Coal Mining Area coal

When opportunities for expanded coal production from NFS lands are created under Alternatives B and C, a number of chain reactions may occur related to production and consumption of fuels, related to power generation. Chain reactions may include some degree of responses such as:

- An increase in the consumption of the coal for power generation,
- A decrease in the consumption of other substitute fossil fuels (including alternative coal sources in some cases), including natural gas,
- A decrease in the consumption of alternative fuel such as nuclear and renewable energy sources, and,
- An increase in total electricity production, reflecting the net effect of increased availability of coal fuel inputs for power generation.

The possible substitutes for North Fork Coal Mining Area coal at coal-fired power plants depend on a number of factors. At one extreme, only coal that has the same characteristics as the North Fork Coal

Mining Area coal might be considered possible substitutes. However, other factors such as coal plant location, boiler design, coal handling and grinding equipment, air permit requirements, and environmental controls, all play an important role in determining the types of coal that might be substitutes for North Fork coal. Finally, other fuels may substitute for the consumption of North Fork Coal Mining Area coal for the production of electric power. These fuels include biomass, hydro, natural gas, nuclear, solar, or wind.

For those coal plants located east of the Mississippi River, where transportation costs from Central Appalachia would be lower than for a coal plant further west, substitutes for North Fork Coal Mining Area coal would include coal from Central Appalachia, as well as other Uinta Basin mines in Colorado and Utah. Coal plants near coastal ports might also be able to substitute North Fork Coal Mining Area coal with Colombian coal. However, for coal plants in the Western United States, substitutes for North Fork Coal Mining Area coal would only be from other Western coal supply regions, such as Colorado, Utah, or Wyoming, as the transportation costs for coal from Central Appalachia or Colombia would make coal from these locations too expensive to be a viable option.

The design of a coal-fired power plant's boiler dictates the rank of coal that the plant can consume. The three ranks of coal used primarily for power generation are bituminous, subbituminous, and lignite. Due to the lower heat content of subbituminous and lignite coal compared to bituminous coal, the boilers for plants burning these types of coal are larger than boilers at coal plants that consume only bituminous coal. The boilers are designed larger because a greater amount of subbituminous coal must be consumed to generate the same amount of electric power as bituminous coal. Thus plants designed to burn bituminous coal only cannot switch to burning subbituminous coal exclusively. However, those plants may be able to blend in a portion of subbituminous coal along with the bituminous coal. Eleven of the plants that are potential consumers of North Fork Coal Mining Area coal (Table C-17) use a mixture of both bituminous and subbituminous coal, and thus would be able to substitute both types of coal for North Fork Coal Mining Area coal.

For coal plants that consume Uinta Basin coal and other bituminous coal exclusively, the substitution options will be limited to other sources of bituminous coal, subject to the limitations of location as discussed above. These plants also may be able to substitute coal with a higher sulfur content, such as from the Illinois Basin, depending on their air permit requirements and installed environmental controls.

Coal plants consuming only bituminous coal can make modifications to use subbituminous coal, although this is not an option for all plants. For example, subbituminous coal requires more space for stockpiles or the plant must be able to handle more frequent deliveries. Also subbituminous coal tends to be softer and dustier, which requires somewhat different coal handling and grinding equipment than that used for bituminous coal. Thus coal plants currently consuming only bituminous coal would need to make capital investments to allow them to blend in the subbituminous coal. Such investments might be economic if the coal plant has a relatively long remaining life and there are not physical or technical restrictions on the use of subbituminous coal. These investments are unlikely at all but a small number of plants.

Coal plants with environmental controls, such as sulfur dioxide scrubbers, bag houses, and nitrogen oxide controls, have more options for the types of coal that they can consume and still meet their emissions limits than coal plants without controls. The impact of environmental controls on coal consumption can be observed in the amount of Central Appalachian coal that has been consumed. Over the last 15 years, there has been a slow erosion of demand for low sulfur Central Appalachian coal as more and more plants install sulfur dioxide scrubbers and are able to switch to higher sulfur alternatives from Northern Appalachia and the Illinois Basin. The pace of decline in demand has accelerated in the last 6 years to the point that demand for Central Appalachian coal has been cut in half since 2002. The low natural gas prices over the last 4 years have contributed to the decline in

Central Appalachian coal demand. The combination of scrubber installations and low natural gas prices has had a synergistic effect on the decline in coal demand, causing a greater decline than would have been caused by these events separately.

Five of the 31 plants listed in Table C-17 do not currently have scrubbers; however, three of those five have plans to install scrubbers in the next 3 years. For coal plants with sulfur dioxide scrubbers, substitutes for North Fork coal might include lower sulfur coal from Central Appalachia and the Uinta Basin as well as higher sulfur coal from the Illinois Basin and Northern Appalachia. Illinois Basin coal has historically had prices similar to Uinta Basin coal, although Northern Appalachian coal has typically been sold at a $10 to $15/short ton premium to Uinta Basin coal, in part due to its somewhat higher heat content. The higher price of Northern Appalachian coal makes it somewhat less likely than Illinois Basin coal to be a substitute for North Fork coal.

IPM Scenarios

Three scenarios were analyzed in this study. The three scenarios differ only in how the coal supply curve for the Colorado Uinta Basin is treated. Two of the three scenarios were analyzed due to the uncertainty about whether the coal supply curves include the North Fork coal reserves or not, while the third scenario models a reduced production quantity out of the North Fork. The Forest Service was not able to confirm that the coal supply curve includes the incremental North Fork coal reserves made available as a result of the Colorado Roadless Rule. However, upon review of the baseline coal reserves assumed within the supply curves for North Fork mines, it appears that baseline reserves are not capable of including the additional North Fork reserves, given that size of baseline reserves are less than what they would be if the additional reserves were included (i.e., baseline reserves are less than 172 million short tons). As a consequence, the Forest Service staff feels there is evidence suggesting that North Fork Coal Mining Area coal reserves are not included in baseline reserves. However, to account for uncertainty about reserves, as well as potential ranges in mine production rates (i.e., unconstrained and low production), the sections below describe three IPM modeling scenarios, including the changes made to the Colorado Uinta Basin coal supply curve.

"Reserves Added" Scenario

In the "Reserves Added" scenario, the North Fork Coal Mining Area coal reserves were added to the existing coal supply curve reserves. The underlying assumption in this scenario is that the coal supply curves do not already include the 172 million short tons of reserves that would be accessed under the proposed action. In this scenario, 172 million short tons of reserves were added to steps 1 and 2 of the coal supply curve. Steps 1 and 2 of the coal supply curve are assumed to represent the Elk Creek and West Elk mines in the North Fork area of the Colorado Uinta Basin. The 172 million short tons of reserves were divided between the two steps based on a rough estimate of the mine area overlap with the roadless areas. Thus step 1 was allocated 66.32 million short tons (38.6 %) of reserves and step 2 was allocated 105.68 million short tons (61.4%) of reserves. The no action and adjusted proposed action reserve amounts are shown in Table C-19.

The "Reserves Added" scenario was modeled using IPM v5.13 base case for the SDEIS. For the SFEIS, the "Reserves Added" scenario was also modeled using the revised IPM v5.15 base case. Results for both modeling runs are presented and compared in the *Environmental Consequences* part of the *Economics* section.

Table C-19. *Adjustments to coal supply curve for reserves-added scenario*

Step	Annual Production (million short tons)	Original Reserves – No Action (million short tons)	Reserves – Proposed Action (million short tons)	Change in Reserves (million short tons)
1	7.0134	15.9265	82.2465	66.32
2	6.3851	131.3236	237.0036	105.68
3	0.4176	0.1850	0.1850	0
4	0.3084	1.0000	1.0000	0
5	5.5443	29.4234	29.4234	0

"Reserves Removed" Scenario

In the Reserves Removed scenario, the North Fork coal reserves were removed from the existing coal supply curve reserves. The underlying assumption in this scenario is that the coal supply curves include the North Fork reserves that would be accessed under the proposed action. In this scenario, the reserves for steps 1 and 2 of the coal supply curve were set to zero. Steps 1 and 2 of the coal supply curve are assumed to represent the Elk Creek and West Elk mines in the North Fork area of the Colorado Uinta Basin. The no action and adjusted proposed action reserve amounts are shown in Table C-20. Note that the reserves for steps 1 and 2 are less than the total estimated reserves (172 million short tons) that would be made accessible under the proposed action, which is why the reserves for these two steps were set to zero. The difference in the reserve estimates may be due to the fact that the coal supply curves used in this analysis were created in 2013 and thus did not have access to the most current reserve estimates.

Table C-20. *Adjustments to coal supply curve for reserves-removed scenario*

Step	Annual Production (million short tons)	Original Reserves – Proposed Action (million short tons)	Reserves – No Action (million short tons)	Change in Reserves (million short tons)
1	7.0134	15.9265	0	-15.9265
2	6.3851	131.3236	0	-131.3236
3	0.4176	0.1850	0.1850	0
4	0.3084	1.0000	1.0000	0
5	5.5443	29.4234	29.4234	0

"Production Limited" to 5.2 Million Tons (and Reserves Added) Scenario

In the "Limited Production" scenario, the North Fork coal production was limited to 5.2 million short tons per year in both the no action and proposed action alternatives, as shown in the annual production column in Table C-20. The proposed action then has the reserves for steps 1 and 2 of the coal supply curve increased by a total of 172 million short tons, as was done for the "Reserves Added" scenario. Steps 1 and 2 of the coal supply curve are assumed to represent the Elk Creek and West Elk mines in the North Fork area of the Colorado Uinta Basin. The no action and adjusted proposed action reserve amounts are shown in Table C-21.

Table C-21. *Adjustments to coal supply curve for "Limited Production" scenario*

Step	Annual Production (million short tons)	Original Reserves – Proposed Action (million short tons)	Reserves – No Action (million short tons)	Change in Reserves (million short tons)
1	2.6	15.9265	82.2465	66.32
2	2.6	131.3236	237.0036	105.68
3	0.4176	0.1850	0.1850	0
4	0.3084	1.0000	1.0000	0
5	5.5443	29.4234	29.4234	0

Social Cost of Carbon

An interagency process used three integrated assessment models to develop SCC estimates and selected four global values for use in regulatory analyses. The SCC estimates were first released in February 2010 and updated in 2013 using new versions of each integrated assessment model (IWG, 2015). The SCC estimates used in this analysis were developed over many years, using the best available scientific information, and with input from the public. Federal agencies have considered the extensive public comments on ways to improve SCC estimation received via the notice and comment period that was part of numerous rulemakings since 2006. In addition, Office of Management and Budget, Office of Information and Regulatory Affairs recently sought public comment on the approach used to develop the SCC estimates.

A range of SCC estimates or values was used in this analysis. Four values from the current SCC Technical Support Document (IWG, 2016) (e.g., $12, $42, $62, and $123 per metric ton of CO_2 emissions in the year 2020, in 2007 dollars) were adjusted to 2014 dollars using a Gross Domestic Product Implicit Price Deflator (BEA, 2013). The first three values are based on the average SCC from three integrated assessment models, at discount rates of 5%, 3%, and 2.5%, respectively. The fourth value corresponds to the 95th percentile of the frequency distribution of SCC estimates from all three models based on a 3% discount rate. This value was included to represent the marginal damages associated with lower-probability, higher-impact outcomes from climate change, which would be particularly harmful to society and thus relevant to the public and policymakers.

The SDEIS used a fifth SCC value to represent a 10th percentile of the SCC at a 3% discount rate. From the Office of Management and Budget, the Forest Service obtained the Monte Carlo simulation results used to generate the 95th percentile SCC estimates for the 3% discount rate (as cited in IWG, 2015) and calculated the 10th percentile SCC estimates. The 10th percentile SCC and SCM values were presented in the SDEIS. For the SFEIS, 10th percentile values are not included in new results that rely on IPM v5.15, but are retained in presentation of prior SDEIS results based on IPM v5.13 as explained in the *Methodology* section in Chapter 3.

In 2015, the IWG (co-chaired by the Office of Management and Budget and Council of Economic Advisers) asked the National Academy of Sciences, Engineering, and Medicine to review the latest research on modeling the economic aspects of climate change to inform future revisions to the SCC estimates. In January 2016, the Academies' Committee on the Social Cost of Carbon issued an interim report that recommended against a near-term update to the SCC estimates, but included recommendations for enhancing the presentation and discussion of uncertainty around the current estimates. The Academies' final report will provide longer term recommendations for a more comprehensive update.

The recent revision to the Technical Support Document (IWG 2016a) responded to these recommendations in the presentation of the current estimates and through the release of the full set of SCC (both carbon dioxide and methane) results on the Office of Management and Budget website,

which had previously been available upon request, for easy access when an agency determines that it is appropriate to conduct additional quantitative uncertainty analysis. In the SDEIS, the Forest Service included an additional analysis based on the 10th percentile of the frequency distribution based on a 3% discount rate. In this SFEIS, the Forest Service has eliminated the 10th percentile values in response to public and agency comments and for consistent application of the Technical Support Document.

When attempting to assess the incremental economic impacts of carbon dioxide emissions, the analyst faces a number of serious challenges. A report from the National Academy of Sciences (National Research Council, 2009) points out that any assessment will suffer from uncertainty, speculation, and lack of information about (1) future emissions of GHG, (2) the effects of past and future emissions on the climate system, (3) the impact of changes in climate on the physical and biological environment, and (4) the translation of these environmental impacts into economic damages (National Research Council, 2009). As a result, any effort to quantify and monetize the harms associated with climate change will raise serious questions of science, economics, and ethics and should be viewed as provisional.

SCC and SCM values are estimates of the monetary value of impacts associated with marginal changes in carbon dioxide emissions in a given year. These values include a wide range of anticipated climate impacts, such as net changes in agricultural productivity and human health, property damage from increased flood risk, and changes in energy system costs, such as reduced costs for heating and increased costs for air conditioning. Although they are typically used to assess the avoided damages as a result of regulatory actions (i.e., benefits of rulemakings that lead to an incremental reduction in cumulative global GHG emissions), they have been used to monetize the impacts of emission increases in RIAs as well. The SCC and SCM are incorporated in this SFEIS to assess the impacts of changes in carbon dioxide and methane emissions as part of the benefit-cost analysis.

The 2010 SCC TSD noted a number of limitations to the SCC analysis, including the incomplete way in which the IAMs capture catastrophic and non-catastrophic impacts, their incomplete treatment of adaptation and technological change, uncertainty in the extrapolation of damages to high temperatures, and assumptions regarding risk aversion. Currently IAMs do not assign value to all of the important physical, ecological, and economic impacts of climate change recognized in the climate change literature due to a lack of precise information on the nature of damages and because the science incorporated into these models understandably lags behind the most recent research. The limited amount of research linking climate impacts to economic damages makes the modeling exercise even more difficult. These individual limitations do not all work in the same direction in terms of their influence on the SCC estimates, though taken together they suggest that the SCC estimates are likely conservative. In particular, the IPCC Fourth Assessment Report (2007), which was the most current IPCC assessment available at the time of the IWG's 2009-2010 review, concluded that "It is very likely that [SCC estimates] underestimate the damage costs because they cannot include many non-quantifiable impacts." Since then, the peer-reviewed literature has continued to support this conclusion. For example, the IPCC Fifth Assessment report (2014) observed that SCC estimates continue to omit various impacts, such as "the effects of the loss of biodiversity among pollinators and wild crops on agriculture." Nonetheless, these estimates and the discussion of their limitations represent the best available information about the social benefits of CO2 reductions to inform benefit-cost analysis. Furthermore, the members of the IWG continue to engage in research on modeling and valuation of climate impacts with the goal to improve these estimates.

Modeled versus Revealed/Observed Carbon Values

SCC (dollars per metric ton carbon dioxide) estimates have been derived using combinations of models for linking GHG emissions, atmospheric carbon stocks, global temperature changes, and losses in goods, services, and/or some measure of public or consumer welfare (IWG, 2010; 2013;

2015). Models are comprehensive and substantial effort has been made to aggregate modeling results and demonstrate robustness (in the context of significant levels of uncertainty). These values are expected to be more representative of the range and nature of damages associated with GHG emissions, given their basis in damage functions. However, these values do not reflect observations of public exchange and do not reflect tradeoffs among the costs and benefits of GHG mitigation perceived by the public associated with carbon credit programs and trading.

Observed values for carbon mitigation or sequestration (or prices for emissions) are driven by GHG policy and mitigation programs, speculation about future GHG policy and regulation (Federal and State), and public perceptions about potential climate change impacts, as represented by current and evolving policy and regulatory trends. These prices provide a measure of the marginal cost of abatement and can be framed as prices paid for the right to emit GHGs and as mechanisms or incentives to promote more efficient use of fossil fuels. Observed or revealed prices are more consistent with traditional market-based values (i.e., the result of some form of exchange) which is the preferred method for evaluating non-market benefits, when possible, in accordance with current Forest Service direction (Forest Service Handbook 1909.17; Forest Service Manual 1970), as well as Office of Management and Budget circulars for conducting cost benefit analysis in support of rulemaking (OMB, 2003).

Examples of auction clearing prices for the Regional Greenhouse Gas Initiative for nine northeastern states have ranged from $1.93 (2012) to $4.72 (2014) $/metric ton CO_2 (downloaded 5/26/2015). California Carbon Allowance Futures, cap-and-trade program have ranged in value from $11 to $23 since 2012 (nominal $). The current allowance price is $12.64/metric ton CO_2 (downloaded 5/26/15). The 3% point adjustment upwards for cost of capital in the Energy Information Agency's Annual Energy Outlook 2014 reference case (EIA, 2014), to account for higher risks for investments that do not install carbon capture, is roughly equivalent to an emission fee of $15/metric ton of carbon dioxide (for plants that do not invest in carbon capture and storage). These examples demonstrate that observed values or prices for carbon have ranged from about $2 to $23 per metric ton.

Example Assumptions and Calculations for "Reserves Added" Scenario (IPM v5.13)

Examples of response coefficients and other input assumptions for benefit and social cost calculations performed under the "Reserves Added" IPM modeling scenario v5.13 from the SDEIS are presented in Table C-22. Input assumptions are constant for all values except coal minemouth prices and coal mine costs. Substitution response factors for production, consumption, and cost savings, as well as coal minemouth prices, vary across IPM modeling scenarios; all other input values remain the same across SCC calculations based on other IPM modeling scenarios. For details about inputs and calculations for revised benefit cost analyses (i.e., using IPM v5.15, including social cost of methane) see calculation worksheets (U.S. Forest Service, 2016a).

Table C-22. *Response coefficients and other factor assumptions for "Reserves Added" scenario for benefit cost analyses based on IPM ® v5.13 (SDEIS)*

Net Coal/Natural Gas Production - After Substitution (from coal market modeling substitution response)		
Substitution Response Coefficients	*2016*	*2054*
Net millions short tons underground coal production/million short tons NF coal production	0.528	0.528
Net millions short tons surface coal production/ million short tons NF coal production	-0.134	-0.134
Net billion cubic feet natural gas production/ million short tons NF coal production	-1.57	-1.57
Net Coal/Natural Gas Combustion for Domestic Electricity Generation (from IPM modeling substitution)		
Substitution Response Coefficients	*2016*	*2054*
Net coal GWh gen/ million short tons NF coal production	651	651
Net gas GWh gen/ million short tons NF coal production	-416	-416
GWh/ million short tons NF coal production	2340	2340
Coal shipped and consumed overseas (exported) (from IPM modeling results)		
Response Coefficients	*2016*	*2054*
millions short tons exported/ million short tons Colorado-Uinta coal production	0.1	0.1
SCC Values, 2007$/metric ton (IWG, 2015)		
	2016	*2050*
5% average	11	28
3% average	38	69
2.5% average	57	95
3% 95th	108	212
Coal Minemouth Price, 2012$/Short Ton (Rocky Mountain supply region)	*2016*	*2054*
Undiscounted (2012$)	27.4	61.3
Coal Mine Cost, 2012$/Short Ton (Rocky Mountain region)	*2016*	*2054*
Undiscounted (2012)	20.1	51.4
Energy Use/Power System Cost Savings (from IPM Modeling results)	*2016*	*2054*
Undiscounted Cost/ million short tons NF coal	22.6	22.6
Carbon Dioxide Emission Rates (metric tons CO_2/short ton coal; billion cubic feet gas; GWh)(see Air resources and greenhouse gas emissions *section)*	*2016*	*2054*
Coal Production, underground (metric tons/short ton)	0.02	0.02
Coal Production, surface (metric tons/short ton)	0.006	0.006
Production of natural gas (metric tons/billion cubic feet)	3,546	3,546
Combustion of coal (metric tons/GWh)	1,055	1,055
Combustion of natural gas (metric tons/GWh)	605	605
Coal transportation, domestic (metric tons/short ton transported)	0.06	0.06
Coal transportation, exported (metric tons/short ton transported)	0.15	0.15

Values in this table apply to modeling scenarios completed for the SDEIS. For values adopted for revised benefit cost analyses in this report, based on updated IPM® v5.15, and accounting for social cost of methane, see calculation worksheets (U.S. Forest Service, 2016a).

The substitution response factors in Table C-22 are examples of information used to project energy market behavior in response to increased availability of North Fork coal reserves, as described in the *Economics* section (*Analysis Methods and Assumptions – Overview of Benefit-Cost Framework* section) in Chapter 3. Substitution response factors are multiplied by the changes in gross annual change in North Fork production under Alternative B (or C) relative to Alternative A, for a given year, to estimate changes in each energy source production and consumption at a national (or domestic) scale. These changes are referred to as 'net' changes because they account for both negative and positive changes in substitute energy sources, triggered by gross changes in North Fork coal production. Estimated net changes in annual energy production and consumption are multiplied by corresponding carbon dioxide emission rates (Table C-22) to calculate annual carbon dioxide emissions. Annual carbon dioxide emissions are then multiplied by SCC values (see *Social Cost of Carbon* section above and the *Social Costs of Greenhouse Gas Emissions* section in Chapter 3) to calculate annual ranges of social costs or damages.

> **Example of Production Substitution:** The substitution response factor for natural gas production (i.e., -1.57 billion cubic feet natural gas per million tons of North Fork coal – Table C-22) is multiplied by a projected increase in North Fork coal production of 13 million tons in 2027, under the 'permitted' North Fork production scenario for Alternative B (see Table 3-19) to estimate a decrease of -20 billion cubic feet of domestic natural gas production in 2027. This decrease in natural gas production is multiplied by that carbon dioxide emission rate for production of natural gas (3,546 tons carbon dioxide per billion cubic foot natural gas – Table C-22) to estimate a decrease of 70,926 tons of carbon dioxide emissions from natural gas production for 2027.
>
> **Example of Combustion and Electricity Generation Substitution:** The substitution response factor for electricity generation from natural gas combustion (i.e., -416 GWh generated from Natural Gas per million tons of North Fork coal – Table C-22) is multiplied by a projected increase in North Fork coal production of 13 million tons in 2027, under the 'permitted' North Fork production scenario for Alternative B (see Table 3-19) to estimate a decrease of -5300 GWh electricity from natural gas in 2027. This decrease is multiplied by that carbon dioxide emission rate for electricity generation from natural gas (-605 tons carbon dioxide per GWh from natural gas – Table C-22) to estimate a decrease of 3,200,000 tons of carbon dioxide emissions from electricity generation from natural gas for 2027.

Sensitivity Discussion

The following inputs are evaluated to determine sensitivity of the PNV estimates to key input assumptions:

- Substitution response factors based on IPM modeling scenarios,
- Fixed demand and percent of North Fork Coal Mining Area coal production subject to substitution,
- Coal values as affected by coal mine costs, and
- Power generation cost savings.

Each of these four assumption areas are adjusted to demonstrate potential sensitivity of PNV results under IPM® v5.13 to baseline assumptions used in primary results. For updated results using the newer IPM® v5.15—accounting for changes in how the final Clean Power Plan rule is accounted for, as well as other market conditions (see Chapter 3).

Substitution Response Coefficients

Ranges of PNV results are provide in Table C-23 for substitution response factors derived from each of the three IPM modeling scenarios discussed above. Substitution response factors for the "Reserves Added" IPM scenario are used for the summary results.

PNV estimates using the "Reserves Added" coefficients are mostly of a magnitude that is in between the PNV estimates using coefficients from the other two IPM scenarios (i.e., PNV from "Reserves Added" are often midpoints). PNV estimates from "Remove Reserves" and "Limited Production" scenarios range from being 136% lower to 109% higher than PNV estimates from the "Reserves Added" scenario. In the following exception, use of the "Reserves Added" scenario results in the highest lower-bound PNV derived from all SCC values in the Global Boundary stance (see bold values in Table C-23).

In all cases, the sign (positive or negative) of the PNV results under the "Reserves Added" scenario are the same as signs of PNV for the other two IPM modeling scenarios, suggesting that PNV results are generally robust across all three IPM modeling scenarios. The only exception being upper bound PNV results using the 3% Average SCC values under the Global Boundary stance where PNV ranges from negative to just slightly positive under the "Reserves removed" scenario coefficients.

Table C-23. *Present Net Value results across IPM modeling scenarios (million 2014$)*

	Reserves Added		*Reserves Removed*		*Limited Production*	
	Alternatives					
	B-A	*C-A*	*B-A*	*C-A*	*B-A*	*C-A*
Global Boundary						
Lower Estimate	-$12,468	-$6,861	-$13,132	-$7,165	-$13,755	-$8,038
3% Avg. (Lower)	-$3,363	-$1,819	-$2,239	-$1,134	-$3,409	-$1,913
3% Avg. (Upper)	-$1,624	-$811	-$341	$72	-$3,409	-$1,913
Upper Estimate	$1,920	$1,317	$3,899	$2,617	$1,076	$779

"B-A" = Difference between Alternatives B and A, etc.

Fixed Demand and Percent of North Fork Coal Subject to Substitution

As noted in the description of the IPM modeling framework above, the IPM model minimizes the cost of meeting fixed schedules of energy demand over time. The modeling assumption of fixed demand implies that demand for energy (e.g., to generate electricity) is not allowed to increase in response to increased supplies. This assumption is expected to be valid given the relatively inelastic nature of coal demand. The sensitivity of the results to this assumption are evaluated by estimating PNV (under the "Reserves Added") substitution response coefficients, using different percentages of gross North Fork coal production that are subjected to substitution. For the results summarized in the main text, 100% of additional North Fork Coal production under Alternatives B and C are multiplied by substitution response coefficients. For this sensitivity analysis, a fraction of additional North Fork coal production is assumed to represent an increase in energy demand and is therefore not multiplied by substitution response coefficients (i.e., a fraction of additional North Fork production is produced and consumed as additional energy, not substitute energy). This approach is not necessarily an ideal means for capturing the effects of variable demand; however, it provides a means for demonstrating potential sensitivity of PNV results to this assumption for the purposes of this analysis. General equilibrium models are necessary to project changes in coal and other energy sources that reflect response to changes in both supply and demand.

As noted in sections above, the price elasticity of coal (i.e., percent change in demand/percent change in price) for the Nation has been estimated to range from -0.11 (U.S. average) to -0.14 and -0.22 for the western and southeastern energy demand regions. Percent changes in Rocky Mountain coal minemouth prices ranged from -5% to -23% based on a comparison of prices under baseline and proposed action conditions for the "Reserves Added" IPM modeling scenario. Multiplying the highest elasticity value (-0.22) by the highest percent change in price (-0.23) results in an estimated percent change in coal demand of about 5%. When 5% of North Fork coal production under Alternative B is assumed to represent a net increase in coal demand, and therefore not subject to substitution, PNV results are slightly lower but still similar to the original summary PNV results (see Table C-24). There is no difference in sign of PNV estimates across the two cases. This sensitivity analysis, as well as the analysis in general, relies on electricity generation cost savings as a surrogate for benefits for domestically consumed coal, justified in part by assumptions that coal demand is inelastic. As the percentage of North Fork coal production assumed to represent increased demand, grows, the reliability of using cost savings as a surrogate for benefits weakens.

Table C-24. *Comparison of modified PNV for 5% increase in coal demand vs original PNV for fixed demand, for "Reserves Added" scenario (million 2014$)*

	Modified PNV Results		*Original PNV Results*	
	Alternatives			
	B-A	*C-A*	*B-A*	*C-A*
Global Boundary				
Lower Estimate	-$14,325	-$7,894	-$12,468	-$6,861
3% Avg. (Lower)	-$3,990	-$2,172	-$3,363	-$1,819
3% Avg. (Upper)	-$2,169	-$1,138	-$1,624	-$811
Upper Estimate	$1,854	$1,277	$1,920	$1,317

Power System Cost Savings

As noted in the *Methodology* section, power system cost savings are adopted as a surrogate for measuring the benefits of increased availability of North Fork coal for electricity generation. Cost savings response factors (dollar cost savings to generate electricity per million short tons of additional North Fork Coal produced) are derived from modeling output for each of the three IPM scenarios noted above. Cost savings response coefficients range from a low of $22.6/short ton North Fork Coal under the "Reserves Added" scenario (used for the summary results in the main text) to $29/short ton under the "Limited Production" scenario, to a high of $42/short ton under the "Remove Reserves" scenario. Cost savings response coefficients, based on the "Reserves Added" scenario, and are reduced by a fixed percentage to evaluate sensitivity of PNV results to this input.

For a 25% reduction in cost savings, there are no changes in signs for PNV results (see Table C-25). Discounted cost savings coefficients range from $2.30/metric ton to $0.30/metric ton.

Table C-25. *Comparison of modified PNV for 25% decrease in cost savings vs original PNV estimates for "Reserves Added" scenario (million 2014$)*

	Modified PNV Results		Original PNV Results	
	Alternatives			
	B-A	C-A	B-A	C-A
Global Boundary				
Lower Estimate	-$12,769	-$7,047	-$12,468	-$6,861
3% Avg. (Lower)	-$3,664	-$2,006	-$3,363	-$1,819
3% Avg. (Upper)	-$2,215	-$1,205	-$1,624	-$811
Upper Estimate	$1,329	$923	$1,920	$1,317

Summary

Sensitivity analysis suggests that PNV results will vary as a result of changes in assumptions about substitution response coefficient values, fixed demand, coal values, and cost savings response coefficients. However, sensitivity analysis demonstrates that substantial changes in assumptions are needed to affect the sign (positive/negative) of PNV estimates, particularly the signs of midpoint PNV estimates derived from 3% average SCC values. The results suggest that PNV summaries presented in the main text, under the "Reserves Added" scenario are reliable for demonstrating potential ranges of net benefits for Alternatives B and C. Substantial uncertainty remains an important consideration in characterizing potential net benefits of actions involving GHG emissions.

Full Present Net Value Results

The comparative estimates presented in Chapter 3 demonstrate the sensitivity of PNV results to the potential dynamics of evolving energy markets and regulatory and policy developments. Hence, it is judicious to disclose and compare those sensitivities. Results carried over from the SDEIS (e.g., analytical results associated with IPM® v5.13, and not accounting for costs of methane) in this appendix, as well as in Chapter 3, include the 10th percentile SCC value. As outlined earlier, the 10th percentile value was removed from the SFEIS analysis in response to public and agency comment for consistency with the TSD and as used among Federal agencies. In the SDEIS, the 10th percentile SCC values only affected results for the upper estimates under the Global Boundary stance; for example, the upper PNV estimate for alternative B, compared to alternative A was $1.9 billion under IPM v5.13 (see Table C-28) and decreased to $850 million without the 10th percentile SCC value. All other PNV results in Table C-28 remain the same, with or without consideration of the 10th percentile SCC value. Retaining SDEIS v5.13 results in this document demonstrates how SFEIS results differ from SDEIS results.

Discounted Benefits, Social Costs, and Present Net Values (not accounting for methane)

The ranges of benefits and social costs of alternatives evaluated in this supplemental analysis are shown in Table C-26 for IPM version v5.13. Calculations and discounting are described under the *Benefit and Social Cost Accounting Stances* section, as well as the *Overview of Benefit-Cost Framework* sections. In summary, discounted benefits are the domestic power generation cost savings resulting from estimated changes in the mixture of fuels used to generate electricity under Alternative B.

Discounted social costs are based on IWG's SCC values (IWG, 2015) and carbon dioxide emissions summarized in Chapter 3, Table 3-26.

Due to the use of electric power generation cost savings as a proxy for benefits, results are provided only for Alternatives B and C, relative to Alternative A (i.e., cost savings cannot be characterized for stand-alone alternatives). Ranges are shown to account for the variation across production schedules (low, average, permitted) and SCC value assumptions (four levels).

Table C-26. *Summary of discounted benefits and social costs results (million 2014$) under IPM® v5.13, accounting for social cost of carbon (but not methane) (SDEIS results)*

	*Alternative B – Alternative A**		*Alternative C – Alternative A**	
	Discounted Benefits	Discounted Social Costs	Discounted Benefits	Discounted Social Costs
Global Boundary				
Lower Estimate (a)	$1,284	-$13,751	$792	-$7,652
3% Discount Avg. (Lower) (b)	$1,284	-$4,646	$792	-$2,611
3% Discount Avg. (Upper) (b)	$2,410	-$4,034	$1,609	-$2,420
Upper Estimate (a)	$2,410	-$489	$1,609	-$293

**The sum of discounted benefits and discounted social costs may not be exactly equal to PNV results in Table C-28 due to rounding. Results are drawn from the full set of individual results obtained from each combination of assumptions regarding social cost values (2.5% to 5% discount rates) and coal production rates (low, average, permitted).*
(a) Lower and upper estimates are drawn from results from coal production rates (low, average, permitted), and using all the SCC values.
(b) Ranges for average SCC values for 3% discount rates are singled out as representative of mid points.

As shown in Chapter 3, Table 3-27, changes in the mixture of energy production, electricity generation, and carbon dioxide emissions under IPM® v5.15 are different than those modeled under IPM® v5.13. Correspondingly, discounted benefits and costs results under IPM® v5.15—as shown in Table C-27—reflect those differences.

Table C-27. *Summary of discounted benefits and social costs results accounting for the social cost of carbon (from carbon dioxide but not methane) under IPM® v5.15 (million 2014$) (SFEIS results)*

	*Alternative B – Alternative A**		*Alternative C – Alternative A**	
	Discounted Benefits	Discounted Social Costs	Discounted Benefits	Discounted Social Costs
Global Boundary				
Lower Estimate (a)	$413	-$1,808	$255	-$1,006
3% Discount Avg. (Lower) (b)	$413	-$611	$255	-$343
3% Discount Avg. (Upper) (b)	$784	-$530	$522	-$318
Upper Estimate (a)	$579	-$122	$425	-$78

**The sum of discounted benefits and discounted social costs may not be exactly equal to PNV results in Table C-29 due to rounding. Results are drawn from the full set of individual results obtained from each combination of assumptions regarding social cost values (2.5% to 5% discount rates) and coal production rates (low, average, permitted).*
(a)Lower and upper estimates are drawn from results from all production schedules (low, average, permitted), and using all the SCC values.
(b) Ranges for average SCC values for 3% discount rates are singled out as representative of mid points.

Discounted benefits and costs decreased across alternatives. This reflects the substantial reductions in net domestic energy production, electricity generation from coal, and associated carbon dioxide emissions under IPM® v5.15, relative to IPM v5.13 as shown and explained above (Tables C-27 and C-28).

Discounted benefits and costs are added to estimate PNVs in Table C-28 for IPM version v5.13. PNV results estimated under the Global Boundary stance are primarily negative, with values as low as negative $12 billion in net damages to positive $1.9 billion in net benefits for Alternative B, compared to A. PNV ranges from negative $6.8 billion to positive $1.3 billion for Alternative C, relative to A. Midpoint PNV estimates range from negative $0.8 to negative $3.4 billion in net damages for alternative B and C, compared to A.

Table C-28. *Present Net Values under IPM® v.5.13 (million 2014$) (SDEIS results)*

	*Alternative B – Alternative A**	*Alternative C – Alternative A**
	(millions of 2014 dollars)	
Global Boundary		
Lower Estimate (a)	-$12,468	-$6,861
3% Discount Avg. (Lower) (b)	-$3,363	-$1,819
3% Discount Avg. (Upper) (b)	-$1,624	-$811
Upper Estimate (a)	$1,920	$1,317

** PNV results may not be exactly equivalent to the sum of discounted benefits and costs from Table C-26 due to rounding. Results are drawn from the full set of individual results obtained from each combination of assumptions regarding social cost values (2.5% to 5% discount rates) and coal production rates (low, average, permitted).*
(a) Lower and upper estimates are drawn from results from all production schedules (low, average, permitted), and using all the SCC values.
(b) Ranges for average SCC values for 3% discount rates are singled out as representative of mid points.

Discounted benefits and costs modeled under IPM® v5.15 (Table C-27) are also summed to estimate PNVs in Table C-29. PNVs under the Global Boundary stance remain negative for results in the lower end of the range, but midpoint PNVs, as represented by average SCC values (based on 3% discount rate), now include a mix of negative and positive results under IPM v5.15. Midpoint values are entirely negative under IPM v5.13. The overall range of PNV results is narrower for the Global Boundary stance under IPM v5.15 due to the substantial decreases in both benefits and social costs (see Table C-29).

Table C-29. *Present Net Values accounting for the social cost of carbon (from carbon dioxide but not methane) under IPM® v.5.15 (million 2014$) (SFEIS results)*

	*Alternative B – Alternative A**	*Alternative C – Alternative A**
	(millions of 2014 dollars)	
Global Boundary		
Lower Estimate (a)	-$1,394	-$750
3% Discount Avg. (Lower) (b)	-$197	-$88
3% Discount Avg. (Upper) (b)	$253	$204
Upper Estimate (a)	$457	$347

**PNV results may not be exactly equivalent to the sum of discounted benefits and costs from Table C-27 due to rounding. Results are drawn from the full set of individual results obtained from each combination of assumptions regarding social cost values (2.5% to 5% discount rates) and coal production rates (low, average, permitted).*
(a) Lower and upper estimates are drawn from results from coal production rates (low, average, permitted) and using all the SCC values.
(b) Ranges for average SCC values for 3% discount rates are singled out as representative of mid points.

Discounted Benefits, Social Costs, and Present Net Values Incorporating Social Cost of Carbon (from Carbon Dioxide and Methane)

Methane emissions were considered in the SDEIS using the SCC values and CO_2e as proxy for methane emissions, as part of the sensitivity analysis (SDEIS pp. E-24 to E-25). Due to public comments and newly available information, SCM values are incorporated here in order to demonstrate the potential for incremental differences in discounted social costs and PNV results that could be attributed to methane emissions associated with coal mining.

The 2016 Addendum to the SCC Technical Support Document summarizes the methodology and presents the social cost estimates from Marten et al. (2014) as a way for agencies to improve analysis of actions that are projected to influence emissions of methane and nitrous oxide in a manner that is consistent with how carbon dioxide emission changes are valued (IWG, 2016b). SCM estimates from IWG (2016b) are used in this analysis as shown in Table C-30; social cost calculations in this analysis make use of the full schedule of SCM values, similar to SCC values.

Table C-30. *Examples of social cost of non-carbon GHG for 2020 in 2007$/metric tons, 2020*

	Discount Rate			
Gas	*5.0% mean*	*3.0% mean*	*2.5% mean*	*3% 95th percentile*
CO_2	12	42	62	123
CH_4	540	1,200	1,600	3,200
N_2O	4,700	15,000	22,000	39,000

Source: IWG, 2016b.

SCM values are applied in this analysis in much the same manner as SCC values (see Chapter 3, *Discounted Benefits, Social Costs, and Present Net Values for Carbon Dioxide and Methane Emissions* for more details). Benefits, costs, and PNV results are presented in the following tables for aggregate consideration of carbon dioxide and methane emissions.

Table C-31. *Summary of discounted benefits and social costs results (million 2014$) under IPM® v5.15 accounting for both social cost of carbon (SCC) and methane (SCM) (SFEIS results)*

	*Alternative B – Alternative A**		*Alternative C – Alternative A**	
	Discounted Benefits	Discounted Social Costs	Discounted Benefits	Discounted Social Costs
Global Boundary				
Lower Estimate (a)	$413	-$3,853	$255	-$2,133
3% Discount Avg. (Lower) (b)	$413	-$1,377	$255	-$762
3% Discount Avg. (Upper) (b)	$784	-$1,263	$522	-$736
Upper Estimate (a)	$579	-$373	$425	-$235

**The sum of discounted benefits and discounted social costs may not be exactly equal to PNV results in Table C-31 due to rounding. Results are drawn from the full set of individual results obtained from each combination of assumptions regarding social cost values (2.5% to 5% discount rates) and coal production rates (low, average, permitted). See Table C-33 for list of PNV results for all assumption permutations and underlying assumptions for values in this table.*

(a) Lower and upper estimates are drawn from results from coal production rates (low, average, permitted), and using all the SCC and SCM values.

(b) Ranges for average SCC values for 3% discount rates are singled out as representative of mid points.

Table C-32. *Present Net Value under IPM® v5.15 accounting for both social cost of carbon and methane (millions of 2014 dollars) (SFEIS)*

	Alternative B - Alternative A	*Alternative C - Alternative A*
Global Boundary		
Lower Estimate (a)	-$3,440	-$1,878
3% Discount Avg. (Lower) (b)	-$964	-$506
3% Discount Avg. (Upper) (b)	-$479	-$214
Upper Estimate (a)	$206	$190

**PNV results may not be exactly equivalent to the sum of discounted benefits and costs from Table C-31 due to rounding. Results are drawn from the full set of individual results obtained from each combination of assumptions regarding social cost values (2.5% to 5% discount rates) and coal production rates (low, average, permitted). See Table C-33 for list of PNV results for all assumption permutations and underlying assumptions for values in this table.*
(a) Lower and upper estimates are drawn from results from coal production rates (low, average, permitted), and using all the SCC values .
(b) Ranges for average SCC values for 3% discount rates are singled out as representative of mid points.

When compared to PNV results, not accounting for methane and based on IPM v5.13 (Table C-28), revised PNV results in Table C-32 remain negative for all lower and midpoint PNV estimates, and positive for upper estimates. Revised ranges of PNV are narrower (e.g., -$3,500 to +$206 million compared to -12,000 to +850 million, for Alternative B-A).These results indicate that some changes to PNV estimates have occurred as a result of aggregate consideration of revised response coefficients based on IPM v5.15 and SCM, compared to PNV results presented in the SDEIS. However, no differences in signs of PNV results, coupled with relatively small changes in midpoint estimates, suggest that PNV results presented in the SDEIS and SFEIS are robust and remain viable in helping to summarize the environmental effects of this decision.

Detailed Benefit Cost Results for Carbon Dioxide and Methane (based on IPM v5.15)

Details regarding estimates of discounted benefits, social costs, and PNV are provided in Table C-33. These results demonstrate how the various assumptions about SCC and SCM value schedules and North Fork coal scenarios (low, average, permitted (high)) affect benefits and costs. Results used to summarize ranges of PNV in the effects analysis in Chapter 3 are flagged (highlighted) in Table C-33 to clarify the underlying assumptions for those ranges. Additional methodological assumptions to consider when reviewing these results include:

- Constraints on benefits for average and permitted production rates: IPM modeling results indicated that the maximum amount of North Fork coal mined in a year is about 5.5 million tons. However, production rates under the ‘average’ and ‘permitted’ production schedules range as high as 10 or 15 million tons of coal per year. Benefit calculations therefore assume that cost savings (i.e., benefits) occur only up to 5.5 million tons of coal mined in a given year; benefits are assumed to be zero for extraction of North Fork coal beyond 5.5 million tons in a given year.
- Constraints on application of SCC and SCM values: Summary ranges are drawn from results from all production schedules (low, average, permitted), and all the SCC and SCM value series except for 7% of average values based on a 5% discount rate, which are lower than typical carbon credit prices.
- Benefits and costs of substituted energy reserves: There may be net benefits or costs derived from coal and natural gas that North Fork coal displaced (through substitution), but is later extracted and used after all North Fork coal is consumed (i.e., after 2027 for permitted (high)

production rates; 2051 for low production rates). The impact of displaced substitute energy sources on future benefits and costs is not accounted for, but is expected to be highly uncertain. North Fork coal-production rates projected by IPM (v5.13 and v5.15) are most consistent with assumed production rates under the 'low' production scenario; suggesting that North Fork coal reserves would be exhausted around 2050. The absence of established SCC or SCM values after 2050 hinders efforts to estimate social costs into the future.

Table C-33. *Detailed benefit, social cost, and PNV results for all assumptions, using IPM V5.15 with both carbon dioxide and methane (in millions of 2014 dollars) (SFEIS)*

Assumptions (a)		*Alternative B -Alternative A*			*Alternative C -Alternative A*			*Range Bounds (b)*
Production Rate	*SCC + SCM Value*	*Net Benefits*	*Benefits*	*Social Costs*	*Net Benefits*	*Benefits*	*Social Costs*	
Permitted	5% Avg.	-$99	$367	-$466	-$29	$237	-$266	
	3% Avg.	-$964	$413	-$1,377	-$506	$255	-$762	*3% Avg. low*
	2.5% Avg.	-$1,553	$426	-$1,980	-$837	$260	-$1,098	
	3% 95th	-$3,440	$413	-$3,853	-$1,878	$255	-$2,133	*Lower*
Average	5% Avg.	$26	$466	-$440	$55	$312	-$257	
	3% Avg.	-$794	$558	-$1,352	-$406	$351	-$757	
	2.5% Avg.	-$1,363	$585	-$1,948	-$727	$362	-$1,089	
	3% 95th	-$3,231	$558	-$3,789	-$1,769	$351	-$2,121	
Low	5% Avg.	$206	$579	-$373	$190	$425	-$235	*Upper*
	3% Avg.	-$479	$784	-$1,263	-$214	$522	-$736	*3% Avg. high*
	2.5% Avg.	-$1,006	$850	-$1,856	-$512	$551	-$1,062	
	3% 95th	-$2,784	$784	-$3,567	-$1,545	$522	-$2,067	

(a) Production Rate: North Fork coal mining rates range from low, average, and permitted; SCC and SCM Value: Average (Avg.) social cost of carbon dioxide and methane values are based on discount rates of 2.5%, 3%, and 5%, 95th percentile values are also used for values based on 3% discount rate.

(b) Values used to summarize upper and lower estimates of benefits, costs, and PNV in Chapter 3 Tables 3-34 and 3-35 as well as Appendix C Tables C-32 and C-33.

Appendix D **EPA Comment Letter**

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

FEB - 8 2016

OFFICE OF
ENFORCEMENT AND
COMPLIANCE ASSURANCE

Mr. Ken Tu
USDA/USFS Strategic Planning Office
Colorado Roadless Rule
740 Simms Street
Golden, CO 80401

Dear Mr. Tu:

In accordance with our responsibilities under Section 102(2)(C) of the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, the U.S. Environmental Protection Agency (EPA) reviewed the U.S. Department of Agriculture, Forest Service's (USFS) November 2015 Supplemental Draft Environmental Impact Statement - No. 20150322 (SDEIS) for the North Fork Coal Mining Area exception of the Colorado Roadless Rule.

Background

The USFS, in cooperation with the State of Colorado, proposes to reinstate the North Fork Coal Mining Area exception of the Colorado Roadless Rule (CRR) on approximately 19,700 acres of National Forest System lands in the North Fork Coal Mining Area of Colorado. This provision was originally included in the CRR effective on July 3, 2012. In September 2014, the District Court of Colorado vacated the North Fork Coal exception based on NEPA violations. The Court also vacated the Bureau of Land Management (BLM) and USFS' approved modifications to leases in North Fork for the West Elk mine and the agencies' approval of an exploration plan. The SDEIS issued in November 2015 was prepared to respond to the deficiencies identified by the court and supplements the 2012 Final EIS for the CRR.

The primary deficiency with the original NEPA analysis for the CRR was the agency's failure to adequately consider greenhouse gas (GHG) emissions and climate change. Therefore, this SDEIS takes a close look at the GHG emissions associated with three alternatives. Alternative A is the No Action Alternative, which would not create a North Fork Coal Mining Area exception, and thus would continue the current management under the Colorado Roadless Rule; this alternative would effectively mean coal mining in the North Fork area could not occur. Alternative B, which is USFS's preferred alternative, would reinstate the North Fork Coal Mining Area exception, allowing temporary road construction for coal mining related activities. Alternative C would establish the North Fork Coal Mining Area exception but over a smaller area, excluding lands recently identified as "wilderness capable" through a relevant Forest Plan revision process.

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As originally prepared, this SDEIS was the principal vehicle for considering the impacts on climate change of opening this large area for future coal mining. However, since the SDEIS was issued, on January 15, 2016, the Department of Interior (DOI) issued Order No. 3338, "Discretionary Programmatic Environmental Impact Statement to Modernize the Federal Coal Program" to undertake a comprehensive review of the federally managed coal program. DOI's stated purpose for this review is to consider whether and how the program may be improved and modernized to foster the orderly development of BLM administered coal on Federal lands. DOI announced that the programmatic EIS (PEIS) will review how development impacts important stewardship values while also ensuring a fair return to the American public, and will consider, among other things, the impact on climate change of the BLM coal leasing program. While that review is undertaken, Order No. 3338 institutes a pause in all new thermal Federal coal leases, lease sales and lease modifications by BLM. Section 6 of Order sets out a number of exceptions to the pause, some of which may apply to existing leases in the North Fork. Because coal leasing in the North Fork area is managed by BLM, all new leases in that area are subject to the recently announced Order No. 3338. Therefore, as a practical matter, there will be a programmatic review of the climate impacts of coal leasing before any decisions are made on new coal leases in the North Fork. The analysis in this SDEIS of climate impacts from potential coal leases in the North Fork Valley will therefore be supplemented with the broader analysis that DOI will undertake, and that analysis will guide BLM's decisions on any future new leases in the North Fork. Therefore, while this SDEIS will help guide USFS's decision on the CRR, that decision will no longer govern consideration of climate with respect to coal leasing in the North Fork. The DOI PEIS will be the controlling review with respect to climate impacts and leasing decisions by the BLM.

While the SDEIS will not be the only, or the controlling, review of the climate implications of coal leasing in the North Fork, consideration of climate impacts does appropriately influence the USFS's decision on this rule. Hence, it remains important to have the climate analysis be as complete and accurate as possible, and it is for that reason EPA offers these comments on the SDEIS.

The SDEIS outlines a reasonable framework for climate analysis starting with estimating the direct and indirect GHG emissions associated with the three alternatives, including consideration of market adjustments, and then attempting to monetize the social costs of the expected increase in GHG emissions. This basic approach makes sense, and we appreciate the thought that USFS gave to this SDEIS. In addition to this basic framework, EPA recommends that all thorough reviews of climate impacts consider ways to mitigation GHG emissions; that issue is particularly important in this case, where mitigation could potentially be very important.

EPA has some concerns about specific choices and assumptions that the USFS used, as well as the clarity of description of these choices, which we recommend be remedied in the Supplemental Final Environmental Impact Statement (SFEIS). These are briefly described below. We have also included detailed comments in the enclosure for your consideration.

Emissions

EPA appreciates the information that the USFS has provided on the coal production and emission assumptions and calculations from the North Fork coal mine area. The analysis reports

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cumulative GHG emission increases of up to approximately 160 MMT CO_2Eq. and 90 MMT CO_2Eq, under Alternatives B and C, respectively. USFS appropriately puts emphasis both on GHG emissions associated with combustion of the coal that could be mined, and the methane associated with the mining of the coal. A robust consideration of methane is appropriate because, as the SDEIS notes, the North Fork geology results in coal mines with methane emissions among the highest levels of any mines in the country. The consideration of methane is also important because it presents opportunities for mitigation, discussed further below. To estimate the likely increase in GHG emissions over what would otherwise occur, USFS first uses an economic model to estimate the energy production and electricity generation changes resulting from the project. USFS then estimates the corresponding change in GHG emissions using three different North Fork (NF) coal production rate assumptions. EPA has a number of comments about how this analysis was conducted, which are described in more detail in the enclosure. A few of the key points are summarized below.

Overall, the analysis could be improved by using updated versions of the models and incorporating current regulations and market conditions into the model runs. If USFS does not update the analysis, we recommend the SFEIS include a robust discussion of the limitations and likely implications of the outdated modeling assumptions on the projected changes in energy production, electricity generation, and carbon dioxide (CO_2) emissions. For example, it is important that the baseline scenario used in the modeling appropriately account for the Clean Power Plan (CPP), which places obligations on states to reduce CO_2 emissions. Including an accurate representation of the CPP and its expected impacts could alter the landscape of the analysis significantly. In addition, we recommend USFS explicitly acknowledge the limitations associated with the ad hoc assumption regarding the proportion of production expected to be exported and the caveats it warrants in interpreting the results of the analysis. Finally, the SFEIS should clarify that the market analysis is based on USFS' application of the Integrated Planning Model and clearly delineate the assumptions used.

Mitigation

According to the SDEIS analysis, approximately 12% - 20% of the estimated net cumulative GHG emissions resulting from the proposed project would be from methane released and not captured or flared during mining operations of the North Fork Mining area. Given these estimated emissions, EPA thinks that an environmental review should appropriately consider the significant opportunities to reduce those emissions. EPA continues to recommend that the SFEIS discuss potential opportunities for methane mitigation in more detail.

Specifically, we recommend that, rather than wait to consider methane mitigation at the project specific stage, the SFEIS provide that information and clarify that disturbances necessary to collect and combust or use methane vented from the mines would be allowable.

We also recommend that the SFEIS clarify that other equipment such as compressors, flares, oxidizing units, etc. will all be temporarily allowed within the roadless area to reduce methane emissions. The USFS has discretion to condition leases on USFS land, so consideration of these important mitigation measures is an appropriate subject for this SDEIS. We have included more information in the detailed comments for your consideration

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Monetization of GHG impacts

The monetization of the climate change impacts associated with the projected GHG emission changes is central to the benefit cost analysis of this project. Given its importance, EPA has several recommendations regarding the USFS' methodology, which may affect interpretation of the findings.

When monetizing the climate change impacts of changes in CO_2 emissions, we strongly recommend the USFS analysis remain consistent with current federal guidance and uniform agency practices. One example of the SDEIS' inconsistency with federal guidance is the use of a 10th percentile social cost of carbon (SCC) estimate in the main analysis. We also recommend that, in accordance with OMB's guidance, the primary focus of the analysis be on the global boundary level results that reflect the full (global) damages caused by CO_2 emissions.
When monetizing the climate change impacts of changes in methane emissions, we recommend that the USFS use newly available estimates of the social cost of methane. We recommend the results be presented as part of the main analysis of the SFEIS. We provide more detailed comments on the monetization of both CO_2 and methane emissions impacts in the enclosure.

Conclusion
The SDEIS conclusion that Alternatives B and C would "likely have no effect on climate change impacts in CRAs, or other NFS lands" (p. 49) is misleading. According to the quantitative analysis, the CO_2 emissions increases alone (not including methane) result in potential net costs of up to $12 billion. These are significant impacts by any measure. While the potential impacts identified in the SDEIS are large, the January 2016 announcement from DOI, which happened after the SDEIS was completed, now demonstrates that a more thorough review of climate impacts will be done before any new leasing decisions not subject to Section 6 of Order No. 3338 are made in the area covered by this SDEIS, and there will be a pause on new leases while that analysis is undertaken. Based on that fact, and the analytic concerns identified in this comment letter, EPA is rating the SDEIS as Environmental Concerns – Insufficient Information (EC-2). We recommend that the issues raised in these comments be addressed in the SFEIS for this project. We have enclosed a copy of EPA's rating criteria for your information.

EPA appreciates the opportunity to offer comments on the SDEIS and would like to continue to work with the USFS as it completes its SFEIS.

Enclosures

Sincerely,

Karen Jeff for

Shari Wilson
Acting Director
Office of Federal Activities

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Summary of Rating Definitions and Follow-up Action

Environmental Impact of the Action

LO--Lack of Objections
The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC–Environmental Concerns
The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

EO--Environmental Objections
The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU--Environmentally Unsatisfactory
The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the CEQ.

Adequacy of the Impact Statement

Category 1--Adequate
EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2--Insufficient Information
The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

Category 3–Inadequate
EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

SDEIS - Colorado Roadless Rule - Detailed Comments

Social Cost of Carbon

The SDEIS methodology to monetize impacts of CO_2 emission changes deviates from federal guidance and standard agency practice in several respects.

First, the Forest Service global level analysis includes results based on a fifth social cost of carbon (SC-CO_2) value with equal prominence alongside the results based on the four SC- CO_2 estimates recommended by the Interagency Working Group (IWG) on the Social Cost of Carbon and currently used by all Federal regulatory agencies. That is, the analysis uses the 10th percentile SCC value from the frequency distribution of SCC values based on a 3% discount rate and argues this estimate is needed "to provide a lower bound SCC value to 'complete' the range of SCC values based on a 3% discount rate (i.e., IWG, 2015 refers to average and 95th percentile SCC values based on a 3% discount rate, but provides no corresponding lower percentile SCC value)" (SDEIS, p. 85). This reasoning is inconsistent with the IWG's rationale for aggregating and selecting the final recommended range of SCC estimates, especially the purpose of using the 95th percentile SCC estimate based on a 3% discount rate. The 95th percentile SCC estimate was included in the recommended range of estimates "to represent higher than expected impacts from temperature change further out in the tails of the SCC distribution" (IWG (2013, revised 2015), p. 2),[1] not to show the probability distribution around the 3% discount rate based SCC. Furthermore, there is no statistical or economic foundation presented for considering the 10th percentile estimate to represent a "lower bound" SCC. We strongly recommend the Forest Service drop the use of the 10th percentile SCC estimate in the final SEIS.

Second, the SDEIS inappropriately focuses on the national and forest boundary level analysis rather than relying primarily on the global analysis. As discussed at length in the 2010 SCC Technical Support Document (TSD)[2], the IWG SCC guidance recommends agencies focus attention on the full (global) impacts of changes in U.S. CO_2 emissions because of the distinctive global nature of the climate change problem. Any secondary results based on domestic only damages should be presented with statements highlighting the highly speculative and provisional nature of the domestic share (7-23%) of global damages, per IWG SCC guidance. In addition, we recommend dropping the forest level analysis altogether as this geographic boundary is arbitrary and provides no meaningful information to the public or decision makers about the market or climate change impacts of the proposed action.

Finally, we recommend revising the description of what the SCC is (and isn't) and the development of the IWG SCC estimates and deleting entirely the incorrect and misleading comparison of SCC and observed carbon credit prices (which Forest Service points to as a reason for omitting the 5% discount rate based SCC estimate in the national level analysis). We are happy to provide your staff with suggested line edits to address this issue in the relevant sections of the SDEIS and Appendix E. We also suggest replacing the use of "present net value" with standard benefit-cost analysis terminology throughout the SDEIS.

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[1] Interagency Working Group on Social Cost of Carbon. 2013. Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866. May (revised July 2015). United States Government. https://www.whitehouse.gov/sites/default/files/omb/inforeg/scc-tsd-final-july-2015.pdf.

[2] Interagency Working Group on Social Cost of Carbon. 2010. Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866. February. United States Government. http://www.whitehouse.gov/sites/default/files/omb/inforeg/for-agencies/Social-Cost-of-Carbon-forRIA.pdf.

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Social Cost of Methane

The SDEIS incorrectly states that "[t]here is no standard or accepted methods of analyzing the social cost of methane" (SDEIS, p. B-9), and considers the climate impacts of changes in non-CO_2 GHG emissions (namely, methane) in sensitivity analysis only using a seemingly GWP-based approximation approach (although few details and no results of this analysis are presented). We recommend the Forest Service review the existing literature on social cost of methane estimates, and consider using newly published and peer reviewed estimates of the social cost of methane that are consistent with the IWG SCC methodology. (For a description of these methodologies, see EPA's Regulatory Impact Analysis of the Proposed Emission Standards for New and Modified Sources in the Oil and Natural Gas Sector (August 2015) .)

Market Analysis

The SDEIS market analysis is based on outdated modeling. If there is no opportunity to update the analysis, we recommend the Forest Service add a robust discussion of the modeling limitations and the likely impact the outdated assumptions have on the energy production, electricity generation, and CO_2 emission results.

First, we recommend the Forest Service revise the IPM analysis, or at a minimum highlight the limitations and implications of the outdated IPM modeling assumptions. For example:

- The electricity sector modeling platform that the Forest Service used (IPM v5.13), with modifications, conforms to conditions that are three to four years old, and whose underlying assumptions might overstate the future domestic demand for coal. In more recent versions of IPM used by EPA (such as IPM v5.15 that EPA used for the final Clean Power Plan):
  - Electricity demand has been revised downward, consistent with more recent EIA AEO forecasts. This revision has notable implications for projections and future demand for electricity among competing sources.
  - Natural gas supply assumptions have been updated, such that gas prices are slightly lower than the v5.13, putting additional competitive pressures on coal as a fuel for electric generation.
  - Coal supply adjustments have also been made, leading to lower prices overall. The SDEIS incorrectly describes EPA's assumptions as being out of date (Appendix E). EPA has updated its assumptions for coal supply (and many other assumptions) and is currently using a more current version of IPM. We recommend the FEIS highlight the out of date nature of some of the assumptions that the Forest Service has chosen to use, and should not characterize them as EPA choices or the EPA model that is currently being used. EPA has also accounted for roughly 35 GW of known coal retirements that are planned to occur over the next few years, or have already occurred since IPM v5.13 was finalized.

  All of these factors tend to make coal-fired generation less competitive in the domestic marketplace. Hence, the projected increases in coal production resulting from the proposed action may be misstated for the domestic market.

- Although the IPM analysis used in the SDEIS assumes a carbon price on electricity sector emissions, there is no discussion of this (or the Clean Power Plan (CPP)) in the analysis. We recommend adding an explanation for how the carbon price modeling choice was made, how it was implemented in IPM, and to what extent this price can provide a proxy for the CPP. The CPP provides states with flexibility in implementation, including the option to adopt various rate-based and mass-based

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trading programs to reduce CO_2 emissions. It would be useful for the FEIS to include discussion of how this flexibility and how potential differences in the implicit stringency of the finalized state goals from the proposed CPP will impact the results.

- The SDEIS does not adequately distinguish between EPA's use of IPM, including the assumptions EPA uses, and the use of IPM in the SDEIS. We recommend the SDEIS list all the assumptions chosen by the Forest Service in their application of IPM and the source of those assumptions, specifying where it borrowed assumptions from EPA's older version of IPM.
- The SDEIS can be revised to indicate that the supply curves that EPA used 4 years ago did in fact include North Fork mines. EPA did confirm (via WoodMac) that the coal supply curves include the North Fork area (Elk Creek, West Elk, and Bowie). So the statement "EPA was not able to provide a definitive answer..." (Appendix E, pg. 14) should be changed.

Second, we recommend that the Forest Service add an explanation for the use of the hypothetical 3 coal production scenario approach to estimating impacts, instead of only using the IPM output as the basis of all impacts analyzed in the SDEIS.

Third, we recommend the Forest Service discuss the caveats associated with applying a fixed coal export assumption (10% of Uinta basin coal production per year) over the entire time period of analysis. The FEIS should highlight that no modeling was conducted to determine what export assumption to include.

Mitigation for Methane Waste Gas

The SDEIS specifically considers the issue of methane capture and reduction and defers more detailed analysis of alternatives for methane gas mitigation "because critical design criteria that bear upon the feasibility of such capture mitigation are too speculative at this time" (SDEIS, p. 9). EPA disagrees with this characterization of the state of knowledge. All coal mines in the North Fork Coal Mining Area are well informed about methane capture systems, as they all deploy gas drainage systems to supplement their ventilation fans. In fact, representatives of West Elk Mine and Elk Creek mines have given presentations describing their gas drainage and use activities at past EPA Coalbed Methane Outreach Program (CMOP) events, and CMOP has provided funding for pre-feasibility studies at the West Elk mine in the past.

We encourage the Forest Service to review the EPA comments to the 2014 Bureau of Land Management's (BLM) Advanced Notice of Proposed Rulemaking seeking comment on waste mine methane capture, use sale or destruction which provided a detailed summary of U.S. coal mine methane capture and use options. Among other things, EPA's August 4, 2014, memorandum to BLM included a summary of technologies available for the capture and use of waste mine methane.[3] The summary was drawn from more detailed publications, including peer-reviewed articles, available on the EPA website at: http://epa.gov/coalbed/resources/index.html. In addition, CMOP maintains an online model that allows for quick calculation of project costs, available at: http://epa.gov/coalbed/resources/cashflow_model.html. Although the model is intended to derive a first order cost assessment of waste mine methane projects, it does provide a reasonable estimate of project costs, including table of Notional Costs of Waste Mine Methane Drainage Projects as well as a

[3] EPA's 8/4/2014 memo is available at www.regulations.gov, see document ID BLM-2014-0001-0029.

list supporting references.

Additional Detailed/Expositional Recommendations

Chapter 2

- Offsets bullet on page 9: EPA/OAP did not understand the objective of this bullet but notes that there is no federal offsets program.

- Pg. 10, second bullet: The report mischaracterizes the CPP, as it relates to IGCC. The CPP covers only *emissions* from existing sources, and includes no specific requirements on fuel use.

Chapter 3

- **Units of Measure:** The SDEIS uses the terms "tons", "metric tons" and "metric tons CO_2e" throughout the document when discussing greenhouse gas emissions (for example, Page 20, Table 2-2, Air Resources section vs. the end of page 32). It is unclear in several places whether the unit specified in the SDEIS is the actual unit of measure the emissions were calculated in, or if the terms "tons" or "metric tons" were used as shorthand for "metric tons CO_2e" (Table 3-19 for example). A consistent unit of measure should be used throughout the analysis and that unit should be referred to consistently. EPA recommends using "metric tons CO_2e" for all greenhouse gas emissions values presented, as this is what is used in EPA's Greenhouse Gas Reporting Program (GHGRP) Facility Level GHG emissions database, which the SDEIS uses as an input in the life-cycle analysis, and EPA's Inventory of Greenhouse Gas Emissions and Sinks, which is referenced in the analysis.

  - **Conversion Factors:** The conversion factors for methane from tons to standard cubic feet could be added as a footnote in addition to the listing of the source of those values (Upstream Dashboard tool's Unit Reference tab). It is also not clear where the coal production values were derived from; a reference to the source of those values should also be added. (Ch. 3, pg. 35)

- **Inconsistent use of outdated Global Warming Potential (GWP) for methane:** The SDEIS does not use a consistent GWP. The SDEIS uses a GWP for methane of 36 to calculate total CO_2 equivalent emissions from three different scenarios. Subsequently, the SDEIS compares these values to the U.S. GHG Inventory. The values cited from the U.S. GHG Inventory are calculated using a GWP for methane of 25. Reported emissions to the GHGRP from 2 mines are also cited. These reported emissions are also calculated using a methane GWP of 25. EPA uses GWPs from the IPCC's Fourth Assessment Report (AR4) consistent with international GHG reporting standards under the United Nations Framework Convention on Climate Change (UNFCCC) which require the use of the GWP values from the IPCC's AR4 report, published in 2007. In order to provide an apples to apples comparison between the potential emissions in each scenario to the selected benchmarks, consistent GWPs should be used. To be consistent with international and national GHG reporting, it is recommended that the SDEIS use GWPs from AR4, and therefore EPA recommends recalculating the emissions scenarios using a methane GWP of 25 (for example table 3-20, and for the data from the 2010 Colorado state GHG

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emissions inventory). The GWP used in the SDEIS for N_2O was 298, which is consistent with the U.S. GHG Inventory and GHGRP.

- **2014 GHG Reporting Program Data:** The analysis cites facility level emissions from the 2011-2013 period and states that the data were pulled from the GHGRP database in "2015". 2014 GHG emissions data for these mines was published in October, 2015. The SDEIS likely made use of 2011-2013 data which was available earlier in 2015, prior to the release of 2014 data. The authors should review the 2014 data to determine if it should be included in the analysis. The 2011-2013 data currently posted should also be reviewed as GHG reports may have been re-submitted by these mines between August 2014 and August 2015. Revised emissions totals would have been made publicly available in October 2015. (Ch. 3, pg. 35, 43)

- **Coal Mine Names:** EPA's GHGRP emissions data is presented in metric tons CO_2e, not tons. In addition, the SDEIS refers to one of the two coal mines using a different name than is presented in the GHGRP's emissions database. Use of consistent names, or a footnote that provides the GHGRP name for each facility, or a link to each facility's reported GHGRP data would make it easier for the public to re-create the analysis. (Ch. 3, pg. 35, line 4)
  - "Elk Creek Mine" is referred to as "Oxbow Mining, LLC" in the GHGRP Database. The following link points to this facility's 2014 data: http://ghgdata.epa.gov/ghgp/service/facilityDetail/2014?id=1009623&ds=E&et=&popup=true
  - "West Elk Mine" is found in the in the GHGRP Database: http://ghgdata.epa.gov/ghgp/service/facilityDetail/2014?id=1010310&ds=E&et=&popup=true

Other comments

- The SDEIS conclusion that Alternatives B and C would "likely have no effect on climate change impacts in CRAs, or other NFS lands" appears inconsistent with the SDEIS finding that presents substantial estimates of social costs from increased CO2 emissions (e.g., an upper bound estimate of $12 billion in net costs). We recommend revising the statement about impacts of Alternatives B and C to reflect the actual analysis contained in the SDEIS.

- The SDEIS misunderstands the purpose of a climate analysis under NEPA by suggesting that such analysis is difficult or impossible because emissions from one project cannot be tied to a specific local impact. Such statements do not reflect an understanding of the nature of climate change, in which incremental additions to GHG emissions collectively cause significant change to climate. For this reason, the appropriate way to evaluation the impact of a project on climate change is through analysis of emissions, as CEQ said in its draft guidance. For this reason, we recommend deleting the following sentence from the SFEIS "It is not possible at this time using global climate models to predict the contribution to warming or other climate change effects (such as changes in the timing and distribution of precipitation or other weather events) from possible coal production on a local scale such as the North Fork Coal Mining Area." (Ch. 3, pg. 40 (PDF pg. 48)).

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- The discussion on pp 47-48 has some language that misconstrues the nature of the climate challenge and the necessity of action to combat it. We recommend that this language be changed in the final.

  - At the top of page 48 of the DSEIS there is a sentence that implies that because climate change is caused by a multitude of sources, it will continue no matter what happens with any individual project. We recommend deleting this sentence, because it suggests that no action is necessary because no one action solves the problem all by itself. We recommend saying instead that the global nature of climate change requires many individual actions over many decades, so that the analysis accurately reflects both the importance of the issue and the necessity for all individual actions to consider their contribution to the problem. This perspective is particularly important given the time scale on which climate pollution operates; a substantial portion of CO2 emitted into the atmosphere is not removed by natural processes for millennia. The combination of incremental carbon pollution contributions from many individual projects and the long lived impacts of such emissions require that every project carefully evaluate and mitigate emissions.

  - The sentence about CEQ misstates CEQ's meaning, by suggesting CEQ is saying that individual actions make no difference. That is the opposite of CEQ's meaning; because many actions will be necessary to combat the collective problem of climate change, it is important that agencies consider emissions and ways to reduce emissions for every project. We suggest the following edits: "The Council on Environmental Quality recognizes that no single individual agency action will solve climate change by itself, and that attention to individual project emissions is important because climate change is exacerbated by a series of smaller decisions, 'program-by-program and step-by-step.' Emissions from single actions and projects contribute to continued climate change, and emissions reductions from single actions and projects contribute to slowing the pace of climate change. " (Excerpt from SDEIS, Ch. 3, pg. 47/PDF pg. 55)

- **Land use emissions and potential impacts on forest carbon pools**: The SDEIS acknowledges that "there are reasonably foreseeable emissions from subsequent decisions, associated with tree-cutting and other vegetation for surface preparation, including roads and drainage pads" but concludes that such potential terrestrial emissions would be small compared to those associated with other primary elements evaluated and quantified (pg. 48/PDF pg. 56). The rationale given here appears to assume that the net effects of this terrestrial disturbance is zero or close to zero without any analysis or discussion of GHG emissions effects or timing. Also, the text implies that assessment of potential terrestrial GHG emissions impacts from future road construction and related projects in the intended area is not warranted. To the extent that it is required as part of a NEPA review, a qualitative discussion of the potential impacts on forest carbon pools, and the associated timing of those potential emissions effects should be included.

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- **Methane emissions factor**: Table 3-20 summarizes methane emissions as a result of the energy mix changes and alternative underground and surface mining. While the surface mining emissions estimates based on an emission factor for the Power River basin appears to be consistent with the U.S. National Greenhouse Gas Emissions Inventory, it is unclear why an emission factor for an Illinois Number 6 coal mine profile was referenced for underground mines, as that does not appear to be relevant. We recommend clarifying the relevance of this reference.

Appendix E

- The use of elasticities in the analysis (Appendix E) - It would be helpful to clarify if some estimation was done outside of IPM, and what that estimation included.

- The coal transportation assumptions in v.5.13 reflect a much higher diesel outlook (characteristic of 2012) rather than the price forecast we expect today. Also, there have been some substantial changes in western rail rates that EPA is in the process of updating. The Assessment may want to address any potential impact this may have on its findings.

- EPA does not have adequate information to evaluate whether the USFS adjustments to the coal supply curve are appropriate. EPA's coal supply curves used in IPM v5.13 reflect production and reserves from the North Fork area (including the West Elk, Elk Creek, and Bowie mines). The USFS analysis added additional mining capacity and reserves to the supply curves reflecting North Fork area mining expansion, so USFS should verify that this is, in fact, truly incremental mine capacity and reserves and not simply a double counting of mine capacity already included in the supply curves.

- It may be beneficial to evaluate whether costs need to be adjusted to reflect any incremental Freight on Board cost associated with the new location of the active mine.

    - Appendix E (page E-4) – This section inappropriately conflates EPA's application of IPM, and the coal supply curves used in IPM v5.13 with the USFS version of IPM used for this analysis. The report should distinguish this analysis more clearly as separate and distinct from EPA's application of the model.
    - For example, the following statement in the SDEIS is not a proper characterization: "The coal prices that the EPA coal supply curves produce…" A more accurate statement would be: "The coal prices produced by USDA/FS IPM modeling are…."
    - We also recommend that USFS include a footnote, or some introductory language at the beginning of the Appendix that explains that USDA/FS has adjusted coal supply curves developed by EPA in 2013 for purposes of this SDEIS, but all analysis, modeling, projections used in the SDEIS are solely the work of USDA/FS, and not EPA .

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Appendix E **Response to Comments**

Public involvement is critical in shaping public land management policy. Public comments ensure a Federal proposal is designed that not only meets agency missions and legal mandates, but addresses the interests of the American public. NEPA and the Council on Environmental Quality regulations require that lead agencies evaluate comments received from persons who review DEISs and prepare a written response. This appendix is a summary of the substantive public comments received on the SDEIS for the Colorado Roadless Rule, reinstatement of the North Fork Coal Mining Area exception, and the responses to those comments.

This appendix briefly describes the process for collecting and responding to the public comments received on the Colorado Roadless Rulemaking, reinstatement of the North Fork Coal Mining Area exception. Comments included in this appendix are those determined to be relevant to the decision to be made, as described in the *Decision Framework* section of the SEIS, or were useful in clarifying and improving the analysis presented in the SEIS. Comments were consolidated and paraphrased for brevity in this appendix.

The following sections in this appendix describe the public involvement and content analysis process in greater detail. A more detailed public comment summary report and the comment database used to develop this appendix are in the SEIS record at the U.S. Forest Service Rocky Mountain Regional Office in Golden, Colorado. All public comments received are available online in the public reading room (U.S. Forest Service, 2016b).

Content Analysis Process

The SDEIS comment period opened on Friday, November 20, 2015, and closed on Friday, January 15, 2016. On December 30, 2015, the Forest Service published a notice in the *Federal Register* granting an 11-day extension to the comment period to ensure that there was sufficient time for interested parties to comment.

Mail was managed from emails received and from letters entered directly into the Comment Analysis and Response Application (CARA) comment form by the commenter. Hard copy mail received by the Forest Service was scanned into pdf documents and entered into CARA. Regulations.gov and email submissions were entered into CARA. Within the 56-day comment period, a total of 104,521 letters were received. Of these letters:

- 733 were designated as unique letters
- 26 were designated as duplicate submissions
- 103,758 were designated form/form plus letters (a form letter with an additional comment)
    - Sierra Club: 50,831 letters attached
    - Earth Justice: 50,831 letters attached
    - Center for Biological Diversity: 1,218 letters attached
    - Wilderness Workshop: 309 letters attached
    - One Click Politics: 1064 letters entered into CARA by commenters
    - Climate Reality Project: 16 letters entered by commenters into CARA
    - Earth Justice: 6 letters entered into CARA by commenters
    - Unknown Form Campaign 1: 110 letters entered into CARA by commenters
    - Unknown Form Campaign 2: 18 letters entered into CARA by commenters

Four letters were designated as petition letters:

- Climate Reality Project: 12,382
- Wildearth Guardians: 6,140
- Conservation Colorado: 367
- Mountain Coal Company: 210

After the comment period closed on January 15, 2016, 32,998 additional letters were received.

- Seven were designated as form letters (One Click Politics).
- Two were designated as unique letters.
- 32,989 were form/form plus letters from Friends of the Earth.

Several form campaign commenters attached files containing additional form letters. Individual comments from the attached letters were grouped together to maximum file size and entered into CARA by the analysis team. This process ensured all comments were read and coded within CARA.

The Forest Service used the content analysis process to organize the public comments received in order to achieve these goals:

- Ensure every comment is considered.
- Identify concerns raised by the comments.
- Represent the breadth and depth of the public's viewpoints and concerns as fairly as possible.
- Present those concerns in a way that facilitates the Forest Service's consideration of comments.

To achieve these goals, the Forest Service Regional Office Roadless staff developed the coding structure for analyzing comments based on the project documents. Unique letters, master form letters, and form plus letters with one or more additional unique and substantive comments were coded according to the structure.

All coding occurred within the CARA database. In total, 4,905 individually coded comments were assigned a subject and category code. Once the unique and substantially different comments were coded, comments were exported into Microsoft Excel for further analysis by the roadless team resource specialists.

Concerns raised by different commenters on the same subject and with the same intent were grouped, capturing the essence of like-concerns. In this way, multiple similar comments may be sent to their respective resource specialist for analysis. The content analysis process ensured that every comment was read, analyzed, and considered.

Individual letters are not included in this document but can be viewed online in the CARA public reading room for this project (U.S. Forest Service, 2016b).

It is important to recognize the consideration of public comment is not a vote-counting process in which the outcome is determined by the majority opinion. Relative depth of feeling and interest among the public can serve to provide a general context for decision-making. However, it is the appropriateness, specificity, and factual accuracy of comment content that provide the basis for modifications to planning documents and decisions.

Further, because respondents are self-selected, they do not constitute a random or representative public sample. The Forest Service encourages all interested parties to submit comments as often as they wish, regardless of age, citizenship, or eligibility to vote. Respondents include Federal, State, local, and Tribal governments; organizations or public interest groups; businesses; people from other

countries; and people who submitted multiple responses. Therefore, caution should be used when interpreting comparative terms in the *Response to Comments* section (Appendix E). Every substantive comment and suggestion has value, whether expressed by one respondent or many. All unique input was read and evaluated, and the analysis team attempted to capture all relevant public concerns in this analysis process.

State and Federal Agency Commenters

The following is a list of State and Federal agencies that submitted a letter regarding this project. The EPA comment letter is included in Appendix D. The list is organized alphabetically, by agency.

Agency

- Colorado Department of Natural Resources
- Colorado Elected Delegation
- Environmental Protection Agency
- Gunnison County
- Mesa County
- Montrose County Board of County Commissioners
- Town of Hotchkiss
- Town of Paonia
- U.S. Chamber of Commerce
- Western Colorado Congress

Organization Commenters

The table below contains the list of organizations, listed alphabetically, who submitted letters regarding this project. The table also includes the city and state of the organization.

Organization Name	*City*	*ST*
350 Colorado	Boulder	CO
Black Canyon Audubon Society	Delta	CO
Center for Biological Diversity	Tucson	AZ
Chicago Astronomical Society	Chicago	IL
Clean Energy Action	Boulder	CO
Climate Reality	Fort Collins	CO
Climate Reality Project	Billerica	MA
Colorado Mining Association	Denver	CO

Organization Name	City	ST
Colorado Timber Industry Association	Woodland Park	CO
Colorado Wildlife Federation	Denver	CO
Conservation Colorado	Denver	CO
Cool Planet	Edina	CO
Denver Catholic Network	Lakewood	CO
Earthjustice	Denver	CO
Earthjustice	San Francisco	CA
Environment Colorado	Denver	CO
Friends of the Earth	Washington	DC
Global Development and Environment Institute	Brookline	MA
Great Old Broads for Wilderness	Aspen	CO
Great Old Broads for Wilderness	Cedaredge	CO
Green Sanctuary of First Unitarian Church	Saint Louis	MO
High Noon Solar & Energy Products LLC	Grand Junction	CO
HydroGeo Inc.	Crested Butte	CO
Inspirational Images	Denver	CO
Institute for Policy Integrity, Natural Resource Defense Council, Environmental Defense Fund, Union of Concerned Scientists		
Interwest Energy Alliance	Colorado Springs	CO
Jemez Sustainable Solutions	Jemez Springs	NM
Lazy M Ranch	Paonia	CO
Lawrence Turk	Hendersonville	NC
Lehigh Hanson Inc.	Irving	TX

Organization Name	***City***	***ST***
Martin Marietta	Dallas	TX
Mount Gunnison Fuel Company	Denver	CO
Mountain Coal Company, LLC	Somerset	CO
Mountain Coal Company, LLC	Minneapolis	MN
National Mining Association	Washington	DC
Natural Resources Defense Council	Bozeman	MT
Northern San Juan Chapter, Great Old Broads for Wilderness	Durango	CO
QGITS	Garden Grove	CA
Sabin Center for Climate Change Law, Columbia Law School	New York	NY
San Miguel Bike Alliance	Telluride	CO
Sierra Club	Washington	DC
South Florida Audubon Society	Fort Lauderdale	FL
Sustainability Alliance	Denver	CO
The Climate Reality Project	Berkley	CA
The Climate Reality Project	Washington	DC
The Meyerson Law Firm	Denver	CO
United Planet Faith and Science Initiative	Honolulu	HI
Vote Solar	Broomfield	CO
Western Resource Advocates	Boulder	CO
Western Slope Conservation Center	Paonia	CO
WildEarth Guardians	Denver	CO
Wilderness Workshop	Carbondale	CO

Forest Service Response to Comments

The public concern statements that have been addressed in this appendix are considered to be comments of a substantive nature. A substantive comment does one or more of the following:

- questions, with a reasonable basis, the accuracy of the information and/or analysis in the SDEIS,
- questions, with a reasonable basis, the adequacy of the information and/or analysis in the SDEIS,
- presents reasonable alternatives other than those presented in the SDEIS that meet the purpose and need of the proposed action and addresses significant issues,
- questions, with a reasonable basis, the merits of an alternative or alternatives,
- causes change in or revisions to the proposed action, or
- questions, with reasonable basis, the adequacy of the planning process itself.

Consistent with 40 Code of Federal Regulations (CFR) 1503.4(b), all substantive comments received a response. The Forest Service is not required to respond to non-substantive comments. Although every comment was carefully considered and reviewed, non-substantive comments did not receive a detailed response. A non-substantive comment is categorized as one of the following:

- general comment, opinion, or position statement,
- concern that is outside the scope or irrelevant to the propose action and decision,
- means of addressing the concern are already decided by law, regulation, or policy,
- concern can be better addressed through another decision process (e.g., project-level analysis), or
- concern requests action that has already been considered in an alternative.

After completion of the content analysis, public concerns statements were given to members of the interdisciplinary team to develop responses and are presented in this appendix. As described in the *Content Analysis Process* section, each public concern statement was derived from one or many individual public comments. The interdisciplinary team reviewed both the public concern and the supporting comments in the preparation of the responses. A response may be general or contain specific details that address a particular comment associated with the public concern. Interested parties may review the original letters and comments online in the CARA public reading room (U.S. Forest Service, 2016b).

Law, Regulation, and Policy Compliance

Comment: What authority does the Forest Service have to develop such an exception?

> **Response:** The Organic Act of 1897, which established national forests, provides the Secretary of Agriculture the authority to make regulations necessary to regulate the occupancy and use of NFS lands and preserve them.

Comment: This proposal contradicts the Forest Service mission to "sustain the health, diversity, and productivity of the nations' forests and grasslands to meet the needs of present and future generations."

> **Response:** The Colorado Roadless Rule is consistent with the Forest Service's mission and balances between the needs to sustain the health, diversity, and productivity of Colorado's national forests while providing for the needs of present and future generations. The exceptions in the Colorado Roadless Rule to the overall prohibitions on tree cutting, road

construction/reconstruction, and use of LCZs were developed to address the present and future needs of Colorado's citizens and economy. Reinstatement of the North Fork Coal Mining Area exception addresses specific concerns of the State of Colorado regarding the local economy of the North Fork Valley, and it preserves coal exploration and development opportunities across 19,700 acres of CRAs, which account for less than 0.5% of total CRAs acreage in Colorado.

Comment: The Forest Service must provide the legal basis for developing the North Fork Coal Mining Area exception when the 2001 RACR nor the Colorado petition did not anticipate such an exception.

Response: In May 2005 the State Petition Rule (also known as the 2005 Roadless Rule) was promulgated, which allowed the governor of a state to recommend roadless area policy in a state petition to the Secretary of Agriculture. The State of Colorado filed a petition in November 2006 that included a recommendation to remove about 55,000 acres from the roadless inventory in the North Fork Valley. The basis for this particular recommendation was to minimize economic impacts in the North Fork Valley from roadless conservation policies by not foreclosing coal mining exploration and development opportunities. When Governor Ritter took office, he resubmitted the Colorado petition in April 2007 and recommended the 55,000 acres remain in the roadless inventory and continued allowance of temporary road construction for coal-related mining activities through an exception.

Although the State Petition Rule was enjoined in September 2006, the Department of Agriculture determined the petitions submitted under the State Petition Rule, such as Colorado's petition, could proceed under the Administrative Procedure Act.

Comment: This proposal is inconsistent with Obama's policy on climate change, the Clean Power Plan, and the recent Paris agreement. The SDEIS must disclose these inconsistencies as required by NEPA.

Response: The proposed reinstatement of the North Fork Coal Mining Area exception into the Colorado Roadless Rule is consistent with the Obama Administration's policy on climate change and the Paris Agreement. A major element of the Obama Administration's policy on climate change and the U.S. commitment to the Paris Agreement is the Clean Power Plan. The Clean Power Plan recognizes the role of coal in the U.S. energy mix and does not directly prohibit or limit the production or burning of coal. In 2014, coal provided almost 40% of U.S. and 60% of Colorado's electricity generation. Coal is still needed to provide for an economically sound and stable electricity generation industry and maintenance of the U.S. standard of living. Congress has declared that it is in the national interest to foster and encourage private enterprise concerning sound and stable mineral development in an orderly fashion to help meet industrial, security and environmental needs using research, wise use, and the study of methods to lessen adverse environmental impacts that may result from mining or activities.

The Colorado Roadless Rule provided only limited access to coal resources within CRAs in the State of Colorado. The majority of coal resources within CRAs do not have roaded access under the Colorado Roadless Rule. Overall, significant restrictions on access to coal resources within CRAs occurred when the Colorado Roadless Rule was promulgated, as roaded access to all coal resources within CRAs on the Pike-San Isabel, Routt, White River, and San Juan National Forests have been foreclosed by the Colorado Roadless Rule. Access to additional coal resources within CRAs but outside the North Fork Coal Mining Area on the GMUG National Forests have also been foreclosed by the Colorado Roadless Rule. The original North Fork Coal Mining Area as petitioned by the State of Colorado was more than 55,000 acres and has since been reduced in size to 19,700 acres to balance potential coal development, energy needs, local economic needs, and conservation of roadless area characteristics.

The Colorado Roadless Rule is not a coal mining regulation and does not make any decisions to explore for or lease Federal coal; it only preserves the option of using temporary roads for future coal exploration and coal-related surface activities within the North Fork Coal Mining Area. It is a programmatic rule that establishes a regulatory framework under which future actions would comply. Any future exploration or leasing of coal resources within the North Fork Coal Mining Area remains subject to site-specific environmental review and would be subject to restrictions, mitigations, or requirements in place at the time site-specific applications are made.

Comment: If this production of fossil fuels is a "bridge," then where is the plan for getting to the "low-fossil fuel energy future"? How many years, how many tons of fuel, how many tons of carbon and methane released, how many more leases to the corporations?

Response: The plan for achieving a low-fossil fuel energy future is a multi-pronged approach which includes the Paris Agreement, the Clean Power Plan, the Presidential Memorandum on Federal Leadership on Energy Management, as well as many other Federal initiatives. More information on the Administration's plan on achieving a low-fossil fuel energy future is available in *The President's Climate Action Plan* (White House, 2013). The reinstatement of the North Fork Coal Mining Area exception would not inhibit the ability of the United States to achieve the plan for a low-fossil fuel energy future.

Comment: This proposal is inconsistent with what USDA Secretary Vilsack is asking farmers and foresters to do on private lands.

Response: The 10 building blocks that make up the USDA's Climate Smart framework are a range of technologies and practices to reduce greenhouse gas emissions, increase carbon storage, and generate renewable energy. The 10 building blocks are a set of voluntary programs and initiatives spanning USDA programs, including the Forest Service, and are encouraged on both private and public lands in collaboration with farmers, ranchers, and forest land owners. Continued use of coal is consistent with the Administration's policies (see above comment response).

Comment: It would be illegal to permit the exception since a moratorium on extracting coal on public lands is now the law of the land. The proposal contradicts the spirit of the moratorium and should not occur until the national programmatic review on the federal coal leasing program is completed.

Response: Secretarial Order No. 3338: Discretionary Programmatic Environmental Impact Statement to Modernize the Federal Coal Program (January 15, 2016) by the Department of Interior does not apply to this rulemaking proposal by the USDA. The Order establishes a comprehensive review of the Federal coal program and includes a temporary pause on certain types of coal leasing while a programmatic evaluation of the Federal coal leasing program is being conducted by the BLM. The Colorado Roadless Rule SEIS does not evaluate or propose to make a decision on any specific exploration or leasing proposals. Issuance of any exploration or leasing leases would need to undergo separate project-level analyses pursuant to NEPA and would need to be consistent with any laws and regulations in place at the time of leasing.

Comment: The Forest Service should not rely on the BLM's methane rulemaking process to determine the USFS policy on methane capture.

Response: The USDA believes that BLM's effort will provide valuable insight into development of sound public policy on mitigating the effects of waste mine methane. Therefore, USDA is deferring this issue to the required environmental review that is performed when specific lands are being considered for leasing, because the analysis will be better informed and more efficient by: 1) a site-specific proposal when unknown factors that influence

the selection of potential capture systems are better known, 2) agencies in charge of mine safety and mine operations can be consulted, and 3) knowing the results of BLM's waste mine methane rulemaking effort.

Comment: The proposal is inconsistent with Governor Hickenlooper's efforts to reduce greenhouse gases. One year alone of net methane emissions from this proposal would nearly wipe out all of Hickenlooper's efforts to limit methane emissions from oil and gas operations.

Response: The State of Colorado continues to support the North Fork Coal Mining Area exception and Governor Hickenlooper has directed his administration to take certain steps to mitigate the impacts of continued coal mining in the North Fork Valley. First, the Department of Natural Resources will be a cooperating agency on environmental reviews for projects proposing to utilize the North Fork exception, pursuant to 36 C.F.R. 294.45(b) and, when participating as a cooperating agency, will consult with the Colorado Department of Public Health and Environment and Colorado Energy Office on ways in which methane emissions from proposed projects can be minimized. In addition, Colorado Department of Public Health and Environment will continue its efforts to work with the Forest Service and BLM to ensure that data collected and reported by North Fork coal mines, where required by the Federal Greenhouse Gas Reporting Rule, regarding the amounts of methane being vented from methane drainage wells is considered in evaluating future projects. Finally, State agencies will work with Forest Service and BLM to encourage and, when feasible and appropriate, require operators to reduce methane emissions through measures that could include collection or combustion of methane that would otherwise be vented.

Comment: The USFS should develop a comprehensive national greenhouse gas and climate change impact policy for analyzing the impacts of all current and future fossil fuel extraction proposals. The lack of a coherent national policy has threatened collaborative efforts to develop the Colorado Roadless Rule.

Response: The Forest Service currently relies on guidance from the Council on Environmental Quality on consideration of GHG emissions and effects of climate change in NEPA reviews. In addition, USDA participated in the development of the IWG SCC methodology. Development of a national policy for analyzing impacts of GHG emissions and climate change is beyond the scope of this analysis. The BLM is currently working on a programmatic environmental impact analysis (PEIS) that will analyze climate impacts related to the entire Federal coal-leasing program, as directed by Secretarial Order 3338.

Comment: Shipping coal overseas does not support "energy security" as outlined in the agency's 2011 Strategic Energy Framework.

Response: The Colorado Roadless Rule does not make decisions on coal market destinations. For the purposes of analysis and disclosure, SEIS analysis assumed that 12% of coal produced in a given year would be exported based on 2004–2013 export data obtained from the Energy Information Administration.

Comment: Gunnison County designated the North Fork Valley Coal Resource Special Area and adopted the Coal Resource Special Area Coal Mining Regulations. In those regulations, Gunnison County recognizes that coal is a resource valuable to the United States, Colorado and Gunnison County.

Response: The USDA and Forest Service acknowledge the contribution of coal to power generation and the standard of living in the United States, Colorado, and Gunnison County. In 2014, coal provided almost 40% of U.S. electricity generation. Coal is needed to provide for an economically sound and stable electricity generation industry and maintenance of the U.S. standard of living. The reinstatement of the North Fork Coal Mining Area exception was

developed specifically to address the local economy of the North Fork Valley and preserves coal exploration and development opportunities across 19,700 acres of CRAs.

Comment: Although this one project may not significantly impact climate change, it sets a precedent to other companies to try to get around the roadless rule.

Response: Reinstatement of the North Fork Coal Mining Area exception would preserve access to Federal coal resources in only a limited area (19,700 acres for Alternative B and 12,600 acres for Alternative C). This is less than 0.5% of all CRAs in Colorado and reflects the collaborative efforts and compromises that occurred between various stakeholders leading to the promulgation of the 2012 Colorado Roadless Rule.

Comment: This type of road construction and its impact on clean water and wildlife habitat is prohibited by Federal law.

Response: Reinstatement of the North Fork Coal Mining Area exception does not approve or authorize any road construction. It merely establishes a regulation that facilitates the ability to construct temporary roads within the North Fork Coal Mining Area for coal exploration and/or coal-related surface activities. All site-specific activities that may be proposed in the future would be subject to applicable laws including the Clean Water Act and the ESA. Any temporary road construction would be completed in accordance with those regulations and performance standards and mitigation established in existing laws and regulations. Based on agency experience, temporary roads in the North Fork Coal Mining Area can be constructed with minor impacts to clean water and wildlife habitat; in addition, any surface disturbance would be temporary and required reclamation would result in any impacts to water and wildlife habitat returning to baseline conditions over the long term.

Purpose and Need

Comment: The Forest Service must utilize the original purpose and need as articulated during scoping. The SDEIS purpose and need was arbitrarily modified and expanded to all CRAs and not just the North Fork Coal Mining Area.

If the Forest Service is going to rely on the arbitrarily modified purpose and need statement, then a broader range of alternatives needs to be developed to address protection of all CRAs.

Response: The purpose and need statements in the scoping notice and SDEIS are paraphrased from the 2012 FEIS. As stated on page 1 of the SDEIS, the purpose and need statement is the same as the 2012 purpose and need statement for the Rule. To avoid future confusion, the 2012 purpose and need statement is now included verbatim in the SFEIS.

The Forest Service evaluated a total of 15 alternatives for this SEIS, which included three alternatives considered in detail (the no action alternative and two action alternatives) and 12 alternatives that were considered but eliminated from detailed study. In addition, the 2012 SFEIS considered 10 total alternatives, which included 4 alternatives considered in detail. The scope of this analysis is narrowly focused on the reinstatement of the North Fork Coal Mining Area exception into the Colorado Roadless Rule, and conserving roadless area characteristics while accommodating State-specific concerns, which includes not foreclosing exploration and development of coal resources in the North Fork Valley. The Colorado Roadless Rule is not a coal mining regulation but is a regulation to manage CRAs. Therefore, many of the alternatives suggested through public comments that would regulate coal mining operations were dismissed from detailed analyses.

Comment: There is no demonstrated need or immediate need for the exception.

There is no demonstrated need for leaving the Pilot Knob Roadless Area in for potential coal exploration and development.

> **Response:** The North Fork Coal Mining Area exception considers the future long-term opportunities for coal exploration and development, not just the current situation or short-term needs for the exception. The established legal and regulatory framework governing Federal coal resources has not changed; therefore, the USDA retains responsibility within context of these laws and regulations to manage the surface resources in areas where Federal coal occurs. The Colorado Roadless Rule addresses this established on-going responsibility. Further, the USDA must honor its commitment to address the concerns of the State of Colorado for management of CRAs.

Comment: The Forest Service alleges the lack of immediate need for the coal resources does not undermine the need for the rule because "it takes years to develop regulations." This lacks merits because this amendment may take a little as 15 months from the scoping notice and the coal lease modification was adopted two months after the rule was finalized in 2012. In addition, one would have to assume that coal producers have only one credible proposal in the planning pipeline for the roadless areas and there are no such proposals for either the Pilot Knob or Flatirons Roadless Areas.

> **Response:** The Forest Service effort on behalf of the USDA to reinstate the exception for the North Fork Coal Mining Area in the Colorado Roadless Rule considers the Department's broader responsibilities under existing laws, including the Mining and Minerals Policy Act of 1970, and more specific responsibilities to manage surface resources under its jurisdiction in the context of the Mineral Leasing Act of 1920, as amended. The Colorado Roadless Rule responds to providing a long-term regulatory framework to manage coal-related activity in CRAs. Processing specific applications for lease is a separate agency effort that will have to comply with the applicable regulations, including the Colorado Roadless Rule.
>
> Preliminary work on the reinstatement of the North Fork Coal Mining Area exception began in August 2014, 8 months before the publication of the scoping notice. A final rule published in September 2016 would be more than 2 years to conduct the supplemental analysis. If the Forest Service waited to reinstate the rule until a proposal was received to develop the Pilot Knob or Flatirons CRAs, it would likely take substantially longer than 2 years because a full EIS would likely be needed because many of the staff that worked on the 2012 FEIS were available to assist in this SEIS effort. This reduced the time needed to conduct the analyses. In addition, it would be inefficient to conduct two separate rulemaking efforts: one for the Sunset CRA which has a proposal for two lease modifications, and one for the Pilot Knob and Flatirons CRAs.
>
> The Forest Service's decision to modify the leases 2 months after the Rule was promulgated is partially because consultations of the lease modification analysis began in 2009 and an environmental assessment was prepared prior to the EIS that supported the decision to modify the leases. It still took multiple years of analyses to complete, but most of the work had been completed by the time the 2012 Colorado Roadless Rule was promulgated.
>
> Once the Forest Service consented to the lease modifications, coal mining was still substantially in the future. First, the BLM needed to make a decision to lease, which relied on the Forest Service's analysis and consent decision. The BLM also needed to conduct a separate environmental review to allow exploration to occur. Then the coal company would have been allowed to conduct exploration operations to develop a mine plan, which would have gone through OSMRE and the Colorado Division of Reclamation, Mining and Safety for mine plan approval and permitting. Without a regulation in place to preserve the opportunity to develop coal resources in roadless areas by using the temporary road construction exception, it could

take years from the time the Forest Service consents to mining activities on NFS lands to the time when mining could actually occur.

The commenter is correct that the BLM and the Forest Service have one proposal (containing two lease modification proposals) in the Sunset CRA and none in the Flatirons or Pilot Knob CRAs.

Comment: The bankruptcy of Arch Coal renders some or all of this proposal moot. It is not the Forest Service's job to prevent bankruptcies.

Response: The reinstatement of the North Fork Coal Mining Area exception is not for the benefit of any specific mining company. The State-specific concern is the stability of local economies in the North Fork Valley and recognition of the contributions that coal mining has provided in the past and may provide in the future to those communities.

The commenter is correct that it is not the role of the Forest Service to prevent bankruptcies of any individual company.

Comment: The North Fork Valley is not dependent on the coal industry, a major argument for the proposal.

Response: It is the position of the State of Colorado that providing the North Fork Coal exception provides a major benefit to the North Fork Valley. It was a concern expressed by the State of Colorado when it identified 55,000 acres in this area for exemption from coverage of the roadless rule. The SDEIS highlights the total employment and labor income for the study area as well as the State of Colorado in 2013 for major industry sectors. The largest study area industries in terms of employment include construction, retail trade, real estate, accommodation/food services, and government. In terms of labor income, the SDEIS shows that mining, construction, manufacturing, information, transportation and the government sectors all show higher average labor income than both the State and the study area total employment averages (SDEIS pp. 88–89).

The estimated annual average economic impacts by alternative are contained in the SDEIS (pp. 94-95). Potential loss of jobs and associated labor income with no additional production associated with the North Fork Coal Mining Area has been disclosed. The energy market's fluctuations have been extensively discussed (SDEIS, p. E-4; EIA, 2015c). The SDEIS further recognized that layoffs have occurred within the study area for the coal mining, oil/gas and dairy sectors, and the impact of the loss of direct jobs within any sector would be followed by changes to other sectors as the ripple effects of lost wages work their way through the economy. (SDEIS p. 89) The SDEIS also acknowledged that any new layoffs within a community can be difficult, from the directly affected workers, to real estate and local school enrollment (DEIS, p. 90). Not all communities within the economic study area would be affected the same, some communities have diversified economies, attracted retiree populations, or are less dependent on coal mining. Those communities that are still dependent on coal mining would be most directly affected. (SDEIS, p. 95).

Public Involvement

Comment: The public should be consulted about any leasing.

Response: Any future leasing proposals would require site-specific analysis pursuant to NEPA. This would include required public scoping and opportunities to administratively challenge the proposal through the Forest Service's pre-decisional objection process (36 CFR 218).

Comment: The Forest Service must respond to all issues raised in the HCCA scoping letter. We specifically request response to our comments on royalties.

Response: There is no requirement to publish agency responses to scoping comments. The NEPA regulations only require response to comments received on draft statements (40 CFR 1503.4). To the extent that any substantive comments were provided again during the official comment period on the SDEIS, those are addressed in this Appendix.

Comment: There was insufficient time to comment on the SDEIS due to the timing around the holiday season.

Response: The USDA and Forest Service received similar comments during the comment period and extended the comment period to account for the holiday season.

Comment: The public should have a minimum of a year to comment on rules and should be notified by mail 6 months before approval can be granted.

Response: The comment periods (scoping and on the draft) are well within the guidelines provided for NEPA analyses and rulemaking efforts. The Forest Service sent about 1,400 hard copy letters and 43,000 emails to individuals and organizations known to be interested in the Colorado Roadless Rule. About 104,500 letters were received during the SDEIS comment period. The amount of comment letters received indicates the comment period length was sufficient.

Alternatives and Mitigation Measures

Comment: Many commenters suggested additional alternatives or mitigation measures for the Forest Service to consider, which included:

- Requiring methane capture and reduction utilizing best available technology and/or setting of reduction targets.
- Requiring a carbon offset or carbon fee.
- Limiting the sale of coal to only facilities with integrated gasification combined cycle or carbon capture and storage.
- Incorporating GHG and climate effects into coal prices.
- Requiring energy efficiency measures and renewable energy focus.
- Assisting coal companies and local communities to switch to renewable energy.
- Issuing new leases based on bond obligations.
- Requiring a $2.5 billion irrevocable bond.
- Excluding the Pilot Knob Roadless Area from the North Fork Coal Mining Area.
- Increasing upper tier acreage.
- Increasing recreational opportunities rather than industrial uses.

Response: Suggested additional alternatives or mitigation measures considered by the Forest Service are addressed in Chapter 2 of the SFEIS. The SFEIS does not analyze any additional alternatives in detail that weren't already analyzed in detail in the SDEIS. A brief discussion on the reasons why the suggested alternatives or mitigation measures were not analyzed in detail is provided in the *Alternatives Considered but Eliminated from Detailed Study* section.

Comment: The Forest Service must evaluate an alternative that forecloses exploration and mining on some of the North Fork Coal Mining Area to conserve roadless character. Alternative C is not the only reasonable alternative that the Forest Service must analyze to provide the public and decision maker a range of reasonable alternatives.

The SDEIS fails to evaluate a range of reasonable alternatives as required by NEPA and case law.

Response: The Forest Service evaluated a total of 15 alternatives, which included three alternatives considered in detail (the no action alternative and two action alternatives) and 12 alternatives that were considered but eliminated from detailed study. As an SEIS, the scope of this analysis is narrowly focused on the reinstatement of the North Fork Coal Mining Area exception into the Colorado Roadless Rule, and conserving roadless area characteristics while accommodating State-specific concerns, which includes not foreclosing exploration and development of coal resources in the North Fork Valley. The Colorado Roadless Rule is not a coal-mining regulation but is a regulation to manage CRAs. Therefore, many of the alternatives suggested through public comments that would regulate coal-mining operations were dismissed from detailed analyses. These alternatives are better considered when site-specific proposals are submitted and additional necessary information is known. At this time 80% of the area has not been explored and little is known. Mining may or may not occur throughout the area. It is less speculative and more efficient and practical to evaluate these alternatives in subsequent environmental analyses.

One of the purposes of a range of alternatives is to sharply define the issues and provide a clear basis for choice among options by the decision-maker and the public (40 CFR 1502.14). From a roadless area conservation standpoint, the primary issue is if and how much the North Fork Coal Mining Area exception should apply to CRAs under the 2012 Colorado Roadless Rule. The range of alternatives is adequate to define this issue and provides a clear basis for choice (apply the exception to 0, 12,600 acres or 19,700 acres).

Comment: The SDEIS fails to evaluate mitigation measures as required by NEPA and case law.

The SDEIS contains no mitigation measures, instead asserting measures can wait until later stages of analyses. Then there is no description of what those measures actually are.

The SDEIS fails to evaluate alternatives and mitigation measures.

Response: By design, the Colorado Roadless Rule mitigates for the exceptions that accommodate State-specific concerns. Specifically, the Colorado Roadless Rule added 409,500 acres into the roadless inventory that were not managed as roadless under the 2001 Roadless Rule; designated 1,219,200 acres as upper tier CRAs where exceptions to tree cutting and road construction are more restrictive and limiting than the 2001 Roadless Rule; and restricted the use of LCZs, which were not restricted under the 2001 Roadless Rule. These features offset or mitigated the environmental impacts of the Colorado Roadless Rule exceptions, such as the North Fork Coal Mining Area exception, to provide a final rule that is more protective to CRAs than the 2001 Roadless Rule.

The Colorado Roadless Rule includes regulatory provisions to mitigate impacts of road construction within CRAs. Specifically they are:

- Within a native cutthroat trout catchment or identified recovery watershed, road construction will not diminish, over the long-term, conditions in the water influence zone and the extent of the occupied native cutthroat trout habitat (36 CFR 294.43(c)(2)(iv)).
- Watershed conservation practices will be applied to all projects occurring in native cutthroat trout habitat (36 CFR 294.43(c)(2)(v)).
- Conduct road construction in a manner that reduces effects on surface resources, and prevents unnecessary or unreasonable surface disturbance (36 CFR 294.43(d)(1)).
- Decommission any road and restore the affected landscape when it is determined that the road is no longer needed for the established purpose prior to, or upon termination or

expiration of a contract, authorization, or permit, if possible. Require the inclusion of a road decommissioning provision in all contracts or permits. Design decommissioning to stabilize, restore, and revegetate unneeded roads to a more natural state to protect resources and enhance roadless area characteristics (36 CFR 294.43(d)(2)).

Listing of potential mitigation measures that would and could be applied to future temporary road construction for coal exploration or coal-related surface activities and then describing what they are would be a redundant, inefficient, and marginally useful exercise. Standard mitigation measures, performance standards and reclamation requirements applied to coal exploration and coal-related surface activities by the Forest Service, BLM, OSMRE, and the State through existing laws and regulations have proven to be sufficient to protect resources based on the condition of areas previously used for exploration or surface activities related to coal mining. Hundreds of standard mitigation measures are applied to mining operations and to describe all of them in this SEIS would be encyclopedic and detract from the primary reason for this SEIS, which is to decide whether or not temporary road construction should be allowed in the North Fork Coal Mining Area.

Comment: Methane flaring should be reconsidered because it is a safe practice, would reduce 90% of methane emissions.

Response: The agency reconsidered methane flaring, as well as other capture and reduction measures, and did not carry this alternative through detailed study (see Chapter 2, *Alternatives Considered but Eliminated from Detailed Study* section). Like capture, methane flaring is best considered at the leasing stage when there is more information on the specific minerals to be developed and the lands that would be impacted by a flaring operation.

In addition, making flaring a regulatory requirement for coal-mining operations in the North Fork Coal Mining Area could be problematic because the Mine Safety and Health Administration could ultimately decide not to allow flaring if it determined that it jeopardizes the safety of the miners. To date, the Mine Safety and Health Administration has not approved a flaring system for a coal mine in the Western United States. This could result in the coal mining company being required to flare by two agencies but not allowed to flare by another agency charged with miner safety, which would be inappropriate from the perspective of agency-to-agency coordination.

Comment: If an exception is being made for coal mining, then an exception should be made to allow companies to harvest dead and diseased trees in the area.

Response: Tree cutting, including the harvesting of dead and diseased trees, is generally prohibited in CRAs with limited exceptions. The Colorado Roadless Rule allows tree cutting in non-upper tier: within the first 0.5 mile of a community protection zone; within the first 0.5 to 1.5 miles of a community protection zone if a community wildfire protection plan identifies the area as a need for treatment; outside of a community protection zone if there is a significant risk to a municipal water supply; to maintain or restore ecosystem composition, structure and processes; incidental to a management activity not otherwise prohibited by the Rule; or personal or administrative use. Just because an exception is made for temporary road construction for coal removal, it does not follow that an exception should be made for tree removal. The purpose of this rule is to reinstate the temporary road construction/reconstruction exception within the North Fork Coal Mining Area that was established in 2012 by addressing identified analysis deficiencies, not to expand the existing prohibitions or exceptions that have already been decided upon in the 2012 Colorado Roadless Rule.

Comment: The Roadless Rule is too restrictive. The rule leaves very little flexibility for safety, fire suppression, water demands, or forest health.

Response: The Colorado Roadless Rule has several other exceptions specifically designed to address fire and fuels, water supply, and forest health. The Rule balances the need to address these issues while conserving roadless area characteristics.

Effects Analysis

Comment: The SDEIS analysis is neither within the scope of analysis under NEPA nor is it required under the court order in HCCA because the agency includes speculative actions that are connected actions, not reasonably foreseeable, or within the rule of reason

Response: The District Court of Colorado determined that the 2012 FEIS failed to disclose GHG emissions resulting from combustion of North Fork Coal Mining Area coal. This led to an agency decision to use the SCC methodology to assist in disclosing impacts of GHG emissions from potential combustion of North Fork Valley coal. In addition, the attempts to quantify GHG emissions from combustion of North Fork Coal Mining Area coal led to the assumption that all recoverable coal that would become accessible from the proposal would be combusted. The agency agrees this is speculative, not reasonably foreseeable, and it is likely that less than 100% of the recoverable coal would be combusted. However, since the agency lacks a method for determining how much coal would be reasonably combusted, 100% was used to disclose a maximum impact level and provide an adequate range of potential environmental effects between the no action alternative and proposed action alternative.

Comment: Many comments were received stating the SDEIS was overly broad and did not sufficiently disclose impacts of various resources. Commenters claimed the SDEIS analysis of impacts did not meet the hard look test, violated NEPA and case law, and/or was arbitrary and capricious.

The SDEIS needs to assess the impacts of road building because they are "reasonably foreseeable" impacts of the exception.

The SDEIS relies on the 2012 FEIS to address potential impacts of resources but does not cite any specific analyses in the FEIS that addresses the potential impacts because the 2012 FEIS contains virtually no such data.

Because the SDEIS contains virtually no information that allows the public to understand the values of the three roadless areas, it is impossible for the decision maker or public to understand the tradeoffs.

The SDEIS fails to provide the necessary baseline data to evaluate impacts to critical resources.

Even if the Forest Service cannot predict the precise location of roads and well pads, it must disclose the differing values that exist within each roadless area and for each alternative, must analyze the impacts to the areas that are likely.

Response: The Colorado Roadless Rule SEIS is a programmatic environmental review that provides a broad, high-level NEPA review of the regulation (36 CFR 294 Subpart D) and relies on tiered environmental review to address site- or project-specific actions and impacts. This is allowable under NEPA (40 CFR 1502.20, 1508.28) and the Council on Environmental Quality has issued guidance for effective use of programmatic NEPA reviews (CEQ, 2014). The tiered environmental review process should lead to clearer and more transparent decision-making by eliminating repetitive discussions and focusing on the issues ripe for decision at each level of review.

In this case, the primary decision is to determine whether temporary road construction for coal exploration and coal-related surface activities should be allowed in certain CRAs and if so, where and to what extent. From a broad, high-level programmatic view, the agency understands

that this allowance would result in temporary loss of roadless area characteristics until the roads are decommissioned, the site is restored, and vegetation has had the opportunity to establish and grow. The agency also understands that the area designated as North Fork Coal Mining Area could potentially be leased and, once leased, underground coal mining could occur with associated surface uses and temporary roads. General surface impacts to various resources from temporary roads and surface facilities are well understood, but the agency does not know if and when coal leasing would actually occur, and thus does not know exactly where associated roads and surface facilities would be located. The laws governing coal leasing provide the Forest Service with authority to include lease stipulations designed to avoid key site-specific areas of concern, such as wetlands, fens, key habitats, etc. Surface disturbance can generally be mitigated to an acceptable level through established regulatory requirements for performance standards, mitigation, and reclamation. Therefore, site-specific analyses at the rulemaking stage is not necessary to make an informed decision on whether or not to reinstate the North Fork Coal Mining Area exception. Site-specific analyses can be deferred to when the decision to lease is ripe and site-specific information is available.

Because the agency does not know if lands will actually be leased or the location of future temporary roads and well pads, the SEIS analysis relies on many assumptions to conduct the analysis. Conducting the site-specific impact analysis at the rulemaking stage could lead to a false sense of understanding. In addition this analysis would need to be repeated at the project level. One of the benefits of conducting programmatic analyses is to gain efficiencies in environmental reviews through the tiering process (40 CFR 1502.20, 1508.28).

Comment: The SDEIS reliance on an analysis that "could" occur later is erroneous. The fact the Forest Service is analyzing a rule does not give the agency carte blanche to turn a blind eye to the values and resources at stake.

Response: The analysis “could” occur because it is unknown whether areas within the North Fork Coal Mining Area will actually be leased. If a lease request is received, an analysis pursuant to NEPA must occur before a lease is sold. As stated above, the Colorado Roadless Rule SEIS relies on tiered environmental review to address site or project specific actions and impacts which is allowable under NEPA (40 CFR 1502.20, 1508.28). Site-specific analyses will occur when a lease proposal is received.

Comment: The Forest Service cannot rely on lack of future site-specific activities as an excuse to fail to disclose impacts because the agency is working on an DEIS for Arch Coal's lease modifications, has historic information to base effects on, and the area at stake is relatively small with discrete types of activities that could occur.

Response: The SEIS considers and discloses projected temporary road mileage and projected disturbance associated with typical surface uses for the 19,700 acres of the North Fork Coal Mining area. The projections were made on the basis of agency experience, including historic information from previous site-specific proposals. The 2012 FEIS disclosed potential effects, and this SEIS updated those effects where needed. This SEIS includes an analysis of road densities from past coal-related surface uses that demonstrated that road and surface-facility placement is highly variable. Average road densities ranged from 0.1 to 11.6 mi/mi^2. Thus, use of more general projections for the overall acreage was determined to be reasonable for the purposes of a programmatic analysis. The majority of the North Fork Coal Mining Area is unleased, and it is unknown if or when it will be leased, nor is it known where surface uses and associated temporary roads would be located. Timing of impacts is an important consideration when conducting site-specific analyses. For example, constructing all of the temporary roads necessary to mine the North Fork Coal Mining Area in 5 years would have vastly different

impacts on water quality, wildlife, and semi-primitive recreation opportunities than if those same temporary roads were constructed over the course of 30 years.

Comment: The SDEIS position that it will not disclose impacts on the three roadless areas at the programmatic level is inconsistent with disclosures made in the 2013 San Juan National Forest LRMP.

Response: There is no requirement that a rulemaking EIS and a land and resource management plan EIS have similar levels of analyses. The SEIS analysis follows Council on Environmental Quality guidance on programmatic NEPA reviews.

Comment: The SDEIS fails to address significant new information that has become available since May 2012. Including not limited to: the pace and impacts of climate change; the need to limit fossil fuel combustion data; the importance of protecting roadless habitat; changed circumstances concerning coal markets; and data concerning wildlife.

Response: Specialist reports for the SFEIS have incorporated new information and best available science as necessary—including the Clean Power Plan, updates to SCC, peer reviewed protocols for SCM, changes to global warming potential from methane, genetic understanding of Colorado River and greenback cutthroat trout, and listing of new wildlife species.

Comment: The Forest Service fails to accurately disclose the impacts of roads and drill pads. It appears the SDEIS underestimates the total area to be impacted. The Forest Service must address impacts of surface disturbance to streams, vegetation, wildlife, ecology, geology, etc.

Response: As appropriate, the SEIS deferred site-specific analysis and disclosure to a future point when a coal-leasing action proposal is received and could be analyzed and decided upon. This is appropriate given the programmatic nature of the rule, the absence of ground disturbing decisions, and the lack of site specific information. An irretrievable commitment of resources will not be made by the rulemaking. Although some information is available about where mining is likely to occur in the near future, it is limited to areas already leased (about 20% of the North Fork Coal Mining Area) and the area with the two proposed lease modifications for the West Elk mine (about 9% of the North Fork Coal Mining Area is currently undergoing site-specific analysis). Site-specific information will be analyzed as proposals are made in a tiered decision making process.

The SEIS considers and discloses projected temporary road mileage and projected disturbance associated with typical surface uses for the 19,700 acres of the North Fork Coal Mining Area. The projections were made on the basis of agency experience, including historic information from previous site-specific proposals. The 2012 FEIS disclosed potential effects, and this SEIS updated those effects where needed. However, the SEIS also includes a geographic information system-based statistical review of temporary road construction related to MDWs at existing operations. This review showed there is large variability in temporary road mileage densities, ranging from 0.1 to 11.6 mi/mi^2. The statistical analysis also showed that the average temporary road density is 2.3 mi/mi^2 with a median of 1.9 mi/mi^2, and that more than half of the sample set fell below 2 mi/mi^2. The potential for high variability demonstrates that it is not reasonable to make precise projections of temporary road miles for rule development purposes within the North Fork Coal Mining Area. Further, since the statistical analysis showed an average of 2.3 mi/mi^2 and a median of less than 2 mi/mi^2, the 3-mile-per-section (or mi/mi^2) estimation carried forward from the 2012 FEIS was found to be statistically greater than the sample median, and thus represents a conservative and reasonable estimate for the purposes of the programmatic SEIS.

Roadless Areas and Wildernesses

Comment: The amount of roadless areas in Colorado is a small percentage of the overall State and should be protected due to the value for backcountry recreation opportunities and ecological benefits. Once disturbed they do not come back to the same level after the extraction is complete.

> **Response:** According to the Forest Service 2015 Lands Report, there are 14.5 million acres of National Forest System lands in Colorado (Forest and Grasslands), about 22% of the total acres in Colorado. In 2012, there were 4.2 million acres of CRA acres, or 29% of NFS lands are managed as roadless. Another 23%, or 3.4 million acres are congressionally designated Wilderness, Special Management Areas, National Protection Areas, or National Monuments. Of the third of the NFS lands that are managed as roadless, 0.5% are included in the North Fork Coal Mining Area. The exception does not apply to the other 99.5% of the CRA acres. Reclamation of temporary roads and well pads in the North Fork Valley has been occurring for many years and has proven to be successful.

Comment: The DSEIS should include more detail on the resource values to the lands classified as wilderness capable within the Sunset and Flatirons Roadless Areas, as well as the potential impacts to those areas from each alternative.

> **Response:** "Wilderness capable" is the first screen in the forest planning process to identify lands for recommended Wilderness. The areas once identified as "wilderness capable" by the GMUG draft forest plan in 2007 were analyzed in the 2012 FEIS for the Colorado Roadless Rule. This is a programmatic rule without any ground disturbing activities. Any future activities within the North Fork Coal Mining Area remains subject to site-specific environmental review, including the potential impacts to the nine roadless area characteristics.

Comment: The SDEIS fails to properly disclose the impacts of coal mine road and drill pad construction on roadless and wilderness character.

> **Response:** This rulemaking does not propose any activity within Wilderness. The Colorado Roadless Rule does not make any decisions to explore for or lease coal; it only preserves the ability to construct temporary roads for future coal exploration or coal-related surface activities within the North Fork Coal Mining Area. It is a programmatic rule without any ground-disturbing activities. Any future exploration or leasing of coal resources within the North Fork Coal Mining Area remains subject to site-specific environmental review, including the potential impacts to the nine roadless area characteristics. The SEIS estimates miles of temporary roads and acres of disturbance from well pads if all coal resources are developed within the North Fork Coal Mining Area, which is unlikely. Since it is unknown if and where coal resources would be developed and where associated roads and well pads would be located, it would be inefficient and speculative to estimate site-specific impacts on roadless area characteristics at the rulemaking stage. However, the 2012 FEIS discloses the general impacts on roadless area characteristics at a programmatic scale.

Comment: The Colorado Roadless Rule exists to keep roads out of wilderness and wilderness capable areas.

> **Response:** This rulemaking does not propose any activity within Wilderness. "Wilderness capable" is the first screen in the forest planning process to identify lands for recommended Wilderness. The areas once identified as "wilderness capable" by the GMUG draft forest plan in 2007 were not brought forward to be recommend for Wilderness. There is no special management associated with areas that have been identified as '"wilderness capable."

Comment: Any roads and/or industrial use would scar, degrade, and harm these lands. Wilderness cleans the air, filters our water, and offers amazing outdoor recreational opportunities. It is where

wildlife feed, give birth, raise their young and migrate, sustaining the role each plays in nature's web of life.

Response: This rulemaking does not propose any activity within Wilderness.

Comment: Please also consider allowing bikes on all (or most) trails. The original intent of wilderness was not to preclude human powered exploration of our forests, but rather to encourage it. This rule has been warped over the years and needs to be amended.

Response: This rulemaking does not propose any activity within designated Wilderness areas. The Wilderness Act of 1964 prohibits mechanized uses (which includes bikes). The Colorado Roadless Rule prohibits only tree-cutting, sale, or removal and road construction or reconstruction—with some exceptions in CRAs. Mountain biking access is considered as a part of individual forest travel management plans, but is not necessarily precluded from roadless areas.

Comment: Lands that have the capability to provide wilderness characteristics should be excluded from development to retain those characteristics. Once temporary roads are allowed to be constructed they persist for many years and the wilderness character of those areas are lost.

Response: This analysis is not considering any lands for recommended Wilderness. Those areas under Alternative C that were considered “wilderness capable” were screened for potential wilderness in 2007 and, as stated in the SDEIS, did not make it through the process to recommended Wilderness. There is no special management associated with areas that have been identified as “wilderness capable.”

Comment: The SDEIS fails to properly disclose the impacts of coal mine road and drill pad construction on roadless and wilderness character. The SDEIS's statement addresses only one component of wilderness character (roadlessness) that will be degraded on the wilderness-capable lands that are to bulldozing in Alternative B (but not Alternative C). Other components - naturalness, opportunities for solitude, sense of remoteness - may also be degraded, and could be degraded for many more years than roadlessness as the GMUG 2005 inventory indicated when it found "remnants of roads" in sufficient density rendered an area not natural enough to possess wilderness character. Neither the SDEIS nor the Colorado Roadless Rule disclose or analyze the potential for long-term damage to wilderness capability, which is, after all, the central reason the Forest Service chose to consider Alternative C (which protects wilderness capable lands).

The location of Sunset and Flatiron Roadless areas adjacent to the West Elk Wilderness is of great concern. The negative impact of noise, traffic, methane venting and extraction to the wilderness is inevitable if leases are sold on or near the wilderness boundary.

Response: This analysis is not evaluating wilderness potential nor is it considering any lands for recommended Wilderness, which is a process for a forest plan revision. The SDEIS clearly states that no additional evaluation or wilderness recommendation of the area will be considered, and the reasons the 2007 wilderness inventory removed those areas from recommended Wilderness were documented (see Appendix A). Any future project-level analysis of activities occurring within the North Fork Coal Mining Area, regardless of the selected alternative, would include an analysis of the potential impact to the nine roadless area characteristics. The Colorado Wilderness Act specifically states that designation of a wilderness area does not lead to the creation of protective perimeters of buffer zones around each wilderness area. Activities are not to be precluded from non-wilderness areas because those activities can be heard or seen from within a designated Wilderness.

Alternative C was analyzed in detail because it was brought forward in scoping comments and provides an intermediate size for the North Fork Coal Mining Area between the proposed

action and no action alternatives. In the past, all requests in the state petition, the DEIS, the revised DEIS, and the 2012 FEIS to reduce the size of the North Fork Coal Mining Area have been adequate in the knowledge that a reduction in size increases protection of roadless areas. (55,000 acres to 19,700 acres). This supplement continues this approach and does not attempt to address site-specific impacts on roadless area characteristics because these effects will be addressed when site-specific proposals are received; it would be more efficient to address them when a site-specific proposal is received; it would be speculative to address many of these impacts without a site-specific proposal (i.e., it is pointless to try to assess water quality impacts without knowing the proximity of construction activities to streams); and it is sufficient to generically address impacts for a programmatic regulation.

Comment: Attempts to create de facto wilderness through alternate means such as removing "wilderness capable lands" from the North Fork Coal Mining Area are beyond the scope of this analysis. For this reason, we find Alternative C to be fatally flawed due to the inclusion of such a provision. We suggest that no special consideration be given to "wilderness capable lands" in any alternatives included in future versions of the SEIS.

Response: Recommendations for Wilderness under the 1982 forest planning regulations were processed through several screens to determine if an area was to be recommended. One of the first screens was “wilderness capable.” The polygons identified to be removed from the North Fork Coal Mining Area in Alternative C did not continue through the Wilderness screen process as they did not pass through the “wilderness capable” screen to move forward. The SEIS states that removing these acres from the North Fork Coal Mining Area does not recommend them for recommended Wilderness. The use of the term “wilderness capable” is only a mechanism to identify these lands that were requested for removal in a scoping comment for consideration as an alternative.

Comment: There is increasing pressure on National Forest and wilderness by summer campers and fall hunters seeking, naturalness, solace, isolation, and peace so more roadless areas are needed.

Response: This comment appears to be focused on Wilderness opportunities, which is outside the scope of this analysis. About 29% of the NFS lands in Colorado have been identified as roadless and are managed under the Colorado Roadless Rule. About 22% of the NFS lands in Colorado have been congressionally designated as Wilderness. Activities in Wilderness are limited to non-motorized, while activities in roadless can be motorized, mechanized, as well as non-motorized. This rule attempts to balance the multiple use mandate that applies to NFS lands.

Comment: The Pilot, Sunset and Flatiron Roadless Areas were designated precisely because they meet the criteria for roadless areas and thus should not be opened up for an exception.

Response: The criteria for CRAs is an area 5,000 acres or greater without roads or substantially altered acres, or an area without roads that is adjacent to a designated Wilderness. Unlike designated Wilderness, there is little criteria for areas to meet in order to be identified as CRAs. During the Governor’s petition process, the North Fork Coal Mining area was specifically identified as an area that many interest groups desired to see managed as roadless with an exception for coal development.

Coal Resources

Comment: The SDEIS fails to account for private coal likely to be mined as a result of the exception.

Response: The Colorado Roadless Rule does not authorize leasing Federal coal resources or mining; rather it is a rule for managing CRAs. The Forest Service and BLM do not have authority over private lands or private coal resources. The analysis assumes that the North Fork

Coal Mining Area exception would facilitate accessibility to Federal coal resources. There are private coal resources adjacent to the Sunset CRA to which access could be made easier with the exception. Thus, for the purpose of disclosure, an estimate of private coal (fee coal) in this area has been added to the SFEIS. Information about other private coal resources is unavailable to the agencies.

Comment: The proposal just puts a coal company filing for bankruptcy on life support at the expense of wilderness areas.

Response: The Colorado Roadless Rule SEIS is a rulemaking effort for roadless area management and was not developed to support any individual mining company. Rulemaking analyzes and establishes clarifying regulations to implement policy and laws; it is at a broader scale than analysis of specific management actions such as leasing actions. The Forest Service is committed to contributing to energy security, and carrying out the government's overall policy to foster and encourage orderly and economic development of domestic mineral resources. Congress has declared that it is in the national interest to foster and encourage private enterprise concerning sound and stable mineral development in an orderly fashion to help meet industrial, security and environmental needs using research, wise use, and the study of methods to lessen adverse environmental impacts that may result from mining or activities.

Comment: The SDEIS fails to address Arch Coal's bankruptcy which may impact its ability to continue operations and comply with reclamation duties.

Response: The SEIS is a rulemaking effort for roadless area management and does not address project-specific actions or companies. Arch Coal Inc. did file for chapter 11 bankruptcy protection in January of 2016 and successfully emerged from bankruptcy on October 5, 2016. Arch Coal Inc. has restructured through Chapter 11 and will be competing in the metallurgical coal market that has seen a resurgence and in the thermal coal markets that have also started to strengthen (Chaney, 2016).

Reclamation requirements are considered when site-specific mine permitting actions are brought forward to the State of Colorado. Reclamation bonding is handled by the State of Colorado with oversight by OSMRE. Prior to and following the Arch bankruptcy, reclamation at the West Elk Mine was guaranteed with two corporate sureties totaling $15 million. This amount is sufficient for the State to conduct reclamation, if necessary, including NFS lands, according to their approved reclamation plan. Arch Coal Inc., through their restructuring, now has third-party surety bonds in place covering 100% of the company's reclamation bonding requirements in the United States.

Comment: With Arch Coal filing for bankruptcy, who will pay for the roads?

Response: This is outside the scope of the analysis in the Colorado Roadless Rule SEIS. The Colorado Roadless Rule is a rulemaking effort and does not look at financing individual road construction. However, individual coal companies would pay for the temporary roads needed to explore and develop the coal resources within the North Fork Coal Mining Area. This information would be disclosed in a site-specific analysis once a proposal for coal exploration or development is received. The Colorado Division of Reclamation, Mining, and Safety (DRMS) would calculate the reclamation liability costs for any temporary roads, and a corporate surety would need to be posted prior to initiating any construction activities. Currently the DRMS holds two corporate sureties in the amount of $15 million, which is adequate to ensure reclamation of all temporary roads, including those on NFS lands, at the West Elk Mine.

Arch Coal Inc. did file for Chapter 11 bankruptcy protection in January 2016 and successfully emerged from bankruptcy on October 5, 2016. Arch Coal Inc. has restructured through Chapter

11 and will be competing in the metallurgical coal market that has seen a resurgence and in the thermal coal markets that have also started to strengthen (Chaney, 2016).

Comment: Once the coal runs out, the American taxpayers are left with huge mitigation and recovery costs.

Response: Development of coal resources is regulated by various existing Federal and State laws, which require reclamation and bonding for reclamation costs. This is outside the scope of the analysis in the SEIS. Based on the Surface Mining Control and Reclamation Act of 1977 and the Rules promulgated thereunder (and their analogous State laws and rules), all coal-mining operations are required to post a sufficient bond for all reclamation activities at the mine site. This bond ensures that the proper regulatory authority can complete reclamation if the operator is unable. The West Elk Mine has two corporate sureties in the amount of $15 million, which is sufficient to cover all reclamation costs at the site, including all NFS lands.

Comment: The SDEIS should more accurately disclose available coal or disclose how the 50% reduction in estimated coal volume was arrived at.

Response: The estimated coal volume is based on the most currently available data for the area and present conditions and mining techniques. Given the area in question it is of particular importance to note that reduced recovery estimates for deep cover mining are based on risks of losses generally experienced in underground mining.

Comment: The Powder River Basin has enough low sulfur coal to supply existing power plants until they are phased out.

Response: This is outside the scope of the analysis for the Colorado Roadless Rule SEIS.

Comment: The Forest Service should research Arch Coal's previous reclamation work to see if it is in satisfactory condition.

Response: The SEIS discloses the requirements for temporary road decommissioning and reclamation as required by the rule itself, and through other coal-specific laws and regulations. The SEIS assumed that all requirements for temporary road decommissioning and reclamation, including re-contouring the land surface and revegetating, would apply. Forest Service review of decommissioned and reclaimed temporary roads in the Flatiron CRA demonstrated these measures to be effective.

Reclamation requirements are considered at the project-specific level and are administered by the appropriate Federal and State agencies.

Comment: The DOI should increase royalty rates for Federal coal to account for the environmental costs of coal production. In addition, the DOI should revise its royalty rate reduction and transportation allowance regulations.

Response: Increasing royalty rates is outside the scope of this SEIS. However, the Department of Interior (DOI, 2016) recently issued Secretarial Order No. 3338 (Discretionary Programmatic Environmental Impact Statement to Modernize the Federal Coal Program), which calls for a programmatic evaluation of the Federal coal leasing program, including environmental consequences, royalty rates, and a fair return to the American public.

Comment: The SDEIS also fails to disclose the location of lands within the North Fork Coal Mining Area that are already mined and/or roaded under Alternative A, and which remain free of roads, temporary or otherwise making it impossible for the public or the decision maker to understand which part will remain undisturbed under Alternative A, and compare that to the action alternatives.

Response: A map has been included in the SFEIS the displays existing leases, which indicates areas that have been or will be disturbed from coal mining activities.

Comment: It remains unclear whether Arch Coal needs to construct roads in the Sunset Roadless Area in the near future, despite the fact that the company re-submitted applications for lease modifications for the area. Arch's staff repeatedly swore that if the company were unable to explore proposed lease modifications in a portion of the coal mine exception area by 2013 (or 2014), the West Elk mine would likely bypass any coal there. And by bypass, they meant: leave the coal in the lease modifications area under the roadless lands unmined unless and until market conditions improved to justify the cost of returning to the area. [...] Under the current schedule for the rulemaking EIS and other approvals Arch will require, it is unlikely that on-the-ground construction activity for coal exploration or mining could occur until spring of 2017 even if the proposed action is adopted.

> **Response:** The Colorado Roadless Rule SEIS is a programmatic analysis for establishing regulations for roadless area management; it does not consider specific applications to modify leases or exploration activity. The Forest Service and BLM process applications for site-specific leasing and exploration as they are submitted.

Comment: The Forest Service should explain Oxbow's plan to drill down into and adjacent the abandoned mines from above. They plan drilling into the highly fractured coal veins, and developing coal bed methane for a reliable future source of income with no labor or infrastructure overhead.

> **Response:** This is outside the scope of the Colorado Roadless Rule SEIS, which is a focused rulemaking effort to consider the reinstatement of the North Fork Coal Mining Area exception to the Colorado Roadless Rule.

Comment: Toxic coal ash residue that is stored in holding ponds near coal-fired power plants can and do leak, causing widespread damage to the surrounding community and polluting water resources.

> **Response:** Coal ash is the remains of coal burned at power plants to produce electricity. This is outside the scope of the Colorado Roadless Rule SEIS. In addition, impacts of coal ash disposal were not addressed in the SEIS because coal ash disposal has been addressed by the EPA in a final rule published in April 2015. This rule promulgated a nation-wide set of regulations and analyzed the environmental impacts associated with coal ash disposal.

Comment: The site must not be allowed to become a Superfund site after mining operations are complete.

> **Response:** This is outside the scope of the Colorado Roadless Rule SEIS. However, Federal coal permitting regulation and State coal statutes require reclamation of coal related disturbances to an approved condition based on site specific assessments occurring at the project level analyses.

Comment: Do not allow mining because of pollution issues and irreparable damage. Mitigation strategies are ineffective.

> **Response:** The Forest Service uses the best available science to craft mitigation measures to reduce resource impacts. The Forest Service is committed to contributing to energy security, and carrying out the government’s overall policy to foster and encourage orderly and economic development of domestic mineral resources. The Colorado Roadless Rule establishes regulations for managing road construction in CRAs; it does not allow mining. All coal mining in the United States is subject to the Surface Mining Control and Reclamation Act of 1977, and in Colorado, it is also subject to State-specific coal statutes. This existing legal framework includes performance standards, mitigation strategies and reclamation requirements.

Comment: Mining operations should include mitigation strategies that will minimize the environmental impact.

Response: Coal mining operations are subject to established performance standards, mitigation measures, and reclamation requirements set forth in the Surface Mining Control and Reclamation Act of 1977, as well as State-specific coal-mining statutes, among other Federal and State laws. The Colorado Division of Reclamation, Mining and Safety ensures that coal-mining operations in the state comply with these laws. In addition, under its authority in the Mineral Leasing Act, the Forest Service applies mitigation measures in the form of lease stipulations at the leasing stage when an application for a new coal lease or lease modification has been received. The Forest Service provides these mitigation measures (stipulations) to the BLM as a condition of consent to lease (43 CFR 3425.3, 3432.3). At the permitting stage, the Forest Service also brings forward conditions within its jurisdiction to mitigate use and effects on NFS lands for the State to include in coal mine permits.

Comment: Mining extraction is difficult to perform and manage.

Response: This is outside the scope of the Colorado Roadless Rule SEIS. All exploration and leasing proposals are analyzed by the appropriate Federal or State agency. Coal mining in Colorado is regulated by the Colorado Division of Reclamation, Mining and Safety; the Mining Safety and Health Administration; and the Bureau of Land Management, among others, according to existing laws and regulations.

Comment: Extracting minerals from the ground will lead to a sinkhole that will inevitably collapse.

Response: This is outside the scope of the Colorado Roadless Rule SEIS; however, subsidence from underground coal mining in the North Fork Valley has been monitored for decades. Minimal effects to surface resources have been documented.

Comment: Eliminate the Mountaintop Removal method of coal mining.

Response: The Surface Mining Control and Reclamation Act of 1977 prohibits surface mining on national forests west of the 100th meridian. Therefore no mountain-top-removal methods of coal mining would occur in this area. Coal-mining operations on NFS land within the North Fork Coal Mining Area occur in underground mines.

Comment: Regulatory authorities must conduct due diligence on the financial positions of present and future self-bond guarantors, particularly with respect to prior or duplicate encumbrance of their assets. If surface mine reclamation self-bonds are found to be secured by assets that will not be available in the event of a reclamation claim, state regulatory authorities must require alternative, collateralized financial assurance. The danger of effectively unsecured reclamation bonds is especially acute in a time of significant debt loads and shrinking coal markets.

Response: It is inefficient and impractical for the Forest Service to engage in this analysis, which is focused on the prohibition of road construction/reconstruction and tree-cutting within roadless areas.

Reclamation bonds are required and administered by the State of Colorado under its delegated Surface Mining Control and Reclamation Act authority from the Office of Surface Mining Reclamation and Enforcement. The West Elk Mine does not have, and has never had, any self-bonds. The Colorado Division of Reclamation, Mining, and Safety holds two corporate sureties in the amount of $15 million for the West Elk Mine. This amount is sufficient to ensure reclamation of the site by the State, if necessary, including NFS lands, according to its approved reclamation plan. Additionally, following Arch's successful emergence from bankruptcy on October 5, 2016, all Arch coal mines have their reclamation obligations guaranteed by corporate sureties (Arch sites are no longer self-bonded).

Comment: The USFS and OSMRE should require all bonding as necessary to complete all future reclamation and restoration needs in the exception area considering the company's recent bankruptcy

filing will not jeopardize the prior or future commitments to reclamation and restoration associated with any and all operations of the West Elk Mine. OSM has admitted that bonding is not high enough to complete remediation.

> **Response:** This is outside the scope of the Colorado Roadless Rule SEIS. Reclamation bonds are administered by the State of Colorado under its delegated Surface Mining Control and Reclamation Act authority from OSMRE and are calculated at the mine permitting stage. Prior to and following the Arch bankruptcy, reclamation at the West Elk Mine was guaranteed with two corporate sureties totaling $15 million. The Colorado Division of Reclamation, Mining, and Safety (the State regulatory agency responsible for permitting and inspecting the West Elk Mine) has independently calculated the cost of the reclamation at the West Elk Mine. The Colorado Division of Reclamation, Mining, and Safety believes that this amount is sufficient for the State to conduct reclamation of the site, if necessary, including NFS lands, according to their approved reclamation plan.

Comment: The tailings contain mercury, arsenic, and sometimes are even radioactive uranium and other toxic minerals that even under the best circumstances and conditions some of those and other toxic contaminants will leach into the surrounding environment causing damage to water and streams. These chemicals can bio accumulate as they move up the food chain.

> **Response:** This is outside the scope of the Colorado Roadless Rule, which establishes a regulatory framework for road construction for coal exploration and coal-related surface activities. Further, tailings are associated with milling wastes from hardrock ore processing. The Colorado Roadless Rule facilitates road construction for coal-related purposes, not hardrock minerals.

Temporary Road Construction and Reconstruction

Comment: The road construction will open up the area to off road activities. Temporary roads never stay temporary because of things like pipelines and management facilities. The temporary roads should be open to off road vehicles/motorcycles. The temporary roads should only be open to recreational access.

> **Response:** The 2012 Colorado Roadless Rule is specific on future road use in order to maintain the roadless character of the CRAs. For any use of an exception that allows for a temporary road, those temporary roads are not open to public travel. See §294.43(c) (4) Road use.
>
> Use of motor vehicles for administrative purposes by the Forest Service and by fire, emergency or law enforcement personnel is allowed. All roads constructed pursuant to paragraphs (b) and (c) of this section shall prohibit public motorized vehicles (including off-highway vehicles) except:
>
> (i) Where specifically used for the purpose for which the road was established; or
>
> (ii) Motor vehicle use that is specifically authorized under a Federal law or regulation.

Comment: The Colorado Roadless Rule with the coal mine exception was less protective of roadless forest than the 2001 national Roadless Rule it supplanted based on an analysis of road mileage.

> **Response:** This issue was addressed in the Final Rule and Record of Decision for the Colorado Roadless Rule published in the *Federal Register* on July 3, 2012. The Colorado Roadless Rule provides a higher degree of protection by designating about 459,100 acres as roadless which were not covered by the 2001 Roadless Rule. The Colorado Roadless Rule designated 1,219,200 acres as upper tier, which are acres where exceptions to road construction and tree cutting are more restrictive and limiting than the 2001 Roadless Rule. In addition, the use of

linear construction zones was not restricted in the 2001 Roadless Rule. The Colorado Roadless Rule addresses the use of LCZs and encourages placement of linear facilities outside of roadless areas or co-locating facilities if they must be constructed in CRAs.

Comment: The effects caused by the mining and vehicle traffic will extend far beyond the actual mining; disrupting wilderness visitors and wildlife, destruction of trees and other plants. The traffic on the roads will undoubtedly lead to more death of wildlife as they are crossing the roads and are hit by vehicles.

Response: The traffic on any of the temporary roads within the North Fork Coal Mining Area would be limited to only activities directly related to coal activities (i.e. management of the methane wells). These temporary roads are not open to public use, so there would not be recreational visitor use on the roads. The traffic would be limited and unlikely to substantially impact wildlife. The actual mining is conducted underground, so it is unclear how visitors and wildlife within the roadless areas and adjacent Wilderness would be impacted by the mining.

Comment: The installation of gates and construction of berms may make roads inaccessible to further motorized use, but these obstacles do not constitute reclamation nor do they mitigate the damage to the integrity of the ecosystem and the species living there.

Response: The Colorado Roadless Rule has provisions for decommissioning and restoring the affected landscape once temporary roads are no longer needed. Reclamation of temporary roads and well pads in the North Fork Valley has been occurring for many years and has proven to be successful. All coal-related roads are considered temporary roads, which are decommissioned and reclaimed once no longer needed for purposes of the lease. Experience in decommissioning and reclaiming temporary roads constructed on coal leases and exploration licenses in the area shows that reclamation practices are effective in returning the NFS lands and resources to condition prior to leasing. Over the long term, decommissioning temporary roads by restoring the corridor to original contour and revegetating the lands will likely restore the roadless area characteristics of the North Fork Coal Mining Area. The following photos highlight some of the decommissioning and restoration efforts.

Decommissioned temporary road for MDW access.

Decommissioned temporary road to exploration drill site.

Air Resources

Comment: Recognize in your emissions analysis that North Fork coal is some of the cleanest burning coal in the world.

Response: The SDEIS and SFEIS acknowledge that North Fork Valley coal is considered to be low in ash and mercury content, and that it is considered to be “compliant” (emitting less than

1.2 pounds of sulfur dioxide per million BTU when burned) or "super compliant" (emitting less than 1.0 pound of sulfur dioxide per million BTU when burned), as defined in the Energy Policy Act of 2005 (42 USC 15991, Section 437).

Comment: The SDEIS underestimates methane due because the analysis used a 100 year time frame rather than a 20 year horizon, which would more accurately estimate methane emissions.

Response: The use of a 100-year global warming potential for methane is consistent with the EPA reporting requirements for the Greenhouse Gas Reporting Program and with internationally accepted standards for reporting greenhouse gas emissions.

The Intergovernmental Panel on Climate Change publishes periodic assessment reports on the state of the science on climate change. The EPA reports methane emissions using the 100-year global warming potential value of 25 (IPCC, 2007). In 2013, the EPA proposed revisions to the Greenhouse Gas Reporting Rule, which specifies the use of this value for reporting (78 FR 71909, 2013). The EPA noted (p. 71913) that it selected the 100-year global warming potentials because these values are the internationally accepted standard for reporting GHG emissions under the United National Framework Convention on Climate Change. It is further noted that climate change occurs on decadal and longer time scales, and while there is no single best way to value both short- and long-term impacts in a single metric, the 100-year global warming potential is a reasonable approach (p. 71914).

The Forest Service estimates of possible future methane emissions are presented in terms of CO_2 equivalents that also use the 100-year global warming potential rather than the 20-year value. The Forest Service chose the value of 25 to be consistent with EPA's greenhouse gas reporting regulations (40 CFR 98, Table A-1). Estimating the global warming potential of a greenhouse gas is a complex process that takes into account a number of different factors; the document itself points out that "…there is no universally accepted methodology for combining all the relevant factors into a single global warming potential for greenhouse gas emissions" (p. 710). According to the Intergovernmental Panel on Climate Change 2013 report, the choice of time horizon is a value judgment that has a strong effect on the global warming potential values (p. 711). In addition, even for a particular time horizon there is considerable uncertainty surrounding the global warming potential. The IPCC 2013 report says that the uncertainty in global warming potentials for gases with lifetimes of a few decades is estimated to be of the order of ±25% and ±35% for 20 and 100 years; the uncertainties in global warming potentials will be larger for shorter-lived gases. The Intergovernmental Panel on Climate Change 2013 report assesses the uncertainty to be of the order of ±75% for the 100-year global warming potential of methane (p. 713). The lifetime of methane is given as 12.4 years (p. 731).

The use of the 100-year value is thus consistent with EPA reporting and a reasonable approach for presenting estimates of methane emissions in this document. The Forest Service used the value of 25 for fossil methane, which is consistent with EPA guidance on reporting under the Greenhouse Gas Reporting Rule and the national greenhouse gas inventory program.

Comment: The analysis of GHGs in the SDEIS is flawed and greatly exaggerates emissions due to allowing coal mining in the area. At every step of the analysis, USDA made assumptions which greatly exaggerated the increased emissions of GHG due to allowing coal mining in the North Fork Area. In the SDEIS, the USDA repeatedly makes assumptions which it describes as "conservative," meaning that the USDAs assumptions would result in the maximum potential GHG emissions. These admittedly "conservative" assumptions included:

…The 4,000 mile round trip distance is therefore conservative and likely to be an overestimate of typical domestic transport distances." This had the effect of increasing the calculation of GHG emissions from domestic coal transportation

…"Emissions from coal production were conservatively estimated." USDA selected the highest possible input assumptions to the "Upstream Dashboard" which it used to calculate GHG emissions from coal production.

Response: This is a programmatic SEIS to establish regulations for management of CRAs; it does not allow coal mining. However, the Forest Service is responding to a Court order that included re-examining GHG emissions that may occur if coal mining were to occur in the future as a result of coal resources being accessible under the Rule. Therefore, analysis to consider possible future impacts of coal-mining activities in the North Fork Valley on emissions of GHGs on a programmatic scale suitable for establishing regulations was completed; it is not a site-specific analysis for a proposed project or specific mine. This analysis considers future potential coal activities within the entire North Fork Coal Mining Area. It is not known when or what the exact parameters of any future mining or related activities will be. Because the Forest Service cannot predict who the future purchasers of North Fork coal might be, the value of 4,000 miles round trip assumed for transportation was chosen to include possible customers throughout most of the United States. The exact choice of assumed transportation distance has little impact on the overall estimate of GHG emissions. As the analysis demonstrates, the portion of GHGs (in CO_2e) attributed to transportation is small when compared with the estimated total possible GHG emissions.

The only other parameter input into the Upstream Dashboard was the estimated emissions factor for methane in cubic feet per ton. For the SDEIS the Forest Service used two values, one computed using reported methane emissions from the West Elk Mine and the other computed using the reported methane emissions from the Elk Creek Mine. Each mine's individual emissions factor was determined using a production-weighted average, and that emissions factor was entered in the Upstream Dashboard. The Upstream Dashboard provided emissions factors in kilograms per ton that were multiplied by each mine's assumed annual production under the low, average, and permitted scenarios. Since the publication of the SDEIS the Forest Service has obtained additional methane emissions data from EPA's Greenhouse Gas Reporting Program web site and recalculated a single estimated methane emissions factor using the combined production and emissions data for both mines. This value was used in the analysis for the SFEIS.

Comment: The SDEIS Fails To Accurately Quantify Methane Emissions. Use the best available data on the likely rate of methane emissions, including data from ten years of coal mining (rather than only the last three years as in the SDEIS).

Response: The commenters raise several issues that are addressed in the following discussion.

1) The Forest Service used the best available data on methane emissions from coal mines in the North Fork Valley coal mining area.

The commenter suggests that the Forest Service should have used the methane data obtained by Power Consulting from EPA (inventory program data) rather than the data the Forest Service used in the SDEIS (regulatory program data). The Forest Service used data from the EPA's Greenhouse Gas Reporting program, 40 CFR 98. This is a regulatory program that mandates reporting for sources emitting greenhouse gases in excess of a threshold amount (36.5 million cubic feet per year). The requirement to report began in 2011, and at the time the Forest Service was preparing the SDEIS there were only data available through 2013.

The data obtained by the commenters directly from EPA were compiled from a different data set that was collected for a different purpose (personal communication, telephone conversation between Debra Miller, U.S. Forest Service, and Clark Talkington, Vice President of Advanced Resources International, Inc., February 12, 2016). Those data were originally collected by EPA for use in its U.S. greenhouse gas inventory reporting program. The United States is required to prepare an annual inventory of its greenhouse gas emissions and sinks as a party to the United National Framework Convention on Climate Change. This is not a regulatory program, so there is no requirement for mines (or other sources) to report data for the inventory program. In order to provide some information on methane releases from underground coal mines for the inventory, the EPA obtained mine inspection data from the Mine Safety and Health Administration. Mine Safety and Health Administration inspectors collect samples from mine ventilation systems as part of their quarterly inspections. Mine Safety and Health Administration has provided this data to EPA at EPA's request. These samples are collected in order to determine whether the mines are operating within required safety limits, not for the purpose of quantifying a mine's methane emissions.

Mine Safety and Health Administration inspectors collect data on one day per quarter, and the data consist of 1-minute air flow measurements and one-time methane concentration measurements for each approach leading to an exhaust shaft. Mine Safety and Health Administration inspectors take a grab sample to determine methane concentration, and use a handheld anemometer to obtain air flow rates. Mine Safety and Health Administration then generates a 1-day sample value for each shaft by multiplying the methane concentration by the air flow rate and assuming the concentration and airflow values remain the same for a 24-hour period. These 1-day sample values have been obtained from Mine Safety and Health Administration by EPA in order to estimate underground coal mine methane emissions from ventilation shafts for the treaty-mandated inventory program. Annual estimates are calculated by EPA by assuming that the single-day samples are representative of the entire quarter, and multiplying those values by the number of days in a quarter. Mine Safety and Health Administration inspectors only sample mine ventilation air; they do not collect samples from degasification systems (i.e., mine drainage wells). The EPA includes some general estimates of methane emissions from degasification systems and adjusts these values using follow-up discussions with company officials where possible (personal communication, telephone conversation between Debra Miller, U.S. Forest Service, and Clark Talkington, Vice President of Advanced Resources International, Inc., February 12, 2016). EPA then compiles the data to use as input to the national greenhouse gas inventory.

The data that were provided to the commenters were collected under the inventory program and differ from the data collected under the newer regulatory Greenhouse Gas Reporting program in several ways. First, the inventory data are derived from Mine Safety and Health Administration data, which are not collected for the purpose of determining a mine's methane emissions. Those data do not include samples taken from methane drainage wells. The Greenhouse Gas Reporting program data, used by the Forest Service for this SEIS, are collected under a regulatory program whose purpose is to determine greenhouse gas estimates. Under the Greenhouse Gas Reporting program, companies are required to collect samples from drainage wells on a weekly basis, or use a continuous emissions monitoring system. Second, the collection of ventilation air samples is somewhat different under the Greenhouse Gas Reporting Program. Under this newer program, companies can use a continuous emissions monitoring system, use the Mine Safety and Health Administration quarterly data, or collect their own grab samples on a quarterly basis. About half of the reporting mines collect their own grab samples, including the West Elk and Elk Creek mines. Third, the Greenhouse Gas program is a regulatory program, which means that companies are required to certify the data they provide. Part of a regulatory program, guidelines specified in 40 CFR 98 subpart FF pertain specifically

to the collection and monitoring of data. Finally, the Greenhouse Gas Reporting program includes some provisions to improve the accuracy of the data for determining emissions volume. For example, the program takes temperature and pressure into account, which is not done under the inventory program. In addition, the Greenhouse Gas Reporting program accounts for times when a mine is not operating, or when a vent or shaft is closed. When data are compiled under the inventory program, which is the source of the data relied upon by the commenters, it is assumed that a mine operates continuously and that all vents and shafts remain open and operating continuously.

The EPA has recognized the limitations of MSHA-collected data, which was relied upon by Power Consulting and cited in the comment, for determining underground coal mine methane emissions, and has recently proposed changes to the Greenhouse Gas Reporting program to improve the quality of methane emissions estimates. EPA published a notice of proposed changes to the rule in the *Federal Register* (81 Fed. Reg. 2536), including a proposal to modify subpart FF. EPA has specifically proposed to no longer allow Mine Safety and Health Administration quarterly inspection reports to be used as a source of data for monitoring methane emitted by ventilation systems. EPA is recommending this change because it has determined that the quarterly flow rate data gathered by Mine Safety and Health Administration cannot reliably be used for greenhouse gas reporting purposes (81 Fed. Reg. 2565-2566). This would leave only two approved methods: via independently collected grab samples, or a continuous emissions system.

In summary, the Forest Service has reviewed the data provided by EPA to the commenters from the inventory program, and has concluded that the Greenhouse Gas Reporting Program data (regulatory program data) are the best available data for estimating methane emissions from the mine. Although the Mine Safety and Health Administration -collected inventory data may have been gathered over a longer period of time, it is not the best data set for determining a methane emissions factor.

2) The longer record of Mine Safety and Health Administration data was not readily available to the Forest Service.

The methane data collected by the Mine Safety and Health Administration and used for the EPA inventory program are not readily available for download on a public web site. The data that Power Consulting obtained from EPA were retrieved from archived internet data stored on an internal EPA system. In short, the Forest Service did not ignore the older Mine Safety and Health Administration data because it did not have access to the data set. Had the Forest Service had access to the Mine Safety and Health Administration data it would still have chosen to use the Greenhouse Gas Reporting (regulatory) program data, as it is the best available data for determining greenhouse gas emissions from underground coal mines.

3) The commenters state that the values presented in the SDEIS (Table 3-4) do not agree with the data on the EPA Greenhouse Gas Reporting program website. This is not correct.

The letter "HCCA Comment Letter re: 2015 Supplemental Draft EIS on Colorado Roadless Rule," dated January 15, 2016 contains the following in footnote 161, p. 47:

The SDEIS states that these values come from the EPA website at http://ghgdata.epa.gov/ghgp/service/facilityDetail/2014?id=1010310&ds=E&et=&popup=true. The emission values from this website do not agree with the numbers quoted in Table 3-4 in the SDEIS on page 43; they also do not agree with values provided by request from the EPA.

The Forest Service re-downloaded the data on February 4 and February 12, 2016, and verified that the emissions values obtained from the website are correct. The Forest Service sent a sample-downloaded Excel spreadsheet to personnel from the EPA's Greenhouse Gas reporting

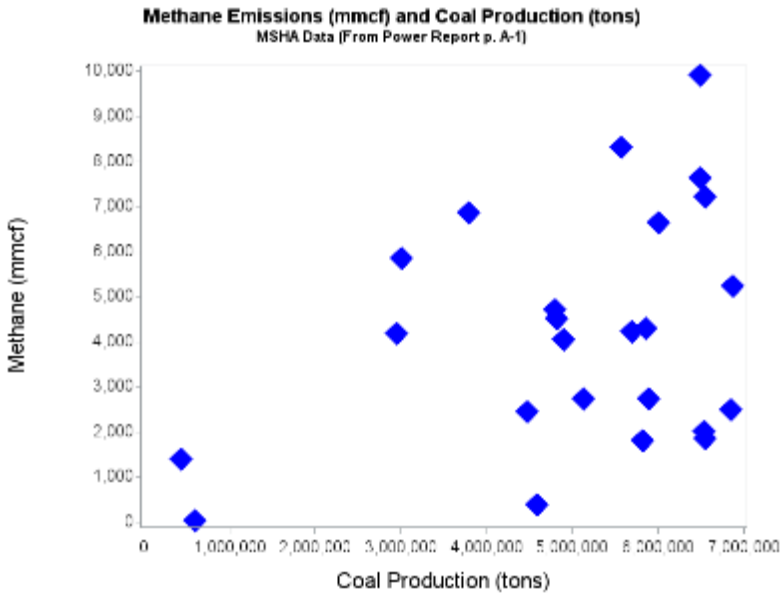
program, who confirmed that the sample spreadsheet did in fact represent reported methane emissions data from 2011 (personal communication, Brian Cook, U.S. Environmental Protection Agency, in an email message to Debra Miller, U.S. Forest Service, on February 12, 2016).

Emissions data are reported by emitters under the Greenhouse Gas Reporting program in units of metric tons of CO_2 equivalent, and are provided to the public on the referenced web site in these units. Emissions data reported under this program are available beginning in 2011. The Forest Service has confirmed twice that 25 is the value for the global warming potential of methane used to report these emissions data (email from noreply@ccdsupport.com to Debra Miller, U.S. Forest Service, March 23, 2015, and personal communication with Brian Cook, U.S. Environmental Protection Agency, February 11, 2016). In order to derive an emissions factor in units of cubic feet of methane per ton of coal produced, the Forest Service had to convert the methane emissions obtained from the web site in mass units to units of volume. After the SDEIS was prepared, an additional year of data were posted to the Greenhouse Gas Reporting web site. The Forest Service incorporated the additional year of data, as well as the 2013 data from the Elk Creek Mine, into its estimated emissions factor for methane; this revised estimate will be used for the SFEIS.

The Forest Service has compared the emissions data it calculated in cubic feet with the data provided by the commenter for the overlapping years of 2011–2013 and agrees that the two data sets are not the same. One reason, as discussed earlier, is that the data were collected under two completely different programs using different methodologies, and for different purposes.

The Power Consulting report also lists the coal production data that it used to compute an average for methane emissions in cubic feet per ton of coal produced. They were obtained from the Mine Safety and Health Administration mine data retrieval system (http://arlweb.msha.gov/drs/drshome.htm). The Forest Service obtained coal production data from the Colorado Division of Reclamation, Mining and Safety (http://mining.state.co.us/Reports/Pages/default.aspx). The production data obtained from the state do not agree with the production data reported by Power Consulting. Different agencies have differing requirements for reporting coal production data. According to the data Division's request form, the mines are asked to provide "Production in Tons ROM," where ROM stands for "run of mine." Run of mine coal is raw coal that has not been processed. After processing, some coal may be found to be unsuitable for sale based upon a customer's requirements and is retained in a waste pile. Thus, ROM coal production would include all coal retrieved from a mine, and not just that loaded onto a train for delivery to an end user. The Forest Service deems it appropriate to include the total volume of coal mined, as the air permit for the West Elk mine specifically limits production of coal to include "coal and refuse." In addition, it is typical for most refuse coal at the mine to be ultimately sold. Although the Forest Service cannot know with certainty that all refuse coal mined in the North Fork Valley will ultimately be sold, or that future air permits will include limits on production defined as "coal and refuse", it is reasonable to use this definition for coal production. For this reason, the Forest Service used production values reported by the State Division of Reclamation, Mining and Safety to calculate a methane emissions factor in units of cubic feet of methane per ton of coal mined.

An examination of the Mine Safety and Health Administration-collected data referred to in the Power Report shows little correlation between reported methane emissions and production. The Pearson correlation coefficient r for the relationship between reported emissions and production is 0.36. A plot of the data is shown below.



Comment: The SDEIS Fails To Disclose Adequately The Quantity Of Projected Greenhouse Gas Emissions From Coal Mining.

Response: The greenhouse gas analysis for the SEIS includes estimates of greenhouse gas emissions that could result from future coal extraction and processing, transport, and combustion. The mine processes considered in the analysis include methane drainage wells and mine ventilation venting, engines and facilities at the mine site, vehicles and heavy equipment on site, and electricity needed to run mine operations. Other mining-related processes considered in the SEIS analysis include long-wall operation, coal preparation facility construction, coal loading silo construction, stacker reclaimer construction, coal mine wastewater treatment plant construction, coal cleaning facility construction, coal crusher facility construction, site paving, conveyer system construction, continuous miner construction, and longwall miner system construction. This represents a comprehensive examination of greenhouse gas emissions from all relevant emission sources.

Comment: The reliance on the "upstream dashboard" to estimate climate emissions is arbitrary.

Response: The decision to use the Department of Energy's Upstream Dashboard tool was not arbitrary. The Forest Service consulted with Department of Energy experts on the best type of greenhouse gas analysis for this SEIS. The Forest Service concluded that the Department of Energy Upstream Dashboard tool was the best available tool for this SEIS.

This is a programmatic EIS to consider impacts of potential future coal-mining activities in the North Fork Valley on emissions of greenhouse gases, not a site-specific analysis for a proposed project or specific mine. This document is considering potential future mining activities within the entire North Fork Coal Mining Area; it is not known what the exact parameters of any future mining activities will be. It would be inappropriate to assume that the operating parameters of any particular operation, as they exist today, would be representative of all future mining that might occur in all areas of the North Fork coal mining area over the time span covered by the SDEIS. The Upstream Dashboard was selected for this analysis because it allows for robust estimation of greenhouse gas emissions associated with all aspects of underground coal mining, and it includes mine building and decommissioning.

The portion of the Upstream Dashboard used for this analysis uses the NETL Illinois No. 6 underground coal mine model for emissions. Details for this model can be found in Appendix C

of the National Energy Technology Laboratory report Life Cycle Analysis of Natural Gas Extraction and Power Generation. In summary, the coal mine model includes coal mine operations, commissioning and decommissioning, mine and equipment construction, and coal preparation facility construction. The mine and equipment construction is based on a longwall/continuous miner system. The West Elk Mine is a longwall mining system, as was the Elk Creek Mine, making the upstream dashboard a reasonable tool to calculate life cycle greenhouse gas emissions for potential future mining activities in the North Fork coal mining area.

The lone parameter available in the Upstream Dashboard for coal extraction is the coal mine methane emitted during operations. The change in emissions associated with changing that parameter are calculated using a linear interpolation between two model runs that varied only coal mine methane emissions using Department of Energy's life cycle software. The default parameter value of 422 standard cubic feet/ton actually comes from the national average for underground mines provided in Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011. This parameter was calculated for this analysis using data specific to the North Fork Valley and input in to the Upstream Dashboard. The Forest Service obtained emissions information from the EPA's Greenhouse Gas Reporting Program and coal production information obtained from the Colorado Department of Reclamation, Mining, and Safety.

Even if it were possible to craft a more precise answer, it would not provide any more useful information for evaluating the alternatives. The greenhouse gas analysis in the SDEIS shows that the greatest contributions to greenhouse gas emissions come not from sources located at the mine or transportation of the coal, but from methane emissions and coal combustion. Therefore relatively small differences in emissions from mine operations have a proportionally small effect on total GHGs. The level of specificity in this analysis is commensurate with the nature of the programmatic decision being made.

Comment: The SDEIS fails to address air pollution impacts - VOCs. It is estimated that VOC emissions would exceed regulatory thresholds. In spite of this the coal companies have not applied for or obtained necessary permits under the Clean Air Act.

Response: Emissions of regulated pollutants, including volatile organic compounds, are not estimated in this document. Analysis of air pollutants from mining activities, as well as possible impacts to wilderness areas and national ambient air quality standards, will be considered in future NEPA documents prepared at a project level. Emissions of criteria pollutants from permitted sources located at coal mines are also considered during the regulatory air permitting process. Emissions of pollutants from mobile sources are regulated by the EPA.

The Forest Service has reviewed and considered the information provided by the commenters related to volatile organic compound emissions at the existing mines. The proposed action being considered under this decision will not authorize any additional mining or ground disturbing activities, nor will it authorize the construction of temporary roads. The possibility that the mines may need to obtain air quality permits for emissions of volatile organic compounds is not relevant to this decision. Furthermore, the fact that a facility is emitting a pollutant at levels above reporting thresholds, or major or minor source thresholds, is not in-and-of-itself an indication of a significant impact to air quality. Volatile organic compound concentrations are not covered by a national ambient air quality standard, but their emissions are regulated because they contribute to ozone formation under certain meteorological conditions and if the ratio of volatile organic compounds to nitrogen oxides is conducive to its formation. It is important to note that there are no ozone or other air quality nonattainment areas in western Colorado.

The Forest Service has discussed the referenced analysis of samples taken from methane drainage wells at the West Elk Mine and the Vessels sampling data from the Elk Creek Mine with the Colorado Air Pollution Control Division (personal communication, Ben Cappa, Colorado Air Pollution Control Division, in a telephone conversation with Debra Miller, U.S. Forest Service, on July 9, 2015). The analysis completed by the division suggests it is likely that the VOC emissions from these mines are above reporting thresholds, and may be above permitting thresholds, but the State's analysis is based upon limited data. The samples from the Elk Creek Mine were collected from in-seam drainage wells specifically placed in closed portions of the mine to draw gases out for routing to a flare or to electrical generation equipment, not from standard methane drainage wells that are placed in advance of the longwall during mining operations. It is not known whether all of the gases in the stream sampled by Vessels would eventually seep from the mine or at what rate they would be emitted in the absence of the Vessels project. The Colorado Air Pollution Control Division does not consider the information used in their own analysis of the volatile organic compound emissions from the Elk Creek and West Elk mines to be sufficiently complete to make a final determination as to what the mines' annual emissions are, or whether a permit is required for either mine. The Forest Service does not deem it appropriate to perform any analysis or draw any conclusions regarding annual volatile organic compound concentrations from any current or future mining activities based upon these preliminary estimates.

In addition, the Forest Service has no authority to determine that any source, including mines in the North Fork Coal Mining Area, is required to obtain a permit under Title V or the Prevention of Significant Deterioration provisions of the Clean Air Act. This authority is clearly delegated under the Clean Air Act to the EPA, which has further delegated that authority within Colorado to the State Air Pollution Control Division.

Comment: The SDEIS fails to address air pollution impacts, as required by NEPA and the Clean Air Act - NAAQS, PSD increments for Class I and II areas.

Response: Emissions of regulated air pollutants are not estimated in this supplemental analysis. Analysis of air pollutants from mining activities, as well as possible impacts to wilderness areas and national ambient air quality standards, will be considered in future NEPA documents prepared at a project level. Emissions of criteria pollutants from permitted sources located at coal mines are also considered during the regulatory air permitting process. Emissions of pollutants from mobile sources are regulated by the EPA.

The need for an increment analysis specified as part of the Prevention of Significant Deterioration program (40 CFR 51.166) is triggered during permitting of a major PSD source. The Code of Federal Regulations specifies (51.166 (a), 51.166(c)) that state implementation plans must ensure that increases in pollutant concentrations over baseline conditions do not exceed limits specified for Class I and Class II areas. Once the increment in a given area has been consumed, no new major emissions sources can be constructed (where "major" sources are defined in 51.166 (b) (1) (i)) unless the source can demonstrate that it does not contribute significantly at the point and time that a violation is detected. Major source permitting is the responsibility of the designated permitting authority, typically the State or EPA (in the case of many Tribal areas). Federal land managers do not have the responsibility or authority to enforce compliance with maximum allowable increases in pollutant concentrations (referred to as "increments" or "Prevention of Significant Deterioration increment") that are specified in the Clean Air Act; this authority lies with the permitting authority. Determining how much increment is used by a source, and when there is no remaining increment in a particular area, is a very complicated process that has to take into account all other increment-consuming sources. This is a task that the permitting authority undertakes when reviewing a permit. The Federal land manager has neither the responsibility nor the authority to make this determination.

Furthermore, this SEIS is not a permit application; the Forest Service is not applying for a Prevention of Significant Deterioration permit nor granting a permit through this SEIS.

Comment: Coal dust impacts on snowfall and forest vegetation should be addressed.

Response: Coal dust is not a greenhouse gas and is not addressed in this supplemental analysis. It is a type of particulate matter (PM10). PM10 emissions from activities in the mine, to include coal dust, are considered as part of the State regulatory permitting process. The West Elk and Elk Creek mines' particulate emissions are limited by their air permits. Certain coal-handling equipment such as conveyers, screens, crushers, and transfer and loading systems are subject to New Source Performance Standards that limit their visible emissions. Some coal dust may also be emitted during transport; these particles are relatively heavy and deposit close to the source (e.g., along train tracks). Controls, such as enclosures, are typically required for above ground coal handling at coal mines and at the end-load location (such as power plants). However, any controls would be determined and required by the State or other regulatory agency at the time of permitting. The Forest Service is not aware of any information specifically linking coal dust from coal handling or transport to forest damage or impacts on snowfall.

Comment: A study recently conducted by Citizens for a Healthy Community and TEDx (The Endocrine Disruption Exchange) concluded that there are already high levels of the kind of contaminant produced by the incomplete combustion of methane, probably from the vents at the West Elk Mine.

Response: The Forest Service has reviewed and considered the information provided by the commenter, and is unable to determine the study to which the commenter is referring. The Forest Service was also unable to locate any information linking vented methane from the West Elk Mine to high levels of contaminants, or indicating that methane combustion from mine sites is a concern for human health to residents in the area.

Most methane from the West Elk Mine is vented, but some is captured for use in heating mine ventilation. Methane from previously mined and sealed portions of Oxbow Mining's previous operations is used to generate electricity by the Vessels Coal Gas project. Emissions from this project are regulated by State of Colorado through project's air permit.

Methane itself is non-toxic to humans and is not considered to be a carcinogen. Methane is explosive at concentrations of 5–15%, which is why it is vented from the mine. In very high concentrations it acts as an asphyxiant by displacing oxygen; this only occurs in confined spaces.

Comment: When the coal is combusted it will produce carcinogenic polycyclic aromatic hydrocarbons, and release very toxic heavy metals. A recent study in the journal Environmental health Perspectives by Thurston et.al showed that pound for pound, coal-burning particles contribute roughly five times as much to heart disease mortality risk as the average air pollution particle in the United States (EnvironHealthPerspect;DOI:10.1289/ehp.1509777)."

Response: The Forest Service has reviewed and considered the reference provided by the commenter. The particulate matter National Ambient Air Quality Standards are established to protect human health and are enforced by regulatory agencies, in part through permitting of stationary sources including those that combust coal. The authority to regulate sources of air pollutants, including particulates, is delegated by the Clean Air Act to the EPA, which typically further delegates that authority to a State or local regulatory agency.

Comment: The SDEIS Fails to Quantify or Address Black Carbon Emissions. The SDEIS must evaluate and disclose emissions from diesel engines (from equipment, heavy machinery, trains, etc.) that may worsen climate change, including black carbon. However, the SDEIS fails to even mention

the words "black carbon," "soot," "diesel" or "engine," let alone address black carbon. Any subsequently-prepared NEPA document must address black carbon emissions. [...] By extending the life of the West Elk mine (and potentially other mines), the proposed action will likely cause multiple, significant sources of black carbon/ PM2.5 emissions. Many of these sources, including on and off-road diesel vehicles, generators, construction equipment and mining equipment associated with the West Elk mine operation, coal extraction, and transportation of the coal, are all direct sources of particulate matter, and thus black carbon, emissions. Additionally, even where PM2.5 emissions are noted, the DEIS fails to assess the significant climate forcing effect of the black carbon fraction of those emissions. Because black carbon is a significant contributor to global climate change, and, like methane and carbon dioxide, its emissions must be reduced to curb future warming of the earth, any subsequently prepared NEPA document must consider black carbon emissions likely to result from the proposed project and their impacts on global warming and climate change.

Response: Black carbon (or soot), which is a component of fine particulate mass (PM2.5), is not a separately regulated air pollutant. Fine particulate matter is a criteria pollutant with an associated National Ambient Air Quality Standard. Potential sources of particulate from coal mining-related activities include emissions from diesel powered on-road vehicles and off-road vehicles and equipment. Emissions of fine particulates will occur when coal is transported and combusted.

This is a programmatic SEIS to consider impacts of potential future coal mining activities in the North Fork Valley on emissions of greenhouse gases, not a site-specific analysis. The document is considering potential mining activities within the entire North Fork Valley Coal Mining Area; it is not known what the exact parameters of future mining activities will be. Emissions of criteria pollutants, including PM2.5, are not estimated in this document. Analysis of criteria air pollutants from mining activities will be considered in future NEPA documents prepared at a project level. Emissions of fine particulate matter from permitted sources such as coal mines and coal-fired power plants are also considered during the regulatory air permitting process. Emissions of particulates from mobile sources are regulated by the EPA.

The Forest Service has reviewed and considered the references on black carbon cited by the commenter. Even if the Forest Service were to attempt an estimate of black carbon emissions from diesel-powered vehicles and equipment used to mine and transport coal, this estimate would not provide additional information that would be useful to the decision maker in evaluating the alternatives. Human-caused emissions of greenhouse gases, such as carbon dioxide, are much more important to climate change than emissions of black carbon.

Black carbon is a component of fine solid mass particles suspended in the atmosphere that is readily deposited; it is not a greenhouse gas. Black carbon has an impact on climate because of its ability to absorb solar energy. When black carbon is deposited on surfaces such as snow and ice, it reduces the reflectivity of the surface and results in higher melting rates. When snow and ice melt, exposing a darker surface below such as water or soil, the exposed surface absorbs more energy than it would if it remained covered by snow or ice.

Black carbon's importance to climate impacts is considered using global-scale climate models. According to Bond et al (2013), black carbon-rich sources account for 99% of the global inventory. These include diesel engines, industrial coal, residential solid fuels, and open burning. Low black carbon sources include coal-fired power plants for generating electricity; they are not considered a large source of black carbon. East and South Asia together contribute more than 50% of the global radiative forcing due to black carbon (Reddy et al., 2007).

Within North America, on-road and off-road diesel engines contribute 70% of black carbon emissions (exhibit 44, p. 5405). According to the EPA 2012 Report to Congress on Black Carbon (EPA, 2012), emissions of black carbon in the U.S. represent about 7% of the global

total; mobile sources account for about 52% of those emissions. In 2005, about 65% of total US black carbon was emitted in urban counties and, in the case of mobile sources, more than 70% of the total U.S. black carbon emissions occur in urban counties. The inventory of diesel-powered sources from mining in the North Fork Valley would comprise a very small portion of the U.S. fleet, and the contribution of diesel on-road and off-road sources from potential future mining activities, including coal transportation via train, would arguably be a very small portion of the U.S. black carbon emissions inventory. Furthermore, the greater impact to climate change comes from greenhouse gases. According to Hansen and Nazarenko (2004), attached to the commenters' letter as exhibit 48, "The substantial role inferred for soot in global climate does not alter the fact that greenhouse gases are the primary cause of global warming in the past century and are expected to be the largest climate forcing the rest of this century." Indirect impacts to greenhouse gas emissions from potential future mining activities have been estimated in this document.

As noted by the commenters, the West Elk lease modification EIS of August 2012 does indicate that operation of the mine results in emissions of fine particulates, however there is nothing in the document to suggest that the mine's emissions sources would be significant contributors of black carbon emissions. Black carbon was discussed in that document in a qualitative manner.

Comment: The SDEIS uses the terms "tons",,"metric tons" and "metric tons CO_2e" throughout the document when discussing greenhouse gas emissions (for example, Page 20, Table 2-2, *Air Resources* section vs. the end of page 32).

Response: The text for the SFEIS has been revised to ensure clear use of units of measure.

Comment: The conversion factors for methane from tons to standard cubic feet could be added as a footnote in addition to the listing of the source of those values (Upstream Dashboard tool's Unit Reference tab). It is also not clear where the coal production values were derived from; a reference to the source of those values should also be added. (Ch. 3, pg. 35)

Response: The text for the SFEIS has been revised to explain how methane was converted to cubic feet and where the coal production values were obtained.

Comment: The SDEIS does not use a consistent Global Warming Potential (GWP).

Response: The analysis has been revised to reflect the use of 25 for the global warming potential of methane throughout the analysis. This is consistent with greenhouse gas reporting and inventory requirements.

Comment: The SDEIS analysis cites facility level emissions from the 2011-2013 period and states that the data were pulled from the GHGRP database in "2015". 2014 GHG emissions data for these mines was published in October, 2015. The SDEIS likely made use of 2011-2013 data which was available earlier in 2015, prior to the release of 2014 data. The authors should review the 2014 data to determine if it should be included in the analysis. The 2011-2013 data currently posted should also be reviewed as GHG reports may have been re-submitted by these mines between August 2014 and August 2015. Revised emissions totals would have been made publicly available in October 2015. (Ch. 3, pg. 35, 43).

Response: The Forest Service has re-queried the Greenhouse Gas Reporting Program database for data from 2011-2014 in February, 2016 and included the updated data in the SFEIS analysis.

Comment: EPA's GHGRP emissions data is presented in metric tons CO_2e, not tons. In addition, the SDEIS refers to one of the two coal mines using a different name than is presented in the GHGRP's emissions database. Use of consistent names, or a footnote that provides the GHGRP name for each

facility, or a link to each facility's reported GHGRP data would make it easier for the public to re-create the analysis. (Ch. 3, pg. 35, line 4).

> **Response:** The text for the SFEIS has been revised to clarify the mines' names as listed in the Greenhouse Gas Reporting Program reports, and units will be clarified throughout the discussion.

Comment: The SDEIS misunderstands the purpose of a climate analysis under NEPA by suggesting that such analysis is difficult or impossible because emissions from one project cannot be tied to a specific local impact. Such statements do not reflect an understanding of the nature of climate change, in which incremental additions to GHG emissions collectively cause significant change to climate. For this reason, the appropriate way to evaluation the impact of a project on climate change is through analysis of emissions, as CEQ said in its draft guidance. For this reason, we recommend deleting the following sentence from the SFEIS "It is not possible at this time using global climate models to predict the contribution to warming or other climate change effects (such as changes in the timing and distribution of precipitation or other weather events) from possible coal production on a local scale such as the North Fork Coal Mining Area." (Ch. 3, pg. 40 (PDF pg. 48)).

> **Response:** The Forest Service is aware that all incremental additions of greenhouse gases contribute to changes in climate, and that impacts are the result of many individual contributions from sources around the globe. The statement was included not to suggest that no analysis is possible, but to clarify for the reader that it is not possible to quantify impacts from specific emissions on a local scale to warming or other climate changes. The analysis of emissions suggested by the commenter (i.e., estimation of possible emissions of greenhouse gases that might occur from coal mining in the North Fork Valley) was included in the SDEIS. However, the statement has been removed from the SFEIS for clarity.

Comment: Table 3-20 summarizes methane emissions as a result of the energy mix changes and alternative underground and surface mining. While the surface mining emissions estimates based on an emission factor for the Power River basin appears to be consistent with the U.S. National Greenhouse Gas Emissions Inventory, it is unclear why an emission factor for an Illinois Number 6 coal mine profile was referenced for underground mines, as that does not appear to be relevant. We recommend clarifying the relevance of this reference.

> **Response:** The default methane emissions factor was given merely as a point of reference. The text for the SFEIS has been modified in order to clarify the discussion.

Climate Change

Comment: Reinstating the North Fork Coal Mining Area exception will have minimal influence on GHG emissions when compared with the U.S. total and global emissions.

> **Response:** Reinstating the North Fork Coal Mining exception (Alternative B or Alternative C) will likely facilitate future coal development, which would lead to indirect GHG emissions from coal mining-related activities, as well as coal transportation, and combustion. These emissions were as estimated by a range, and analyzed in the SFEIS. The *Climate Change* and the *Air Resources and Greenhouse Gas Emissions* sections provide this range.

Comment: Alternative B would have minimal or no impact on climate change.

> **Response:** The Council on Environmental Quality's final guidance on NEPA and climate change describes the cumulative nature of climate change as "resulting from the incremental addition of GHG emissions from millions of individual sources, which collectively have a large impact on a global scale." (CEQ, 2016). Coal mining associated with the proposed action is one

of these sources. CEQ also states that GHG emissions should be used as a proxy for climate change impacts. Emissions are quantified and described for each alternative in this SFEIS.

The indirect GHGs from mining, transportation, and combustion activities would be an additional load on atmospheric concentrations of GHGs, which cumulatively cause anthropogenic climate change.

Comment: The SDEIS is incorrect stating Alternative B has no direct effects on emissions or climate change.

Response: The analysis does not imply that there would be no GHG emissions associated with this action. Direct effects are caused by the action and occurrence at the same time and place (CEQ 1508.8a). The National Environmental Policy Act requires Federal agencies to discuss impacts in terms of direct, indirect, and cumulative effects. The actions connected to this decision - mining, transportation, and combustion of coal - are best described as indirect, since the rulemaking decision being considered does not result in any on-the-ground activities and direct emissions.

For the analysis described in the *Climate Change* section, emissions were described as:

- Direct GHG Emissions (Direct Effects): There are no direct GHG emissions that will be linked to this decision. Subsequent analyses and Federal decisions may have direct effects. This decision will not authorize any ground-disturbing activity.
- Indirect GHG Emissions (Indirect Effects): Indirect effects are caused by the action and are later in time, or further removed in distance, but are still reasonably foreseeable. Emissions associated with coal mining, transportation, and combustion are being described as indirect effects since they are connected, and reasonably foreseeable, but not directly as a result of a decision supported by this analysis. A range of potential emissions from these indirect activities is provided in the *Air Quality* section of the SFEIS.

Comment: The SDEIS failed to address climate impacts from forest removal.

Response: Some public comments on the SDEIS encouraged more rigorous, detailed, and quantitative analysis of the role in tree-cutting to support mine-related activities, such as temporary road construction and well pad development. The *Climate Change* section of the SFEIS contains a qualitative discussion about the role of tree-cutting and soil disturbance on the carbon cycle, and this is sufficient for this programmatic analysis. This is consistent with the Final Guidance for Greenhouse Gas Emissions and Climate Change Impacts (CEQ, 2016) recognition of proportionality, when weighing between qualitative discussion and quantification. This decision will not result in any ground disturbing activities. Specific information regarding trees that may be cut, and their size, and species will depend on the precise locations of temporary roads, well pads, and other features.

Carbon emissions from tree-cutting would be a small part of the overall indirect emissions associated with this Federal action. Site rehabilitation will take place after the temporary roads and well pads are no longer needed. This will include reseeding and re-vegetation on these sites, which will result in carbon sequester as trees grow. In whole, forests in the United States, including national forests, function as carbon sinks, and forests effectively offset about 13% of national emissions in 2013 (EPA, 2015g).

Comment: The cumulative effects of many similar projects have on climate change may even be worse than one large project.

Response: Although individual projects, such as this decision, may individually be a minor source of overall GHGs, collectively individual actions are all sources that contribute to anthropogenic climate change. For example, an average vehicle in the United States might be

insignificant in terms of GHG emissions and climate change. However, collectively, all vehicles in the United States are important for GHG emissions and climate change. Climate change is indifferent to the source of GHGs. The atmosphere does not discern whether emissions come from large projects, small projects, natural sources, or human sources. Given the incremental nature of climate change, it is unknown what the precise impacts would be from emissions resulting from coal mining, transportation, and combustion of coal from the North Fork Coal Mining Area. When considering the cumulative nature of climate change, each source of GHGs contributes to the global, long-term problem.

Comment: A warming climate affects soil moisture and nutrient cycling which will result in a positive feedback, making warming happen faster.

Response: Site-specific climate feedback loops, including soil moisture and nutrient cycling are speculative and likely unhelpful for this programmatic analysis. Climate change information has been provided where it was available and relevant. Some feedback loops are considered in climate projections discussed in the *Climate Change* section (moderate and high scenarios for the Gunnison Basin). Climate change will generally increase soil temperature, largely as a function of increases in ambient air temperature, but it will likely have uneven effects on soil moisture content.

Comment: The SDEIS fails to address the urgent need to address climate change.

Response: The SDEIS addressed climate change within the climate change analysis, the air analysis, and in the economic analysis in terms of the social cost of carbon. The FEIS improves and clarifies these analyses, responding to comments and addressing best available science. It also incorporated the final guidance from CEQ regarding NEPA and climate change (CEQ, 2016).

Water Resources

Comment: Methane drainage well venting requires water which is used for mining and later retrieved in a polluted form into holding ponds.

Response: The Colorado Roadless Rule analysis defers site-specific analysis and disclosure of well-drilling effects to the project level when specific methane drainage well construction may be considered and locations are known. The Forest Service cannot predict the exact number or location of methane drainage wells at this programmatic rulemaking stage. Site-specific information on methane drainage well construction is best analyzed as proposals with site-specific information are submitted in the future.

Water used in drilling a methane drainage well is delivered to the site via flexible hose or water truck. Water used in drilling is contained in a reserve pit. Nearby surface waterbodies are protected from this water through the use of site-specific measures such as setbacks from the waterbody and secondary containment methods. Appropriate site-specific measures are determined when the proposed location of a well pad is known.

Comment: Vulnerability to extreme events is also expected to increase. Changes in the frequency of floods and drought could affect geomorphic processes. Sediment flows after major fires can severely impact instream habitat availability and quality, but sediment can also be moved out quickly with additional high flows. Without flushing, excessive sediment can be expected to adversely impact individual streams, but this effect may not be widespread. An increase in intense isolated monsoon storms can result in debris flow and mudslides, impacting aquatic habitat in smaller streams.

Response: The analysis provided for the SFEIS does not attempt to capture all realized and potential impacts of climate change, but focuses on aspects more important for the decision

being considered. Climate change will likely exacerbate floods and intense precipitation events in some places. These effects are not likely to be universal and will vary substantially according to elevation and topography.

More specific impacts were reviewed and considered in response to public comment on the DSEIS. The *Gunnison Basin Climate Change Vulnerability Assessment, 2011* contains more detailed information on impacts to terrestrial and aquatic systems in the Upper Gunnison Basin, including potential impacts to snowmelt and hydrology. The assessment describes the influence on elevation and complex topography on down-scaled climate models for this area. It recognizes the general principles that "increasing temperature leads to a later start of the snow season, earlier snowmelt, runoff and peak runoff, and greater evapotranspiration from plants and the ground (TNC, 2011)." The assessment also models a monthly hydrograph for the Gunnison River Basin above Blue Mesa Reservoir. The results show a range of possible future flows, but all show earlier runoff. The vulnerability study also included data from the US Bureau of Reclamation, which indicates total annual runoff decreasing through 2100.

Comment: Mining uses HUGE volumes of water when water is becoming scarce and takes most of the water out of the water cycle.

Response: This issue is outside the scope of the SEIS to establish regulations for managing CRAs. The right to use water, and the beneficial uses to which that water can be put, is governed by Colorado State law, not the Forest Service.

Comment: Climate change caused earlier snowmelt is increasing the spread of *Didymosphenia geminata*. This organism is causing a variety of issues to water quality such as the spread of other water diseases.

Response: Climate change has widespread impacts across ecosystems and economic sectors. The analysis provided for the SFEIS does not attempt to capture all realized and potential impacts of climate change. More specific impacts were reviewed and considered as part of the Gunnison Basin Climate Change Vulnerability Assessment from 2011. It contains more information on impacts to terrestrial and aquatic systems in the Upper Gunnison Basin. However, much of this information is not helpful to the programmatic decision here of whether or not to allow surface disturbance in the form of temporary road construction for coal related activities.

Comment: The average annual temperature of the Upper Gunnison Basin is projected to increase by about 3°C (5.4°F) from the late 20th century to the middle 21st century. Average summer temperatures are projected to increase by about 4°C (7°F). Climate projections show a 10-25 percent decrease in average annual runoff, more precipitation falling as rain rather than snow, earlier snowmelt and spring runoff peaks, and changes in the seasonality of flooding.

Response: Some public comments from the DSEIS requested more site specific information for climate change impacts to the area. Some information from the Gunnison Basin Climate Change Vulnerability Assessment was included for the SFEIS in the *Climate Change* section. The impacts of climate change in the Upper Gunnison Basin (and throughout the world) will continue, absent the range of emissions from the activities described in this analysis.

The moderate and extreme scenarios in the table below are taken from the Gunnison Basin Climate Change Vulnerability Assessment from 2011. These scenarios were developed by the Gunnison Climate Change Adaptation Workshop from the range of appropriate global and regional projections for the central Colorado Rocky Mountains. The "more extreme scenario" does not represent the most extreme model, but rather represents scenarios in the top 25% of modeled projections.

	Moderate Scenario			More Extreme Scenario		
Season	Precipitation (percent)	Temp °F	Temp °C	Precipitation (percent)	Temp °F	Temp °C
Annual	~0.0	+3.6 to +5.4	+2.0 to +3.0	-10.0	+5.4	+3.0
Winter	+15.0	+3.6	+2.0	~0.0	+5.4	+3.0
Spring	-12.0	+4.5	+2.5	-15.0	+5.4	+3.0
Summer	-15.0	+5.4	+3.0	-20.0	+7.0	+4.0
Fall	+4.0	+4.5	+2.5	-10.0	+5.4	+3.0

Table from Gunnison Basin Climate Change Vulnerability Assessment, (Neely et al., 2011).

Comment: Montane groundwater-dependent wetlands - was rated highly vulnerable. These wetlands are already adversely affected by water development, grazing, and invasive species, and these stresses are expected to be exacerbated by climate change.

> **Response:** The analysis provided for the SFEIS does not attempt to capture all realized and potential impacts of climate change. Groundwater-dependent ecosystems, including wetlands are generally vulnerable to a variety of activities. Groundwater-dependent ecosystems will likely become more vulnerable when climate change impacts includes warmer temperatures or increased drought. Site-specific information on the impacts to groundwater-dependent ecosystems will be analyzed as proposals are made in a tiered decision making process. At that time, site-specific best management practices, design features, and other mitigation measures appropriate to the proposed road locations will be determined in order to avoid, minimize, or mitigate direct and indirect effects to groundwater-dependent ecosystems, water quality and public water supplies.

Comment: Road construction on steep slopes causes irreversible damage in the form of rock fall. Rock fall dramatically increases the area affected by temporary construction. It also increases the rate of erosion, the amount of sediment yield making its way to nearby waters, water pollution, and the direct and indirect loss of habitat.

> **Response:** The Colorado Roadless Rule analysis deferred site-specific analysis and disclosure of direct and indirect effects of road construction on soils, water quality, and aquatic habitats to such time when specific temporary road construction is proposed and locations are known. The Forest Service cannot predict the number and location of temporary roads that may be needed if and when coal-exploration or leasing proposals are submitted in the future. Site-specific information on temporary road construction will be analyzed in a tiered decision-making process as proposals are submitted. At that time, site-specific best management practices, design features, and other mitigation measures appropriate to the proposed road locations will be determined in order to avoid, minimize, or mitigate direct and indirect effects to soils, water quality, and aquatic habitats.

Comment: Road construction will endanger the drinking supply for nearby residents. The communities, representing nearly 60,000 residents, shifted to the municipal watershed from the Colorado River because high volumes silt made the water difficult to process and unhealthy to drink. However, silt will soon invade the municipal watershed if construction is allowed in the wilderness capable areas of NFV, forcing the communities to find yet another water source.

> **Response:** This comment appears to refer to an area far removed from the North Fork, which is not on the Colorado River. The North Fork Coal Mining Area is on the North Fork of the Gunnison River. The Town of Paonia would be the closets municipal watershed.
>
> The Colorado Roadless Rule analysis deferred site-specific analysis and disclosure of direct and indirect effects of road construction on water quality and drinking water supplies to such time

when specific temporary road construction is proposed and locations are known. The Forest Service cannot predict the number and location of temporary roads that may be needed if and when new mining proposals are developed. Site-specific information on temporary road construction will be analyzed as proposals are made in a tiered decision making process. At that time, site-specific best management practices, design features, and other mitigation measures appropriate to the proposed road locations will be determined in order to avoid, minimize, or mitigate direct and indirect effects to water quality and public water supplies.

Wildlife, Fish, and Plants

Comment: Do not allow the proposed action because invasive species will destroy the habitat.

Response: The present alternatives and decision to be made are to establish regulations for managing CRAs and do not authorize ground disturbance; as a result, there will be no creation of habitat for invasive species from this decision. Any ground-disturbing activities that are allowed as a result of any of the alternatives analyzed here would be subject to project-level NEPA analysis and disclosure, which would include relevant mitigation measures to reduce the spread of invasive species as directed in Forest Service Manual 2900 (Invasive Species Management) in particular Forest Service Manual 2903.5, State-relevant best management practices, Executive Orders, and USDA and Forest Service policies.

Comment: Road construction will cause substantial damage to the surrounding ecosystem through habitat loss, degradation, and fragmentation. Habitat loss from degradation and fragmentation is the primary threat to survival of wildlife in the United States. Road construction and operation disturbs trails used for hunting, gathering, mating, migrating, destroys homes or burrows, and scares wildlife from the surrounding area. This disruption will affect all wildlife and result in higher mortality and lower birth rates.

Response: Habitat fragmentation concerns and other potential impacts of roads is a common theme of these comments. These concerns as they relate to fish, wildlife, and rare plants were acknowledged in the SDEIS and treated in more depth in the specialist reports and 2012 FEIS. The earlier details and conclusions still apply and were summarized and considered again, rather than repeated verbatim in the SDEIS. Roads can have many of the biological implications for wildlife expressed by the commenter as discussed in the 2012 and current documents. This is particularly true if the activities are carried out in ways unfettered by any meaningful concerns or mitigation for resource impacts.

Should the North Fork Coal Mining Area exception be restored in some form to the 2012 Colorado Roadless Rule, future proposals for activities in that area will continue to be subject to all pertinent requirements of the GMUG forest plan, further NEPA evaluations by the Forest Service, and ESA Section 7 consultation as needed with the U.S. Fish and Wildlife Service. These will continue to be important ongoing “safety nets” to help ensure all relevant fish and wildlife impacts will be properly considered and minimized to the extent possible in the design and implementation of future activities in roadless areas and the North Fork exception area.

Comment: Do not allow the proposed action because it will result in biodiversity and habitat loss for bear, elk, goshawk, lynx, cutthroat trout, and other species. Opening these roadless lands to road construction for coal mining is also likely to have significant, damaging impacts on the ground across a 30-square-mile landscape of largely undisturbed roadless lands - the Sunset, Flatirons, and Pilot Knob Roadless Areas. Mining here will degrade soils and landscapes upstream of habitat for Colorado River cutthroat trout and endangered Colorado River fish. It will also create noise, pollution, and fragment landscapes.

Response: The commenter's concerns about the potential impact of temporary road construction and related activities on fish and wildlife in the North Fork Coal Mining Area are understood. The specialist reports and 2012 FEIS discussed many related risks in depth and were acknowledged again in the SDEIS. These are management concerns that will be addressed in site-specific NEPA evaluations by the Forest Service, consultation with the U.S. Fish and Wildlife Service as needed, and project design and mitigation for future activities proposed in the North Fork Coal Mining Area.

Comment: The SDEIS fails to disclose the cumulative impacts of climate change on wildlife. Seventy-four percent (54 out of 73) of the species of conservation concern analyzed were rated vulnerable to projected climate change in the Gunnison Basin: 43 (of 50) plants and 11 (of 23) animals. The most vulnerable mammals are lynx, snowshoe hare, and American pika - all high elevation species with vulnerability scores driven by their limited capacity to adapt to warmer temperatures.

Adding to climate change would threaten many species. It would force alpine species to continue to migrate higher until there is no more "up" to go. Then there are all the species who are threatened by droughts, forest fires and the proliferation of destructive insects like the pine bark beetle.

Response: Information provided in the Gunnison Basin Climate Change Vulnerability Assessment (Neely et al. 2011) has been addressed more specifically in the specialist reports and SFEIS. Regarding the climate change points, the potential cumulative effects of climate change were discussed in general in the SDEIS and acknowledged as another potential stressor to species. Connected mining actions are reasonably foreseeable under Alternative B and Alternative C, and will add GHG emissions to atmospheric concentrations.

However, it is not feasible to link these specific emissions to climate change impacts on the species identified in the comments. It is not possible under current science to evaluate a cause and effect relationship between the indirect GHG emissions from future connected activities (potential coal mining, transportation, and combustion) and special status species in the CRAs or North Fork Coal Mining Area. Therefore, the effects of activities specific to the North Fork Coal Mining Area and relationship to climate change and cumulative impacts to species in the local area are difficult to quantify or reasonably evaluate.

The approach taken in the SDEIS was to acknowledge climate change as an additional cumulative stressor in the environment. As an agency, the Forest Service is acutely aware of and concerned about climate change. The Forest Service is actively working with stakeholders to develop new science and refine management strategies for the national forests and grasslands and habitats in the face of climate change. The agency also encourages and welcomes ongoing dialogue with the public about ways to do this more effectively.

Comment: Vulnerability to increased damage from invasive species is expected. Increased temperatures and hydrologic changes that result from these increases may make freshwater and riparian ecosystems more susceptible to invasion by non-native species. Of particular concern are quagga mussel, New Zealand mudsnail, rusty crayfish, and Eurasian millefoil, but unforeseen invasives are also possible. Didymo, a native alga that can have highly adverse impacts when its population explodes, could experience climate-change induced spread and increase if streams experience longer periods without floods. Vulnerability to pathogens is also expected to increase. Negative impacts resulting from whirling disease, giardia, cryptosporidium, and possibly other pathogens could increase.

Response: The comments are aimed specifically at the potential for the proposed action to contribute to the spread of invasive aquatic species and waterborne diseases. The spread of aquatic invasive species is a significant problem, and the Forest Service is an active participant

in the fight against many of the organisms mentioned, including New Zealand mudsnails, invasive mussels, and milfoil. Unfortunately, while habitat and climate certainly affect an invasive species' ability to maintain a population, they are much less important than human contributions to their spread. It is important to note that the proposed action relates to establishing regulations for management of CRAs and does not authorize any ground disturbance, extractive activities, roads, or other activities that could promote the spread of invasive aquatic species. The Forest Service evaluates, on a project by project basis, the potential for activities to result in the spread of a long list of aquatic and terrestrial invasive species. If, in the future, temporary road construction is proposed for this area, site-specific design criteria and best management practices will be used to minimize the chance for invasive species to further extend their range.

Comment: Mining reclamation will not return to pre-mining habitat conditions.

Response: Reclamation activities have been largely successful on existing coal leases as evidenced by ongoing reclamation under the State-issued coal mining permit. The applicable laws specific to coal mining and related surface activities, the Surface Mining Control and Reclamation Act along with State-specific statutes, require reclamation to an approved post-mining land use. On NFS lands, the post-mining land use is linked to management direction in the applicable Land and Resource Management Plan. This rulemaking effort does not authorize site-specific surface disturbance, and future proposals for the North Fork Coal Mining Area will involve reclamation and monitoring to ensure recovery from disturbance does occur within realistic and meaningful timeframes and using appropriate native materials.

Comment: This is another way that the oil industry won't have to deal with any Federal, State or Local laws.

Response: All existing laws, regulations, and policies governing management of Federal coal resources, national forests and grasslands, and the resources that use them, will continue to apply to activities proposed in the North Fork Coal Mining Area.

Comment: Alternative B will have little or no impact on the identified species. When specific activities are proposed existing federal and state regulations will require mitigation of impacts on these species as part of the permitting process.

Response: The 2012 Colorado Roadless Rule and the North Fork Coal Mining Area temporary road exception do not authorize ground-disturbing activities. Future proposals will be subject to further evaluation and mitigation as needed for potential impacts to fish, wildlife and rare plant species, including consultation with the U.S. Fish and Wildlife Service as needed to protect listed species and critical habitats. For purposes of the evaluation of the current alternatives, the analyses assumed some potential impact on special status species if they or their habitat were known or likely to occur in roadless areas and the North Fork Coal Mining Area. This helps highlight the potential for conflict between these species and future activities in the North Fork exception area. It also helps identify those species and critical habitats protected under the Endangered Species Act that should be involved in the Section 7 consultation with the U.S. Fish and Wildlife Service.

Comment: Ensure compliance with ESA and provided appropriate documentation for foreseeable negative impacts on wildlife. Comments related to Threatened, Endangered and Sensitive Species list numerous species that the plan "May affect, not likely to adversely affect." Weight should be given to the actual presence of these species on the exemption and much larger CRR lands. If there is no record of any sightings on the exemption lands the possible impact should be given a very low weighting.

Response: The Forest Service is re-initiating ESA Section 7 consultation with the U.S. Fish and Wildlife Service on the Colorado Roadless Rule including restoration of the North Fork Coal Mining Area. If there are known occurrences or habitat potential (in the absence of dedicated surveys) of species protected under the ESA or are Regional Forester sensitive species, for purposes of impact evaluations the agency will identify them as occurring in a project area or potentially indirectly affected in some way by activities there. As part of the Section 7 consultation process, the U.S. Fish and Wildlife Service helps us confirm the ESA species that may be associated with a project area. The depth of analysis by species is then commensurate with the complexity of the proposal and expected risk and does vary by species. The Forest Service uses this standard approach for all biological evaluations of proposed actions.

Comment: A legally sufficient analysis would have found that Pilot Knob provides winter range for deer and bald eagles, and that it alone provides the only severe winter range for elk.

Response: The specialist reports, Biological Evaluation, and Biological Assessment for the 2012 FEIS used explicit information about occurrence of wildlife and special status species by roadless area that were available at the time from accepted reputable sources, including Colorado Parks and Wildlife records, Colorado Natural Heritage Program, and Forest Service records. This included information similar to what the commenter describes for the roadless areas associated with the North Fork Coal Mining Area. These data did inform the evaluation of alternatives for the Colorado Roadless Rule. The Forest Service is unaware of substantial new information since that time for general fish and wildlife resources or concerns, whether for the larger roadless network or specifically the North Fork exception area. Consequently, the evaluations in the SEIS focus on those species of plants and animals for which there was substantial new information since the 2012 rulemaking, specifically related to more recent ESA listings and critical habitat designations affecting national forests in Colorado. The agency also reconsidered the effects of the roadless rule and North Fork Coal Mining Area exception and changed the 2012 determination for the endangered fishes of the Upper Colorado River. Wildlife-related concerns like the commenter identified will be addressed and mitigated as appropriate in future NEPA evaluations, forest plan consistency reviews, and Forest Service decisions. Site-specific information existing at the time a proposal is made to explore for or mine coal—which could be 50 years in the future—will better inform the analysis.

Comment: Neither the SDEIS nor the 2012 Colorado Roadless Rule FEIS provide baseline data for wildlife (including big game), habitat, or vegetation (including spruce fir forest) in the North Fork Coal Area or surrounding landscapes of the Upper North Fork Valley, nor do these documents disclose the impacts that permitting road construction to facilitate coal mining is likely to have on these values that vary across the landscape. CPW have noted the habitat values of the landscape in the Upper North Fork Valley and has repeatedly expressed concerns about cumulative effects from industrial development on wildlife populations associated with various project proposals. Their comments stress the important wildlife habitat of the area and the incremental effect that development is having on its interconnected wildlife populations. Rocky Mountain Wild has prepared a screen of wildlife and habitat values in the North Fork Coal Area. The screen, utilizing data sets from CPW, the Forest Service and other entities, identifies the presence and location of wildlife habitat and associated values within the confines of the North Fork Coal Area. That analysis reveals that habitat for Canada lynx, black bear, elk, mule deer, cutthroat trout, Brazilian free-tail bats, moose, turkey and mountain lion exists in the exception area.

Response: Earlier specialist reports for the 2012 FEIS and roadless rulemaking for Colorado provided more of the detailed information the commenter describes. Explicit information about known and likely occurrence of wildlife and threatened and endangered species by roadless area were used from a number of reputable sources, including Colorado Parks and Wildlife

information and data, natural heritage program records, and Forest Service records in evaluating and developing the Colorado Roadless Rule. This informed the nature of the analysis of benefits and risks to these species and species groups at that time for the roadless alternatives.

The Forest Service is unaware of substantial new fish and wildlife information in general for the roadless area network, or specifically the North Fork Coal Mining Area, beyond that provided in the 2012 documents and supplemented in the SDEIS. It is possible the commenters may have identified additional wildlife species not previously identified, but that does not change the basic approach to the analyses or fundamental conclusions from them. Substantial new information about ESA and Regional Forester sensitive species in the form of new status changes (ESA listings and critical habitat designations, new sensitive status) that were considered and evaluated in the SEIS.

Other developments since 2012 that the Forest Service provided specific information for the North Fork Coal Mining Area was new information on Colorado River cutthroat trout and a change to the 2012 effect determination of no effect for the Colorado River endangered fishes to adverse effect based on reconsideration of the water depletions issue. The listed fishes will be included in the re-initiation of Section 7 consultation with the U.S. Fish and Wildlife Service.

Comment: The Forest Service fails to disclose baseline data about, or analyze; potential impacts to, Canada lynx, including denning habitat, connectivity and linkage areas. Compliance with Endangered Species Act requirements for protecting Canada lynx, a threatened species under the Act, cannot be determined given the level of analysis undertaken in the Colorado Roadless Rule FEIS or SDEIS. Neither document presents any information or maps discussing lynx presence or habitat in the North Fork Coal Area and Upper North Fork Valley. The SDEIS should have included analysis of the potentially differing impacts of the two action alternatives on lynx, based on the significant information it has concerning site-specific, reasonably foreseeable proposals and impacts. The SDEIS does not discuss lynx directly at all. Relying on the Colorado Roadless Rule FEIS might have passed muster if there was any semblance of "hard look" analysis in that document. But the 2012 FEIS contains no analysis of lynx in the North Fork Coal Mining Area, and no analysis of the type and intensity of development associated with coal operations envisioned across this 19,700-acre landscape. The SDEIS posited the estimated road mileage, estimated number of MDWs, and projected surface disturbance. The Forest Service should evaluate where and how this level of projected development would impact lynx and other species.

Response: As already stated, earlier specialist reports for the 2012 FEIS and roadless rulemaking for Colorado provided much of the more detailed information the commenter describes. The current proposed action is to restore the North Fork Coal Mining Area temporary road exception that was fully evaluated for the 2012 Colorado Roadless Rule. Specific to the Canada lynx, habitat was identified for North Fork and most CRAs and considered in the analyses of effects and consultation with the U.S. Fish and Wildlife Service in 2012. The Forest Service biological assessment and effects determination of "may affect, not likely to adversely affect" for the Canada lynx was concurred with by the U.S. Fish and Wildlife Service. Whether it was the Colorado Roadless Rule, or the current alternatives in the SEIS, no ground-disturbing activities are authorized in any instance. The rule and the current proposal to restore the exception North Fork Coal Mining Area only provide the opportunity for temporary roads in roadless areas associated with the exception area. They do not approve specific projects, locations, or timing that will be properly identified and evaluated at a future time. At those time, the forest plan management direction will continue to apply including most importantly to this comment, the direction under the 2008 lynx plan amendments that address habitat, linkage, and other management issues pertinent to the Canada lynx in that area.

Additionally, any future proposed activities in the vicinity that may affect the Canada lynx or any other species or critical habitat protected under the ESA, will continue to require consultation with the U.S. Fish and Wildlife Service.

Comment: The Forest Service has recognized many big game values in the affected roadless Areas: the Sunset Roadless Area provides summer range for elk, mule deer, black bear and mountain lion; the Flatirons Roadless Area is a fall concentration area for black bear, mule deer summering area, and provides calving area, summer range, and winter range for elk and the Pilot Knob Roadless Area provides summer range for mule deer, black bear, mountain lion and elk, provides calving areas and winter range for elk, moose overall habitat, lynx habitat, and bald eagle winter range. These descriptions, and maps of the area's big game habitat, also demonstrate that the roadless areas are not uniform. Therefore, the addition of roads in differing areas will impact different values, the need for mitigation, and the weighing of alternatives. The SDEIS fails to disclose those impacts or where they might occur.

Response: The Forest Service acknowledges that the CRAs associated with the North Fork Coal Mining Area have important wildlife values and agree those values differ across that geographic area, as well as for all of the 4.2 million acres of CRAs. The most precise and effective way to account for varying wildlife values in a more site-specific way across the CRAs including those in the North Fork Coal Mining Area, is for future site-specific NEPA evaluations to address the conditions, resources present, and project-specific features at that time and place. This will continue to occur, because the 2012 Colorado Roadless Rule with or without the North Fork Coal Mining Area exception, does not authorize specific ground-disturbing activities. Forest plan requirements will continue to apply to any proposals, NEPA evaluations will be done, and ESA consultation with the U.S. Fish and Wildlife Service will be conducted if effects to federally protected species are projected. Avoiding and minimizing impacts to fish and wildlife will be through these ongoing project evaluations and based on appropriate design features, mitigation, and outcomes of consultation with U.S. Fish and Wildlife Service (as needed) that make sense for that local spatial and temporal context.

Comment: The SDEIS fails to discuss relevant language in the GMUG Forest Plan or to ensure that the exemption is consistent with the following provisions of the Plan: - Provide hiding cover within 1000 feet of elk calving and deer fawning areas. - Maintain habitat for viable populations of all existing vertebrate species. Maintain at least 40 percent of potential habitat capability. Maintain deer and elk cover on at least 60 percent of the perimeter of all natural and created openings. Maintain a minimum of 40 percent habitat effectiveness for deer and elk in diversity units dominated by forested ecosystems. Minimum size cover areas for deer is 2 to 5 acres, and for elk, 30 to 60 acres.

Response: The GMUG forest plan and all requirements and management direction in it relevant to projects in the CRAs, including those in the North Fork Coal Mining Area, will continue to apply. Additionally, other existing policies and requirements at the time of project proposals that relate to wildlife, Regional Forester Sensitive Species, Management Indicator Species, and other related management issues will continue to apply to future project proposals in the North Fork Coal Mining Area and across the entire Colorado roadless area network.

Comment: The Forest Service fails to adequately disclose baseline data about, or analyze potential impacts to, cutthroat trout. The SDEIS admits that is has location and other data about Colorado River cutthroat, but fails to include that information in the SDEIS. For example, the Forest Service has maps displaying the overlap of cutthroat trout habitat with the three roadless areas, but it chose to withhold that data from the public and the decision maker by failing to include them in the SDEIS. The limits of the narrative description are apparent, given that while the SDEIS describes the length of creek habitat occupied by cutthroat and provides a few place names, it fails to provide the reader with any visual representation to understand whether a selection of Alternative B or C will protect

potentially occupied watersheds. The total discussion of cumulative impacts to trout from the proposed exception is one sentence, which does not discuss Colorado River cutthroat trout: "More variable flows and temperatures in streams and rivers will profoundly affect aquatic species such as greenback cutthroat trout." When considered in conjunction with the Colorado Roadless Rule FEIS, the NEPA record is almost entirely devoid of baseline data and direct, indirect and cumulative impacts analysis. The SDEIS kicks the can down the road when it comes to sufficient environmental review, stating: "proper consideration of the Colorado River cutthroat trout in further site-specific planning of the coal mining-related activities will likely be important in conservation of local ; individuals and populations."

Response: The comments were directed at the dearth of disclosure pertaining to the location and potential effects of the proposal to affect Colorado River cutthroat trout. A significant change from the 2012 Roadless Rule analysis and the analysis of this SEIS was the disclosure based on more recent field work, of the presence of two types of Colorado River cutthroat trout in the North Fork of the Gunnison watershed. The first type, commonly called green lineage, is a species that is protected as threatened under the ESA. Several populations can be found in the North Fork watershed, but none are located within, adjacent to, or directly downstream of the North Fork Coal Mining Area. A population of the second type, called Blue Lineage, is present in Hoodoo Creek, a stream located on the southern end of the proposed North Fork Coal Mining Area, Alternative B. In fact, a portion of Hoodoo Creek is located within Alternative B.

The thrust of the comments is that the Forest Service did not provide enough information to evaluate the effect of the proposed action on Colorado River cutthroat trout, and, in particular, the population in Hoodoo Creek. The effect of this proposal was evaluated thoroughly by the Forest Fisheries Biologist for the GMUG National Forests. The analysis included 1) a field site visit to validate the presence of Colorado River cutthroat trout in Hoodoo Creek; 2) a GIS-based analysis of the direct contributing watershed of Hoodoo Creek in order to determining the land area within which temporary road construction could affect Hoodoo Creek; 3) an evaluation of the cutthroat trout population in Hoodoo Creek with respect to size and distribution of Colorado River cutthroat trout across the GMUG NF; and 4) a review of appropriate design criteria and best management practices that would be implemented if temporary road construction was proposed in the Hoodoo Creek watershed. Based on this analysis and the assumption that appropriate design criteria would be implemented with temporary road construction activities, the Forest Fisheries Biologist concluded this project was unlikely to have an effect on the population of fish in Hoodoo Creek and would not have an effect on this species at the forest scale.

A second point raised in the comments is that the Forest Service did not make sufficient information available to determine if there could be a difference between Alternatives B and C in the effect on Colorado River cutthroat trout. Under Alternative C, the Hoodoo Creek watershed is, in fact, removed from the North Fork Coal Mining Area. Therefore, it is logical to conclude that Alternative C is a better choice with respect to Colorado River cutthroat trout conservation. However, neither Alternative B nor C authorize ground-disturbing activities within the Hoodoo Creek watershed, nor the larger project area. If, in the future, ground-disturbing activities are proposed within the watershed, the presence of a Forest Service Rocky Mountain Region sensitive species will be an important consideration in authorizing or conditioning those activities.

A third point was focused on cumulative effects on cutthroat trout. Cumulative effects to fisheries resources in the Rocky Mountains have been well studied. These effects include roads and road density in a watershed and stream temperature changes related to deforestation in riparian areas.

Climate change is an important cumulative effect and the Forest Service has spent considerable effort evaluating the potential for climate change to affect fish populations on the GMUG National Forests. Agency efforts include a Forest-wide evaluation of the status of native trout populations (completed in 2011) and an on-going effort to measure stream temperatures and develop predictive stream temperature models for the Forest.

As the proposal does not authorize specific projects involving constructing temporary roads in the North Fork Coal Mining Area, it is difficult to determine the number, length, and density of roads that could result from mining-related activities there. The Forest Service has considerable latitude in conditioning the placement and maintenance of roads created on the Forest. Should temporary roads be proposed in the future, the potential for direct or indirect effects on stream and aquatic populations will be thoroughly evaluated. Road density within the project area will be monitored closely so that it will not exceed published thresholds over which the presence of a road network could impact stream habitats. Six years of intensive temperature monitoring suggest that streams in the North Fork of the Gunnison River watershed are on the cold end of suitable for native cutthroat trout. Based on this, it appears that it could take decades for stream temperatures to warm sufficiently to impact extant native cutthroat trout populations. Indirect effects of climate change such as large fires, debris flows, and drought are phenomena with which these species evolved and there is considerable uncertainty about how much more frequent these occurrences will be in this part of the Rocky Mountains. Given that the primary threat to native trout in western North America of non-native fishes, and the secondary threat, habitat alterations by humans, are so pervasive and would constitute threats in the absence of climate change, it is difficult to conclude climate change represents an additive threat to native cutthroat trout in this part of western Colorado.

Comment: The Forest Service fails to adequately disclose baseline data about, or analyze potential impacts to, sage-grouse. GIS analysis conducted by Rocky Mountain Wild indicates that Gunnison Sage-grouse historical habitat occupies a significant portion of the Pilot Knob Roadless Area. On November 12, 2014, the U.S. Fish and Wildlife Service announced that the Gunnison Sage-grouse requires the protection of the ESA as a threatened species a decision that postdates the Colorado Roadless Rule FEIS. The Pilot Knob Roadless Area contains historic habitat which may still be suitable for occupancy by Sage-grouse should populations expand. The SDEIS fails to disclose to what extent development in the coal Mining exception area may have direct, indirect, and cumulative; impacts on the species and their current or historical habitat, and fails to consider the need for; management prescriptions to maintain and enhance the potential for Gunnison Sage-grouse restoration.

Response: The SDEIS acknowledged the recent ESA listing of the Gunnison sage-grouse and identified that as substantial new information since the Colorado Roadless Rule. Critical habitat designated since 2012 does not overlap the North Fork Coal Mining Area, but is found in a few other CRAs in the State. The sage-grouse was a Regional Forester sensitive species in the Rocky Mountain Region at the time of the enactment of the Colorado Roadless Rule and effects analyses were conducted for that species at that time under that status. The effect determination then was “May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward Federal listing.” This was a programmatic determination considering the entire Colorado Roadless Rule including the exceptions and appropriate when a mix of beneficial and some negative effects are projected. For similar reasons in the SEIS, the determination for the sage-grouse under its ESA status was “May affect, not likely to adversely affect.” This is an appropriate determination when effects cannot be ruled out entirely, but are highly unlikely to occur or if they do occur would be so small as to be for all practical purposes immeasurable. This was based on similar logic as in 2012 that the combination of the roadless protections and ongoing requirement for NEPA evaluations of

future projects and Section 7 consultations as needed together leads us to this determination. This determination cannot be teased out in any meaningful way to suggest a different determination for the North Fork Coal Mining Area. Due to the may affect determination, the sage-grouse is included in the Section 7 consultation between the Forest Service and U.S. Fish and Wildlife Service. The “may affect, not likely to adversely affect” determination will be validated during the consultation process.

Comment: Although the SDEIS displays the miles of road likely required to construct MDWs for coal mining, it failed to quantify the habitat eliminated by road construction. This failure is arbitrary given that: (1) the Forest Service calculated the acreage of habitat disturbance caused by MDW pad clearance and (2) BLM and the Forest Service quantified habitat projected to be eradicated by road construction for the Sunset Trail coal exploration project in 2013, concluding that road construction would "disturb 4.24 acres per mile." If that projection is accurate, reinstating the coal mining exception could result in over 280 acres of linear clearcuts. Further, the SDEIS fails to address data suggesting that its assumptions concerning the impacts of road construction required for exploration are too low.

Response: The actual habitat affected by future construction of temporary roads will be addressed in the site-specific NEPA evaluations if and when a proposal to develop coal resources is received. The SEIS estimates acres of disturbance from MDWs if all coal resources are developed within the North Fork Coal Mining Area, which is unlikely. However, since it is unknown if and where coal resources would be developed and where associated roads and well pads would be located, it is impossible to estimate the acres of disturbance by habitat type. The Sunset Trail exploration project the commenter references is substantially different than the programmatic review of the Colorado Roadless Rule because the exploration project has an associated proposal for actual road and well-pad locations provided by the coal company. Extrapolating that information across the entire North Fork Coal Mining Area would be inappropriate due to the topographic and geologic variability. The Forest Service addressed the road and well-pad estimates made in the 2012 FEIS in the SDEIS (p. 28) and concluded that for the purposes of the programmatic analysis, the estimates were sufficient. The Forest Service conducted a geographic information system analysis of road densities related to MDWs of existing operations and found large variability in road densities and the average road densities to be less than the 3 miles/square mile used in the 2012 FEIS, which was carried forth in the SDEIS recognizing that it represents a conservative but reasonable estimate.

Comment: The reinstatement could harm recent conservation efforts for more than one species that has range or potential range in the area.

Another issue that needs to be strongly considered is the pressure this reinstatement could pose on the American Pika. Some range still exists throughout the Gunnison National Forest, ground zero for the proposed coal mining area. [...]Continuing on with this proposed rule will indefinitely infringe upon the survival of the American Pika throughout the Gunnison area by way of its contribution to global climate change as well as habitat destruction.

A massive amount of habitat destruction and deforestation will occur, affecting numerous species. Eagles, Beavers, yellow-bellied marmots, Mule deers, Elk, Mountain Lions and possibly Canadian Lynx are just some of the species that bring people into these areas. Destroying their habitat could change the entire ecosystem, pushing populations closer to each other, resulting in heavy predation for some. Other species could change their behavior as well to avoid these circumstances and some may even be keystone species that the ecosystem completely depends on.

Response: All of these comments are from the same commenter and are related. First, Forest Service evaluations presented in the SDEIS and for the 2012 FEIS do not support the conclusion that the Colorado Roadless Rule and alternatives for the North Fork Coal Mining

Area represent a serious threat to species and conservation efforts. The Forest Service acknowledges the potential of impacts to fish and wildlife from potential future activities in the North Fork Coal Mining Area. Those possibilities were raised and considered in evaluations and conclusions. While it is agreed that road construction is not generally a positive impact on many fish and wildlife, whether there is an impact and to what extent is largely a function of whether appropriate design or mitigation are brought into project proposals including compliance with mitigation and reclamation requirements in the existing legal and regulatory framework. These will not always completely remove risk or impacts but are important elements to avoid and minimized negative impacts. The reality is that activities like temporary road construction are not uncommon on the national forests and grasslands, even in some cases for roadless areas. It is Forest Service responsibility to ensure that activities are consistent with the multiple-use mandate for these Federal lands and overall mission of the Forest Service, follow all applicable laws and policies, and that environmental impacts are avoided and minimized.

Specific to the American pika, it was not on any of Forest Service lists of species of special status or concern for the national forests and management of them (i.e., ESA, Regional Forester sensitive species, Management Indicator Species) and did not receive special treatment in evaluations as a result. Further, there was no information available to suggest to the agency that the North Fork Coal Mining Area was disproportionately important to the health and welfare of this species in Colorado and the roadless area network. Pika and many other wildlife species associated with high elevation areas are likely found in many of the roadless areas in the State. Similar to the conclusions for many species would equally apply to the pika, the protections that continue to be afforded to roadless areas under the Colorado Roadless Rule should overall be highly beneficial to wildlife like pika in the State.

Overall, Forest Service evaluations do not support the statement that there will be massive habitat destruction or deforestation, or disproportionate impacts to species, as a consequence of granting a temporary road exception for the roadless areas in the North Fork Coal Mining Area. Site-specific evaluations of proposals will continue to be conducted by the Forest Service and other Federal and State agencies in the exception area for environmental impacts and conformance with the forest plan and applicable laws and policies.

Comment: The 19,000+ acres included in this exception area fall directly within the boundaries of lynx habitat that is critical for ongoing success of the reintroduction project established in 1997. Increased infrastructure in this area will lead to a higher occurrence of animal-vehicle collisions, as well as increased habitat fracturing. [...] By allowing this measure to pass, the forest service will be endangering another state run program by decreasing survival chances of the lynx.

Response: Effects to the Canada lynx were evaluated for the Colorado Roadless Rule including the North Fork Coal Mining Area exception and determined by the Forest Service to be "may affect, not likely to adversely affect." This determination was concurred with by the U.S. Fish and Wildlife Service. No substantial information has surfaced since then to alter that conclusion. The forests including the GMUG National Forests where the North Fork Coal Mining Area occurs, will continue to implement the forest plan which include the lynx management direction that addresses the relevant risk factors to the Canada lynx from individual projects. The forest will also continue to analyze site-specific proposals and consult with the U.S. Fish and Wildlife Service on any subsequent activities that may affect the lynx. This is an additional key safety net that ensures impacts are avoided and minimized and remain consistent with the forest plan management direction under our regional conservation strategy for the Canada lynx known as the Southern Rockies Lynx Amendments.

Comment: Polluted water will lead to the demise of the Colorado Cutthroat Trout. The Colorado Cutthroat Trout is an indigenous species that relies on clean and safe waterways within the Sunset Roadless Area and Flatirons Roadless Area. Recently, the trout has been identified as a sensitive species and multiple organizations, including the United States Forest Service have entered an agreement to assure the long-term viability of the Colorado Cutthroat Trout in their historic range. The main objectives of the agreement are to secure and enhance conservation of populations and secure and enhance watershed conditions. In order to live up to the agreement that the Forest Service entered, it needs to restrict the location and amount of roads authorized in GMUG National Forests. This can best be done by utilizing the curtailment measures in Alternative C.

Response: The SDEIS confirmed for the first time the presence of Colorado River cutthroat trout in watersheds associated with parts of the North Fork Coal Mining Area. Although the Colorado River cutthroat trout was 'presumed' present in some roadless areas and potentially affected by implementation of the Colorado Roadless Rule exceptions, this validated that presumption for the North Fork Coal Mining Area. It did not necessarily change the earlier conclusion that was already based on presumed occupation. As the SDEIS pointed out, "…proper consideration of the Colorado River cutthroat trout in further site-specific planning of the coal mining-related activities will likely be very important to conservation of the local populations."

The commenter's concern about the potential effect of pollutants on native trout populations in the designated Roadless Areas and North Fork are acknowledged. It is true the North Fork of the Gunnison River watershed supports several populations of native Colorado River cutthroat trout that are classified as either Regional Forester sensitive species or Threatened under provisions of the ESA. The concern expressed for impacts of roads is sound: poorly designed or maintained roads can impact streams and the fish that live in those streams. However, neither the 2012 Colorado Roadless Rule nor proposal to restore the North Fork Coal Mining Area exception. Any future proposal to construct a road on this portion of the Forest in the exception area would continue to be subject to the requirements of the forest plan for resource protections, a thorough review under the NEPA, and ESA Section 7 consultation with the U.S. Fish and Wildlife Service as needed if effects to protected species or habitats are projected. We have considerable latitude regarding the design and construction of roads on the lands we manage in addition to the ability to impose design criteria and best management practices to reduce the likelihood of impact to streams and the organisms they support.

There is one population of Colorado River cutthroat trout present in the southern portion of the project area. The population, which resides in Hoodoo Creek, is native to Colorado and is a Regional Forester sensitive species. The watershed in which Hoodoo Creek is located is a very small portion of the project area and likelihood of a road being placed near the stream is relatively low. However, should a road be placed in the watershed Forest Service specialists will work to minimize the risk such a temporary road poses to the fish population and the stream in general.

The commenter suggested Alternative C would be a better option to protect native cutthroat trout from the potential deleterious effects from roads. Under Alternative C, the Hoodoo Creek watershed is removed from the North Fork Coal Mining Area. Therefore, it is logical to conclude that Alternative C is a better choice with respect to Colorado River cutthroat trout conservation. However, neither Alternatives B nor C authorize ground disturbing activities within the Hoodoo Creek watershed, nor the larger project area. If, in the future, ground disturbing activities are proposed within the watershed the presence of a Forest Service Rocky Mountain Region sensitive species will be an important consideration in authorizing or conditioning those activities.

Comment: The Forest Service has a duty to consult and avoid take under the ESA.

> **Response:** The Forest Service does have a duty to fully consider impacts of activities on the national forests to species and habitats protected under the ESA. Where the agency determines species may be affected by activities on the lands we manage, we are required under Section 7 of the Act to consult with the U.S. Fish and Wildlife Service to avoid and minimize negative effects and unauthorized take that could jeopardize the continued existence of a species. The Forest Service has re-initiated consultation with the Service on the 2012 Colorado Roadless Rule and North Fork Coal Mining Area exception to help ensure that the final decision for North Fork remains in compliance with the ESA.

Comment: The Forest Service cannot rely on the GMUG programmatic BO because of lack of sufficient progress in recovery. The fact the USFWS is reevaluating the recovery criteria does not excuse the Forest Service from its Section 7 obligations.

> **Response:** As stated in the SDEIS, it is likely that the Forest Service will be changing the determination for the Upper Colorado River listed fishes from no effect in 2012 to now adverse effect, based on potential for some new water depletions associated with any new mining activities in the North Fork Coal Mining Area. Therefore, re-initiation of consultation with the U.S. Fish and Wildlife Service will include consideration of these species, something the 2012 consultation did not. The Agency believes any depletions associated with any new activities at North Fork will annually be well within acceptable thresholds identified in several prior programmatic biological opinions by the Service for management of depletions potentially affecting these Colorado River fishes. Annual monitoring and coordination with the Service will confirm whether that is the case or not, and procedures to follow should depletions exceed acceptable thresholds in any one year. The Forest Service thinks that scenario is highly unlikely. This will all be discussed and resolved in the consultation and new biological opinion from the Service.

Comment: The Forest Service's stated course of action is to conflated two distinct triggers for separate actions - (1) the ongoing implementation of the Colorado Roadless Rule and (2) the proposed action of reinstating the coal mining exception - and combine them in a single re-consultation on a fiction that does not now exist: the Colorado Roadless Rule including the now vacated coal mining exception. The Forest Service has correctly determining that it must re-initiate consultation on the ongoing agency action of the Colorado Roadless Rule due to changed circumstances and new information, but has failed to understand that it must consult separately on its present, discrete proposed action-the North Fork Coal Mining Area exception. The Forest Service cannot, in determining whether its proposed action "may effect" listed species and/or designated critical habitat under the ESA, rely on potentially beneficial effects from other aspects of the 2012 Colorado Roadless Rule to offset adverse effects from the coal mining exception. In addition, the Forest Service must re-consult with the Fish and Wildlife Service regarding its ongoing action of implementing the Colorado Roadless Rule, but not only because of changes in species designations and known species range. The Forest Service must also re-initiate consultation on the 2012 Colorado Roadless Rule because "new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered." The 2012 BA contains several other gaps in the analysis of water depletions, including the failure to properly account for the impacts of water depletions from oil and gas development allowed by the Colorado Roadless Rule. Finally, the Forest Service cannot rely on the 2007 Biological Opinion regarding small water depletions associated with Mining development on the GMUG forests ("GMUG PBO") to address water depletions from coal mining, as the SDEIS argues. The Forest Service cannot do so because, by its own terms, the GMUG PBO requires re-consultation when the endangered pikeminnow have not recovered to certain levels as of the Fish and Wildlife Service's 2015 review. Based on the latest information available from the

Fish and Wildlife Service, those population goals have not been met, and, therefore, the Forest Service cannot rely on the 2007 GMUG PBO.

Response: Because this is a supplemental EIS, the Forest Service is re-initiating consultation on the 2012 Colorado Roadless Rule and is considering new information that has emerged in the interim, including newly listed species and critical habitats, new information for a listed fish in the vicinity of the North Fork Coal Mining Area, and reconsideration of other listed fish and potential impacts from activities at North Fork. Therefore, the analyses and the consultation with the Service appropriately address both scales: roadless network and the North Fork Coal Mining Area. The current proposal to restore the North Fork Coal Mining Area exception is in many ways re-evaluating something that was previously evaluated, while now factoring in substantial new information into the analyses and consultation. The agency believes this is an effective and appropriate approach to the effects analyses that was discussed with the U.S. Fish and Wildlife Service at the beginning of the project. No resolution was lost in the effect related to species relative to the North Fork Coal Mining Area. Where new information pertains specifically to North Fork, it was disclosed and evaluated under the alternatives on its own merits. In other cases, the substantial new information applies to the larger roadless network and rule. The agency believes it is also necessary to address that information and at that larger, more appropriate scale.

Concerning the allegations of gaps in the 2012 Biological Assessment in analysis of water depletions, the SDEIS indicated that depletions that may affect the Colorado River endangered fishes were probably not properly accounted for in 2012 and this will be addressed in the Biological Assessment and consultation with the U.S. Fish and Wildlife Service.

Regarding the 2007 “depletions” biological opinion, as discussed in response to another related comment, the Forest Service is likely changing the effect determination for the Upper Colorado River listed fishes from no effect in 2012 to now adverse effect. Therefore, these fishes will be included in the re-initiation of consultation with the U.S. Fish and Wildlife Service, something the 2012 original consultation did not. The agency expects annual depletions at North Fork if they occur at all will be well within acceptable thresholds identified in several prior programmatic biological opinions of the Service for management of depletions potentially affecting these Colorado River fishes. Annual monitoring and coordination with the Service will confirm whether that is the case or not, and procedures to follow should depletions exceed acceptable thresholds in any one year. This will all be discussed and resolved in the consultation and new biological opinion to the Forest Service.

Social and Economic

Comment: The SDEIS must complete a Regulatory Impact Analysis.

Response: The Office of Management and Budget reviews rulemaking efforts and determines the level of significance and any additional analysis requirements to be completed by individual agencies. In 2015, the proposed rulemaking for the reinstatement of the North Fork Coal Mining Area exception into the Colorado Roadless Rule was determined to be non-significant and thus a regulatory impact analysis was not prepared. However, in 2016 the Office of Management and Budget reviewed the final rule and found it to be a “significant regulatory action” pursuant to Executive Order 12866, Section 3(f)(4), which indicates the rule may “raise novel legal or policy issues.” In addition, the Office of Management and Budget did not find the final rule to be economically significant. A regulatory impact analysis is only required for economically significant rules. However, a regulatory impact analysis was prepared for the 2012 final rule and an updated benefit-cost analysis is included in this SFEIS.

Comment: The SDEIS cannot assume that lacking North Fork coal, utilities would substitute 100% with lower carbon fuels or with zero carbon sources.

The Forest Service erred in assuming less than 100% market substitution; that an increase in domestic coal production will result in a shift towards greater domestic coal use (and a corresponding decrease in natural gas and renewable energy use), which will reduce electricity costs.

> **Response:** The Forest Service does not assume 100% market substitution, nor restrict any substitution with lower carbon fuels or zero carbon sources. Substantial efforts have been applied in this analysis in order to estimate the changes in the mixture of energy production, electricity generation and carbon emissions across alternatives. (DEIS pp. 76-78) The DEIS noted that North Fork Coal Mining Area coal is bituminous and is characterized by low sulfur content and high heat content (DEIS, p. E-1 and E-6 to E-7). The disposition of—and potential fuel substitutes for—North Fork Coal Mining Area coal have been disclosed and discussed (DEIS, pp. E-10-14).

Comment: The proposal undermines the clean renewable energy market because the coal will displace 40,000 Gwh of renewable energy.

The SDEIS substitution response coefficient for renewable is unrealistic (should be zero or near zero).

> **Response:** IPM modeling results indicate that the mix of energy sources used to generate the electricity changes, in response to increases in North Fork Coal Mining Area coal production, include alternative supplies of coal, natural gas, and other energy supplies such as renewables, especially in later years of the analysis. Electricity generated from coal (underground and surface mined) was estimated to increase by about 112,000 GWh, while electricity generation from natural gas decreases by about 72,000 GWh. Decreases in electricity generation from renewable energy sources makes up the remaining balance. This balance was estimated to be about 40,000 GWh. (SDEIS, p. 97) The SFEIS analysis employs a newer Base Case model using IPM v.5.15, which accounts for the Clean Power Plan and other factors and updated assumptions, and generated substantially different fuel substitution. See SFEIS (Table 3-27) for the updated results as well as detail discussion on the differences.
>
> Outside of the IPM models, a number of factors may affect production and consumption of fuels related to power generation. The SDEIS recognized some of those chain reactions may include responses such as a potential decrease in the consumption of other substitute fossil fuels (including alternative coal sources in some cases), including natural gas; or changes in the consumption of alternative fuel such as nuclear and renewable energy sources. (SDEIS, pp E-12 to E-13) Changes in the national energy market may affect these responses in both magnitudes and direction.
>
> Over the last 5 years, the United States has had unprecedented amounts of coal to gas switching as natural gas prices have dropped to the $3/MMBtu range on multiple occasions. In addition, during periods of high natural gas demand, gas prices have increased and there has been a switch from gas to coal consumption for power generation. The amount of switching between fuels in the model results is entirely within the realm of historical precedent. The commenter suggests that switching from renewable generation to coal generation is implausible. However, the modeling results show that the decrease in renewable generation is due to decreases in pumped storage hydro power and from a geothermal plant that is postponed from 2040 to 2050. Geothermal plants, like coal plants, are dispatchable and tend to be baseload plants. Thus it is reasonable that there is a shift in the timing of construction for a geothermal plant. Pumped storage hydro is also a dispatchable resource that is used to meet peak load periods. As a dispatchable renewable resource it is reasonable that there are shifts in this resource given other changes in the model inputs. On a percentage basis, the shift in pumped storage hydro

generation is less than 0.25% of total pumped storage hydro generation in any one year. The SFEIS analysis using IPM v.5.15 accounting for the final Clean Power Plan and other factors generated noticeably different fuel substitution (See SFEIS Table 3-27).

Comment: The SDEIS modeled net decreases in renewable fuel production but substitution response factors were assumed to be zero. This had the effect of assuming that reduced generation of electric power from renewable energy would not offset any of the increased GHG emissions from coal generation.

Response: GHG emissions from renewable fuel production and use are conservatively assumed to be zero. The extraction and downstream combustion of fossil fuel energy sources, including coal, are different from renewable energy production and use. Therefore, gross increases in GHG emissions from the North Fork Coal Mining Area coal production that substitute for renewable energy are modeled as net or cumulative increases in GHG emissions for the purposes of calculating GHG damages.

Comment: There are limitations and errors in the modeling of the domestic energy market impacts.

One or more errors appear to have occurred in the running of the model. The text of the SDEIS clearly explains that the market for coal generally and for Uinta Basin coal specifically is inelastic, ranging from 0.14 for national coal-gas elasticity, and even lower (0.05) for the Western Electric Coordinating Council. SDEIS at E-11 to E-12. The very highest elasticity is for the Southeastern States Reliability Corporation, at 0.38. Id. Yet the summary Table 3-19 in the SDEIS opines that the addition of 172 million tons of North Fork Coal will result in 52 million tons of net additional coal domestic coal consumption, an implied elasticity of nearly 0.33. Although Table 3-19 includes renewables as well as natural gas, natural gas is the dominant affected alternative fuel. The summary results simply do not square with the stated inputs.

The Forest Service appears to have over-weighted shipments to the Southeast, the most elastic sub-region. Relatively little Uinta Basin coal is now shipped to that area, and most fuel-switching effects have already occurred as a result of the precipitous decline in natural gas prices starting in 2012, as well as plant retirements and installation of compliance controls.

The SDEIS conclusion on coal substitution is completely opposite of the Tongue River DEIS. The Forest Service should assume more exported coal and perfect substitution of exported coal. ICF was used in the Tongue River EIS.

Response: The comments offer insightful but inaccurate suggestions regarding the explanation for the relatively high implied elasticity. The model is only shipping a small amount of coal to the southeast, while it is distributing most of the coal in Colorado and Utah. While the model is not using the Colorado Uinta Basin coal for industrial demand, it is using Utah Uinta Basin coal and Colorado Green River coal to meet the local industrial coal demand. The reason that there is a relatively high elasticity is due to the relatively high natural gas prices in the SDEIS analysis and the low cost of the additional 172 million short tons of North Fork coal. The analysis showed that the additional coal resources would mainly displace natural gas and thus the higher implied elasticity of the coal demand. In the SFEIS analysis (using IPM v.5.15), where natural gas prices are relatively lower, the elasticity of the coal demand is much lower at about 0.05. In all but 2020 and 2030 the natural gas prices are lower in the SFEIS. In 2020 and 2030 the natural gas prices under IPM v.5.15 are within 5% ($0.27/MMBtu 2012$) of the SDEIS analysis (with v.5.13) gas prices. However, even though the gas prices are less than or close to those presented in the SDEIS, the natural gas production in the SFEIS through 2030 is higher on average by 2,038 TBtu – nearly 20% of the total natural gas used for electric power generation. It is this large amount of additional natural gas at lower prices that results in the coal to coal switching in the SFEIS under v.5.15 as compared to the SDEIS. See the *Economics*

section for a thorough comparison between the differences between IPM v.5.13 and v.5.15 and their implications to energy market substitution response factors used in the benefit-cost analysis.

Comment: It is unclear whether North Fork coal was included in the base model supply curve.

The Forest Service errs in calculating the industrial energy market for Uinta Basin coal. IPM employs a crude approach to supply curve and response development, as graphically illustrated by the Forest Service's inability to determine whether the North Fork Coal is already included in IPM's supply curves. This reflects the inadequacy of ICF modeling.

Response: Two different scenarios were analyzed in the SDEIS due to the uncertainty about whether the coal supply curves (used in EPA v.5.13 base cases) included the additional North Fork coal reserves potentially made available under this action or not. EPA provided comments signifying that the supply curves do include the North Fork reserves in question. However, upon review of coal supply curves for North Fork mines within the baseline IPM modeling conditions, it appears that baseline reserves are not capable of including the additional North Fork Coal Mining Area reserves, given that baseline reserves are less than what they would be if the additional reserves were included. As a consequence, the Forest Service feels there is evidence suggesting that North Fork Coal Mining Area coal reserves are not included in baseline reserves. To account for uncertainty about reserves, the “Reserves Removed” scenario was analyzed with the underlying assumption that the base case coal supply curves included the North Fork reserves that would be accessed under the proposed action; while the “Reserves Added” scenario assumes that the coal supply curves do not already include the 172 million short tons of reserves that would be accessed under the proposed action. Results for both of these scenarios, as well as an additional “Limited Production” scenario to simulate situations where North Fork coal production are limited to 5.2 million tons per year, are contained in Table E-15 (SDEIS, p. E-21). PNV results are generally robust across all scenarios.

Comment: An increment of approximately 100 million tons, spread over at least 20 years, is not a significant change in the national coal supply. The model's "least-cost' assumptions regarding fuel choice substantially overstates customers' ability and willingness to switch between different fuel types, given investments in existing generation methods. Users of Uinta Basin coal are not likely to make material changes in their fuel mix based on the presence or absence of North Fork Exception area coal. That will tend to suppress any potential fuel-switching that IPM might suggest would otherwise occur.

Response: IPM provides a comprehensive and integrated view of the electric, natural gas, coal, and the air regulatory markets, as described in Appendix E of the SDEIS. The IPM model will estimate how changes of inputs in one market will affect all of the other markets. Thus it is well suited to evaluating both small and large changes in input parameters. The commenter states that the model overstates a customer’s ability to switch fuel types. In fact, each generating facility is assigned one or more fuel types that it can use that restrict its ability to switch between fuel types. For example, coal plants may be assigned either bituminous or subbituminous coal types, but only both types if the plant has consumed both on a regular basis in the past. For a coal plant to switch from one type of coal to another, the plant would be required to incur a capital cost in the model. Most coal plants already source their coal from multiple regions. In fact, many plants that use Colorado Uinta Basin coal also source coal from other regions. Energy Information Administration’s Form # 923 (coal delivery data for 2009 through 2015) shows that the following plants have used both Colorado Uinta Basin coal and Wyoming PRB coal or Illinois Basin coal or Utah Uinta Basin coal: Reid Gardner (NV), Victor J Daniel (MS), North Valmy (NV), Colbert (AL), and Johnsonville (TN). The shifts in sourcing within each coal plant are reasonable and based on historical coal consumption patterns.

Comment: The Forest Service should assume more exported coal and perfect substitution of exported coal, thus no net change on carbon emission.

The SDEIS notes that coal exports have been increasing, and selects a 12% export rate as a "conservative" estimate going forward. Given trends in exports, a 20% export rate is more appropriate over the life of production.

What are the caveats associated with applying a fixed coal export assumptions. Did the Forest Service complete modeling to determine what export assumption to include in the analysis?

> **Response:** Export rates are not directly assumed in the benefit-cost analysis. Instead, export response coefficients (i.e., net tons of domestic coal exported per ton of North Fork coal mined) are derived from IPM modeling results (as described on pages 78 and 96 of the SDEIS), and used to characterize net changes in domestic exports resulting from changes in North Fork coal supply, The IPM framework projects coal exports, by supply region, that can be used to calculate export rates. Calculated annual export rates for the Rockies supply region, covering the North Fork area, range from 4–25% (depending on the year) and average about 16% for the "add reserves" scenario in the SDEIS. These values are consistent with recent evidence about export rates for the Uinta basin, as discussed on page 78 of the SDEIS. These export rates can be calculated from data provided in the SCC workbook files (see "Response Coefficient" tab) for the "add reserves" scenario in the public record. The corresponding export response coefficient is estimated to be 0.10 tons of domestic coal exports per ton of North Fork coal mined (see Table E-14 in the SDEIS); response coefficients are expected to be lower than export rates due to substitution across supply regions (e.g., gross exports of North Fork coal may be offset by decreases in coal exports from Powder River).
>
> As implied above, the rate of exports is not a fixed input assumption in ICF's modeling. It is also not appropriate to assume perfect substitution for all exported coal. If there are differences in the heat and sulfur content of the substitute coal, there will be changes in GHG emissions.
>
> Given the current state of the international coal market and the fact that coal exports fluctuate over time, the 12% export rate assumed in the air section of the SDEIS is reasonable going forward. In addition, the model allows for Colorado and Utah coal to be exported out of both California ports and the proposed ports in the Pacific Northwest. Thus if it is economic, the model could export more than the 12% (see ranges of export rates above). In addition, the domestic coal consumption in the SFEIS (under IPM v.5.15) is higher, which results in less coal being exported due to the higher domestic demand.
>
> The reason that there is more coal consumption and less natural gas consumption under IPM v.5.15 is because under v.5.13 a carbon price was used as a proxy for the proposed Clean Power Plan and that carbon price continued to increase over time. As the carbon price increased it caused coal-fired generation to be less and less economic compared to natural gas-fired generation. In contrast, in the SFEIS (under IPM v.5.15), the final Clean Power Plan is modeled. The Clean Power Plan has increasingly stringent performance requirements over the implementation period of 2022 through 2030; however, those performance requirements do not change after 2030 and do not become more stringent. Because the Clean Power Plan performance requirements do not change after 2030, while the carbon price in the SDEIS continued to increase after 2030, natural gas consumption is higher and coal consumption is lower in the SDEIS compared to the SFEIS in the period after 2030. In fact, under IPM v.5.15 in the SFEIS 13% more coal is consumed over the entire analytical timeframe from 2016 through 2050.

Comment: A significant share of North Fork coal is consumed at industrial facilities (in production of cement and in lime kilns). The SDEIS assumed all North Fork coal would be consumed for power generation.

> **Response:** The commenter suggests that because North Fork coal is used in industrial processes that less coal is used by power plants than is presented in the SDEIS results, and that this somehow has an effect on the GHG emissions. As is observed from the Energy Information Administration Form 923 fuel delivery data, North Fork coal is used by a variety of power plants that also use other Colorado Uinta Basin coal and coal of similar characteristics from Utah, Wyoming, and other parts of Colorado. Like the industrial users of North Fork coal, the power plants that use North Fork coal will also substitute coal from other sources. If a coal plant is part of a utility's larger portfolio of plants, then the utility will not only make fuel decisions about what coal to use at that plant, but whether to use other coal or more gas generation.

Comment: The Forest Service must consider the effects EPA's Clean Power Plan may have on the coal and energy markets.

ICF did not use EPA's v.5.15 Base Case, thus failed to account for the Clean Power Plan, which results in an overestimation of economic benefits in the cost-benefit analysis.

Explain how carbon price proxy is used in IPM v.5.13 in the SDEIS and discuss the states' flexibility in implementing the Clean Power Plan.

> **Response:** While the IPM v5.13 base case did not endogenously account for the final Clean Power Plan rule, the SDEIS considered the likely effects of a proposed carbon policy for the domestic energy sector through a future carbon price schedule. The majority of assumptions were obtained from EPA's IPM v5.13 base case. Although the Clean Power Plan was not finalized and the newer v5.15 was not available at the time of the SDEIS analysis, the proposed Clean Power Plan rule and its likely effects were recognized and integrated into ICF's modeling runs. Specifically, IPM® has the capability to model carbon polices as a price on carbon. In the SDEIS, ICF modeled a price on carbon from all electric generating sources as a proxy for the proposed Clean Power Plan. The modeled carbon price reflects the proposed rule, which covers CO_2 emissions only from the power sector (ICF, 2015a).Since this carbon price proxy was based on the proposed Clean Power Plan and not the final rule, v5.15 IPM Base Case was used in the SFEIS to provide further understandings regarding the final Clean Power Plan implications on the energy market. Specifics on the IPM v5.15 that EPA used for the final Clean Power Plan, and specifics about the Clean Power Plan are outlined in the SFEIS.
>
> The implementation of the Clean Power Plan will affect the competitiveness of coal-fired power generation in the domestic marketplace, consequently, influencing the projected market substitution of coal production resulting from the proposed action. Based on these potential implications, public comments and newly available information, an additional IPM modeling run was conducted by ICF using IPM v.5.15 Base Case in order to evaluate changes to market response factors under proposed actions. Specific changes to market responses from the mixture of energy production, electricity generation, and CO_2 emissions based on IPM v5.15 are shown in SFEIS Table 3-27.
>
> It is important to note that the Clean Power Plan provides states with flexibility in implementation, including the option to adopt various rate-based and mass-based trading programs to reduce CO_2 emissions. Due to this flexibility, upcoming legal challenges, as well as potential differences in the implicit stringency of the finalized state goals from the proposed Clean Power Plan, the generalized market responses projected for this analysis contain substantial uncertainties.

Comment: Do not conflates EPA's application of IPM with Forest Serve and ICF's modeling efforts. In the SEIS (Appendix C), change to "The coal prices produced by Forest Service/ICF IMP modeling are…"

> **Response:** Language in Appendix C has been edited: 'The Forest Service has adjusted coal supply curves developed by EPA in 2013 for purposes of this SDEIS, but all analysis, modeling, projections used in the SDEIS are solely the work of the Forest Service, and not EPA. It is important to note that EPA uses IPM to analyze the impact of air emissions policies on the U.S. electric power sector; but data and assumptions used by ICF in this analysis are not necessarily the same as used by EPA. However, ICF did use many of the EPA assumptions as documented in ICF (2016).' Because of these similarities and for ease of reference, this analysis uses IPM nomenclature (5.13 and 5.15) similar to EPA. Use of this nomenclature is not meant to indicate that the Forest Service has used IPM in the exact manner as EPA. See Appendix C for more detail regarding the Forest Service's use of IPM.

Comment: The SDEIS incorrectly assumes electricity demand will remain constant, regardless of price changes. The analysis needs to account for the price elasticity of demand.

There is a failure in the IPM model to account for price effects from increased coal quantity, which defies basic economics; NEMS is able to account for this.

Some of the elasticities should be clarified outside of IPM modeling.

> **Response:** There is no clear evidence to support the suggestion that making available a pre-determined quantity of coal would lower coal prices enough to cause an increase in electric demand in a decision of this magnitude. While it is true that under the law of demand 'a decrease in the own price of a normal good will cause quantity demanded to increase'; the responsiveness of how quantity demanded changes relative to a change in price is more nuanced (own-price elasticity) and depends upon numerous factors such as the availability of substitutes, length of adjustment period and the budget share spent on the good. In the case of electric power generation, the consumption of coal is generally, relatively unresponsive to prices (inelastic).
>
> The SDEIS acknowledged that change in consumption of fuels by power generating facilities, in response to changes in fuel prices, varies by supply region (e.g., natural gas-coal elasticity ranges from 0.05 to 0.38; -0.14 to -0.22 for coal's own price elasticity), as expected given differing market, technology, policy, and demand conditions across regions. (SDEIS p. 92) Electricity generation is typically price inelastic because many power plants are designed to operate with a particular fuel type and must operate within certain ranges because of reliability and environmental restrictions (compliance). The SDEIS (p. E-12) shows the estimated U.S. natural gas-coal elasticity of substitution (ranging from 0.05 to 0.38), suggesting lower potential for natural gas as a substitute for coal if the affordability or availability of coal were to change.
>
> There is also a lack of data supporting the phenomena where retail electric rates would decrease enough to cause a noticeable change in electric demand due to changes in fuel prices, in response to shifts in fuel supply of the magnitude modeled in this action. In this present case, evidence has not been presented to support the claim that electricity demand would change with the addition or subtraction of projected amounts of North Fork coal from the coal supply. The assumption that IPM does not incorporate the basic economic principle of price elasticity of demand is mistaken. In actuality, IPM does not hard-wire coal demand or coal plant dispatch; rather, the demand for coal is allowed to be determined in a competitive environment with other generating resources. This means that as the price for coal decreases, the demand for coal will increase.

It is also inaccurate to state that this analysis is inadequate because IPM does not include demand elasticity for electric demand. The relationship between fuel prices for electric generators and the retail rate of electricity is complex. First, while the new coal may have a lower cost of production than some existing mines, the price differential on a delivered basis is likely to be relatively small. As an example, on a minemouth basis, any given new mine might have a lower cost of 8–15% ($1 to 2/ton); however, on a delivered basis the price differential would be 2.5–5.0% if the total delivered cost was $40/ton. Therefore, the likelihood that making available "low cost coal reserves" would impact electricity prices under this decision is low.

There exists some evidence of the impact of fuel prices on electric rates with respect to natural gas. However, this does not directly applied to coal-powered electric generators. Since natural gas fired power plants are more often on the margin, the impact of lower natural gas prices should have a more pronounced impact on electric rates than would lower coal prices. Also, the decrease in natural gas prices applies to all natural gas fired plants and not just a small percentage of them. So given these two factors, one would conclude from general economic principles that a decrease in natural gas prices would result in lower electric prices and thus an increase in demand. But historical data on natural gas price and electric retail price show otherwise.

For the four year period between November 22, 2004 and January 16, 2009, natural gas prices were above $5/MMBtu for all but 24 days. In fact the average natural gas price for this period is well above $5/MMBtu at $7.76/MMBtu. By March 6, 2009, natural gas prices had fallen below $4/MMBtu and have generally stayed below $4.5/MMBtu, except for two short periods in 2009 and 2014. Between January 17, 2009 and July 28, 2015, the average Henry Hub natural gas price has been $3.75/MMBtu. Thus there has been a 51.6% decrease in the average natural gas price during these two periods, with each period lasting at least four years, which should be sufficient time to see an impact.

In fact, average U.S. retail electric prices obtained from Energy Information Administration show that retail electric rates between 2009 and 2014 increased at an average of 1.25% per year. From 2009 to 2013, the percentage of generation from natural gas was increasing from 23.3% to 27.5%, while the percentage of generation from coal was generally decreasing from 44.4% to 39.1%. This historical evidence refutes the assertion that this analysis must include electric demand elasticity or be rejected as inadequate.

As part of the sensitivity analysis in Appendix E of the SDEIS, a fraction of North Fork coal production is assumed to trigger an increase in electricity demand and therefore exempted from substitution – in order to help demonstrate the sensitivity of net benefits to assumptions of fixed electricity demand. When 5% of North Fork production is assumed to represent a net increase in coal demand (not subject to substitution), net benefits are only slightly lower (see p. E-22 of the SDEIS).

Comment: The SDEIS fails to take a hard look at the recent changes in the coal market which is a violation of NEPA. Since 2012 the demand for coal has decline. The SDEIS fails to explain why it assumes the market would rebound at some point in the future, which is contrary to market trends.

Response: The SDEIS acknowledged that demand for coal has declined in recent years (SDEIS, p. E-4). It was discussed that since 2013, coal prices in general have declined by 10% to 20%, although some prices started declining in 2012 and others, such Powder River Basin coal fell 20% to 30% in 2012 and have been gradually increasing. Coal prices have decreased recently due to lower demand because of milder weather and because of being displaced by natural gas, which has been at historically low prices. Between 2008 and 2013, U.S. coal

production fell by 187 million short tons (16%), as declining natural gas prices made coal less competitive as a fuel for generating electricity.

However, in the mid to long term, which is the focus of this analysis, coal prices are expected to increase above the low prices observed in 2015. Based on Energy Information Administration projection, (Annual Energy Outlook 2015 Reference case, EIA 2015c) U.S. coal production increases at an average rate of 0.7%/year from 2013 to 2030, from 985 million short tons (19.9 quadrillion Btu) to 1,118 million short tons (22.4 quadrillion Btu). Over the same period, rising natural gas prices, particularly after 2017, contribute to increases in electricity generation from existing coal-fired power plants as coal prices increase more slowly. After 2030, coal consumption for electricity generation levels off through 2040.

Price is also expected to increase according to Energy Information Administration's projection. The average minemouth coal price increases by 1.0%/year in the Annual Energy Outlook 2015 Reference case, from $1.84/million Btu in 2013 to $2.44/million Btu in 2040. Increases in minemouth coal prices (in dollars/million Btu) occur in all coal-producing regions. In Appalachia and in the West, increases of 1.2%/year and 1.5%/year between 2013 and 2040, respectively, are primarily the results of continuing declines in coal mining productivity (EIA, 2015d).

The Energy Information Administration also estimated the potential implication of implementing the Clean Power Plan. In the Base Policy case (Clean Power Plan) projected U.S. coal production in 2020 and 2025 is 20% and 32% lower relative to the Annual Energy Outlook 2015 baseline level in those years, respectively. But in 2040, it is projected that coal production will edge higher (but still remains 20% below the Annual Energy Outlook 2015 Reference case). The Interior and the West coal-producing regions account for most of the increase in production levels during this period. As for price, average delivered coal prices to the power sector are lower than the baseline cases in all of the Clean Power Plan cases analyzed by the Energy Information Administration. In the Base Policy case (Clean Power Plan), delivered coal prices fall to 13% below the underlying Annual Energy Outlook 2015 Reference case baseline levels in 2030, but rebound slightly to 10% below base in 2040 (EIA, 2015e).

The SFEIS presents net benefit results for two alternative coal market trends as represented by substitution response coefficients derived from IPM output assuming EPA's base-case v5.13 and EPA's base-case v5.15. The comparative net benefit results are presented in the FSEIS (see the *Cumulative Effects* part of the *Economics* section), demonstrating the effect of alternative assumptions about energy and electricity generating sector conditions.

Comment: The local economy's future depends on future coal extraction. The nation's economy needs access to inexpensive electricity provided by coal.

The SDEIS underestimates the significance of stable, well-paying employment provided by the coal industry.

The boom-bust cycles of the energy industry wreak havoc upon a local economy. Any job creation benefit is outweighed by the instability of these boom-bust cycles.

Response: The SDEIS highlights the total employment and labor income for the 6-county study area as well as the State of Colorado in 2013 for major industry sectors. The largest study area industries in terms of employment include construction, retail trade, real estate, accommodation/food services, and government. In terms of labor income, the SDEIS shows that mining, construction, manufacturing, information, transportation and the government sectors all show higher average labor income than both the State and the study area total employment averages (SDEIS pp. 88–89).

The estimated annual average economic impacts by alternative are contained in the SDEIS (pp. 94–95). Potential loss of jobs and associated labor income with no additional production associated with the North Fork Coal Mining Area has been disclosed. The energy market's fluctuations have been extensively discussed (SDEIS, p. E-4; EIA, 2015c). The DEIS further recognized that layoffs have occurred within the study area for the coal mining, oil/gas and dairy sectors, and the impact of the loss of direct jobs within any sector would be followed by changes to other sectors as the ripple effects of lost wages work their way through the economy. (SDEIS p. 89) The SDEIS also acknowledged that any new layoffs within a community can be difficult, from the directly affected workers, to real estate and local school enrollment (SDEIS, p. 90). Not all communities within the economic study area would be affected the same, some communities have diversified economies, attracted retiree populations, or are less dependent on coal mining. Those communities that are still dependent on coal mining would be most directly affected (SDEIS, p. 95).

Comment: The Forest Service must consider recreational tourism and the impact industrial uses of Roadless areas may have on tourism; recreation supports sustainable jobs/economy.

Response: The focus of this supplemental analysis is the reinstatement of the North Fork Coal Mining Area within the Colorado Roadless Rule and addressing Court-identified deficiencies. Impact to recreation and tourism within roadless areas was addressed within the 2012 Colorado Roadless Rule analysis and will not be considered in this document.

Comment: The SDEIS sets an arbitrary boundary for the economic study area. Two counties included are unlikely to be affect by coal operations.

The SDEIS ignores declining employment in the North Fork and basis its employment assumptions on historic employment of the Elk Creek mine which is closed.

Response: The economic impact analysis employed best available data at the time of the SDEIS – IMPLAN's 2013 input-output model – and have acknowledged that economic conditions in the local study area have changed since that time, therefore, may not fully reflect conditions in 2015. (SDEIS p. 71) Nonetheless, the present supplemental analysis focuses on the relative differences so that alternatives can be compared using the best available datasets. It is equally important to note that this SFEIS is a limited scope document that updates the 2012 FEIS.

In the 2012 FEIS, five western slope counties were included in the economic impact study area: Delta, Garfield, Mesa, Montrose, and Rio Blanco. Continuation of these five counties facilitates comparability between the 2012 FEIS and this supplemental. The SDEIS explained that while the mines and some employees are physically located in Gunnison County, they are economically connected with communities in Delta, Montrose, and Mesa Counties. Therefore, analogous to the 2012 FEIS, a customized IMPLAN model was developed for this supplemental analysis by incorporating coal mines located within Gunnison County. (SDEIS p. 73).

The economic impacts of each alternative are based on estimates of coal that may be leased and produced within the North Fork Coal Mining Area over the 15-year period, and not on the current number of operation, mine, or profitability. In this programmatic analysis, all recoverable coal within the North Fork Coal Mining Area was assumed to be economically viable. It is also noteworthy to mention that the economic impact results as shown in the SDEIS (pp. 94–95) were estimated via an Input-Output model generated production, employment and labor income multipliers (SDEIS pp. 72–73), and not the mere results of arithmetic accounting of the number of mines/employees in the area. In other words, results were derived from multipliers expressed in terms of output, job and income per $1MM final demand, and not a

simple aggregation of the number of jobs from any particular mines or other operations. Ultimately, among other factors, the total economic impact depends on the labor and technological productivities of industries across the regional economy.

Comment: The use of the SCC model and its output is arbitrary and capricious and a violation of the APA and Information Quality Act. SCC estimates should not be used until it undergoes rigorous notice, review and comment processes. The SCC model should not be used because it was developed in a flawed process, not required by the court, not designed for use in NEPA documents, and is so speculative that it is useless.

Response: The SDEIS prefaced the benefit-cost analysis by clarifying that the PNV analysis (incorporating SCC) is provided to respond to questions associated with Court-identified deficiencies, which extends the scope and methodology well beyond the traditional use of benefit and cost analysis performed for public land use decisions and are not required by NEPA (40 CFR 1502.23). (SDEIS p. 71) The SDEIS also discusses at length on the limitation and provisional nature of IWG's SCC protocol (SDEIS pp. 75–76, pp. 83–86, and E16–E18).

The IWG's SCC protocol does not violate the Administrative Procedure Act nor the Information Quality Act because IWG has provided detailed explanations and justifications for the data, assumptions, and models used to estimate the SCC. The additional Office of Management and Budget public comments solicitation provided a further opportunity for the public to comment on the data, assumptions, and models used in developing the SCC estimates. Responses to those comments are available online through the White House (2015b) website.

Comment: The IWG should update is socio-economic assumptions to reflect the latest shared socio economic pathways.

Response: The IWG acknowledges those scenarios chosen are not precise characterization of the baseline but believes it is a reasonable approach at present, in light of data limitations. The IWG will continue to follow and evaluate the latest science on socioeconomic-emissions scenarios and seek external expert advice on the technical merits and challenges of potential approaches to update these scenarios in future revisions to the SCC estimates.

Comment: The SDEIS did not address the benefits and costs of the destruction of homes and businesses that would be under water due to rising ocean levels or attempt to quantify the human misery of those affected.

Response: The IWG's SCC estimates were developed with a number of models; some have explicitly incorporated select catastrophic effects, disease, and CO_2 fertilization in the damage functions (although the treatment may not be complete). In fact, the IWG undertook the 2013 revision because of updates to the models, which include new or enhanced representation of certain impacts, such as sea level rise damages. The IWG agrees that it is important to update the SCC periodically to incorporate improvements in the understanding of GHG impacts and will continue to follow and evaluate the latest science on impact categories that are omitted or not fully addressed in the IAMs.

Comment: The SEIS should be revise the description of what the IWG's SCC is (and isn't) and delete entirely the incorrect and misleading comparison of SCC and observed carbon credit prices.

Response: The SDEIS appropriately discloses the process and caveats associated with the IWG's SCC protocol (SDEIS pp. 75–76; pp. 83–86 and E-16–E-18), and in various instances, directly quoting IWG's SCC technical support document (for example, SDEIS, p. E-17). Observed carbon credit price is referenced in the SDEIS to allow for a discussion on the preferred method for evaluating non-market benefits. This discussion is suitable in the SDEIS because observed or revealed prices are established sources of information about value and are

the preferred method for evaluating non-market benefits, when possible, in accordance with Forest Service direction (Forest Service Handbook 1909.17; Forest Service Manual 1970) and Office of Management and Budget Circular for conducting benefit-cost analysis in support of rulemaking (OMB, 2003).

The public is likely aware of carbon credit prices, and the Forest Service discusses those prices and their differences with respect to SCC values in the SDEIS (see pages E-17 to E-18). The Forest Service does not claim that carbon credit prices represent discounted social costs of GHG, nor serve as substitutes for the range of potential social costs captured by SCC values. Instead, the Forest Service distinguishes between these two types of available values, notes the relevance of using SCC values for this analysis, and adopts carbon credit prices simply as thresholds to help apply SCC values to characterize lower-end estimates of net benefits. The inclusion of discussions about carbon credit prices is not misleading, but rather provides a more thorough understanding of available information about different sources of values, consistent with economic practice and Forest Service policy.

Comment: Social cost of methane should not be used until it undergoes a more rigorous notice, review and comment process.

SCM should be included in order to meet the NEPA hard look requirement.

The SDEIS failed to address the indirect costs of GHG gases and the enormous climatic costs associated with the release of methane, which is unknown. The social cost of methane should be used in in the economic analysis of GHG impacts.

The SCC analysis in the SDEIS is underestimated and should account for methane emissions because they appear to be substantial.

The SCM results should be part of the main BCA, and not relegated as part of a sensitivity analysis.

SCC and SCM are appropriate protocols for use in the SEIS analysis.

Response: Methane emissions were considered in the SDEIS with SCC values as proxy (SDEIS, pp. E-24 to E-25). Due to public comments and newly available information, the methane emission impacts are monetized in the main analysis of the FEIS using the SCM estimates published by Marten et al. (2015) and recently incorporated into an Addendum to the SCC Technical Support Document (IWG 2016b). SCM is a measure of the monetary value of the damages occurring both within and outside economic markets as the result of an additional unit of methane emissions.

The SCM estimates used in the FEIS are consistent with the methodology and modeling assumptions underlying the IWG's SCC estimates. The methodology and estimates described in Appendix C of the SFEIS have undergone multiple stages of peer review and their use in regulatory analysis has been subject to public comment.

The IWG's SCM estimates are presented with an acknowledgement of the limitations and uncertainties involved and with a clear understanding that they should be updated over time to reflect increasing knowledge of the science and economics of climate impacts, just as the IWG committed to do for SCC. The National Academy of Science, Engineering, and Medicine is currently reviewing the latest research on modeling the economic aspects of climate change to inform future revisions to the SCC estimates. While the Academies' review focuses on the SCC methodology, recommendations on how to update many of the underlying modeling assumptions will also likely pertain to the SCM estimates. The IWG will evaluate its approach based upon any feedback received from the Academies.

Comment: The 10th percentile lower bound SCC value should be abandoned, as it is not suggested by the IWG; There is no economic foundation for the Forest Service's choice to include a 10th

percentile estimate in a misguided attempt to balance out the 95th percentile estimate and "complete" the range.

Response: In this SFEIS, the Forest Service has eliminated the 10th percentile values in response to public and agency comments and for consistent application of the Technical Support Document. The SDEIS used a fifth SCC value to represent a 10th percentile of the SCC at a 3% discount rate. From the Office of Management and Budget, the Forest Service obtained the Monte Carlo simulation results used to generate the 95th percentile SCC estimates for the 3% discount rate (as cited in IWG, 2015) and calculated the 10th percentile SCC estimates. The 10th percentile SCC values were used to calculate social costs for the global accounting stance. Domestic 10th percentile SCC values (i.e., 7% to 23% of the global 10th percentile SCC values) are lower than typical ranges of market prices for carbon credits and therefore too low to be representative of social costs. The full set of PNV results including the 10th percentile SCC and SCM values were presented in the SDEIS, as discussed in the *Economics* section.

In 2015, the IWG (co-chaired by the Office of Management and Budget and Council of Economic Advisers) asked the National Academy of Sciences, Engineering, and Medicine to review the latest research on modeling the economic aspects of climate change to inform future revisions to the SCC estimates. In January 2016, the Academies' Committee on the Social Cost of Carbon issued an interim report that recommended against a near-term update to the SCC estimates, but included recommendations for enhancing the presentation and discussion of uncertainty around the current estimates. The Academies' final report will provide longer term recommendations for a more comprehensive update.

The recent revision to the Technical Support Document (IWG 2016a) responded to these recommendations in the presentation of the current estimates and through the release of the full set of SCC (both carbon dioxide and methane) results on the Office of Management and Budget website, which had previously been available upon request, for easy access when an agency determines that it is appropriate to conduct additional quantitative uncertainty analysis. In the SDEIS, the Forest Service included an additional analysis based on the 10th percentile of the frequency distribution based on a 3% discount rate. In this SFEIS, the Forest Service has eliminated the 10th percentile values in response to public and agency comments and for consistent application of the Technical Support Document.

Comment: The Forest Service inappropriately applied a Forest-Level and national-level Cost-Benefit Analysis that Is Inconsistent and Not Endorsed by the IWG or any other Federal Agency.

Only the Global boundary accounting stance using a 2.5 and 3% rates should be used.

Inappropriate in the context of climate change and inconsistent with uniform agency practices; misleading results.

> **Response:** The SFEIS uses only the Global Boundary stance and the discount rates in the TSD due to the global nature of climate change and in response to public and agency comments.

Comment: The 7% downscaling factor comes from the IWG's downscaling of the Social Cost of Carbon to the national level and is based on one of the models [FUND] that was used to create the Social Cost of Carbon, which estimated that the U.S. represented 7% of the global damages associated with global warming at a 2.5% discount rate. Therefore, to apply the 7% factor to any other discount rate other than 2.5 is a misapplication of the IWG estimates for downscaling, and implies that the analyst believes one [FUND] of the three models has an advantage over the combination of the three different models that the IWG used.

Response: The Forest Service appreciates this comment. However, this issue is now moot as the national boundary stance has been removed and the cost benefit analysis now focuses on the global boundary stance.

Comment: Due to the speculative nature of the analysis, the anticipated benefits should be qualified and softened so they are discussed on equal footing with the potential impacts. The SDEIS conveys a false sense of precision. A better path include figures, present results in ranges, better qualifiers, etc.

Response: Results are presented in a variety of ranges and scenarios in the SFEIS, and the level of rounding is appropriate. Various uncertainties, including speculative natures of the analysis are adequately qualified throughout the benefit-cost analysis (SDEIS, pp. 74–82; p. 101; pp. E-20–E-25).

Comment: There appears to be a typographical error in table 3-21, page 99 of the SDEIS. The text indicates that national benefits and global benefits are identical, but in the table the upper estimates for each of those two scenarios do not match ($2,410 vs $2,614).

Response: Thank you for your comment, the figures in the SFEIS have been revised due to new benefit-cost results.

Comment: The term “present net value” should be replaced with standard benefit-cost analysis terminology.

Response: Forest Service’s directives provide policy and principles for conducting economic and social evaluation of programs, resource plans, and projects in the agency (FSM 1970). In the handbook that sets forth guidance for evaluating economic efficiency, “Present Net Value” is defined as “the present benefit value (PVB) of the stream of benefits less the present cost value (PVC) of the schedule of costs. It can be expressed in the following equation: PNV = PVB – PVC” (FSH 1909.17, Chapter 10). As such, this definition of PNV is employed appropriately throughout the SDEIS and analogous to the term “Net Present Value.”

Comment: The SDEIS fails to adequately consider environmental justice impacts of climate change.

Response: Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires Federal agencies to focus on the environmental and human health conditions in minority and/or low-income communities with the goal of achieving environmental justice.

A fundamental basis for Executive Order 12898, which directed Federal agencies to make environmental justice a priority, is to ensure that all Americans are equally protected from adverse environmental effects or impacts.

With respect to each Federal agency’s environmental justice program, the Executive Order mandates objectives in the following areas: (1) identify disproportionately high and adverse human health or environmental effects on minority and low income populations; (2) coordinate research and data collection; (3) conduct public meetings; and (4) develop interagency model projects.

The 2012 FEIS identified low-income and minority populations of those areas most likely to be impacted by the provisions of the 2012 Colorado Roadless Rule on the 4.2 million acres of CRAs. The identification of these populations and the potential impacts have not changed with this supplement so no additional analysis is needed.

As highlighted in the comments, we recognize that there is a global consideration to climate change and related impacts to low-income and minority populations. The atmosphere does not discern whether emissions come from large or small projects. When considering the cumulative nature of climate change, each source of GHGs contributes to the global, long-term problem.

The following is a discussion of the general social and economic impacts to low-income and minority populations related to climate change.

Relevant Top-Level Findings from the Working Group II AR5 Summary for Policy Makers, Climate Change 2014 – Impacts, Adaption, and Vulnerability Intergovernmental Panel on Climate Change (IPCC, 2015).

- In recent decades, changes in climate have caused impacts on natural and human systems on all continents and across the oceans.
- At present the worldwide burden of human ill-health from climate change is relatively small compared with effects of other stressors and is not well quantified.
- Differences in vulnerability and exposure arise from non-climatic factors and from multidimensional inequalities often produced by uneven development process (very high confidence). These differences shape differential risks from climate change.
- Climate-related hazards exacerbate other stressors, often with negative outcomes for livelihoods, especially for people living in poverty (high confidence).
- Global economic impacts from climate change are difficult to estimate.
- Until mid-century projected climate change will impact human health mainly by exacerbating health problems that already exist (very high confidence). Throughout the 21st century, climate change is expected to lead to increases in ill-health in many regions and especially in developing countries with low income, as compared to a baseline without climate change (high confidence).
- Climate change over the 21st century is projected to increase displacement of people (medium evidence, high agreement).Throughout the 21st century, climate-change impacts are projected to slow down economic growth, make poverty reduction more difficult, further erode food security, and prolong existing and create new poverty traps, the latter particularly in urban areas and emerging hotspots of hunger (medium confidence).

At present, the ability to estimate global impacts from climate change on minority and low-income populations is limited. It is also uncertain how to accurately separate global activities that contribute to climate-related impacts to minority and low-income populations from the potential impacts from future mining projects that may occur in the North Fork Coal Mining Area. Future site-specific NEPA analysis would occur on any coal mining lease proposal in this area, and would provide a more accurate accounting of any disproportionate and adverse impacts to the local area, it would be difficult to determine how a project in this area would impact specific environmental justice populations globally.

Other Comments and Requests

Comment: Your analysis of the effects on Cultural Resources is virtually non-existent. In Table 3.6 you state that Traditional cultural properties and sacred sites are at risk of being damaged, looted or destroyed, yet nowhere in the document do you discuss the National Historic Preservation Act Section 106 process.

Response: There is no ground-disturbing activity associated with this decision. In the case of this rulemaking, the Colorado State Historic Preservation Office was informed of the finding of no potential to cause effects to historic properties. Any future undertakings are subject to existing laws and regulations and will require compliance with the implementing regulations of the National Historic Preservation Act. This supplemental analysis was completed to address deficiencies found by the Court; the analysis and coordination completed in 2012 with the Colorado State Historic Preservation Office was not one of the deficiencies identified by the

Court. Section 106 coordination was completed for this SEIS and rulemaking effort and is on file in the project record, but not outlined specifically in the supplemental documentation.

Comment: Coal mining must not be introduced to the forest to ensure species diversity, protect the air, protect waterways, and ensure tourism continues.

Response: The Forest Service continues to manage NFS lands according to the laws and polices set forth by Congress, including the Mining and Minerals Policy Act of 1970 (30 USC 21((a)), as well as the Multiple-Use Sustained-Yield Act of 1960, the Clean Air Act of 1963, the Endangered Species Act of 1973, the National Environmental Policy Act of 1970 the Clean Water Act of 1972, and the National Forest Management Act of 1976.

Comment: Rural areas could make a lot of money from drought resistant farming if we would fix our rail lines. Make Arch build more rail lines rather than more roads.

Response: The Forest Service is not familiar with the success of drought resistant farming in and around the North Fork Valley. And the agency is also not familiar with problems with the existing railing lines. It is not within the authority of the Forest Service to make companies build infrastructure that is outside the Forest Service purview.

Comment: The disaster left by the coal mine will result in an area degraded by increased erosion.

Response: The proposed action does not authorize any ground-disturbing activities. Any future site-specific proposals for coal exploration, leasing, or permitting would be subject to project-level environmental analysis and would be subject to performance standards, mitigation measures, and reclamation requirements (including erosion control) in existing laws including the Surface Mining Control and Reclamation Act, State-specific coal statutes, Executive Orders, USDA and Forest Service policies, and the Clean Water Act.

Comment: Areas of deforestation have been known to harbor more disease, increased vulnerability to natural disasters and increased frequency of these disasters.

Response: The present alternatives and decision to be made would not result in deforestation. Any specific project that arose from this decision would undergo project-level environmental review and analysis. If applicable the impacts to forested and non-forested vegetation would be analyzed and disclosed, particularly in relation to forest health and disturbance events within and outside of the historic range of variation for each of those ecosystems.

Comment: The proposed action is not in the public interest because it would release climate pollution, waste methane, adversely impact the global economy and environment with billions in climate damages, degrade high elevation-forests and wildlife habitat, and benefit only one company – now bankrupt Arch Coal.

The new decision should be based on the SDEIS analysis and not the prior deals made. The SDEIS demonstrates the 2012 FEIS was wrong in its conclusion the Rule would have little impact on climate change.

Response: The Secretary of Agriculture will consider the public interest, SFEIS, comments received on the SDEIS, and additional information contained in the project record as needed to determine whether to reinstate the North Fork Coal Mining Area exception.

Comment: Comments were received urging the selection of a certain alternative for multiple reasons. Support and opposition were voiced for all the alternatives presented in the SDEIS. The majority of comments urged the selection of Alternative A, the no action alternative, for a wide variety of reasons including, but not limited to: adverse impacts to roadless areas, climate change, local real estate values, wildlife habitat, listed species, recreation values and human health/safety; ecosystem services are greater than the benefits of the coal; social cost and damage to the global environment;

contribution to social unrest; undermining of the renewable energy industry; coal is available elsewhere; lack of rationale presented in the SDEIS for selection of an action alternative; and lack of need.

Reasons commenters gave for the selection of Alternatives B included, but were not limited to: the multi-year collaborative effort to develop the 2012 final rule; mining jobs are among the highest paying jobs in the area; quality of North Fork Valley coal; impacts to local economies; and U.S. energy needs. Reasons commenters gave for selection of Alternative C included, but were not limited to: it protects the most sensitive and wilderness capable areas while providing economic opportunities; and protects nearly as much resources as Alternative A.

> **Response:** The Secretary of Agriculture will consider the public interest, SFEIS, comments received on the SDEIS, and additional information contained in the project record as needed to determine whether to reinstate the North Fork Coal Mining Area exception.

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