APPENDIX A:
MAPS

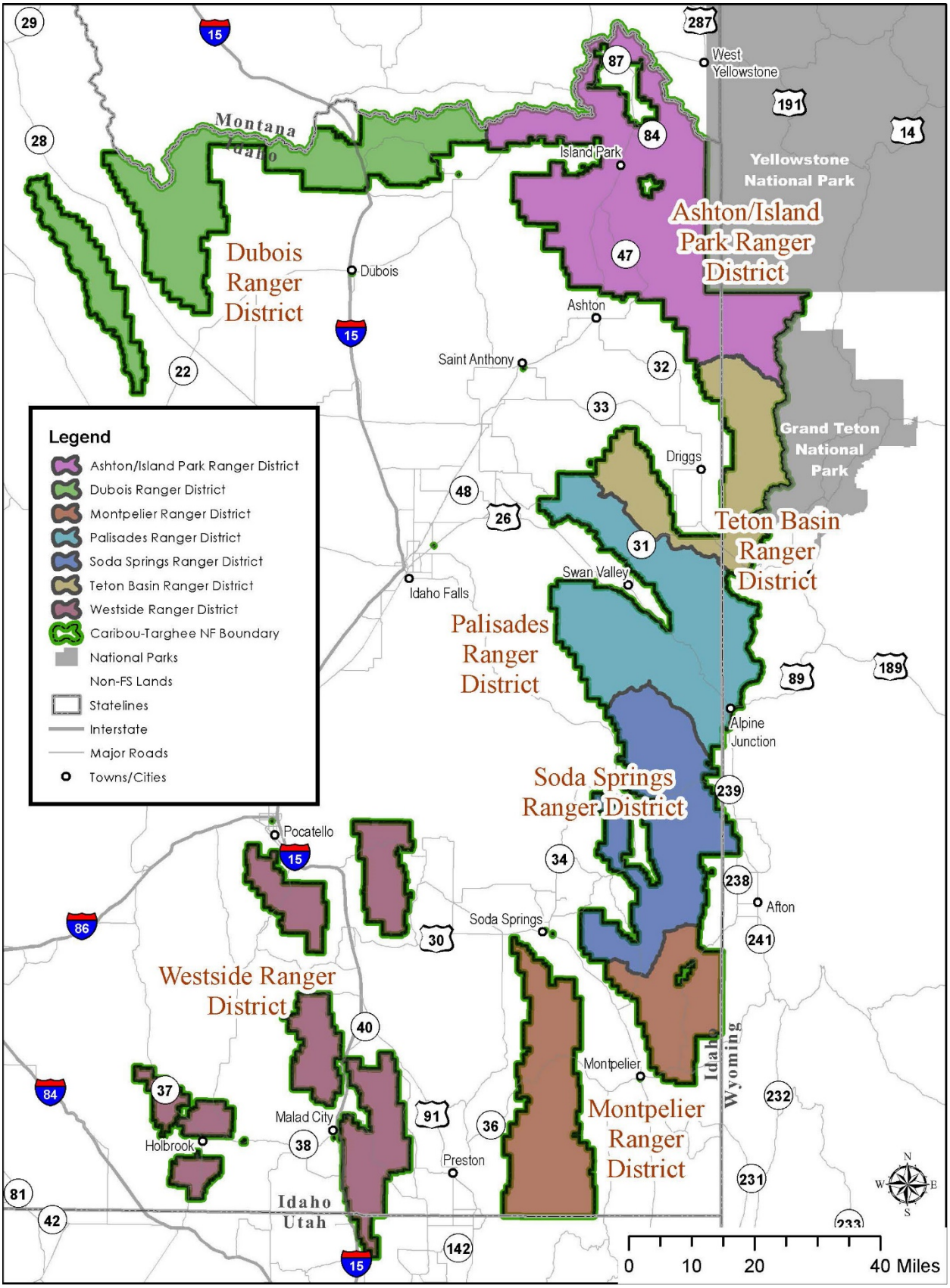

Figure A-1. Location of Caribou-Targhee National Forest (CTNF) and Curlew National Grassland (CNG) ranger districts.

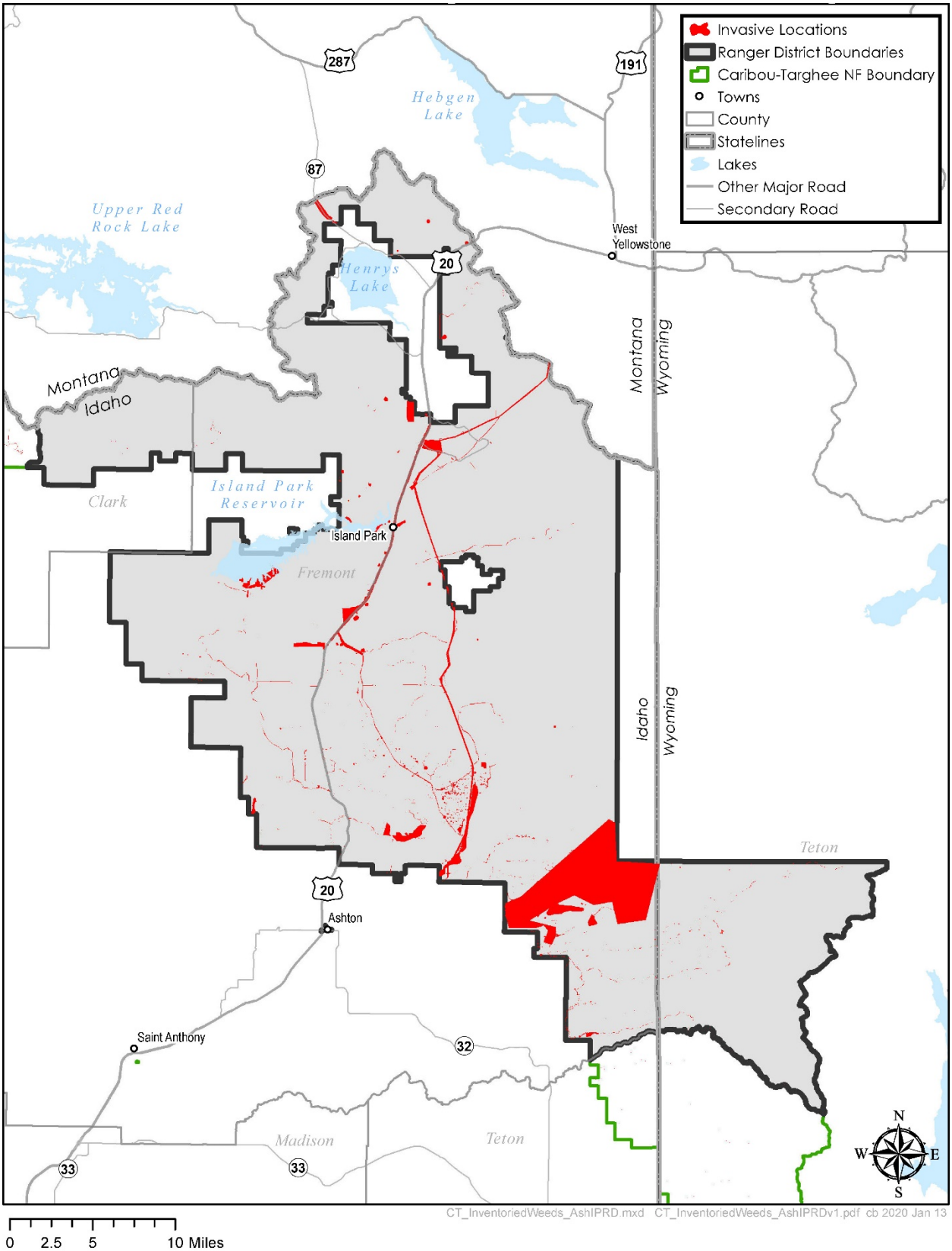

Figure A-2. Inventoried noxious weed locations by district—Ashton/Island Park Ranger District.

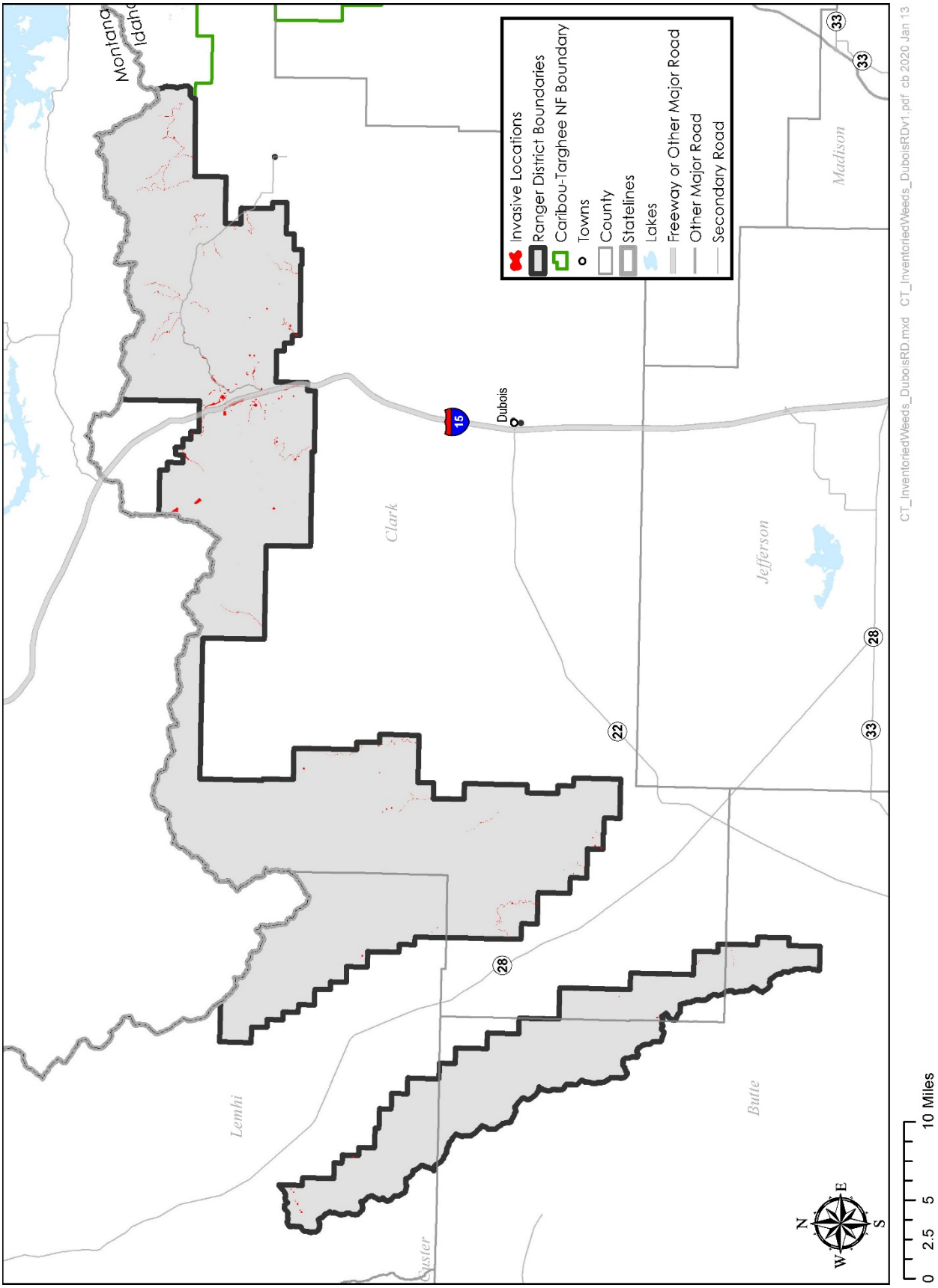

Figure A-3. Inventoried noxious weed locations by district—Dubois Ranger District.

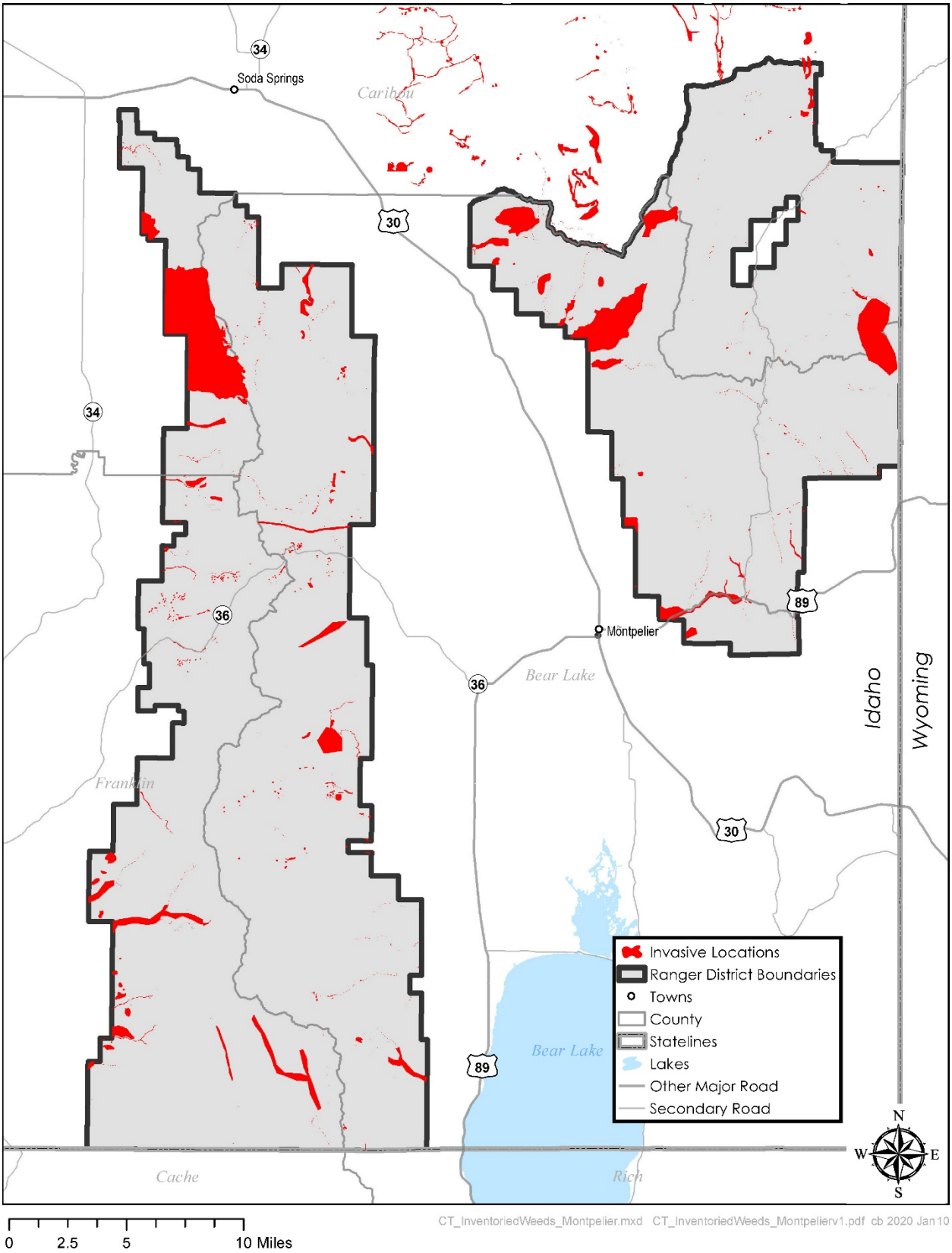

Figure A-4. Inventoried noxious weed locations by district—Montpelier Ranger District.

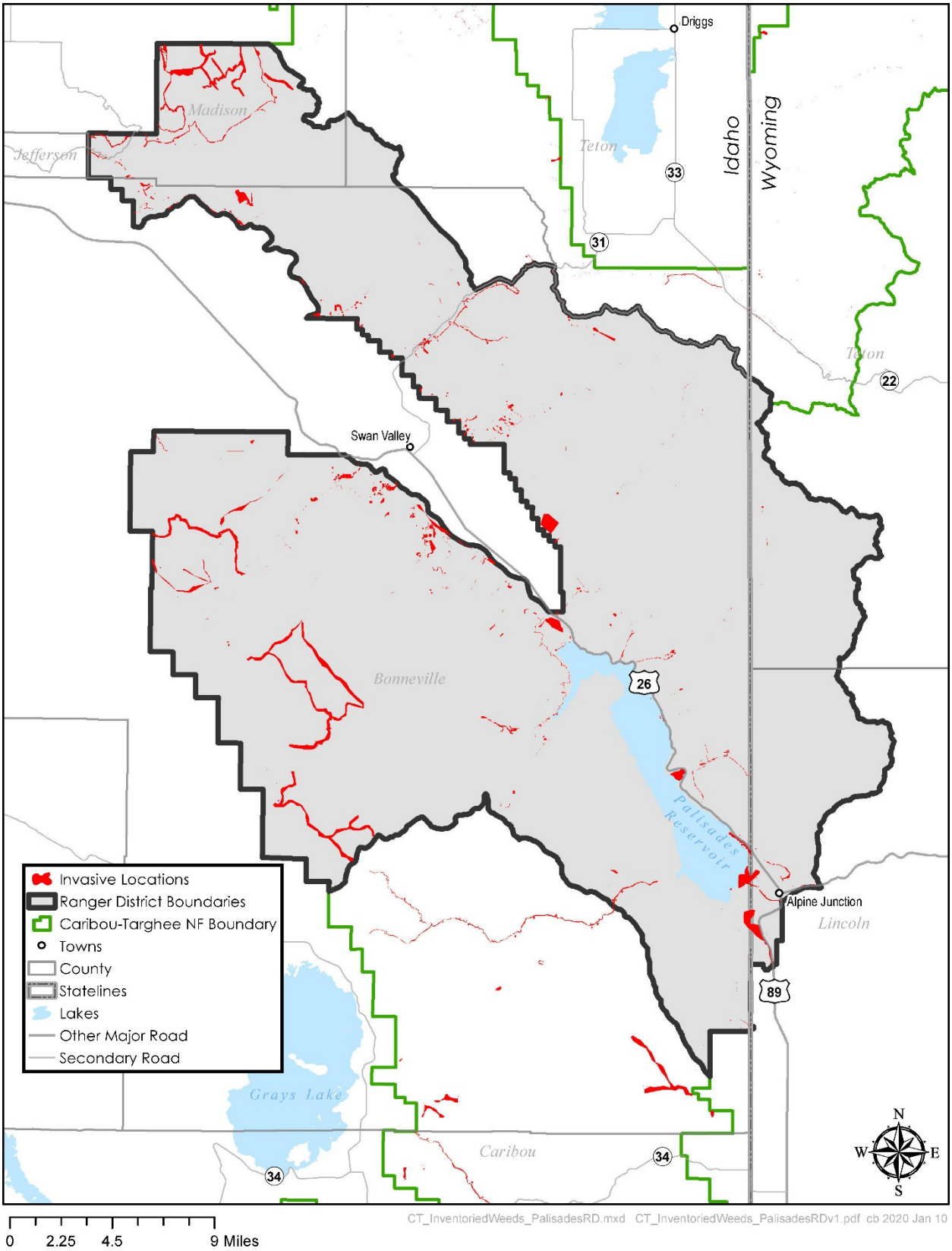

Figure A-5. Inventoried noxious weed locations by district—Palisades Ranger District.

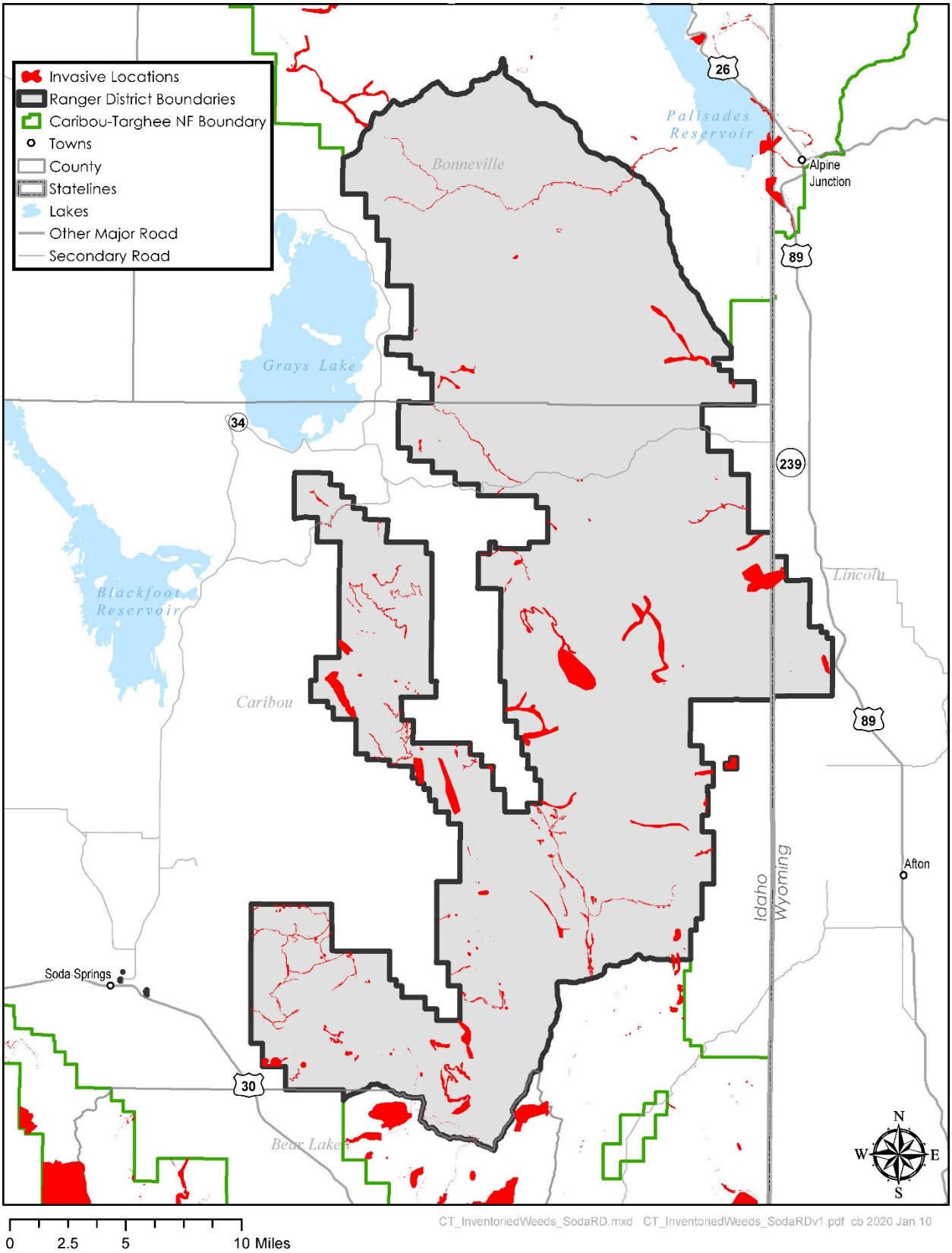

Figure A-6. Inventoried noxious weed locations by district—Soda Springs Ranger District.

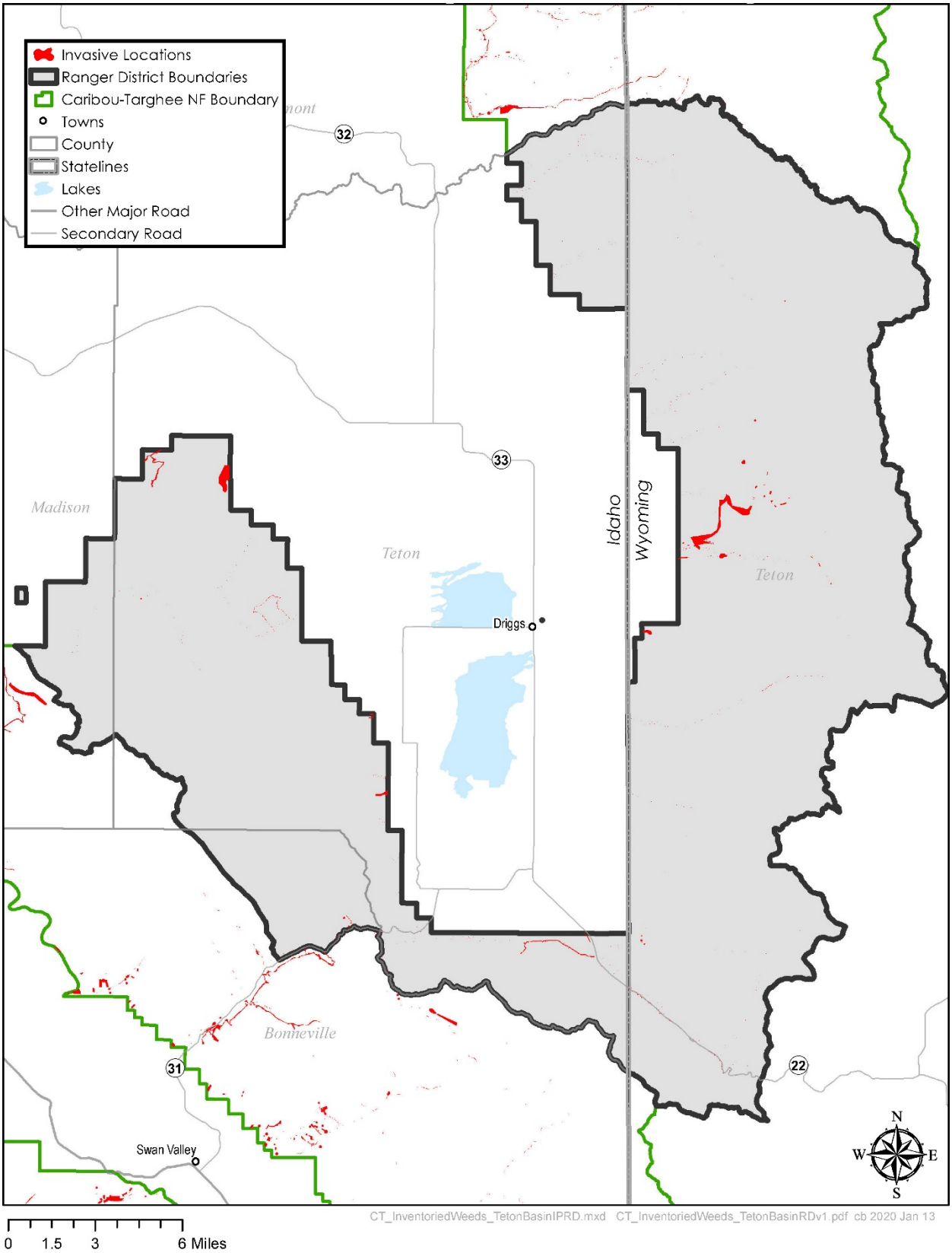

Figure A-7. Inventoried noxious weed locations by district—Teton Basin Ranger District.

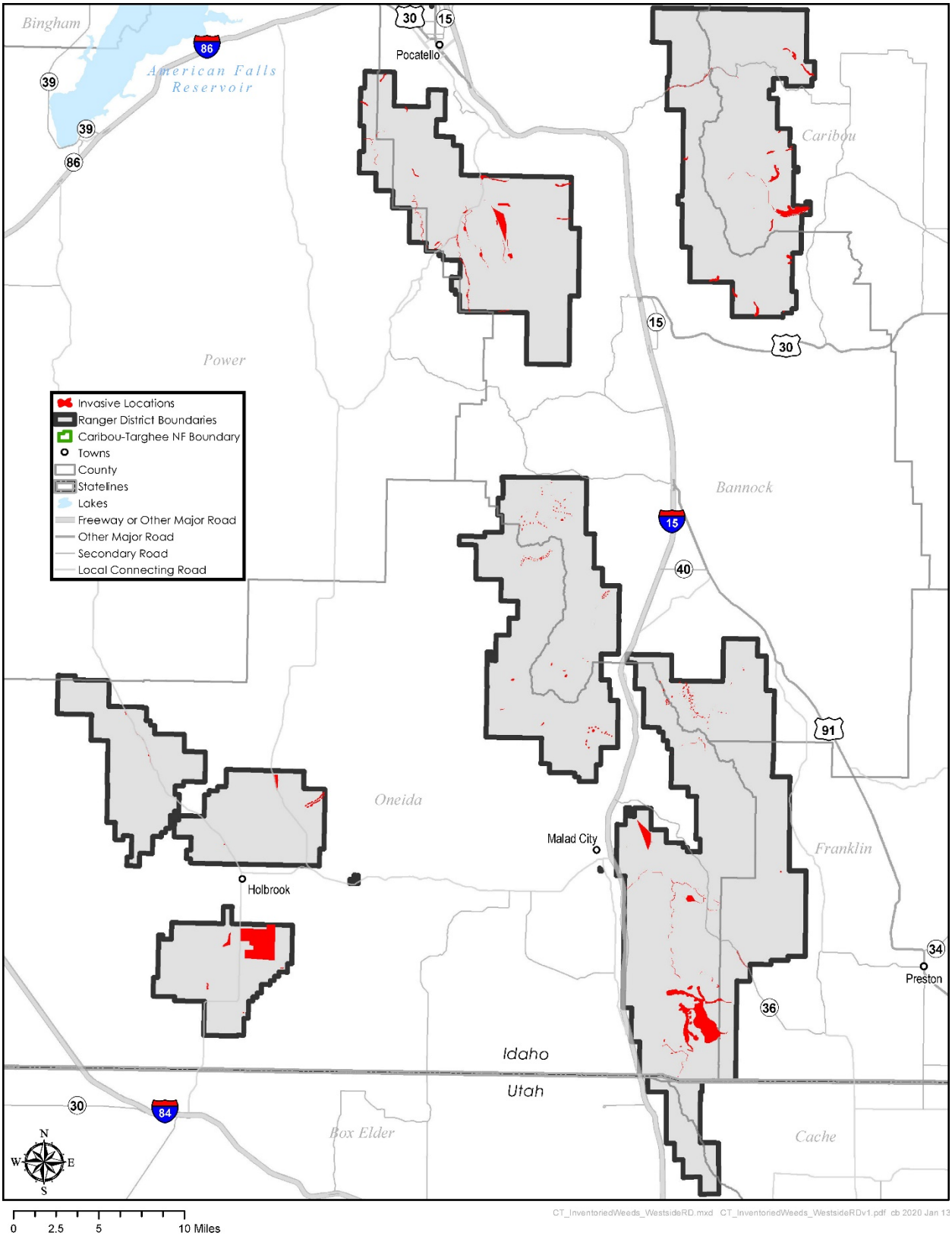

Figure A-8. Inventoried noxious weed locations by district—Westside Ranger District.

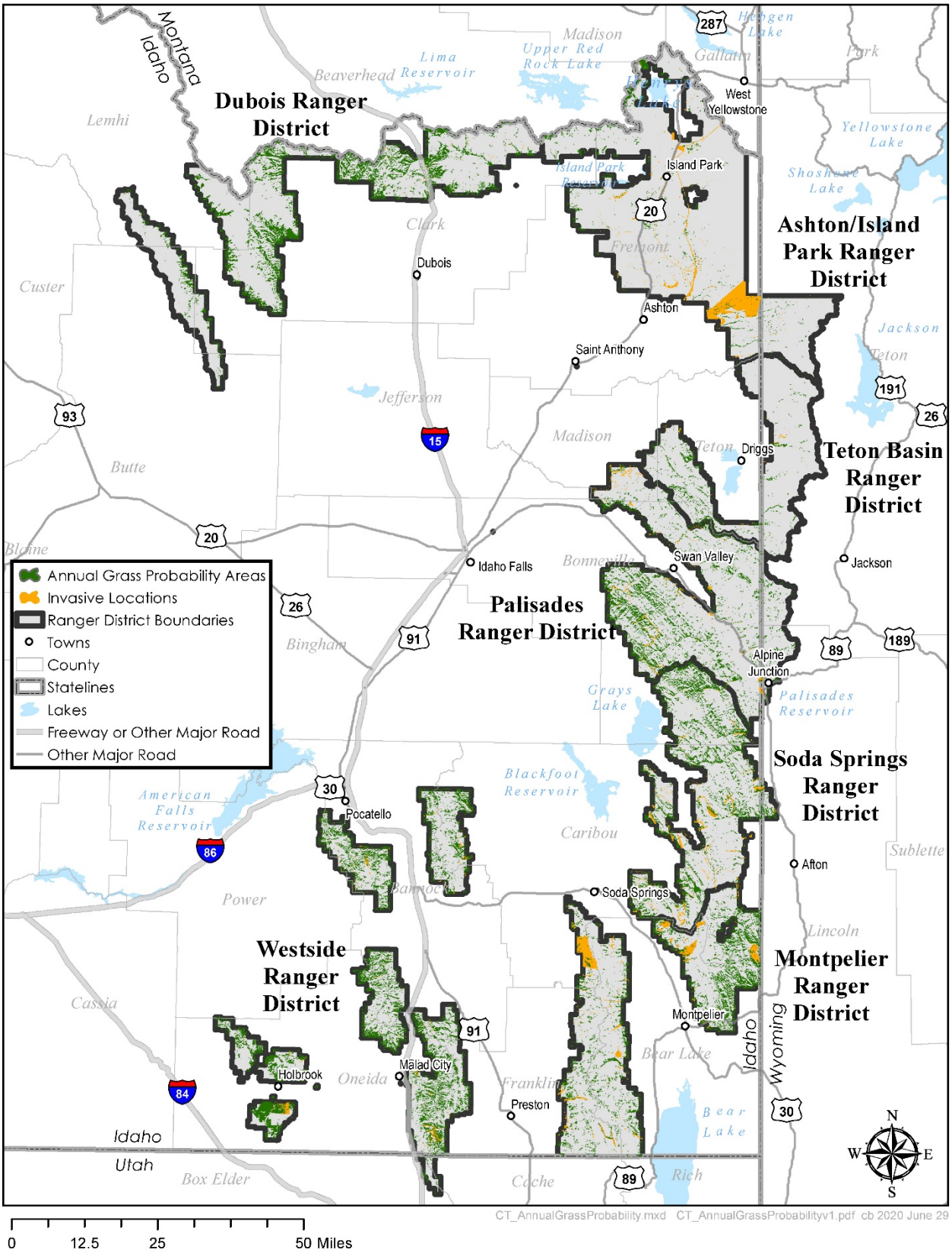

Figure A-9. Annual grass probability areas and invasive species locations by ranger district.

APPENDIX B:
TREATMENT OPTIONS BY TARGET SPECIES

APPENDIX B: TREATMENT OPTIONS BY TARGET SPECIES

Table B-1 summarizes commonly used, species-specific, integrated control measures that would be applied to known noxious weed species in the CTNF and CNG. The table displays a range of effective treatment options. Different treatment choices may be used based on circumstances such as new Endangered Species Act (ESA) consultation requirements, information on treatment effectiveness, and availability of new products. The priority and intensity of treatment needed varies widely based on site conditions, resources at risk from invasion, and the range and aggressiveness of individual target species.

Table B-1. Range of effective treatment options by target species.

NOXIOUS WEED	TREATMENT METHOD[a]		
	Biological	Chemical[b]	Mechanical
Russian knapweed (*Acroptilon repens*)	*Subanguina picridis, Jaapiella ivannikovi* Target grazing	triclopyr + clopyralid; picloram; clopyralid + 2,4-D; clopyralid; aminopyralid; aminopyralid + metsulfuron; aminopyralid + 2,4-D; glyphosate; 2,4-D; chlorsulfuron	Pulling and hoeing
Hoary alyssum (*Berteroa incana*)	None available	metsulfuron; chlorsulfuron, +2,4-D	Pulling
Cheatgrass (*Bromus tectorum*)	Non currently available Target grazing	Imazapic, Imazapic+glyphosate, glyphosate, sulfometuron methyl+chlorsulfuron	Hand pulling and mowing prior to seed production for small infestations
Whitetop (*Cardaria draba*)	Target grazing	metsulfuron; metsulfuron+2,4-D; chlorsulfuron; metsulfuron + chlorsulfuron; 2,4-D	Not effective
Musk thistle (*Carduus nutans*)	*Rhinocyllus conicus, Trichosirocalus horridus* Target grazing	chlorsulfuron; metsulfuron; metsulfuron + dicamba + 2,4-D; metsulfuron + chlorsulfuron; triclopyr + clopyralid; clopyralid; aminopyralid; aminopyralid + metsulfuron; aminopyralid + 2,4-D; picloram; clopyralid + 2,4-D; dicamba; 2,4-D; glyphosate + 2,4-D	Mowing and hoeing
Diffuse knapweed (*Centaurea diffusa*)	*Cyphocleonus achates, Larinus minutus,Sphenoptera jugoslavica, Urophora affinis, Urophora quadrifasciata, Bangasternus fausti, Pterolonche inspersa* Target grazing	clopyralid + triclopyr; picloram; clopyralid; aminopyralid; aminopyralid + metsulfuron; aminopyralid + 2,4-D; clopyralid + 2,4-D; glyphosate; 2,4-D	Pulling and hoeing
Spotted knapweed (*Centaurea biebersteini*)	*Agapeta zoegana, Bangasternus fausti, Chaetorellia acrolophi, Cyphocleonus achates, Larinus minutus, Larinus obtusus, Metzneria paucipunctella, Sphenoptera jugoslavica, Terellia virens, Urophora affinis, Urophora quadrifasciata* Target grazing	triclopyr + clopyralid; picloram; clopyralid + 2,4-D; clopyralid; aminopyralid; aminopyralid + 2,4-D; 2,4-D; glyphosate	Pulling and hoeing
Rush skeletonweed (*Chondrilla juncea*)	*Cystiphora schmidti, Eriophyes chondrillae, Puccinia chondrillina, Bradyrrhoa gilveolella* Target grazing	clopyralid; aminopyralid; aminopyralid + metsulfuron; picloram; metsulfuron + chlorsulfuron; 2,4-D	Mowing
Oxeye daisy (*Leucanthemum vulgare*)	Target grazing	metsulfuron; aminopyralid; aminopyralid + metsulfuron; aminopyralid + 2,4-D; picloram; clopyralid	Pulling and hoeing
Canada thistle (*Cirsium arvense*)	*Rhinocyllus conicus, Urophora cardui, Hadroplontus litura* Target grazing	clopyralid + triclopyr; clopyralid; aminopyralid; aminopyralid + metsulfuron; aminopyralid + 2,4-D; picloram; metsulfuron + chlorsulfuron; metsulfuron + dicamba + 2,4-D; chlorsulfuron; glyphosate; dicamba	Not effective

Table B-1. (Cont.)

NOXIOUS WEED	TREATMENT METHOD[a]		
	Biological	Chemical[b]	Mechanical
Field bindweed (*Convolvulus arvensis*)	*Aceria malherbae, Tyta luctuosa*	dicamba; picloram; dicamba + 2,4-D; metsulfuron + dicamba + 2,4-D; metsulfuron; metsulfuron + chlorsulfuron; glyphosate; 2,4-D	Not effective
Houndstongue (*Cynoglossum officinale*)	None available	metsulfuron; aminopyralid + metsulfuron; imazapic; metsulfuron + dicamba + 2,4-D; picloram	Pulling and hoeing
Leafy spurge (*Euphorbia esula*)	*Aphthona cyparissiae, Aphthona czwalinae, Aphthona flava, Aphthona lacertosa, Aphthona nigriscutis, Hyles euphorbiae, Oberea erythrocephala* Target grazing	imazapic; picloram + 2,4-D; picloram; glyphosate; dicamba	Mowing
Black henbane (*Hyoscyamus niger*)	None available	metsulfuron; picloram; dicamba; metsulfuron + chlorsulfuron; metsulfuron + dicamba + 2,4-D	Pulling, hoeing, and mowing
Common St. John's Wort (*Hypericum perforatum*)	*Agrilus hyperici, Aplocera plagiata, Chrysolina hyperici, Chrysolina quadrigemina*	2,4-D; metsulfuron; glyphosate; imazapic; picloram; fluroxypyr	Not effective
Dyer's woad (*Isatis tinctoria*)	Target grazing	metsulfuron; chlorsulfuron; metsulfuron + dicamba + 2,4-D; metsulfuron + chlorsulfuron	Pulling
Perennial pepperweed (*Lepidium latifolium*)	Target grazing	chlorsulfuron; metsulfuron; aminopyralid + metsulfuron; metsulfuron + chlorsulfuron; glyphosate; 2,4-D; imazapyr; metsulfuron + dicamba + 2,4- D; metsulfuron + chlorsulfuron	Mowing
Dalmatian toadflax (*Linaria dalmatica*)	*Brachypterolus pulicarius, Mecinus janthinus, Calophasia lunula*	chlorsulfuron; metsulfuron; picloram + chlorsulfuron; picloram; dicamba	Pulling
Yellow toadflax (*Linaria vulgaris*)	*Brachypterolus pulicarius, Calophasia lunula,Gymnetron antirrhini, Mecinus janthinus*	chlorsulfuron; picloram + chlorsulfuron; picloram + metsulfuron; picloram; dicamba	Pulling
Scotch thistle (*Onopordum acanthium*)	Target grazing	chlorsulfuron; metsulfuron; clopyralid + 2,4-D; clopyralid; aminopyralid; picloram; dicamba; 2,4-D	Hoeing
Knotweed (*Polygonum arenastrum*)	Target grazing	Imazapyr; glyphosate	Cut stem
Sulphur cinquefoil (*Potentilla recta*)	Target grazing	triclopyr; 2,4-D; picloram; chlorsulfuron; aminopyralid; metsulfuron	Hoeing
Saltcedar (*Tamarix* spp.)	*Diorhabda carinulata* Target grazing	imazapyr; glyphosate; triclopyr	Cut stump
Puncturevine (*Tribulus terrestris*)	*Microlarinus lareynii*	Chlorsulfuron; 2,4-D	Pulling and hoeing
Eurasian watermilfoil (*Myriophyllum spicatum*)	None available	2,4-D; imazamox; triclopyr; and glyphosate	Raking and seining
Parrot feather milfoil (*Myriophyllum aquaticum*)	None available	2,4-D; glyphosate	Not effective
Yellow iris (*Iris pseudacorus*)	None available	glyphosate; Imazapyr	Pulling, mowing, and cutting
Curly-leaf pondweed (*Potamogeton crispus*)	None available	imazamox	Raking and seining

[a] Prather et al. 2011, Prather 2012, Prather 2013, Newton et al. 2013
[b] 2, 4-D is a frequent tank mix partner that may be used as a dose addition where approved by the label to facilitate the translocation of many other broadleaf selective herbicides depending on application timing and plant phenology. The Proposed Action limits mixtures to three herbicides or fewer. Dose addition is considered most appropriate for mixtures with components that affect the same endpoint by the same mode of action, and are believed to behave similarly with respect to uptake, metabolism, distribution, and elimination (Choudhury et al., 2000).

Literature Cited

Choudhury, H. Cogliano, J., Hertzberg, R., Mukerjee, D., Rice, G., and Teuschler, L. 2000. Supplementary Guidance for Conducting Health Risk Assessment of Chemical Mixtures. US Environmental Protection Agency. Washington, DC 20460

USDA 2020. Target Grazing White Paper. Caribou-Targhee National Forest. Idaho Falls, Idaho.

APPENDIX C:
FOREST-WIDE INTEGRATED WEED MANAGEMENT PREVENTION PLAN

APPENDIX C: FOREST-WIDE INTEGRATED WEED MANAGEMENT PREVENTION PLAN

The Caribou-Targhee Integrated Weed Management (IWM) Environmental Impact Statement (EIS) is focused on treatment of invasive/noxious weeds and to a lesser extent on restoration. This IWM Prevention Plan is provided as supplemental information to the overall program and is implemented depending upon priority and funding for each national forest. Forest plan directions in the form of standards and guidelines (described below) are mandatory direction. This plan is intended to be a living document, being updated as needed to be most effective.

Introduction

It has been well-established that the most effective method for managing noxious weeds is to prevent their invasion and expansion. Prevention is the most economical and ecologically sound method for weed management. However, no single element of IWM operates independently. Within prevention are aspects of education, early detection, on- going monitoring, site restoration, general land use practices, and other elements of IWM. All elements of IWM are inter-connected in a variety of relationships. The challenge and the primary goal of IWM is to incorporate a variety of strategies in a coordinated, multi-disciplinary, ecological approach with the goal of maintaining or developing healthy plant communities that are relatively weed-resistant.

Prevention Aspects of Integrated Weed Management

The primary focus of this prevention plan is the prevention and education component of IWM. The goal is to increase public and agency personnel awareness about the noxious weed issue. To be most effective, the elements of IWM should not function independently. For example, prevention goes well beyond public education. The prevention aspects of other elements of IWM are highlighted below to illustrate the multi-disciplinary approach.

Inventory

- Continuing Inventory efforts provide the opportunity for repeated field visits and the detection of new invaders and new infestations of established species. Identification of weed-free areas provides baseline data on healthy, intact ecosystems.

Treatment

- Treatment practices restrict the encroachment of noxious weeds onto adjacent lands.
- Treatment practices limit the number of seeds produced and/or inhibit rhizomatous growth.

General Land Management Practices

- Minimizing soil disturbances by vehicles, machinery, wildlife, livestock, and recreation impacts is central to preventing weed establishment.

Monitoring/Evaluation

- Annual Monitoring efforts provide evaluation of effects of various treatments on weed populations and non-target resources and determine population trends such as expansion rates and habitat susceptibility.
- Adaptive strategies can be determined and implemented to maximize prevention efforts.

Partnerships/Coordination

- Information-sharing and a coordinated/cooperative approach within and outside the agency allow for a broad, regional perspective and rapid response to new infestations.
- The process of educating and motivating individuals to promote noxious weed management and prevention has positive, long-term, compounding effects.

Restoration

- Establishment of competitive, healthy plant communities in areas susceptible to invasion hinders the introduction or re-introduction of noxious weeds.

Prevention is one element of all the interrelated elements of IWM. A coordinated approach of a variety of tactics is the primary strategy of IWM.

Forest Plan Direction

Both the Caribou- National Forest Plan and Curlew National Grassland Plan have direction regarding noxious weeds while the Targhee National Forest Plan is silent.

The Desired Condition and national forest standards and guidelines are outlined in Chapter 1 and the specialist reports.

Forest User Group's Education and Prevention Practices

National forest access and recreation are two of the primary means of introduction and continuing spread of weed infestations. Some of the most common areas in which weed infestations become established on the national forest are along national forest roads, trail systems, boat launches, and in and around designated and dispersed camps. To reverse this trend, a well-planned, comprehensive education program targeted at national forest users is necessary.

The lists below outline education measures and prevention practices targeted at particular user groups. The intention is to have representatives of the various user groups and other stakeholders implement measures to reach their constituents. These lists should not be considered a finalized plan. They are provided as examples of the extensive variety of education options available for development and implementation.

All Users

Action items:

- General noxious weed information and specific management actions posted at strategic locations such as trailheads, roads, boat launches, information kiosks, and forest portals.
- Make a variety of weed materials (brochures, identification cards, etc.) available to users at Caribou-Targhee National Forest offices.
- Establish network of volunteer groups, individuals, outfitters, and landowners for treatment, inventory, and logistical support.

Specific prevention practices:

- Clean all equipment and transportation aids before traveling into the national forest and after leaving.

Water Recreation Users

Action items:

- Post general noxious weed information and specific management actions at all launch sites.
- Noxious weed information included when purchasing fishing licenses.
- Encourage users to clean boots and equipment before traveling to a new area.
- Provide "Interpretation and Education" (I&E) materials to river-based outfitters and guides.
- Provide I&E materials to recreation associations (Western Whitewater, Idaho Whitewater Association, etc.).

Specific prevention practices:

- Clean all boats, trailers, vehicles, and equipment before and after using water systems.
- Know how to identify noxious weeds and where to report observations of infestations.
- Interstate boat transport to comply with the Idaho Boat Inspection Program
- Boaters to comply with Idaho State Invasive Species sticker requirement.

Motorized/Mechanized Road and Trail Users

Action items:

- Post general noxious weed information and specific management actions at all trailheads and portals.
- In weed-infested areas, post weed awareness messages and prevention practices at roadsides.
- Include I&E materials on travel plan maps.
- Provide I&E materials to and coordinate implementation of prevention practices with local and regional recreation associations.

Specific prevention practices:

- Inspect and clean motorized and mechanized trail vehicles of weeds and their seeds before and after using national forest roads and trails.

Horsepackers and Backpackers

Action items:

- Enforce Intermountain Region weed-free hay closure (04-00-97).
- Post general noxious weed information and specific management actions at all trailheads and portals.
- Include I&E materials on travel plan maps.
- Enforce weed seed free feed regulation.
- Provide I&E materials to and coordinate implementation of prevention practices with recreation associations such as Backcountry Horseman and other regional recreational groups.
- Coordinate with State agencies and their education efforts to increase compliance with the certified weed-seed free feed regulation.
- Make I&E materials available at outdoor and feed/stock supply retailers.
- Develop and provide I&E package to hunting and pack-trip outfitters.

Specific prevention practices:

- Avoid traveling through and camping on weed infestations.
- Pack and saddle stock users should feed stock only weed-free feed for several days before initiating use of National Forest System (NFS) lands.
- Inspect, brush, and clean animals, especially hooves, legs, manes, and tails, before entering public land.
- Tie or hold stock in ways that minimize soil disturbance and avoid loss of native vegetation.
- Brush and clean pets before and after using NFS lands. Keep pets from traveling through noxious weed infestations.
- Clean boots and equipment before traveling to or camping at a new area.

Forest Resource Users (firewood, mushrooms, etc.)

Action items:

- Include noxious weed I&E and prevention practices on woodcutting/mushroom picking maps.
- Provide noxious weed information and prevention practices to users at time of permit purchase.

Specific prevention practices:

- Avoid traveling through weed infestations.
- Inspect and clean vehicles of weeds and their seeds before and after using NFS roads and trails.
- Clean boots and equipment before traveling to a new area.

Hunters

Action items:

- Incorporate noxious weed information into Hunter Education courses, IDFG Check Stations, and during hunting license purchase.
- Make I&E materials available at outdoor supply retailers.
- Coordinate prevention measures with the Idaho Department of Fish and Game.

Specific prevention practices:

- Avoid traveling through weed infestations.
- Inspect and clean vehicles of weeds and their seeds before and after using NFS roads and trails.
- Clean boots and equipment before traveling to or camping at a new area.
- Know prevention practices for motorized/mechanized/stock users as applicable.

Other Audiences

The following is a list of prevention and education measures targeted to a more general audience. While these efforts may not specifically address Forest Service personnel and national forest users, they are included in this prevention plan because of their inherent value. Other audiences (children, community, and volunteer groups) may benefit from noxious weed prevention and education.

Action items:

- Initiation of cooperative weed management areas (CWMAs) to coordinate management efforts with state and federal initiatives.
- Completion of display board depicting species identification, the impacts of noxious weeds, and the Forest Prevention Plan for use at county fairs, conferences, annual meetings, and in Forest Service offices.
- Post prevention practices and I&E materials at trailheads and developed recreation facilities, provide information to user groups, and have education material available at Forest Service offices and on the website.
- Survey of noxious weed I&E materials by Student Conservation Association crew.
- Variety of programs in local school systems.
- Coordinate prevention efforts with other agencies. Continue work with federal, state, county, and other interested partners to develop additional educational materials.

- Discuss weed prevention practices at permittee and cooperator meetings, and at contractor pre-work sessions, where applicable.
- Design of a web page for noxious weed management on the Caribou-Targhee National Forest.
- Television and/or radio segments dealing with weed prevention.
- Newspaper articles and layouts dealing with weed prevention.
- Development of multi-media program(s) for presentation to interested parties.

Internal Education and Prevention Practices

Internal education refers to the process of training employees and representatives of the agency in the various elements of IWM. Agency personnel, both permanent and seasonal, must be informed about the conditions under which weeds become established, how weeds are spread, and the effects weeds have on all resources. Implementing this knowledge can minimize weed spread because of resulting altered land management activities. Personnel should be encouraged to incorporate weed prevention and control messages into their day-to-day work priorities and appropriate public information materials.

Some particular messages to be communicated through the process of internal education are as follows:

- Prevention is part of every employee, contractor, and volunteer's job.
- Weeds can be spread by many land management activities and are detrimental to many activities on public lands.
- Integrating preventive measures into daily and authorized activities can improve the health of the land at little cost.
- Integrating prevention messages into informational materials will raise awareness at little additional cost.
- Weeds are spreading at an alarming rate--ignoring them is not an option.
- Working with partners in the weed control effort is vital to helping improve the health of the land.
- Using pilot projects and demonstration areas, education and outreach efforts will help illustrate the nature of the problem and options for dealing with it.

The objectives of the prevention and control measures are to reduce the risk of spreading noxious weeds, prevent the establishment of new invasions, integrate weed management into all resource programs, and build awareness within the agency. A challenge to managers is to ensure that the strategies outlined are being implemented on the ground by all agency personnel.

APPENDIX D:
AQUATIC INVASIVE PLANT CONTROL FRAMEWORK STRATEGY

APPENDIX D: AQUATIC INVASIVE PLANT CONTROL FRAMEWORK STRATEGY

The Caribou Targhee National Forests and The Curlew National Grassland's proposed Integrated Weed Management Plan includes a Framework Strategy (the Framework) for dealing with current and future aquatic invasive plant treatments.

The Framework has been identified to facilitate and expedite a treatment response when an aquatic infestation is identified. Elements of the Framework serve to accomplish the following:

1. Specifically identify key agency and non-agency partners.
2. Establish a routine opportunity for interagency collaboration regarding inspections, potential treatment methods (chemical and/or mechanical), agency responsibilities, funding opportunities, new products/literature.
3. Document steps for developing response plans to address any future infestations (e.g., action plans).
4. Document any future aquatic treatments (chemical, physical, mechanical) in ESA listed waters (note: presently there are no ESA waters on the Forest), which includes the following:
    - Identify the need for completion of the appropriate type of site specific ESA consultation prior to implementation of any chemical, mechanical or cultural treatment.
    - Determinations regarding the need for ESA consultation, and determining agency responsibilities for conducting it, would be made on a case-by-case basis.
    - Expedited consultation may be used when it is determined that the infestation threats to property, life, or resources are imminent. Treatment would follow design criteria identified in this EIS. The framework process should provide a means to have potential treatment tools pre-identified to expedite response and completion of any necessary emergency or standard ESA consultation.

There are a number of factors that weed managers would use to determine the appropriate treatment of an aquatic invasive plant infestation, and measures that would need to be taken to prevent spread to other nearby water bodies. The State of Idaho, Department of Agriculture (ISDA, 2007, 2017) has a set response to the detection of new aquatic invaders.

The following example illustrates the basic early detection and rapid response EDRR as outlined by ISDA and forms the framework for response to an aquatic invasive plant infestation.

- Verify reported detection.
- Once the aquatic invasive plant infestation was detected, CNF, TNF, or CNG weed managers would collect samples for verification of the identification of the weed species.
- Make initial notifications to all relevant program managers.

  - CNF/TNF/CNG weed managers would notify the Forest Supervisor, District Ranger and other program managers (e.g. range, recreation and special uses) as well as the ISDA and County Weed Program Managers.

- Define extent of colonization.
  - CNF/TNF/CNG in cooperation with ISDA would conduct another inventory of the affected waters to detect additional aquatic invasive plant infestations and would also inventory other nearby water bodies to learn if the infestation was confined to just the one location or is already present in other water bodies.
  - Set up interagency response management team.
  - CNF/TNF/CNG would coordinate with the Idaho state aquatic invasive species coordinator and relevant weed program managers in the county in which the infestation is located.
- For ESA listed waters, or actions that may affect downstream ESA-listed waters, identify needs for ESA Consultation with National Marine Fisheries Service, US Fish and Wildlife Service, or both.
  - Initiate emergency or non-emergency consultation with appropriate Services at this stage.
- Establish external communications system.
  - The interagency response management team would work together to identify water users who could be affected by the aquatic invasive plant infestation and by potential eradication efforts. A variety of communication tools could be used including e-mail, phone calls, letters, personal visits, website posts, radio, newspaper, etc.
- Organize resources (personnel, equipment, funds).
  - The interagency response management team would determine and organize the resources needed to conduct inventories for other water bodies potentially infested, notify water users, identify a proposed eradication treatment, and initiate a monitoring program.
- Prevent further spread via quarantine and pathway management.
  - Since the risk of vectoring aquatic invasive plant infestations to other nearby water bodies could be very high, CNF/TNF/CNG weed managers will work with ISDA, BOR, other agencies, Counties, and County Weed superintendents to develop effective quarantines. The Forest Supervisor may initiate short-term closures to water entry for the following reasons: preventing the transport and spread of invasive species and for public safety concerns, while plans and strategies are developed and put in place.
- Launch available and relevant control actions.
  - In order to determine the treatment options available to eradicate an aquatic invasive plant infestation, weed managers would need to define the characteristics of the invasive species, the characteristics of the infested waters and human uses of the waters.
  - Weed managers in consultation with ISDA and County Weed superintendents would consider the available range of treatment options to eradicate the infestation. Eradication is the CNF/TNF/CNG management objective for aquatic invasive plants because they are

new invaders that are not present elsewhere on forests. Eradication helps prevent the movement of aquatic invaders from one water body to another.

- Treatment:
  Any aquatic treatment in ESA listed waters or those that may affect ESA waters that are funded, authorized, carried out by Forest Service will require ESA consultation.

  Aquatic treatments carried out by the State in waters identified by the Idaho Department of Lands as navigable, and do not involve the use and occupancy of NFS lands as defined in 36 CFR251.50 are considered State actions. Under these circumstances, aquatic treatments are not considered a Forest Service action requiring a NEPA decision, a Forest Service special use authorization and ESA section 7(2)(a)consultation by the Forest Service.

  The forests would work with ISDA on jurisdiction of treatment waters and potential cooperative funding available for EDRR treatment of state listed noxious weeds. In-water herbicide treatments require an NPDES permit and requires specific NPDES and FIFRA posting and monitoring requirements. ISDA or the County would obtain the NPDES permit for the treatment.

  - For small infestations: First priority would be to utilize physical or mechanical treatment methods to control aquatic infestations such as hand removal or diver assisted suction harvesting to remove plants. Benthic barriers can also be a tool for eradicating small populations.
  - Larger infestation: Herbicides are the most effective tool for larger populations. Herbicide selection would depend on target species, treatment location and water movement. Some species and the herbicides used to treat them include the following:
    - Eurasian watermilfoil: Systemic herbicides: 2,4-D, triclopyr
    - Hydrilla: Imazamox
    - Flowering rush: Imazapyr
    - Yellow floating heart: 2,4-D, triclopyr, glyphosate

Citations

Idaho State Department of Agriculture. 2007. Idaho Aquatic Nuisance Species Plan, A Supplement to Idaho's Strategic Action Plan for Invasive Species 2007. https://static1.squarespace.com/static/564b8c9ae4b0459b2b8187a3/t/570d26d662cd940d9f34f51a/1460479707506/planAquaticNuisance.pdf

Idaho State Department of Agriculture. 2017. The Idaho Invasive Species Strategic Plan 2017-2021. https://static1.squarespace.com/static/564b8c9ae4b0459b2b8187a3/t/5a4681049140b7ea14babfe4/1514570012237/Idaho+IS+Strategic+Plan+2017-2021_Compressed+for+Web.pdf

APPENDIX E:
SPECIES TREATMENT MONITORING PLAN

APPENDIX E: SPECIES TREATMENT MONITORING PLAN

A: General Reporting

The following process will be implemented to document the yearly program for invasive and noxious plant treatments on the Boise and Sawtooth National Forest.

- Pesticide Use Proposals (PUPs) (Form FS-2100-2) as required in Forest Service Handbook 2109.14 will be developed, evaluated and approved by the District Ranger before treatment can occur. These proposals will be developed and approved prior to treatment activities each year. Copies of the proposals will be submitted for review by Forest Biologists for compliance with the BA.

- Maps and records associated with noxious weed infestations will be maintained in the NRIS Invasives Data Base.

- Daily Application Logs, along with maps of treatment sites, will be maintained by the treatment supervisor and anyone authorized under special use permit. All information will be recorded in the FACTS database as appropriate.

- An annual report will be submitted by February to the Environmental Protection Agency (EPA) for the Pesticide General Permit (PGP) for chemical weed treatments completed in the past year. The EPA report summarizes all chemical treatments inside Waters of the United States (WOTUS). It also summarizes the herbicides used and amount of Active Ingredients applied within WOTUS.

- Annual treatment summary reports are reviewed by the District pesticide use coordinators in the past year.

B. Monitoring

Monitoring will be conducted to determine how well the design criteria are being implemented. Design Criteria are intended to protect aquatic and terrestrial resources by ensuring that the actions fall within a specific range of effects.

Weed managers will meet with district and/or Forest biologists annually or as needed, prior to treatments, to review the PUPs for the upcoming season's treatment objectives, emphasis areas, and to share any potential resource concerns and/or identify any necessary field reviews or additional site-specific mitigation. Periodic coordination with district specialists should also occur as new information is available throughout the field season.

Implementation monitoring will be conducted onsite during treatment application and recorded on the Daily Application Log to validate the implementation of the appropriate BMPs and mitigation measures applicable for the site. Monitoring the effectiveness of the noxious weed

control program will be conducted at the landscape level as well as the site-specific treatment level.

Site-specific treatment level monitoring would involve assessing the effectiveness of the treatment agent or control method on selected infestations of invasive plants. Treated and restored sites would be monitored for effectiveness through field investigations to determine the following: (1) whether the desired management objectives of eradicating, controlling, or containing aggressive invasive plants are being achieved; (2) whether site restoration techniques (if used) are resulting in the re-establishment of native plants; and if not, what follow-up treatments would be necessary to achieve establishment; and (3) whether the native vegetation is responding adequately in non-restored treatment areas to provide for adequate site protection; and, if not, what follow-up restoration treatments are necessary. Follow-up treatments would occur as staffing and funding allow. Monitoring of selected sites may occur over multiple years at an appropriate frequency to determine effectiveness. Initial monitoring of different invasive plant treatment control methods would be conducted on selected sites within 1 to 2 months of treatment or the following year for biocontrol treatments. Monitoring will be through visual observation of target species' relative abundance/site dominance compared to pre-treatment conditions. Follow-up monitoring of these sites would occur in subsequent years as appropriate. Control areas (non-treated) should also be examined to make comparisons for effectiveness, species diversity, and revegetation needs.

Effectiveness monitoring would be accomplished by tracking invasive plant species occurrence through Geographic Information System (GIS) and NRIS Invasives database mapping across the Forest and Grassland. Noxious weed infestations would be inventoried, mapped, and tracked through GIS to monitor the amount of the National Forest land base with invasive plants, density of infestations, and how the control program has worked. Inventory and mapping results would be included in the annual monitoring report.

Inventory and monitoring is expected to reveal new populations of invasive plants, which would be mapped and evaluated for control or eradication. Management of these newly discovered sites would occur under the guidelines as described in the preceding description of the Proposed Action.

C. Evaluation

The invasive plant species treatment program is a long-term endeavor to control these species when and where practicable. However, because there are areas of scientific and management uncertainty, management actions may need to be refined over time to meet the basic objective of treatment program. Annual site-specific monitoring would assess the effectiveness of specific control measures on invasive plant species relative to treatment, application rate, and area. Management actions may require refinement or change over time as data from specific effectiveness monitoring are analyzed. Based on annual treatment evaluations and with the likely development of new control methods and technology, changes in existing or use of new treatments may be authorized and warranted as described in the Proposed Action – Adaptive Management section.

D. Aerial Monitoring

Monitoring Procedure

Water quality will be monitored using drift cards (or other improved methods) if needed. Monitoring will be performed on 10% of the aerial units that have identified "no spray" buffer zones. The number and location of cards within the spray unit will be determined by the hydrologist based on site conditions and experience with past projects. Herbicide label would be followed. Where a treatment unit is bisected by a stream, drift detection cards may be placed on both sides of the stream depending on buffer distances and wind direction and speed.
For other live water bodies, drift detection cards will be placed at intervals moving outwards from the water body where it intersects the treatment area, if needed. The line farthest from the water body will initially be located at 300 feet, in appropriate locations where drift could potentially occur.

Before the day's application, project managers will determine strategic locations for placing drift detection cards if needed. GPS coordinates will be taken and an individual identification number recorded at the site of each card holder. Project personnel will observe and record information on dew and precipitation on vegetation from the night before. Care is required in setting out the cards as they are very sensitive to moisture and contact by dew drops can skew monitoring results.

Herbicide label will be followed. If label determines buffer are needed, buffers from live water will be specifically identified on all treatment area maps and provided to the pilot both digitally and hard copy so pilot can visually reference the buffers. Drift detection cards will be used to determine if desired coverage is being attained and buffer zones are being avoided. Application can be adjusted as necessary based on feedback from these drift cards and communicated directly to the pilot. The pattern on drift detection cards in subsequent intervals, placed as needed where drift has the potential to occur, will be monitored during application to detect drift. Wind speed and wind direction would continue to be closely monitored.

Observations by personnel at the time of collection are critical to an accurate reading. To complete and document monitoring, project personnel will observe and record spray detection on the cards before removing them from the card holders. Each drift detection card will be photographed and tagged for identification. Cards will be handled carefully along the edges only to avoid damage to the record. Dew markings, animal tracks, herbicide and other markings will be recorded. Each card will be sealed in a dry sealed plastic bag for transport and storage. Complete the drift detection monitoring cards results form and attach observation report and photos.

The site would be monitored on a regular basis to determine treatment efficacy, need for follow-up treatments and to document non-target effects.

E. Monitoring Requirements from the National Pollutant Discharge Elimination System (NPDES) Permit—Pesticides General Permit

Monitoring

Visual Monitoring Requirements for Pesticide Applicators
During any pesticide application with discharges authorized under this permit, all Applicators must, when considerations for safety and feasibility allow, visually assess the area to and around where pesticides are applied for possible and observable adverse incidents*, caused by application of pesticides, including the unanticipated death or distress of non-target organisms and disruption of wildlife habitat, recreational or municipal water use.

Visual Monitoring Requirements for all Operators
During any Operator post-application surveillance of any pesticide application with discharges authorized under this permit, all Operators must visually assess the area to and around where pesticides were applied for possible and observable adverse incidents*, caused by application of pesticides, including the unanticipated death and distress of non-target organisms and disruption of wildlife habitat, recreational or municipal water use.

*"Adverse incident" means an unusual or unexpected incident that an Operator has observed upon inspection or of which the Operator otherwise becomes aware, in which:

1. There is evidence that a person or non-target organism has likely been exposed to a pesticide residue, and
2. The person or non-target organism suffered a toxic or adverse effect.

The phrase "toxic or adverse effect" includes effects that occur within Waters of the United States on non-target plants, fish or wildlife that are unusual or unexpected (e.g., effects are to organisms not otherwise described on the pesticide product label or otherwise not expected to be present) as a result of exposure to a pesticide residue, and may include:

- Distressed or dead juvenile and small fishes
- Wasted up or floating fish
- Fish swimming abnormally or erratically
- Fish lying lethargically at water surface or in shallow water
- Fish that are listless or nonresponsive to disturbance
- Stunting, wilting, or desiccation of non-target submerged or emergent aquatic plants
- Other dead or visibly distressed non-target aquatic organisms (amphibians, turtles, invertebrates, etc.)

The phrase "toxic or adverse effects" also includes any adverse effects to humans (e.g., skin rashes) or domesticated animals that occur either from direct contact with or as a secondary effect from a discharge (e.g., sickness from consumption of plants or animals containing pesticides) to Waters of the United States that are temporally and spatially related to exposure to a pesticide residue (e.g., vomiting, lethargy).

F. National Best Management Practices (BMP) for Water Quality

Management on National Forest System Lands—Chemical Use

The National BMP Program was developed to improve agency performance and accountability in managing water quality consistent with the Federal Clean Water Act (CWA) and State water quality programs. Current Forest Service policy directs compliance with required CWA permits and State regulations and requires the use of BMPs to control nonpoint source pollution to meet applicable water quality standards and other CWA requirements. The National Core BMPs are written in broad, non-prescriptive terms, focusing on "what to do", not "how to do it". The National BMP Monitoring Forms/Protocols can be used to monitor and analyze BMP implementation and effectiveness at several different scales, including national, regional, land management plan, and project-level purposes.

Monitoring implementation and effectiveness of BMPs focused on chemical use and application for treatment of invasive plant species is accomplished through use of two evaluation forms1. The Chemical A (Chem A) form assesses BMPs employed to protect water quality and aquatic habitats from chemicals that are used near water, including projects in which broad-scale aerial treatments of chemicals were used, such as for forest pest control, but flight paths were not discontinued over waterbodies (including small streams). Chem A is not aimed at evaluating the effectiveness of how well the chemicals met their primary objectives of controlling plants, insects, or animals, or altering soil chemical properties (e.g., lime or fertilizers). Chemical B (Chem B) Use form assesses BMPs employed to protect water quality from the application of chemicals in waterbodies. For Chem A and Chem B, the normal high water line separates the waterbody from the area outside the waterbody. That is, chemical application targeting areas above the normal high water line constitutes treatment outside the waterbody (i.e., near the waterbody for the purposes of Chem A), and chemical application targeting the area below the high water line constitutes treatment in/of the waterbody (Chem B).

The term aquatic management zone or AMZ is used in the National BMP Program as an inclusive term to denote the longitudinal protection zone adjacent to any type of waterbody. Use of this single term avoids having to reference the many terms used by National Forests and Grasslands to describe these zones. For the purposes of BMP monitoring, employ the AMZ width normally assigned by the land management plan to the type of waterbody present, unless that waterbody has been assigned a different width (e.g., it is given a greater level of protection).

Monitoring can be performed any time after the chemical use project has been completed and should include only those projects for which BMP effectiveness monitoring can be timed to detect unintended water quality or aquatic ecosystem impacts from the particular chemical applied. Monitoring sites are selected randomly—and ultimately one representative site is selected for implementation and subsequent effectiveness monitoring.

G. Forest Service Handbook—Monitoring Requirements

FSH 2109.14,50

FSH 2109.14 - PESTICIDE-USE MANAGEMENT AND COORDINATION HANDBOOK

WO AMENDMENT 2109.14-94-1

EFFECTIVE 12/06/94

CHAPTER 50 - QUALITY CONTROL MONITORING AND POST-TREATMENT EVALUATION

Note: This Forest Service Handbook is cited here only as a reference and the most current version should be accessed online.

APPENDIX F:

COMPLIANCE WITH FOREST PLAN AND OTHER RELEVANT DIRECTION FOR THE CARIBOU-TARGHEE NATIONAL FOREST AND CURLEW NATIONAL GRASSLAND INTEGRATED WEED MANAGEMENT ANALYSIS

APPENDIX F: COMPLIANCE WITH FOREST PLAN AND OTHER RELEVANT DIRECTION FOR THE CARIBOU-TARGHEE NATIONAL FOREST AND CURLEW NATIONAL GRASSLAND INTEGRATED WEED MANAGEMENT ANALYSIS

Chapter 3 of the CTNF and CNG Integrated Weed Management Analysis EIS presents the results of environmental impact analyses for the various resources that may be affected by invasive plant species control and described and disclosed potential direct, indirect, and cumulative changes in the human environment. The significance, intensity, and duration of effects are also disclosed.

This appendix is a continuation of assessing impacts. Specifically, it contains information related to compliance of the Proposed Action to the revised Forest Plan for the Caribou National Forest (CNF; USDA Forest Service 2003), revised Forest Plan for the Targhee National Forest (TNF; USDA Forest Service 1997), and Curlew National Grassland (CNG; USDA Forest Service 2002). The relationship of this EIS to federal land management agency plans, including the Forest Plans, was described in Section 1.5 of the EIS.

The Forest Plans establish forest-wide requirements that apply to - and regulate - future management activities. The Forest Service evaluates all proposed activities against these requirements (i.e., standards and guidelines). According to these plans:

- Standards are used to promote the achievement of the desired future condition and objectives and to assure compliance with laws, regulations, Executive Orders, or policy direction established by the Forest Service. Standards are binding limitations on management activities that are within the authority of the Forest Service to enforce. A standard can also be expressed as a constraint on management activities or practices.
- Guidelines are used in the same way as standards but tend to be operationally flexible to respond to variations, such as changing site conditions or changed management circumstances. Guidelines are a preferred or advisable course of action, and they are expected to be carried out, unless site-specific analysis identifies a better approach.

The focus in the following tables apply to the Proposed Action, unless noted otherwise. This is not an exhaustive list of every standard and guideline in the Forest Plans, but instead focuses on the resources that would most likely be impacted by the proposed invasive plant species control. Section 1.5 of the EIS provides detailed descriptions of the three federal land management plans that guide land use developments and activities in the Forests and Grassland and subsequent compliance with those plans. The relevant Forest Plan standards and guidelines are presented, along with a discussion of whether or not invasive plant species control would be in compliance with the particular standard or guideline. Some resources do not have standards and guidelines that are relevant to the project; only those that do are included in the following sections.

1.1 Wildlife

Table F-1 summarizes compliance with applicable standards and guidelines from the Forest Plans with regard to wildlife resources under the Proposed Action.

Table F-1. Compliance with applicable standards and guidelines for wildlife resources under the Proposed Action.

Standard/Guideline	Compliance under the Proposed Action
Caribou National Forest Plan	
Guideline for Sensitive Species. Survey for the presence of sensitive species if suitable habitats are found within a project area a minimum of once prior to or during project development.	Impacts were evaluated assuming the presence of sensitive species in all suitable habitat. Therefore, the project is in compliance with the intent of this guideline.
Guidelines for Bald Eagle Habitat—occupied nesting zones (Zone I, 0.25-mile radius of nest) and primary use areas (Zone II, 0.5-mile radius of nest). All human activities should be minimized from February 1 to August 1.	The project would be in compliance with this guideline as the minimal amount of disturbance necessary to complete the project would be implemented.
Guidelines for Bald Eagle Habitat—occupied nesting zones (Zone I, 0.25-mile radius of nest) and primary use areas (Zone II, 0.5-mile radius of nest). Within a 2.5-mile radius of nest, prohibit all use of herbicides and pesticides which cause egg shell thinning as determined by product labeling furnished by the US Environmental Protection Agency (EPA).	The project would be consistent with this guideline as only agency-approved herbicides would be used, and all applications would follow label directions, as outlined in the Herbicide Application Methods section under section 2.2.2.2 of the EIS. None of the pesticides proposed for use would cause eggshell thinning in any bird species.
Guideline for Peregrine Falcon Habitat. For proposed projects within 2 miles of known peregrine falcon nests and minimize such items as (1) human activities (rock climbing, aircraft, ground and water transportation, high noise levels, and permanent facilities) that could cause disturbance to nesting pairs and young during the nesting period between March 15 and July 31; (2) activities or habitat alterations which could adversely affect prey availability.	The project would be in compliance with this guideline as the minimal amount of disturbance necessary to complete the project would be implemented and IWM activities would not adversely affect prey availability.
Standard for Peregrine Falcon Habitat. Within 15 miles of all known nest sites, prohibit all use of herbicides and pesticides that cause egg-shell thinning as determined by risk assessment.	The project would be consistent with this standard as only agency-approved herbicides would be used, and all applications would follow label directions, as outlined in the Herbicide Application Methods section under section 2.2.2.2 of the EIS. None of the pesticides proposed for use would cause eggshell thinning in any bird species.
Guideline for Trumpeter Swan Habitat. Change livestock grazing through management or fencing when grazing is adversely affecting trumpeter swan use or productivity.	e project would be in compliance with this guideline as all targeted grazing would be managed through term grazing permits and/or conducted under a livestock use permit. Authorized grazing instruments would include the mitigation of impacts. Additionally, a site-specific project operation plan will be required prior to implementing prescriptive livestock grazing treatment, as outlined under section 2.2.2.2 of the EIS. Livestock grazing would be modified as needed to avoid adverse effects to trumpeter swan habitat.

Standard for Trumpeter Swan Habitat. Maintain suitable trumpeter swan nesting habitat conditions in Elk Valley Marsh and other sites.	The project would be in compliance with this standard as the removal of invasive species in riparian and aquatic habitats would improve trumpeter swan habitat.
Guidelines for Sage-grouse and Columbian Sharp-Tailed Grouse. If management activities would impact courtship, limit all physical, mechanical, and audible disturbances in the breeding complex during the breeding season (March to May) and within 3 hours of sunrise and sunset each day.	The project would be in compliance with this standard, as no IWM activities would be conducted in a manner that would create noise at 10dB above ambient measured at the perimeter of an occupied lek during lekking, and no treatments in occupied breeding or nesting sage grouse habitat until after June 15 would occur, as stated as a design criteria under section 2.2.2.2 of the EIS.
Guidelines for Sage-grouse and Columbian Sharp-Tailed Grouse. Where management actions will disturb nesting grouse, avoid manipulation or alteration of vegetation during the nesting period (May to June).	The project would be in compliance with this guideline as no IWM treatments would occur in occupied breeding or nesting sage grouse habitat until after June 15, as stated in the design criteria under section 2.2.2.2 of the EIS.
Guidelines for Amphibians. Ensure habitats in the Tincup Creek Drainage and other known toad breeding locations are managed to maintain or improve the existing population and distribution of western toads.	The project would be in compliance with this guideline as the removal of invasive species would improve riparian, wetland, and aquatic habitat. Label restrictions would be followed for use near water features.
Guidelines for Amphibians. Ensure habitats in the Toponce area and other known northern leopard frog breeding locations are managed to maintain or improve the existing population and distribution of the frogs.	The project would be in compliance with this guideline as the removal of invasive species would improve riparian, wetland, and aquatic habitat. Label restrictions would be followed for use near water features.
Guidelines for Landbirds. Practices that stabilize or increase native grass and forbs cover in sagebrush habitats with 5–25 percent sagebrush canopy cover should be implemented.	The project would be in compliance with this guideline as the removal of invasive species would improve sagebrush habitat, allowing for the return of native grass and forb species.
Targhee National Forest Plan	
Standards and Guidelines—Bald Eagle Habitat. Minimize all human activities from February 1 to August 1. (G)	The project would be in compliance with this guideline as the minimal amount of disturbance necessary to complete the project would be implemented and Forest Biologist recommendations would be followed as part of the project design criteria.
Standards and Guidelines—Bald Eagle Habitat. Permit historic levels of livestock use as long as no adverse impacts (such as abandonment of nest territory or reproduction failures) occur related to this activity. Manage livestock to allow successful reproduction of cottonwood where applicable. (G)	The project would be in compliance with this guideline as all targeted grazing would be managed through term grazing permits and/or conducted under a livestock use permit. As outlined in the Biological Control section under section 2.2.2.2 of the EIS, the numbers of livestock and grazing season would be designed on a site-specific basis to achieve management objectives.
Standards and Guidelines—Bald Eagle Habitat. Within Zones I, II, and III, prohibit all use of herbicides and pesticides which cause egg shell thinning as determined by EPA labeling. (S)	The project would be consistent with this standard as only agency-approved herbicides would be used, and all applications would follow label directions, as outlined in the Herbicide Application Methods section under section 2.2.2.2 of the EIS. None of the pesticides proposed for use would cause eggshell thinning in any bird species.

Standards and Guidelines—Peregrine Falcon Habitat. Within 15 miles of all known nest sites, prohibit all use of herbicides and pesticides which cause eggshell thinning as determined by risk assessment (USDA Forest Service, September 1992). (S)	The project would be consistent with this standard as only agency-approved herbicides would be used, and all applications would follow label directions, as outlined in the Herbicide Application Methods section under section 2.2.2.2 of the EIS. None of the pesticides proposed for use would cause eggshell thinning in any bird species.
Standards and Guidelines—Trumpeter Swan Habitat. Maintain suitable trumpeter swan nesting habitat conditions including (but not limited to) the following lakes and ponds: Boundary Pond, Swan Lake, Lily Pond, Hatchery Butte, Railroad Pond, Mesa Marsh, Bear Lake, Upper Goose Lake, Long Meadows, Thompson Hole, Twin Lakes, Chain Lakes, Widgit Lake, Rock Lake, Indian Lake, Putney Meadows, and unnamed pond (Sec 19, T9N, R46E). (S)	The project would be in compliance with this goal as the removal of invasive species would improve trumpeter swan nesting habitat.
Standards and Guidelines—Trumpeter Swan Habitat. Change livestock grazing through management or fencing when grazing is adversely affecting trumpeter swan use or productivity. (G)	e project would be in compliance with this guideline as all targeted grazing would be managed through term grazing permits and/or conducted under a livestock use permit. Additionally, a site-specific project operation plan will be required prior to implementing prescriptive livestock grazing treatment, as outlined under section 2.2.2.2 of the EIS.
Standards and Guidelines—Trumpeter Swan Habitat. No vegetation management will occur within 300 feet of the lake or pond shoreline unless necessary to improve riparian habitat conditions favorable for trumpeter swans. Management may occur after the swans have left the lake or pond. (S)	The project would be in compliance with this standard as no vegetation management activities as defined in the Targhee Forest Plan would be implemented. Additionally, all herbicide labels would be followed if herbicides are applied in aquatic habitat, as outlined under the Herbicide Control section under section 2.2.2.2 of the EIS.
Standards and Guidelines—Trumpeter Swan Habitat. Implement habitat improvement projects at these lakes and ponds, such as dredging to maintain proper water depths and aquatic vegetation control. (G)	The project would be in compliance with this guideline as the removal of invasive species would improve trumpeter swan habitat.
Curlew National Grassland Plan	
General Wildlife Habitat Standard. The habitat requirements of MIS will be considered in all resource development projects. The MIS for sagebrush habitat is sage-grouse and for riparian/wetland areas is a breeding bird complex.	The project would be in compliance with this standard as impacts on riparian breeding birds were evaluated as an MIS and the greater sage-grouse was evaluated as a sensitive species in section 8.2.9 of the Terrestrial Wildlife Resource Specialist Report associated with this project.
Sage-grouse and Columbian Sharp-Tailed Grouse Guidelines. (see section 3.5 for sage-grouse amendment guidelines) If management actions would impact courtship, limit physical, mechanical and audible disturbances within the breeding complex during the breeding season (March–May) within 3 hours of sunrise or sunset.	The project would be in compliance with this standard, as no IWM activities would be conducted in a manner that would create noise at 10dB above ambient measured at the perimeter of an occupied lek during lekking, as stated as a design criteria under section 2.2.2.2 of the EIS.

Sage-grouse and Columbian Sharp-Tailed Grouse Guidelines. (see section 3.5 for sage-grouse amendment guidelines) Where management actions may disturb nesting grouse, avoid manipulation or alteration of vegetation during the nesting period (May–June).	The project would be in compliance with this guideline since no IWM treatments in occupied breeding or nesting sage-grouse habitat would occur until after June 15, as stated as a design criteria under section 2.2.2.2 of the EIS.
Northern Rockies Lynx Management Direction and Record of Decision	
Guideline GRAZ G2. In aspen stands, livestock grazing should be managed to contribute to the long-term health and sustainability of aspen.	The project would be in compliance with this guideline as all targeted grazing would be managed through term grazing permits and/or conducted under a livestock use permit. Authorized grazing instruments would include the mitigation of impacts. Additionally, a site-specific project operation plan will be required prior to implementing prescriptive livestock grazing treatment, as outlined under section 2.2.2.2 of the EIS. Livestock grazing would be modified as needed to avoid adverse effects to lynx habitat.
Guideline GRAZ G3. In riparian areas and willow carrs, livestock grazing should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.	e project would be in compliance with this guideline as all targeted grazing would be managed through term grazing permits and/or conducted under a livestock use permit. Additionally, a site-specific project operation plan will be required prior to implementing prescriptive livestock grazing treatment, as outlined under section 2.2.2.2 of the EIS.
Guideline GRAZ G4. In shrub-steppe habitats, livestock grazing should be managed in the elevation ranges of forested lynx habitat in LAUs, to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.	The project would be in compliance with this guideline as all targeted grazing would be managed through term grazing permits and/or conducted under a livestock use permit. Additionally, a site-specific project operation plan will be required prior to implementing prescriptive livestock grazing treatment, as outlined under section 2.2.2.2 of the EIS.
Greater Sage-Grouse Land Use Plan Amendments	
GRSG-GEN-ST-006-Standard. Do not authorize new surface disturbing and disruptive activities that create noise at 10dB above ambient measured at the perimeter of an occupied lek during lekking (from March 1 to April 30) from 6 p.m. to 9 a.m. Do not include noise resulting from human activities that have been authorized and initiated within the past 10 years in the ambient baseline measurement.	The project would be in compliance with this standard, as no IWM activities would be conducted in a manner that would create noise at 10dB above ambient measured at the perimeter of an occupied lek during lekking, as stated as a design criteria under section 2.2.2.2 of the EIS.
GRSG-GEN-GL-007-Guideline. During breeding and nesting (from March 1 to June 15), surface disturbing and disruptive activities to nesting birds should be avoided.	The project would be in compliance with this guideline since no IWM treatments in occupied breeding or nesting sage-grouse habitat would occur until after June 15, as stated as a design criteria under section 2.2.2.2 of the EIS.
GRSG-GRSGH-ST-027-Standard. Design habitat restoration projects to move towards desired conditions (Table F-1**).	The project would be in compliance with this guideline as the removal of invasive species would move habitats towards desired conditions.
GRSG-GRSGH-GL-029-Guideline. In priority, important, and general habitat management areas and sagebrush focal areas, actions and authorizations should include design features to limit the spread and effect of undesirable invasive plant species.	The project would be in compliance with this guideline as the proposed project would remove invasive species and includes design criteria to limit the spread of invasive species under section 2.2.2.2 of the EIS.

GRSG-GRSGH-GL-032-Guideline. In priority and important habitat management areas and sagebrush focal areas, vegetation treatment projects should only be conducted if they maintain, restore, or enhance desired conditions (Table F-1**).	The project would be in compliance with this objective as the proposed project would remove invasive species and improve sage-grouse habitat.
GRSG-LG-GL-038-Guideline. During the breeding and nesting season (from March 1 to June 15), trailing livestock through breeding and nesting habitat should be minimized. Specific routes should be identified; existing trails should be used; and stopovers on active leks should be avoided.	The project would be in compliance with this guideline since no IWM treatments in occupied breeding or nesting sage-grouse habitat would occur until after June 15, as stated as a design criteria under section 2.2.2.2 of the EIS.
2016 Conservation Strategy for the Grizzly Bear in the Greater Yellowstone Ecosystem	
The number of commercial livestock allotments and number of permitted domestic sheep will not exceed 1998 levels inside the PCA. Existing sheep allotments will be phased out as the opportunity arises with willing permittees.	The project would be in compliance with this guideline as all targeted grazing would be managed through term grazing permits and/or conducted under a livestock use permit. As outlined in the Biological Control section under section 2.2.2.2 of the EIS, the numbers of livestock and grazing season would be designed on a site-specific basis to achieve management objectives. Additionally, the project would be in compliance because it would not create new allotments or restock vacant allotments.

1.2 Fisheries and Water Resources

Table F-2 summarizes compliance with applicable standards and guidelines from the Forest Plans with regard to fishery resources under the Proposed Action.

The Targhee RFP (1997) does not provide specific water resource direction for invasive plant species or herbicide treatments. The Caribou RFP (2003) provides direction for noxious weeds on pages 3-20 thru 3-21 but does not specifically address water resources. Pesticide use within riparian areas is addressed only as guidelines on page 4-50. The Curlew Plan (2002) addresses noxious weeds only in a cursory manner within the Biological Elements—Terrestrial Ecosystems–Vegetation section. In February 2001, the Caribou-Targhee National Forest Noxious Weed Strategy was developed. The strategy includes priority setting, reiterated Forest-wide direction and set objectives for implementing the Strategy. It also specified Board Members, which included the Forest Hydrologist. Since the development of the Strategy, the Caribou RFP and Curlew Plans have been implemented, requiring Strategy updating based on these new plans and national direction. Table F-2 also summarizes compliance with applicable standards and guidelines from the Forest Plans with regards to water resources under the Proposed Action.

Table F-2. Compliance with applicable standards and guidelines for fishery resources under the Proposed Action.

Standard/Guideline	Compliance under the Proposed Action
Caribou National Forest Plan	
Watershed and Riparian Resources, Guideline 2. Proposed actions analyzed under NEPA should adhere to the State Source Water Assessment Plan to achieve consistency with the Safe Drinking Water Act (and amendments) to emphasize the protection of surface and ground water sources used for public drinking water.	The project would be in compliance with this guideline as all herbicides would be used according the label recommendations to ensure no cumulative impact to surface and ground water. Design criteria for protecting surface and ground water resources are given in section 2.2.2.2 of the EIS.
Watershed and Riparian Resources, Guideline 3. Projects in watersheds with 303(d)-listed waterbodies or delineated source water protection areas should be supported by scale and level of analysis sufficient to permit an understanding of the implications of the project within the larger watershed context.	The project would be in compliance with this guideline as this EIS serves as sufficient analysis to permit the treatment of invasive plant species under the proposed action. Herbicide use in accordance with label recommendations would have limited to no effect on 303(d)-listed waterbodies or delineated source water protection areas. All invasive plant control methods would adhere to best management practices and herbicides would be used according to label recommendations to ensure no cumulative impact to surface and ground water.
Watershed and Riparian Resources, Guideline 4. Proposed actions analyzed under NEPA should adhere to the State Nonpoint Source Management Plan to best achieve consistency with both Sections 313 and 319 of the Federal Water Pollution Control Act.	The project would be in compliance with this guideline as this EIS serves as sufficient analysis to permit the treatment of invasive plant species under the proposed action.
Prescription 2.8.3-Aquatic Influence Zone: General Riparian Area Management, Standard 1. Within legal authority, ensure that new proposed management activities within watersheds containing 303(d) listed waterbodies improve or maintain overall progress toward beneficial-use attainment for the pollutants that led to listing (standard).	The project would be in compliance with this guideline as this EIS serves as sufficient analysis to permit the treatment of invasive plant species under the proposed action. All invasive plant control methods would adhere to best management practices and herbicides would be used according to label recommendations to ensure no cumulative impact to surface and ground water. No streams have been listed under 303(d) for pesticide contamination from invasive plant species treatment.
Prescription 2.8.3-Aquatic Influence Zone: General Riparian Area Management, Guideline 3. Avoid storage of fuels and other toxicants or refueling within AIZs unless there are no other alternatives. Any refueling sites within an AIZ should have an approved spill containment plan (guideline).	The project would be in compliance with this guideline as chemical and fuel storage would be avoided when feasible within AIZs and refueling, if necessary, would follow proper safety and spill containment practices.
Prescription 2.8.3-Aquatic Influence Zone: Fisheries, Guideline 2. Design and implement fish and other aquatic biota habitat restoration and enhancement actions in a manner that contributes to attainment of desired AIZ attributes.	The project would be in compliance with this guideline as the desired condition of the AIZs would be included in any invasive species treatment approach.

Targhee National Forest Plan	
Fisheries, Water, and Riparian Resources, Standard and Guidelines 3. Within subwatersheds occupied by native cutthroat trout or designated as vital to meeting recovery goals, avoid management activities that are found, through interdisciplinary site-specific analysis, to either reduce habitat features below the expected values described in the table on page III-11 of the Targhee National Forest Plan or retard the rate of recovery of degraded habitat features (guideline).	The project would be in compliance with this guideline as the proposed action would not negatively impact quality cutthroat trout habitat features as outlined in this EIS.
Fisheries, Water, and Riparian Resources, Standard and Guidelines 4. Emphasize watershed analysis or site-specific analysis to more accurately define fisheries habitat features when planning or conducting management activities within native-trout watersheds (guideline).	The project would be in compliance with this guideline as efforts would be made to improve native trout habitats when applicable under the proposed action.
Curlew National Grassland Plan	
Water Quality, Standard 1. Within legal authorities, ensure that new or proposed management activities within watersheds containing 303d listed water bodies maintain or improve overall progress toward beneficial use attainment for pollutants which led to listing, and do not allow additions of these pollutants in quantities that result in unacceptable adverse effects.	The project would be in compliance with this standard as all herbicides would be used according the label recommendations to ensure no cumulative impact to surface and ground water. No streams have been listed under 303(d) for pesticide contamination from invasive plant species treatment.
Water Quality, Guideline 1. Work with the State of Idaho's 2-year cycle to determine if the 303(d) waterbodies are correctly listed or have been restored adequately to provide designated beneficial uses.	The project would be in compliance with this guideline as all herbicides would be used according the label recommendations to ensure no cumulative impact to surface and ground water. Thus, beneficial use would not be degraded as a result of the proposed action.
Water Quality, Guideline 2. New projects within watersheds containing 303(d) listed waterbodies should be supported by the appropriate scale of analysis and collaboration with appropriate Federal, State, Tribal and Local Agencies, organizations and individuals.	The project would be in compliance with this guideline as this EIS serves as the supporting document and collaboration to proceed with the proposed action.
Water Quality, Guideline 3. New project proposals analyzed under the National Environmental Policy Act (NEPA) should consider the 11 questions outlined in the Idaho Nonpoint Source Management Plan to achieve Federal consistency with the Idaho Nonpoint Source Management Plan and the Clean Water Act as implemented by the State of Idaho.	The project would be in compliance with this guideline as this EIS serves as the supporting document and collaboration to proceed with the proposed action. Since the signing of the Curlew Plan in January 2002, updates to the Idaho Nonpoint Source Management Plan have occurred with the most recent being in 2015 (DEQ 2015). The water quality analysis does adhere to this plan, state water quality standards, and the CWA and addresses water quality and state listed waterbodies. The current Idaho Nonpoint Source Management Plan no longer contains those 11 questions.
Fisheries, Water, and Riparian Resources, Standard 2. Streams identified as being in riparian Properly Functioning Condition will be maintained in that condition.	The project would be in compliance with this guideline as the proposed action would have limited to no effect on the Properly Functioning Condition of riparian habitats.

Fisheries, Water, and Riparian Resources, Guideline 2. When applying herbicides aerially, maintain a 100-foot buffer on all streams.	The project would be in compliance with this guideline as the 100-ft stream buffer would be maintained during aerial application under the proposed action. All herbicides would be used according the label recommendations to ensure no cumulative impact to riparian habitats.

1.3 Vegetation

Table F-3 summarizes compliance with applicable standards and guidelines from the Forest Plans with regard to vegetation resources under the Proposed Action.

Table F-3. Compliance with applicable standards and guidelines for vegetation resources under the Proposed Action.

Standard/Guideline	Compliance under the Proposed Action
Caribou National Forest Plan	
Vegetation manipulation may include mechanical treatments, chemical treatments, commercial or non-commercial timber harvest of wood products, prescribed fire, wildfire for resource benefit, or other appropriate methods. Manipulations should emphasize ecological and multiple use outcomes over being “above-cost” (G).	The Proposed Action would be in compliance with this guideline. IWM would allow the use of the most appropriate treatment method.
Give priority to vegetation treatments in private land interface zones or in those vegetation types identified as having high degree of departure from their historical range variability (HRV) (G).	The Proposed Action would be in compliance with this guideline. IWM management priorities would be based on risk factors.
Only weed-free hay, straw, pellets, and mulch shall be used within the CTNF and CNG (S).	The Proposed Action would be in compliance with this standard. IWM emphasizes actions to prevent invasive plant species introduction and spread.
All seed used shall be certified to be free of noxious weed seeds from weeds listed on the current All States Noxious Weeds List (S).	The Proposed Action would be in compliance with this standard. IWM emphasizes actions to prevent invasive plant species introduction and spread.
Gravel or borrow material sources shall be monitored for noxious weeds and other invasive species. Sources infested with noxious weeds shall be closed until the weeds are successfully controlled (S).	The Proposed Action would be in compliance with this standard. IWM emphasizes actions to prevent invasive plant species introduction and spread.
Noxious weeds shall be aggressively treated throughout the CTNF and CNG, unless specifically prohibited, following the Caribou Noxious Weed Strategy. Using IWM, methods of control and access shall be consistent with the goals of each prescription area (S).	The Proposed Action would be in compliance with this standard. Early Detection and Rapid Response is an important component of an IWM program.
Invasive plant treatment projects, especially those using herbicides, should be timed to achieve desired effects on target vegetation, while having minimal effects on non-target vegetation (G).	The Proposed Action would be in compliance with this guideline. IWM includes flexibility to optimize timing of treatments.
Protect biological control insectories and allow harvest for distribution to other invasive plant infestations, providing the original insectory can be maintained (G).	The Proposed Action would be in compliance with this guideline. Biological control is a component of IWM and biological control areas would be managed for success.

Monitor, as needed, disturbed areas, such as landings, skid trails, roads, mines, burned areas, etc., for noxious weeds or invasive species and treat where necessary (G).	The Proposed Action would be in compliance with this guideline. Early Detection and Rapid Response is an important component of an IWM program, and disturbed areas would be a focus.
Evaluate the potential for invasive plant infestation in proposed vegetation units and wildland fire use plan areas and modify units or mitigate where necessary (G).	The Proposed Action would be in compliance with this guideline. IWM emphasizes prevention and projects would be evaluated for invasive species risks.
Projects and activities shall be managed to avoid adverse impacts to sensitive plant species that would result in a trend toward federal listing or loss of viability (S).	The Proposed Action would be in compliance with this standard. The EIS addresses potential effects of the Proposed Action to sensitive species.
Native plant species from genetically local sources should be used to the extent practical for erosion control, fire rehabilitation, riparian restoration, road rights-of-way seedings, and other revegetation projects (G).	The Proposed Action would be in compliance with this guideline. IWM includes restoration and rehabilitation and addresses selection of species for revegetation.
Where practical, disturbed sites should be allowed to revegetate naturally where the seed source and soil conditions are favorable (e.g., low erosion potential, deeper soils) and invasive plants are not expected to be a problem (G).	The Proposed Action would be in compliance with this guideline. IWM includes restoration and rehabilitation, including passive restoration where appropriate.
Known occurrences or habitat for rare plants on the Forest Watch list and rare or unique plant communities within the CTNF and CNG should be maintained (G).	The Proposed Action would be in compliance with this guideline. The EIS addresses potential effects of the Proposed Action to sensitive species.
The forest botanist or ecologist should review seed mixes used for revegetation to insure no adverse impacts to threatened, endangered, sensitive species, other species at risk and the overall native flora within the analysis area (G).	The Proposed Action would be in compliance with this guideline. IWM includes restoration and rehabilitation and addresses selection of species for revegetation.
Targhee National Forest Plan	
Vegetation manipulation may include mechanical treatments, commercial or non-commercial timber harvest of wood products, prescribed fire, or other appropriate methods (G).	The Proposed Action would be in compliance with this guideline. IWM under the Proposed Action would allow the use of the most appropriate treatment method.
Native plant species from genetically local sources will be used to the extent practicable for erosion control, fire rehabilitation, riparian restoration, forage enhancement, road right-of-way seeding, and other revegetation projects (G).	The Proposed Action would be in compliance with this guideline. IWM includes restoration and rehabilitation and addresses selection of species for revegetation.
Areas planned for nonnative seedings or plantings of nonnative woody species must be evaluated to determine the impacts to the native flora within the analysis area and habitats adjacent to it (G).	The Proposed Action would be in compliance with this guideline. IWM includes restoration and rehabilitation and addresses selection of species for revegetation.
Introduced species should be utilized in (1) project seedings where native species would not meet the objectives of erosion control, such as in high-use or impact areas, and where the effects on local, native flora is minimal; (2) sites that are currently dominated by introduced species and use of nonnative species has not degraded the adjacent native flora; and (3) sites where the management objective is to utilize nonnative species in one area to prevent degradation of other natural areas (G).	The Proposed Action would be in compliance with this guideline. IWM includes restoration and rehabilitation and addresses selection of species for revegetation.

Information on the presence of threatened, endangered, or sensitive plant species will be included in all assessments for vegetation and ground-disturbing management activities Appropriate protection and mitigation measures will be applied to the management activities (S)	The Proposed Action would be in compliance with this standard. The EIS addresses potential effects of the Proposed Action to federally listed, candidate, and sensitive species.
Curlew National Grassland Plan	
Information on the presence of threatened, endangered, or sensitive plant species will be included in all assessments for vegetation and ground-disturbing management activities. Appropriate enhancement, protection and mitigation measures will be applied to the management activities (S)	The Proposed Action would be in compliance with this standard. The EIS addresses potential effects of the Proposed Action to sensitive species. No federally listed or candidate species have potential habitat in the CNG.
Invasive species such as noxious weeds will be treated to contain or control as appropriate using integrated pest management (IPM) methods and following the most-recent version of the Caribou-Targhee Noxious Weed Strategy (S)	The Proposed Action would be in compliance with this standard. The IWM under the Proposed Action would allow the use of the most appropriate treatment method.
Invasive species such as noxious weeds will be treated to contain or control as appropriate using integrated pest management (IPM) methods and following the most-recent version of the Caribou-Targhee Noxious Weed Strategy (S).	The Proposed Action would be in compliance with this standard. The IWM under the Proposed Action would allow the use of the most appropriate treatment method.
Do not allow plowing in areas identified on the map as “No Till” areas. Other methods of treatment may be permitted after site-specific analysis (S).	The Proposed Action would be in compliance with this standard. IWM under the Proposed Action would allow the use of the most appropriate treatment method.
Conduct a risk assessment for all sagebrush herbicide treatments, including aerial applications, using the most-current multi-regional risk assessment (S).	The Proposed Action would be in compliance with this standard. IWM decisions would include an assessment of risk factors.
Do not seed nonnative grasses in existing native vegetation unless it is necessary to meet other resource objectives, such as eliminating cheatgrass invasion (S).	The Proposed Action would be in compliance with this standard. IWM includes restoration and rehabilitation and addresses selection of species for revegetation.
Emphasize native plant species where they would meet the desired resource conditions. Introduced species may be used in project seedings (1) where native species would not meet the objectives of erosion control, such as in high-use or impact areas, and where the effects on local, native flora is minimal; (2) on sites that are currently dominated by introduced species and the use of nonnative species has not degraded the adjacent native flora; (3) on sites where the management objective is to use nonnative species in one area to prevent degradation of other natural areas; or (4) when native seed is unavailable or cost prohibitive (G).	The Proposed Action would be in compliance with this guideline. IWM includes restoration and rehabilitation and addresses selection of species for revegetation.
Prioritize bulbous bluegrass treatments in areas that are not meeting wildlife, soil, and vegetative desired future conditions (G).	The Proposed Action would be in compliance with this guideline. IWM priorities would be a targeted to meet desired future conditions.
Consult with the regional ecologist when designing restoration treatments and monitoring protocols for bulbous bluegrass projects (G).	The Proposed Action would be in compliance with this guideline. IWM projects would consult with appropriate resource specialists during the project planning phase.

Greater Sage-Grouse Record of Decision Idaho and Southwest Montana Nevada, Utah	
GRSG-GRSGH-GL-029-Guideline—In priority, important, and general habitat management areas and sagebrush focal areas, actions and authorizations should include design features to limit the spread and effect of undesirable non-native plant species.	The Proposed Action would be in compliance with this guideline. IWM would utilize the most appropriate tools and strategies to prevent the spread of invasive plant species and to treat existing populations.
GRSG-GRSGH-GL-031-Guideline—In priority, important, and general habitat management areas and sagebrush focal areas, native plant species should be used, when possible, to maintain, restore, or enhance desired conditions.	The Proposed Action would be in compliance with this guideline. IWM includes restoration and rehabilitation and addresses selection of species for revegetation.
GRSG-GRSGH-GL-032-Guideline—In priority and important habitat management areas and sagebrush focal areas, vegetation treatment projects should only be conducted if they maintain, restore, or enhance desired conditions.	I The Proposed Action would be in compliance with this guideline. IWM includes restoration and rehabilitation and addresses selection of species for revegetation.
Northern Rockies Lynx Management Direction Record of Decision	
N/A	N/A

1.4 Human Health

The management plans for the CTNF and CNG are silent regarding human health standards and guidelines specific to herbicide use. Several standards and guidelines address public health relative to facilities, recreation activities, roads, wildfire, etc., but none address the use of herbicides on human health. The design criteria developed for all treatment methods, the herbicides analyzed, and the application methods in all the action alternatives comply with FSM and USDA Forest Service Handbook (FSM 2150, FSM 2150 R4 supplement, FSH 2109.14, FSM 6709.11) and FIFRA safety standard guidelines. The U.S. EPA considers many forestry pesticide uses to be minor. Thus, the project-specific application rates, spectrum of target and non-target organisms, and specialized exposure scenarios evaluated by the Forest Service are frequently not evaluated by U.S. EPA in its generalized registration assessments. Risk assessment documents and worksheets are included for human health risk. Risk assessments on human health were analyzed in the EIS.

1.5 Wilderness

Table F-4 summarizes compliance with applicable standards and guidelines from the Forest Plans with regard to wilderness under the Proposed Action.

Table F-4. Compliance with applicable standards and guidelines for wilderness under the Proposed Action.

Standard/Guideline	Compliance under the Proposed Action
Targhee National Forest Plan	
Wilderness, Guideline 2. Utilize the Forest Service's Recreation Opportunity Management (ROS) system to manage for primitive to semi-primitive nonmotorized classification.	The project would be in compliance with this guideline because implementation activities under the proposed action, such as using horse and backpack sprayers to control invasive species, are compliant with primitive to semi-primitive nonmotorized classifications under the Forest Service's ROS system within Wilderness areas.

Wilderness, Standard 3. Utilize the Forest Service's Visual Quality Objective (VQO) system to manage for preservation.	The project would be in compliance with this standard because implementation activities under the proposed action, such as using manual and chemical treatments to control small scale invasive species infestations, are compliant with the preservation classification under the Forest Service's VQO system within Wilderness areas.

APPENDIX G:
COMMON INJURIES TO NON-TARGET SPECIES BY HERBICIDE ACTIVE INGREDIENTS

APPENDIX G: COMMON INJURIES TO NON-TARGET SPECIES BY HERBICIDE ACTIVE INGREDIENTS

Table G-1. Common Injuries to Non-Target Species by Herbicide Active Ingredients for Terrestrial Use

Herbicide Active Ingredient	Comments	Conifers	Deciduous Trees/Shrubs	Evergreen Shrubs	Grasses	Forbs
2,4-D	Selective herbicide, very limited soil residual activity. Primarily under canopy applications.	Seedlings susceptible to injury (e.g. slowed growth, leader dieback), but conifers otherwise tolerant of rates used on forbs, injury includes chlorosis (leaves produce insufficient chlorophyll) and needle-shed of damaged foliage. More tolerant than deciduous species.	Seedlings may be injured or killed. Tolerant of rates used on forbs, injury includes leaf curling/ cupping, twisting, defoliation of damaged foliage. High application rates could result in root absorption and increased injury.	Seedlings may be injured or killed. Many species tolerant of rates used on forbs, injury includes leaf curling/ cupping, twisting, chlorosis, defoliation of damaged foliage.	Tolerant after the seedling stage. Reduced seed production if high rates applied during flower to seed-producing stages.	Most families susceptible to some degree. Active plants will tolerate some injury at low rates. No injury to dormant plants from fall applications.
Aminopyralid	Selective herbicide. Soil residual activity. Under and over canopy applications	Mortality of seedlings. If applied within the dripline, root-uptake and injury possible. Injury from application to foliage includes chlorosis, possible needle-shed and branch dieback.	Mortality/severe injury of seedlings/saplings. Deciduous species more tolerant than conifers. Typical injury is minor (leaf curling/cupping).	Possible mortality/severe injury of seedlings. Otherwise, many shrub species tolerant. Temporary injury is minor (leaf curling/cupping).	Grasses tolerant after the seedling stage. Injury/death to seedlings, increased if tank- mixed with 2, 4-D. No injury after 45 days post-germination	Most native forb families moderately tolerant to tolerant.

Herbicide Active Ingredient	Comments	Conifers	Deciduous Trees/Shrubs	Evergreen Shrubs	Grasses	Forbs
Chlorsulfuron	Selective herbicide. Slight soil residual activity. Primarily under canopy applications.	Tolerant at typical use rates. Injury (e.g. needle curl/ chlorosis) may result if applied during active foliage growth.	Seedlings may be injured or killed. Otherwise, tolerant at typical use rates for forbs. Some leaf curl/ chlorosis possible if applied during active foliage growth.	Seedlings may be injured or killed. Many species tolerant of rates used on forbs. Some leaf curl/ chlorosis possible if applied during active foliage growth.	Tolerant at low use rates. Foliage and seed production could be reduced.	Borage, mustard, and pea families most susceptible. Many plants in the aster family tolerant at typical use rates.
Clopyralid	Narrow spectrum, selective herbicide. Short-term residual activity. Under and over canopy applications.	Tolerant at typical use rates. Injury (e.g. needle curl/ chlorosis) may result if applied during active foliage growth.	Tolerant of rates used on forbs. Some leaf curl possible if applied during active foliage growth.	Evergreen species tolerant of rates used on forbs. Some leaf curl possible if applied during active foliage growth.	Tolerant after the seedling stage.	Four families primarily susceptible: aster, pea, knotweed, and nightshade. Borage family tolerant. Many families, (e.g. mustard, pink, goosefoot, morning glory) not susceptible. Corm/bulb species not susceptible.
Dicamba	Selective herbicide. Some soil residual activity, primarily during growing season in which applied. Primarily under canopy applications.	If applied within the dripline, root-uptake and injury possible. Application to foliage includes chlorosis, possible needle-shed and branch dieback. More tolerant than deciduous species.	Seedlings may be injured or killed. If applied within the dripline, root-uptake and injury possible. Injury from foliar application includes cupping, curling, epinasty and possible defoliation and branch dieback.	Seedlings may be injured or killed. Injury from foliar application includes cupping, curling, epinasty (increased growth on upper surface of leaf) and possible defoliation and branch dieback. Root-sprouting species recover quickly. Mahogany and bitterbrush more susceptible.	Tolerant after the seedling stage.	Most families susceptible to some degree, pea family especially susceptible.

Herbicide Active Ingredient	Comments	Conifers	Deciduous Trees/Shrubs	Evergreen Shrubs	Grasses	Forbs
Fluroxypyr	Selective herbicide for broadleaf weeds along roadsides and in rangeland, non-crop areas, and grazed areas as well as for the control of woody brush. Soil residue up to 4 days on vegetation or fruit.	Most species very tolerant of over and under canopy applications up to maximum label rate. (Used in pine plantations)			For tolerant species such as grasses, no adverse effects would be anticipated from either runoff or the erosion of contaminated soil by wind. Unclear that exposure would cause adverse effects in tolerant species of terrestrial plants, even in the event of a direct spray.	Much more toxic to dicots (e.g., broadleaf plants) than to monocots (e.g., grasses)
Glyphosate	Non-selective, no soil residual. Primarily under canopy applications.	Little to no root uptake. Injury/ death of living tissue (foliage, green stems, non-woody tissue) where sprayed. Otherwise no injury.	Little to no root uptake. Injury/ death of living tissue (foliage, green stems, non-woody tissue) where sprayed. Otherwise no injury.	Injury/death of living tissue (foliage, green stems, non-woody tissue) where sprayed. Otherwise no injury.	Established perennial grass stands tolerant at low use rates, even when mixed with 2,4-D, although foliage and seed production is reduced.	Most families susceptible. Active plants will tolerate some injury at low rates. No injury if dormant.
Imazamox	Active on submerged, emergent and floating broadleaf and monocot species.			**Algae**- Varies from no adverse effects to slight to moderate growth inhibition. Little information available overall.	Active on submerged, emergent and floating broadleaf and monocot species.	**Macrophytes**- Will damage many native macrophytic species. Effects include reduced root and shoot growth, curling, chlorosis and/or necrosis and plant death.

Herbicide Active Ingredient	Comments	Conifers	Deciduous Trees/Shrubs	Evergreen Shrubs	Grasses	Forbs
Imazapic	Selective herbicide, often used in restoration projects. Some soil residual activity at higher rates. Under and over canopy applications.	Most species very tolerant of over and under canopy applications up to maximum label rate.	Some minor injury may result (e.g. tip chlorosis, minor death of plant tissue).	Most species very tolerant of over and under canopy applications up to maximum label rate.	Many perennial grasses tolerant to very tolerant, application and reseeding of these perennial grasses can take place at the same time. Some perennials and annual grasses more susceptible.	Many families tolerant to very tolerant. Borage, mustard, and goosefoot susceptible. Aster family not susceptible.
Imazapyr	Non-selective herbicide. Slow-acting. Soil residual activity. Over and under canopy applications. Effective control on woody species.	Woody species susceptible. Apply well outside the dripline of nontarget species.	Woody species susceptible. Apply well outside the dripline of nontarget species.	Woody species susceptible. Apply well outside the dripline of nontarget species.	Many grasses susceptible. Used to control cheatgrass, for example.	Most families susceptible.
Metsulfuron methyl	Non-selective herbicide, primarily used on annual grasses. Slight soil residual activity. Primarily under canopy applications.	Tolerant at typical use rates. Injury (e.g. needle curl/ chlorosis) possible.	Seedlings may be injured or killed. Otherwise, tolerant at typical use rates. Injury (e.g. chlorosis) is temporary.	Tolerant, although small seedlings may be injured or killed. Some leaf curl/ chlorosis possible.	Used to control annual grasses. Established stands of perennial native grasses not affected past the seedling stage.	Most families not susceptible at rates used on invasive annual grasses (up to 1.5 oz/ac). Slight, temporary injury may occur.

Herbicide Active Ingredient	Comments	Conifers	Deciduous Trees/Shrubs	Evergreen Shrubs	Grasses	Forbs
Picloram	Selective herbicide. Soil residual activity up to one year after application. Under canopy applications.	If applied within the dripline, root-uptake and injury possible. Application to foliage includes chlorosis, possible needle-shed and branch dieback.	Seedlings may be injured or killed. If applied within the dripline, root-uptake and injury possible. Injury from foliar application includes cupping, curling, epinasty and possible defoliation and branch dieback. Cottonwoods/willows more susceptible.	Seedlings may be injured or killed. Many species are susceptible during active growth, especially when tank-mixed (e.g. with 2,4-D). Sagebrush less susceptible at lower (16 - 24 oz/ac) rates used for forbs. Root-sprouting species recover quickly. Mahogany and bitterbrush very susceptible.	Tolerant after the seedling stage at rates up to 32 oz/ac. Temporary injury including inhibited growth, chlorosis at higher rates.	Many families susceptible to some degree, injury/mortality particularly for aster and pea. Established, deep-rooted plants less so than young or shallow-rooted plants. Corm/bulb species not as susceptible as fibrous-rooted species, will tolerate lower rates with temporary injury (inhibited flowering, leaf damage, etc.)
Sulfometuron methyl	Selective herbicide. Slight soil residual activity. Primarily under canopy applications.	Tolerant at typical use rates. Injury (e.g. needle curl/ chlorosis) possible.	Injury or death at rates above 1 oz/ac, particularly when tank-mixed.	Injury or death at rates above 1 oz/ac, particularly when tank-mixed.	Severe injury to seedlings. Used in establishment of native perennial grasses, which are tolerant once established. Foliage and seed production could be reduced.	Borage, mustard, and pea most susceptible. Many plants in the aster family tolerant at typical use rates.
Triclopyr	Selective herbicide. Soil residual activity during the growing season in which applied. Primarily under canopy applications.	Tolerant at typical use rates. Injury (e.g. needle curl/ chlorosis) may result if applied at high rates.	Many species susceptible, but somewhat tolerant of rates used on forbs. Injury to sprayed foliage including leaf curl, death of plant tissue, defoliation, and branch dieback. Higher rates will cause mortality.	Many species susceptible, but somewhat tolerant of rates used on forbs. Injury includes chlorosis, death of plant tissue, defoliation, branch dieback, etc. Higher rates will cause mortality.	Tolerant after the seedling stage.	Borage, mustard, and peas families most susceptible. Many plants in the aster family tolerant at typical use rates.

Season of use for all herbicides is spring through fall

Table G-2. Common Injuries to Non-Target Species by Herbicide Active Ingredients for Aquatic Use

Herbicide Active Ingredient	Comments	Algal Species	Graminoids	Macrophytes
Glyphosate	Non-selective herbicide for many broadleaf and monocot species. Readily moved to above ground and below ground plant parts. Active ONLY on floating and emergent vegetation. Does not kill submersed vegetation.	Varies from stimulation of growth (apparently beneficial) to no adverse effects to slight to moderate growth inhibition and injury.	Rate dependent, but may damage or kill wetland grass species. Chlorosis and death of affected tissue. May injure or kill root system depending on species and rate used. Damage on tolerant species is usually temporary.	Glyphosate will damage or kill many native emergent or floating species (e.g. cattails). Effects include wilting, chlorosis, death of plant tissue, and plant death.
Imazamox	Active on submerged, emergent and floating broadleaf and monocot species.	Varies from no adverse effects to slight to moderate growth inhibition. Little information available overall.	Varies from no effect to severe effects. Reduced root and shoot growth. Curling, chlorosis and/or death of plant tissue at stem tips at moderate to high use rates.	Imazamox will damage many native macrophytic species. Effects include reduced root and shoot growth, curling, chlorosis and/or death of plant tissue and plant death.
Imazapyr	Non-selective herbicide for many broadleaf and monocot species. Readily translocated to above ground and below ground plant parts. Active ONLY on floating and emergent vegetation. Does not kill submersed vegetation.	May cause short-term damage to some sensitive species of algae. However, imazapyr is not an effective algaecide and adverse effects from aquatic applications would not be anticipated.	Rate dependent, but may damage or kill some wetland graminoid species. Chlorosis and death of plant tissue of affected tissue. May injure or kill root system depending on species and rate used. Damage on tolerant species is usually temporary. Damage from indirect exposure (e.g. shoreline plants with roots extending into a treated body of water) is not likely.	Imazapyr will damage many native emergent or floating macrophytic species. Effects include reduced root and shoot growth, chlorosis, death of plant tissue and plant death. Sensitive species are likely to be killed. Damage from indirect exposure (e.g. shoreline plants with roots extending into a treated body of water) is less likely.

APPENDIX H:
PAST, CURRENT, AND FORESEEABLE FUTURE ACTIVITIES FOR THE CARIBOU-TARGHEE NATIONAL FOREST AND CURLEW NATIONAL GRASSLAND

APPENDIX H: PAST, CURRENT, AND FORESEEABLE FUTURE ACTIVITIES FOR THE CARIBOU-TARGHEE NATIONAL FOREST AND CURLEW NATIONAL GRASSLAND

Cumulative effects are "the incremental impacts of the Proposed Action and alternatives when added to effects of other actions both on National Forest System lands and other adjacent federal, state, or private lands" (40 Code of Federal Regulations (CFR) 1508.7).

The Council on Environmental Quality (CEQ) regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. With regard to past actions, the agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects during the scoping process and the preparation of the analysis. Dependent upon the Proposed Action, the accounting for past actions and specific information about the direct and indirect effects of their design and implementation could, in some contexts, be useful to predict the cumulative effects of the proposal. The CEQ regulations, however, do not require agencies to comprehensively list and analyze all individual past actions. Just because information about past actions may be available or obtained with reasonable effort does not mean that it is relevant and necessary to inform decision making (40 CFR 1508.7).

Past Activities

Human activities are known to have influenced the spread of invasive plants into North America, the Pacific Northwest, and specific sites within the project area. A complete list of past actions is not necessary to understand how land uses have contributed to the current distribution of invasive plants. **The baseline for cumulative effects analysis is the current condition.**

Ongoing Herbicide Treatments–Non-Forest Ownership

Herbicide treatments occur on private land adjacent to the Caribou-Targhee National Forest (CTNF) and Curlew National Grassland (CNG). Because of the manner in which the State of Idaho collects data regarding pesticide use, it is not possible to track which herbicides are used or in what quantity on the private land adjacent to the CTNF and CNG. We know that private landowners do use herbicides (e.g., Round-up), so assumptions had to be made about the level of use. Those assumptions are described below.

State of Idaho Cooperative Weed Management Areas (CWMAs) are formed when the landowners and land managers of a given area come together and agree to work cooperatively to control weeds. A CWMA may consist of a portion of a county, a county, portions of several counties, or portions of more than one state. The CWMA partners track herbicide use; however, the level to which these are tracked and documented varies greatly by CWMA, and tracking is also dependent upon staffing and funding. There are six CWMAs in and around the CTNF and CNG. These include: the Continental Divide CWMA, Henrys Fork CWMA, Highlands CWMA, Jackson Hole CWMA, Upper Snake CWMA, and Utah-Idaho CWMA. Every effort was made to secure CWMA data and discover where it was acquired so that it could be incorporated into the

project record. The data received came in many different forms (e.g., GIS layers, paper maps) The CWMAs treat private-, state-, county-, and federally owned lands and provide herbicide to some landowners. However, a private landowner can treat weeds on their property without reporting it. The CWMA partners are licensed pesticide applicators, thus it is assumed that herbicides were applied by them are in compliance with label directions. The US Bureau of Land Management (BLM), is a federal agency that manages invasive plant species on public lands (licensed pesticide applicators) adjacent to the project area. They were also contacted for their herbicide use records and it is incorporated into the project record.

Based on information gained from the BLM and the CWMAs, Table H-1 shows the herbicides we know are used in and around the CTNF, listed by active ingredient. This list is considerably longer than the list of approved herbicides used by the Forest Service in either of the project alternatives.

Table H-1. Active ingredient names in herbicides used adjacent to the project area.

ACTIVE INGREDIENT	
1	2,4-D Ester
2	Aminopyralid
3	Aminopyralid + 2,4-D
4	Aminopyralid + metsulfuron
5	Aminocyclopyrachlor
6	Bromacil + Diuron
7	Chlorsulfuron
8	chlorsulfuron + 2,4-D
9	Clopyralid
10	clopyralid + 2,4-D
11	Dicamba + 2,4-D + Fluroxypyr
12	Diglycolamine
13	Diuron
14	Flumioxazin
15	Glyphosate
16	glyphosate (with POAE)
17	Imazapic
18	Imazapyr
19	Indaziflam
20	Isoxaben
21	metsulfuron methyl
22	metsulfuron methyl + 2,4-D
23	Picloram
24	Picloram + 2,4-D
25	Sulfentrazone
26	Sulfometuron methyl
27	Triclopyr
28	Topramezone
29	Water Conditioning Agent

Because there is not consistent or complete information about herbicides being used adjacent to the project area, certain assumptions were made for this analysis. For lands adjacent to the project area, the following assumptions were made:

1. Herbicide labels are being followed; herbicides are being applied per their labels.
2. Herbicides are being used on known nonnative plants adjacent to the CTNF and CNG.
3. Herbicide treatments, including aerial and ground application of herbicides, will continue on state-owned, privately owned, and public lands adjacent to and surrounding the CTNF and CNG.
4. The applications of herbicides outside the project area are spatially distinct from treatments within the project area.
5. Where croplands are adjacent to the CTNF and CNG, we assume that herbicides being applied for crop management may also include treatment of nonnative invasive plants.
6. Other applicators may be applying combinations or mixes of herbicides in addition to those listed below, but always within specified label restrictions.

The extent of herbicide applications for invasive-plant management on lands adjacent to or near the CTNF and CNG cannot be quantified in all instances because only some of these activities are known to the Forest Service and are not required to be reported to the state or other government agencies. Because other governmental invasive-plant management entities do not collect usage data to the extent that the CTNF and CNG does, or in the same manner, comparison can in some instances be difficult. Moreover, the State of Idaho does not require that private applicators collect application data to the same degree as professional applicators.

Additionally, management of these areas may change over the 10–15-year timeframe of this project. Currently, county road right-of-ways and state highway right-of-ways are treated with herbicides. The BLM, the Idaho Department of Fish and Game, Idaho Department of Transportation, and all counties included in the project area engage in invasive-plant control measures, as do many private landowners, particularly ranchers and other agricultural producers. It is expected that invasive-plant control efforts, including aerial and ground application of herbicides, will continue on state-owned, privately owned, and public lands adjacent to the CTNF and CNG.

The SERA risk assessments identified connected actions and cumulative effects for each of the herbicides reviewed. In the risk assessments, connected actions include actions or the use of other chemicals that are necessary and in close association with the use of the analyzed herbicide. Cumulative effects are analyzed within the context of the Food Quality Protection Act, which requires the assessment of chemicals with a similar mode of action. It is beyond the scope of the risk assessments to identify and consider all agents that might interact with or cause cumulative effects with the analyzed herbicide.

In additional to treatments on private, county, and state lands, invasive plant management activities are ongoing on public lands managed by the BLM and the National Park Service (NPS), the Salmon-Challis National Forest, the Bridger-Teton National Forest, Beaverhead-Deerlodge National Forest, and Uinta-Wasatch-Cache National Forest adjacent to the project

area. The invasive-plant management program in these areas are very similar to that conducted in the project area. All of the essential program elements, such as detection and control using herbicides, are present. Likewise, present and foreseeable actions also contribute cumulatively to the introduction, establishment, and spread of invasive plants as humans engage in legitimate and permitted use of natural resources.

Cumulative effects are both temporal and spatial, with recurring and frequent introduction events spread across the project area wherever activities occur. Vectors for spread of invasive plant species is the same on all lands adjacent to and within the project area. Cumulative effects may result when a single viable invasive plant seed is dropped from a motor vehicle alongside a road, for example, or from large-scale vegetation and soil disturbance resulting from projects such as minerals exploration and timber harvest. Natural events, such as drought, high-intensity storms, and wildfires, can exacerbate the cumulative effects of human uses of natural resources in the project area. The Forest Service responds to the need to alleviate these impacts through the use of prevention measures and contract and permit clauses intended to reduce the risk of invasive plant introduction.

Under Alternative 1—No Action/Current Management, we currently implement an active program of invasive-plant management, including ground-based herbicide application, mechanical control, and biological control releases. Alternative 2—Proposed Action would expand its current program of invasive-plant management with inclusion of an aerial herbicide application strategy, and development of an aquatic invasive-plant treatment strategy. Active invasive-plant treatments, including each of these same treatment methods, would additionally continue to occur on adjacent private, county, state, NPS, and BLM lands through actions conducted by CWMA participants.

Current, ongoing, and foreseeable forest management activities within this cumulative effects analysis area are identified below. Even without knowing how much herbicide is applied to private and public lands, the proportion of private land in relation to the entire project area is low, as shown in Table H-2. The applications of these herbicides are also spatially distinct.

None of the herbicides analyzed have obvious, cumulative, adverse effects when used in combination with other herbicides. Given the relatively small proportion of treatment across the landscape, the implementation of design criteria designed and utilized to protect sensitive species, and the use of label guidelines for proper application, cumulative adverse effects to aquatic species are not expected from the implementation of any of the action alternatives. All the proposed treatments used in conjunction with treatment methods that neighboring land management agencies, landowners, and CWMA partners implement may serve to increase the efficacy of treatments which could result in beneficial cumulative impacts to aquatic habitats.

Cumulative effects from treatments from alternatives 1 and 2, combined with treatments in adjacent lands, would result in benefits to aquatic habitat and resources through the widespread eradication, control, and containment of invasive plants. The NPS, BLM, CWMAs, and the CTNF and CNG invasive-plant management programs would be expected to cumulatively result in increased levels of invasive-plant treatment success. Invasive plant infestations on the CTNF and CNG would progressively decline. This would reflect the eradication, control, or

Table H-2. Ownership by county (acres).

OWNERSHIP	PRIVATE	STATE	BUREAU OF LAND MGMT.	US FOREST SERVICE	OTHER FEDERAL	TRIBAL	OTHER	TOTAL ACRES
Bannock, Idaho	375,176	47,852	75,432	118,932	613	116,264	478	734,746
Bear Lake, Idaho	350,703	18,883	55,409	227,544	19,213	0	0	671,753
Bonneville, Idaho	559,399	57,191	94,021	482,967	22605	0	0	1,216,186
Butte County, Idaho	171,806	13,265	512,936	271,660	462988	0	0	1,432,660
Caribou County, Idaho	535,366	107,161	76,712	376,465	17,119	38,306	0	1,151,130
Clark County, Idaho	337,874	79,165	341,186	357,495	13,305	0	0	1,129,025
Franklin Co, Idaho	275,876	13,294	14,397	121,946	1,824	0	1	427,335
Fremont County, Idaho	385,166	114,166	150,616	523,577	40028	0	0	1213553
Madison County, Idaho	220,895	22,050	17,501	41,459	1,021	0	0	302,926
Lemhi County, Idaho	245,440	37,878	575,180	2,065,788	0	0	0	2,924,286
Oneida County, Idaho	350,608	12,974	266,327	138,407	0	0	0	768,316
Power County, Idaho	452,554	26,915	203,279	36,017	1,916	166,336	0	922,963
Teton County, Idaho	190,789	1,633	7,622	88,083	0	0	0	288,127
Teton County, Wyo.	109,352	6,493	2,385	1,367,702	1,401,171	0	158	2,699,045
Lincoln County, Wyo.	591,687	107,970	984,609	902,450	33593	0	251	2,620,558
Box Elder County, Utah	1,910,685	930,537	1,078,937	104,048	280,168	196	0	4,306,711
Cache County, Utah	426,296	37,916	131	286,306	0	0	0	750,649

containment of new invasive plants that have invaded the CTNF and CNG from adjacent lands covered by the CWMAs, and increased success in preventing invasive plants presently occurring on the CTNF and CNG from invading adjacent lands. Table H-2 shows the landownership by county.

Current and Foreseeable Future Activities−National Forests

Listings of the ongoing activities and foreseeable future projects that are most likely to affect the spread of invasive plants in the CTNF and CNG and adjacent lands are shown in tables H-3–H-9. Many of these activities have the potential to act as vectors—factors or influences that introduce or spread noxious invasive plants. Permitted activities have stipulations, such as prevention measures included in grazing allotment annual operating instructions, timber sale contracts, and mineral material plans of operation. The update of the CTNF and CNG's travel management plan eliminated cross-country motorized travel, which eliminated a substantial potential for introducing or spreading nonnative invasive plant species. The acres of wildfire illustrate the disturbed acres that have the potential for noxious plant invasion. Although the possibility for the increase of infestations (e.g., wildfire) as well as for the decrease (e.g., elimination of cross country motorized travel) exists for virtually any activity that occurs on the CTNF and CNG. This analysis includes the following activities:

1. Vegetation and fuels projects
2. Fires (including prescribed fire)
3. Livestock grazing
4. Travel management
5. Minerals

Table H-3. Vegetation and fuels.

ACTIVITY	FOREST/ DISTRICT	DATE IMPLEMENTED	ACRES	NOTES
Bridge Creek Forest Management Project	Soda Springs Ranger District	2020	12,500	Proposing to treat approximately 12,500 acres with a combination of harvest, mechanical and prescribed fire treatments. To facilitate removal of timber existing roads would be improved and temporary roads constructed.
Ephraim Aspen Wildlife Habitat Enhancement Project	Montpelier Ranger District	2020	1,692	The Montpelier Ranger District of the Caribou-Targhee National Forest is proposing a project to improve wildlife habitat on the southern end of Caribou County in the Gannet Spring Creek Inventoried Roadless Area, 16 miles northeast of Montpelier.
Flatiron Wildland Urban Interface Fuels Reduction Project	Palisades Ranger District	2020	1,533	Use prescribed fire to treat 1,533 acres to improve the declining aspen population and decadent brush species to create a diversity of age classes for wildlife and critical summer range for big game species as well as for public safety.
Middle Henry's Fork Aspen Enhancement Project	Ashton/Island Park Ranger District	2020	49,000	The purpose of this project is to increase aspen regeneration across the Middle Henrys Fork watershed by decreasing their competition with conifer species. Treatments may include timber harvest and prescribed burning.
Strawberry Forest Management Project	Montpelier Ranger District	2020	2,658	The purpose of the project is to improve the overall health and resilience of forests in the landscape by reducing tree density and accumulated fuels, while shifting species composition and age-class structure toward desired conditions.

Table H-4. Twenty-year fire history.

YEAR	ACRES BURNED
1998	586
1999	104
2000	21,107
2001	1,675
2002	65
2003	5,572
2004	14
2005	2,153
2006	51,288
2007	5,021
2008	8,312
2009	425
2010	3,816
2011	629
2012	516

YEAR	ACRES BURNED
2013	256
2014	145
2015	603
2016	6,607
2017	452
2018	1,587
Grand Total	110,934

Table H-5. Rangeland management allotments (range specialist report).

DISTRICT AND FOREST	NUMBER OF ACTIVE AND VACANT GRAZING ALLOTMENTS	AVERAGE HMS ON ACTIVE ALLOTMENTS
Montpelier Ranger District, Caribou National Forest	35	63,667
Soda Springs Ranger District, Caribou National Forest	53	113,181
Westside Ranger District, Caribou National Forest, Curlew National Grassland	39	65,408
Ashton Island Park Ranger District, Targhee National Forest	21	31,245
Dubois Ranger District, Targhee National Forest	41	54,894
Palisades Ranger District, Targhee National Forest	40	71,441
Teton Basin Ranger District, Targhee National Forest	14	3,350

Table H-6. System motorized roads.

DISTRICT	MILES
Ashton/Island Park Ranger District	1,341
Dubois Ranger District	510
Montpelier Ranger District	734
Palisades Ranger District	384
Soda Springs Ranger District	576
Teton Basin Ranger District	300
Westside Ranger District	584
Grand Total	4,428

Table H-7. System trails non-motorized trails.

DISTRICT	NON-MOTORIZED (miles)	MOTORIZED (miles)
Ashton/Island Park Ranger District	163	85
Dubois Ranger District	104	108
Montpelier Ranger District	217	350
Palisades Ranger District	307	297
Soda Springs Ranger District	238	188
Teton Basin Ranger District	213	144
Westside Ranger District	165	306
Grand Totals	1,407	1,480

Table H- 8. Travel management projects.

ACTIVITY	DATE IMPLEMENTED	MILES	NOTES
Motorized Roads and Trails—Motor Vehicle Use Map			
Bear Creek Trail Repair	2020	1 mile	Build four trail reroutes equaling 1 mile and two trail bridges on Forest Service Trail #273 in order to eliminate six current trail creek crossings. There will not be a net change in miles of trail; there will be 1 mile of reroutes and 1 mile removed.
Crestline Trailhead Relocation	2020	5 miles	The Proposed Action is to obliterate the current Crestline Trailhead and .25 mile of road (Forest Road 333). The trailhead would be re-constructed in a new location immediately adjacent to Forest Road 001 (Scout Mountain Road).
Fleming Canyon Trail Reroute	2020	0.63 mile	The Proposed Action would utilize an old sheep herder trail that is already on a fairly sustainable grade and would take minimal work to bring it up to Forest Service standard for a trail class-3, single-track motorized trail.
Lake Canyon Trail Project	2020	0.5 mile	Reroute approximately .30 mile at head of canyon, putting it on a grade of 5 to 10%. Close and rehab old segment to eliminate eroding section of trail. Reroute .20 of a mile at mid-trail to eliminate rock hazards.

Table H-9. Mineral projects.

ACTIVITY	DATE IMPLEMENTED	ACRES	NOTES
Dairy Syncline Phosphate Mine	2020	1,672	Analyze a proposed new phosphate mine plan and associated projects and infrastructure on existing lease I-28115 and I-0258, encompassing approximately 1,672 acres on lease and approximately 1058 acres off lease. Considers land exchange proposal.
East Smoky Panel Mine EIS	2020	847	Analyze a proposed phosphate mine expansion plan and associated projects and infrastructure at the existing J.R. Simplot Company's Smoky Canyon Mine on leases I-26843, I-012890, and I-015259. 527 acres of disturbance on forest, 322 off forest.

APPENDIX I:
AERIAL SPRAY GUIDELINES AND DRIFT MODEL RESULTS

APPENDIX I: AERIAL SPRAY GUIDELINES AND DRIFT MODEL RESULTS

Aerial Spray Guidelines

These guidelines are intended as a practical field guide for weed managers who may be considering use of aerial herbicide application as part of an integrated pest management program. Some of the terminology and work force, fiscal year, planning references are specific to Forest Service project planning. The information and observations in this guide are specific to large droplet liquid herbicide applications and does not address pellet, insecticide or other fine droplet aerial application projects. Aerial applications require an additional air safety plan, FHS 6709.11 (22.11b), 2109-14.

Why Aerial Spray?

Scale: The impacts of weeds on native vegetation, wildlife, soils, fisheries, aesthetics, wilderness and a host of other resources are widely recognized by both the public and land managers. At the same time, the invasive plant problem in the northern Rockies has grown beyond the scale of ground based weed control.

While ground based and biological weed management practices still are important elements in an IWM program, they have site and species limitations. Ground-based application methods such as truck, ATV, horseback, backpack, and atomizer applications are generally most effective for the following situations:

- New or small infestations
- Infestations on flat or open ground
- Near roads or trails

Biological control alone, while effective and applicable in certain situations, is:

- Often cyclic,
- Not available for many weed species,
- Not as effective on weed infestations with several weed species,
- Not effective for small or pioneering infestations scattered over a large landscape, and
- Not effective on complex terrain with a wide range of slope, aspect, soil and canopy combinations.

Aerial application is an efficient and useful method land managers can add to their IWM toolboxes for weed infestations involving:

- Multiple weed species,
- At landscape scale, and
- On steep and remote areas.

Cost: Aerial application reduces costs in at least two ways. Helicopter aerial application in the Northern Region costs $10 to $15 per acre. Ground-based applications can range from $25 per acre for truck-based broadcast spraying to more than $300 per acre for backpack applications. The lower application cost of aerial application, combined with the growing scale of the

problem, makes aerial application an attractive option when we consider that weed infestations are growing faster than any anticipated increases in weed budgets.

Access: Many wildland infestations occur in remote areas and very steep topography. Aerial application can quickly (in terms of application time), safely (with regard to applicator and public exposure) and efficiently (in terms of infested area coverage) treat infestations far from roads and trails and in steep or otherwise inaccessible terrain.

Safety and exposure: Aerial application improves safety and reduces worker and public exposure to herbicides. Worker exposure and risk are influenced by the:

- Time a worker is exposed to a product,
- Physical proximity and exposure to a product,
- Personal protective equipment and safe handling practices,
- Toxicity of the product, and
- Terrain, hazards, and weather in the treatment area.

Aerial application reduces application time and the time a worker is exposed to a product. It also reduces the number of applicators needed to accomplish a project and the chance of slips, falls, and spills associated with ground-based treatments in steep, remote, and hazardous terrain.

The public impacts are influenced by:

- The time it takes to treat an area and the resulting limitations on public use or access,
- Individual physical or philosophical sensitivity to a product, and
- Toxicity of the product.

Aerial application reduces the time that a treatment area is unavailable to the public. It also provides an aerial platform from which an applicator can see people who may have unknowingly entered a treatment area.

Weather and wind patterns also affect worker and public exposure. Aerial application reduces the potential for both worker and public exposure from weather-related factors because more acreage can be treated in less time, thereby rapidly capitalizing on favorable weather conditions. Worker and public exposure are reduced when it takes less time to treat a larger area.

Efficacy: Aerial application allows a manager to quickly complete projects when the target species is at the most susceptible phenological stage and weather conditions are most favorable for efficacy. This maximization of efficacy factors can reduce the number and scale of follow up treatments.

Overgrazing and grazing animal distribution: Lower application costs allow for more ecologically compatible weed management. With lower application costs, a manager can afford to treat larger project areas at one time. Higher treatment costs may necessitate treatment of only a portion of a project area each year. This can inadvertently attract big game or livestock to the treated area and result in overgrazing. Overgrazing in turn can reduce the retreatment interval. By treating larger areas at one time, big game and livestock will be better distributed over a larger area as they express preference for the improved forage resulting from the treatment.

Reduced wildlife disturbance: The short operational time needed for aerial treatment minimizes wildlife disturbance and use of an area. Aerial applications may typically take only one operational day compared to a week to a month for ground-based treatments.

Visual quality: Lower application costs that allow treatment of larger areas with a single entry reduce the visual impacts that result from annual treatment of only a portion of the project area. The color and texture of a landscape-scale treatment is homogeneous rather than broken up by color, texture and straight lines.

Relation with Fire

The conditions that result from prescribed fire and wildfires are conditions that favor weeds. Open canopies, more direct sunlight, reduction of other competitive vegetation, soil damage from high heat, soil disturbance from fireline construction, and the potential introduction of weed seed from firefighters and firefighting equipment all favor the establishment of new weed species and the spread of weeds already found in an area.

Species-specific research to describe quantitative effects of fire on five weed species (i.e., spotted knapweed, sulfur cinquefoil, leafy spurge, Dalmatian toadflax and St. Johnswort) is being conducted on the Lolo National Forest in cooperation with the National Bison Range and the City of Missoula, Montana. Research is also underway to determine whether managers should burn and spray or spray and burn.

Aerial Spray Control Strategies

Weed management objective: Weed managers should develop realistic and obtainable weed management objectives before beginning a direct weed control program. Even selective herbicides will affect non-target forbs. The effect of invasive weeds on native or desirable vegetation needs to be recognized and considered in relation to the effect of herbicides on non-target vegetation. Aerial application is a general treatment and it can be difficult to avoid small or isolated non-target vegetation. Non-target vegetation can be flagged and smaller sites can be tarped to avoid treatment, but the effect of weed control on individual non-target plant species should be carefully weighed in relation to the effect of unchecked weed spread on the overall population viability of non-target species both on and off the treatment site.

The herbicides and rates used for weed control are selective (depending on rate) and many do not generally kill woody vegetation or grasses. While woody vegetation may show short-term effects, widespread mortality or damage is uncommon. Forbs are the non-target plants most at risk from the use of wildland weed herbicides. Whether native forb impacts are long term or short term depends on the rate and frequency of treatment, which is influenced by size of the infestation and whether you have rhizomatous or non-rhizomatous weeds.

While an objective to “Restore native plant communities” may be desirable, it may be unrealistic or unobtainable on widespread or rhizomatous weed infestations. More realistic and obtainable objectives may include:

- Improving or protecting existing or adjacent native plant communities,
- Improving wildlife forage areas,
- Preventing new invasive species from establishing in an area,
- Containing or reducing the acreage of difficult-to-control weeds (such as rhizomatous species),
- Controlling areas of weeds growing in large areas and difficult terrain,
- Controlling widespread invasive species in areas with high resource value (such as concentrated public recreation areas, big-game winter ranges, or area adjacent to neighboring landowners with active weed control programs).

Spring vs. Fall Treatments

Both spring and fall treatments have advantages and disadvantages. Fall treatments have less effect on non-target forbs. Climatologically, weather is more consistent in the fall, but may be consistently too cold, especially in the morning. A drawback is that there is greater annual variability in the fall treatment window. It is difficult to know (and plan) when the fall treatment window will arrive. During some years there may be no fall treatment window due to warm weather and no rainfall. And if a treatment window does open, it may last a week or as long as several weeks. The end of the fall window can arrive abruptly with the snowfall and cold, windy weather.

The spring treatment window is relatively long and dependable in terms of start and end date, and it usually arrives in a way that allows planning for budget and staff. The days are longer in the spring, which allows more application time (and thus more treated acreage) each day. Late sunset gives application operations the option of shutting down midday if there is wind, then resuming in the evening when the wind subsides.

Both seasons can conflict with aircraft availability as a result of prescribed burning or wildfires.

Re-treatment Considerations

Before beginning an aerial treatment program or re-treatment needs, funding and scheduling should be considered. The objective is not to simply kill the existing standing weed crop, but to:

- Restore and encourage desirable and competitive vegetation and
- Deplete the weed seed soil bank.

With these objectives in mind, a single treatment may be insufficient. As with all weed control methods, initial herbicide treatments should include planning for follow-up treatments. Follow-up treatment frequency should be influenced by the soil seed life of the most abundant and longest-lived weed on the site and the residual control provided by the herbicide selected. Spotted knapweed for example, has a soil seed life of 8–10 years. Once a treatment program begins, managers should plan for follow-up treatments based on the soil seed life of the weeds present and the residual control of the herbicide selected.

For example, if spotted knapweed is being treated with picloram, a manager may consider follow up treatments every three growing seasons (the approximate residual control period for picloram) for three to four cycles (3 growing seasons x 3 to 4 cycles = 9 to 12 years—the approximate soil seed life for knapweed). Commitment to this program is important because if a cycle is missed and a weed seed crop is allowed to develop, the treatment cycle may have to be extended.

Pre-field Project Preparation

It is helpful to develop a checklist of the protection measures and management requirements. This checklist should clearly identify tasks and provide a place to date and sign off as each task is completed. This checklist should be filed in the project file.

Some of the items that can go on the checklist include:

- Herbicide prescription, including site-specific, water-quality risk assessment will need to be conducted. Once the exact treatment areas are delineated in preparation for the contract, treatment acres can be determined for 6th hydrologic unit code (HUC) watersheds potentially affected by aerial application. These delineated areas can be incorporated into the risk assessment to estimate probable herbicide concentrations and allowable treatment acres. If concentrations exceed the recommended safe threshold, treatment acres would need to be reduced to the allowable amount.
- Pesticide use proposal.
- Protection measures from NEPA decision.
- Notification of neighbors. (*Note: neighboring landowners may want to treat their lands when they learn a project is scheduled next to them.*)
- Pretreatment monitoring plots (these plots should be established during the growing season prior to the treatment).
- Designation of aerial equipment manager (helicopter manager).
- Recon and selection of a helibase (close to treatment area, with good road access, far from waterways, and reviewed and approved by pilot).
- Posting of the area to be treated.
- Establish temporary closure orders, when needed.
- Identification and marking of sensitive areas to be avoided.
- TES plant and animal considerations.

Field Project Layout

It is difficult to pre-determine the treatment day due to weed phenology, weather, and aircraft availability. It is recommended that aerial spray projects be prepped well in advance (2–4 weeks) of the anticipated treatment date.

Ground Truthing: Treatment units should be carefully ground truthed prior to treatment to determine:

- Weed species and distribution
- Road system and any differences in roadside infestations in relation to off road infestations
- Herbicide prescription considering both weeds and native vegetation
- Live water, wet areas or other sensitive resources to be avoided
- Overstory canopy closure

This information can be recorded on aerial photographs that include project boundaries and other adjacent or in holding ownerships. Two copies of these aerial photos should be made, one copy for the project manager and one set for the application pilot to have on board the aircraft. When possible, geo-reference the aerial photo information in order to provide the pilot GPS location information.

Buffers and No-treatment Areas: Buffer and no treatment areas should be established around any sensitive resource to be avoided. These areas may include live water, wet areas, other land ownerships, TES wildlife/plants or other occupied areas. Aerial treatment buffer zones may vary depending on site characteristics. Treatments would be reviewed by Forest Hydrologist, Botanist, and Wildlife or Fisheries Biologist to avoid any aerial treatment near sensitive resources. The width of an aerial treatment buffer zone near sensitive resources should consider:

- Slope (steeper = wider)
- Vegetation (less overstory vegetation = wider)
- Wind prescription (applications should be made only with low upslope winds)
- Overstory vegetation (which determines release height - higher release height = wider buffer)
- Use of a drift agent (no drift agent = wider buffer—drift reduction agents are recommended near buffer areas)
- Droplet size (smaller droplet size = wider buffer)—limited to 240-400 microns
- Topographic position (narrow deep draws = wider buffer areas)
- Sensitivity of neighboring landowners (more sensitive = wider buffer)

Buffer Monitoring: Water-reactive "drift cards" may be placed as needed within the buffer zones to document herbicide placement. The number of drift card lines should be determined by the sensitivity of the resource and the size of the area. The number of card lines should be considered carefully because they are time intensive and require additional project staff. Drift cards should:

- Be placed equidistance within the buffer from the sensitive resource to the beginning of the treatment area.
- Have the Line # and location on the line recorded on each card at the time of placement.
- Be placed 10–30 feet apart depending on the width of the buffer area.
- Be placed on drift card holders.

- Be placed immediately before application and picked up and stored in waterproof bags immediately after treatment.
- Not be placed the day or evening before early morning applications due to dew, fog or humidity contamination.
- Be laid out in a dry office setting in the order they were placed and interpreted as soon as practical. (Cards often come with interpretation information and sampling square templates.)
- Filed in waterproof bags in the project file.

It is critical that the personnel placing drift cards receive training regarding handling, placement, contamination, collection and storage of the cards. Those placing and picking up the cards should carefully check the card condition as they are placed and picked up and note any non-herbicide contamination. Contamination can include fog, high humidity, dew droplets off leaves, moisture on hands, improper card handling, rodent urine or foot prints, wildlife or insect moisture and/or feeding on the cards.

If drift cards are used, card lines should also be placed in treatment areas under full-spray conditions to serve as a reference for determining percentage of full spray on cards in buffer areas that have detection. The purpose of buffers is to protect the resource that is at the end of the buffer area, so detection within the buffer areas may be acceptable as long as the sensitive area itself is protected.

In-stream water sampling has limitations for the following reasons: (1) it is expensive, (2) should be sterile and automated to avoid contamination, (3) indicates only whether herbicide reached a waterway in detectable quantities, (4) does not indicate how close herbicide may have come to the sensitive resource, and (5) is subject to dilution depending on stream volume and velocity.

Drift Mitigation Measures: Drift mitigation measures may include the following:

- Use of a drift agent
- Use of buffer areas next to sensitive resources
- On site weather monitoring
- Treatment next to sensitive areas when wind is upslope and gentle
- No treatment during inversions
- No treatment when winds in the project area are > 6 mph
- No treatment when weather forecasts predict rain in next 24 hours

Unit Marking Strategies: In agricultural or residential settings, treatment area boundaries are clearly defined by fences, roads, and buildings. Wildland project managers should identify treatment areas on the ground and be sure the application pilots know where treatment and no treatment areas are.

Wildland unit marking strategies fall into two general categories:

- Identification of specific treatment polygons and delineation of where to treat within a larger project area, or

- Identification of the general project area and delineation of areas not to treat.

Large wildland treatment areas that include many polygons and a mix of timbered and open areas may be difficult to mark and find from the air. If treatment units are large, and there are only three to five in the project area, it may be practical to mark each individual unit. If there are many units within a large area, it may be more efficient to mark the project area boundary and buffers and instruct the pilot which areas not to treat within the larger project area. The no-treatment areas could include marked buffer areas (which would include waterways and wet areas), talus, rock and cliffs and areas with a closed overstory canopy.

On-the-Ground Unit Marking: Technology is rapidly developing that allows managers to mark treatment units digitally. On-the-ground block marking is the most expensive part of project layout, and through the use of digital marking may be eventually eliminated. Some on the ground features and topography may require some degree of on-the-ground marking.

When on-the-ground marking is needed, uniform unit marking is recommended to ensure consistency between treatment blocks, different ranger districts and to reduce pilot workload. Unit marking can be accomplished with high-contrast, high-strength flagging staked or rocked to the ground or with aerosol survey paint. Markings should be kept as simple as possible. Frequency of marking should depend on the specific site and site features.

Some suggested unit markings are:

- The vertical line should be on the unit boundary with the perpendicular line pointing into the treatment unit. These markings can also be places where roads enter and leave the treatment units. A unit number can be added for further aerial orientation.
- A horizontal line to mark the edge of a buffer or area to be avoided. The line should be parallel to the feature inside the buffer area.

All ground marking schemes should be closely coordinated with the application pilot.

Digital Unit and Treatment Marking: GPS-guided navigational devices are available that allow an aircraft to develop a digital treatment polygon file from either a recon flight or an on the ground unit layout. These digital shapes appear on a navigational screen in the aircraft and are used to guide the pilot to the units. GPS line files are collected for each spray swath and are displayed on the polygon on the screen during application. These swath lines can be printed after application to provide a digital map record of the treated area. The swath width can be loaded into the program to generate area treated based on swath length and width.

The aircraft recently used on the Lolo National Forest utilized the AgNav system. Additional information on this technology is available in Demonstration of Aerial Spray Aircraft Navigation Systems in Deep Mountain Valleys, a November 2001 “Tech Tip” by Dick Karsky at the Missoula Technology and Development Center (406.329.3921 or dkarsky@fs.fed.us).

Pretreatment Recon Flight: On or before treatment day, the pilot and project manager should fly the project area with aerial photos in hand to review and discuss treatment area, boundaries,

other ownerships, buffer zones and on the ground marking. It is helpful for the project manager to GPS key project locations (such as unit corners or sensitive areas) prior to the flight to allow the pilot and project manager to quickly and efficiently orient from within the aircraft. Things can look different from an aircraft than from the ground and this step can save flight time.

Equipment

Helicopters and fixed-wing aircraft are available for aerial application work. Helicopters have been better-suited to the steep topography and diverse vegetation. In 2002, the Lolo National Forest used a Bell 206 BIII, which carried 70 to 80 gallons of water and herbicide mix. Herbicide was applied in 2 gallons of water per acre. Each 70 to 80 gallon cycle treated 35 to 40 acres. Cycle times were about 15 to 30 minutes depending on the size of the treatment polygon and distance from the helibase. This equated to about 400 to 700 acres of treatment per day.

Aerial applicators typically come with a mix truck equipped with aviation fuel tanks, water tanks, a mix tank and a mix master. Water can be supplied by the Forest Service or by the applicator. Applicator mix trucks are not typically suited to travel over rough or steep forest roads so it is recommended to select a mix site (helibase) with relatively easy road and water access. Forest Service-rented water tenders can add expense to the project and Forest Service engines may be difficult to schedule during wildfire or prescribed burning season. Pump and hose fitting must be compatible between Forest Service engines and mix trucks. Water should be clean or potable to avoid plugging up the spray system.

Field Staffing and Operations

Commercial, aerial-spray operations are typically conducted with two people: a pilot and a mix master. For reasons of safety, cost, and public relations, project managers should try to minimize the number of people in the project area during spray operations. Additional people increase exposure and may have nothing to do, creating a negative public perception. Spray contractors should be allowed to conduct the operation with a minimal amount of interruption from project staff. All on the ground project staff should have radio communication with each other and the pilot. Suggested staffing is shown below.

Table I-1. Suggested project staffing and duties.

POSITION	DUTIES	LOCATION
Project Manager	Direct and oversee project; Recon flight; answer pilot questions about the application; ensure project is within weather prescriptions; record loads, herbicide use and cycle times; maintain contract diary; monitor and document weather; review and approve invoices; ensure project mitigation measures are applied; help with buffer monitoring; maintain project file and complete the project report.	Helibase and throughout the project area
Aerial Equipment Manager	Oversee the flight operations; develop communication plan; review and brief pilot on Project Aviation Safety Plan; assist project manager with load and weather monitoring and documentation.	Helibase
Drift Card / Buffer Monitors	Place and pick up drift cards; monitor and record weather in buffer areas; report on the ground weather to pilot and project manager when treating next to buffer zones.	In buffer areas
Traffic Managers / Public Information staff	Secure access to the project area; prevent unauthorized public access to the project area during treatment; answer questions and provide short briefings on the project objectives and operations.	Roads and/or trails leading into the project area.

All project staff should be briefed on the project objectives, operations and duties prior to treatment day. Written briefs are suggested for traffic management staff and any others likely to encounter the public. Boxes or satchels should be prepared with all the necessary equipment and forms each person will need to do their job. Project staff will typically report to the office as early as 0400 or 0500 hours to allow for travel to the project area, so it is suggested you have everything organized and ready to go the day before.

Aerial Spray Recommendations

The treatment block should be marked with flagging to mark the block corners or clearly described and reviewed with applicator. It is desirable to have a GPS system on board to record helicopter swaths, position, and boom-on and boom-off times and locations.

In canyon areas, winds should follow the typical diurnal pattern of upslope during the day and down slope during the night. These diurnal winds result from heating and cooling of the ground's surface. Clear skies with solar radiation reaching the surface during the day cause up canyon and upslope winds. Cooling that occurs after sunset generates downslope or drainage winds. Given that waterways and riparian areas are often located at the bottom of canyon areas, it is essential to avoid drift down canyon and downslope. Down-canyon and downslope winds will likely occur on clear days following daytime hours. To prevent spray from drifting down canyon/downslope, winds should be up canyon and upslope. Also, inversion can result in spray drifting off site; winds indicate that an inversion is not present.

Avoid spray drift impacting non-target sites by taking the following steps:

- When treating next to sensitive areas spray in the morning when up canyon and upslope winds are well established and blowing up canyon (most sensitive areas are down canyon). The specific time will need to be determined by real-time weather monitoring.
- Maintain boom pressure at less than 40 pounds per square inch.

- Monitor spray pressure during flight, since changes in pressure can change the application rates and may change the drop size.
- Use nozzles designed for medium to coarse droplet size (240 to 400 microns)
- Use drift agent to help maintain large droplet size.
- Check nozzles and review calibration with pilot.
- Begin the first swath 300 feet from any sensitive area.
- Mark boundaries so they are clearly understood by the pilot. Fly area with pilot prior to treatment to verify location. Use GPS to document boundaries and record treatment flight paths.
- Monitor treatment boundaries next to sensitive areas with spray deposit cards to detect any possible drift. Train people in how to handle the cards, interpret the cards (many things can contaminate the cards such as dew, moisture from hands, insects) and also document results. Card lines should also be placed in treated areas under full spray to serve as a reference.
- Monitor and record weather in the area. The weather should be monitored in real time for operational control and to help with the post-spray analysis. Strive for winds from 3 to 6 miles per hour or per label instruction. Do not treat if rain is predicted within next 24 hours.
- Consider using Forest Service Cramer-Barry-Grim (FSCBG) or AGDISP computer models to evaluate drift potential and to develop operational and drift protection measures prior to treatment.

Post-treatment Considerations and Tasks

Post-treatment tasks may include:

- Monitor and document in the project file daily rainfall for up to a week after treatment.
- Schedule reading of monitoring plots sometime between one growing season and one year after treatment.
- Read drift cards and complete a drift report.
- Compile a treatment project file for reference for the next retreatment.
- Add the project to the retreatment schedule
- Pick up ribbon and any other unit markings
- Complete contract daily diary and submitting original to the Contracting Officer
- Complete a Post Treatment Evaluation (FSH 2109.14 Ch 72.1).

FSM and FSH References

- FSH 1909.15 Chapter 20 (Environmental Impacts Statements and Related Documents) FSH 2080 Noxious Weeds
- FSM 2100 Chapter 2150 Pesticide-Use Management and Coordination R1 Supplement 2100-88-1 (some Forest may also have supplements) FSM 2100 Chapter 2160 Hazardous

Materials Management

- FSH 2109-14 Pesticide Use
- FSM 5711.11 Planning for Project Aviation Operations FSH 6709.11 Health and Safety Code Handbook

Items to Bring on Aerial Spray Projects

- ☐ Drift cards
- ☐ Drift card holders
- ☐ Zip lock bags
- ☐ Sharpie pens to write on zip locks
- ☐ WR BA EIS, ROD, Maps (EIS has spill plan / labels / MSDSs)
- ☐ Project File
- ☐ Radios
- ☐ Extra Batteries
- ☐ Communication Plan
- ☐ Ribbon
- ☐ Blank Diary forms
- ☐ Aerial Photos
- ☐ Wind meters
- ☐ Camera
- ☐ Amendment 11 to Forest Plan
- ☐ Calculator

Contents of Treatment Project File (Reference Fsh2109.14 Chapter 72.1)

1. Name and location of the target pest
2. Treatment objectives
3. Date of treatment
4. Pesticide application
    a. Equipment malfunctions
    b. Pesticide formulation problems
    c. Overlaps and/or skips noted
    d. Weather conditions
    e. Application timing
    f. Treatment costs
5. Treatment success in terms of:
    a. Pest population reduction
    b. Foliage protection from defoliators or growth reduction from herbicide use.
    c. Acres covered
6. Monitoring results
7. Recommendations for follow-up and/or future projects.

Table I-2. Drift monitoring supplies.

ITEM	SPECIFICATIONS	SOURCE
Deposit Paper	White Kromekote coated both sides 0.006 weight, size 16.9 x 11 cm = 1mm Detects dyed droplets	Nationwide papers (Paul) 345 Schwerin St. San Francisco, CA 94119 415.586.9160 or 800.652.1326 X215 FAX 415.239.7871
Water sensitive paper (Syngenta)	Product # 20301-1; size 3” x 1” – pack of 50 Product #20301-2; size 3” x 2” – pack of 50	Spraying Systems Co. North Ave at Schmale Road Wheaton, IL 60188 630.665.5000 or AgWest (Montana distributor) 800.452.0010
Holders for deposit papers	Kromekote card holder (white plastic) for 16.9 x 11 cm card	Rick and Carl Borbons Acrylonics Labs 666 Stockton #c San Jose, CA 95126 408.998.8339
Holders for deposit papers	Kromekote card holder (yellow or orange plastic) for 16.9 x 11 cm card ($3 + each)	E and F Plastics (Frank) 2756 Aiello Drive San Jose, CA 95111 408.226.6672

Load Record Example

Aerial Spray Project Load Record

Contract Number: _____

Project Name: _____

Date: _____

Load #	Time Out	Time In	Unit	Prescription	Acres Trt'ed	Amt. Herbi	Cycle Time	Comments

Time	Location	Temp.	Wind / Direction	Rel. Humidity	Comments

Drift Model Results

AGDISP model predictions were conducted by Harold Thistle, Ph.D., USDA Forest Service, Morgantown, WV to assist in developing aerial spray strategies for proposed applications to control noxious weeds on the Custer National Forest. The predictions can be used to plan operational methodologies, determine size of buffer strips to prevent or minimize sensitive area contamination, and decide under which wind and other atmospheric conditions to conduct aerial spraying.

Three commonly used aircrafts in Western Montana are the: Bell 47 Soloy, Bell 206BIII, and Hiller 12E. Table I-3 lists the AGDISP model inputs.

Table I-3. Spray conditions—AGDISP model inputs (release height: 10–25 feet above ground).

SPRAY CONDITIONS	AGDISP MODEL INPUTS FOR		
	Hiller 12E	Bell 206BIII	Bell 47 Soloy
Operating Speed	40 mph	80 mph	50 mph
Formulation	Tordon/Picloram	Tordon/Picloram	Tordon/Picloram
Application Rate	2 gal/acre	2 gal/acre	2 gal/acre
Swath Width	40 feet	45 feet	45 feet
Temperature	70 deg. F.	70 deg. F.	70 deg. F.
Relative Humidity	60%	60%	60%
Wind Speed	6mph	6mph	6mph
Nozzle Vertical Distance	-8.70 feet	-9.01 feet	-8.07 feet
Nozzle Type and Orientation	CP/0 degrees	TeeJet D4-46/0 degrees	D8 Jet/45 degrees
Number of Nozzles	29	35	16
Rotor Diameter	35.43 feet	33.37 feet	37.17 feet
Nozzles	Evenly spaced over 100% of the boom	Evenly spaced over 100% of the boom	Evenly spaced over 100% of the boom
Wind Directions Crosswind	45 degrees (where the direction of a north wind is 0 degrees)	45 degrees (where the direction of a north wind is 0 degrees).	45 degrees (where the direction of a north wind is 0 degrees)

Table I-4. Summary from five simulations showing the amount of expected herbicide (ounces per acre) at 100- and 300-foot intervals (at an application rate of 2 gallons per acre).

FEET DOWNWIND	SPRAY CONDITION—RELEASE HEIGHT & PROJECTED DEPOSITION					
	1–10 feet ounce per acre	1–25 feet ounce per acre	2–10 feet ounce per acre	2–25 feet ounce per acre	3–10 feet ounce per acre	3–25 feet ounce per acre
100 feet	0.176	0.510	0.643	0.552	0.552	0.913
300 feet	0.006	0.044	0.083	0.114	0.096	0.206

Modeling runs demonstrate that:

- Most of the spray is deposited in the treatment block;
- There would be essentially no deposition in the sensitive areas with a buffer of 300 feet.

APPENDIX J:
ADJUVANTS TREATMENT

APPENDIX J: ADJUVANTS TREATMENT

Adjuvants are specially designed chemicals that are added to an herbicide solution to modify the performance of the total spray mixture. Adjuvants are not regulated by the EPA in the same way that pesticides are. The EPA does not register or approve the labeling of spray adjuvants. Field testing is generally completed by the adjuvant manufacturer (Bakke 2007). Labels accompanying adjuvants describe their properties and prescribe use rates. Information on types of adjuvants to use can also be found on herbicide labels and in publications by university extension services (Prather et al. 2011, Zollinger 2012).

Adjuvants perform various functions, including: enhanced plant uptake of the herbicide; better mixing of otherwise incompatible herbicides; increased adhesion of the spray to plant surfaces; and reduced spray drift. In many herbicide products, adjuvants are included as part of the pre-mixed formulation as purchased. Applicators can also add adjuvants to spray mixtures prior to application.

For many pesticide products containing adjuvants as part of the formulation, the compounds are not explicitly identified on the label or the Material Safety Data Sheet (MSDS). Unless they are on one of US EPA's lists of more toxic chemicals, they do not have to be identified. The identity of these ingredients in a pesticide or adjuvant product is legally protected from full disclosure as "Confidential Business Information."

At least one adjuvant is known to pose hazards to aquatic wildlife—the surfactant used in the original formulation of RoundUp®, polyoxyethyleneamine (POEA). This surfactant is more toxic to aquatic life than the active ingredient glyphosate. The POEA adjuvant (Roundup Pro) will only be used in uplands where there is no potential for movement into aquatic systems. Within or near aquatic systems, only products labelled for aquatic application would be used. Adjuvants used on the Boise & Sawtooth National Forests are identified below in Table J-1.

Table J-1. Recommended adjuvant type by herbicide.

HERBICIDE	RECOMMENDED ADJUVANT TYPES
2,4-D	Non-ionic surfactants (NIS), fertilizer, crop oil concentrate
Aminopyralid	NIS
Chlorsulfuron	NIS, seed oil, organosilicone
Clopyralid	NIS, crop oil concentrate
Dicamba	Any as allowed by label
Fluroxypyr	No specific adjuvants are recommended
Glyphosate	NIS
Imazamox	NIS, seed oil, organosilicone
Imazapic	NIS, seed oil, organosilicone
Imazapyr	NIS, seed oil
Imazamox	NIS, fertilizer, seed oil, petroleum/crop oil concentrate
Metsulfuron methyl	NIS, seed oil, organosilicone
Picloram	None needed but can add as per surfactant manufacturer's label
Sulfometuron methyl	Any allowed by label
Triclopyr triethylamine salt (TEA)	NIS

Note: Recommended by Prather et al. 2011, and product labels.

Adjuvants with low toxicity to wildlife include modified seed oils, alkyl ethoxylates, and silicones. The most commonly used adjuvant is marker dye and it is analyzed in "Use and Assessment of Marker Dyes Used With Herbicides" (Pepling, Howard, Durkin, 1997).

"Activator" adjuvants enhance activity of an herbicide's active ingredient, while "special purpose or utility modifier" adjuvants offset common problems occurring during application, including poor water quality or foam produced during agitation of the spray mixture (Bakke 2007). Many adjuvants have properties that place them on a continuum between these two definitions and function both as activators and utility modifiers. Special purpose or utility adjuvants are used to offset or correct certain conditions associated with mixing and application such as impurities in the spray solution, extreme pH levels, and drift. These adjuvants include acidifiers, buffering agents, water conditioners, anti-foaming agents, compatibility agents, and drift control agents. Acidifiers enhance absorption of weak acid type herbicides. Drift reduction agents will generally increase the average droplet size. Defoamers reduce foaming that occurs during agitation of the spray mixture. Colorants or dyes help applicators determine what area was treated. This helps to prevent skips and overlaps and treatment of non-target areas. They reduce the chance of human exposure to recently treated vegetation (Bakke 2007).

Surfactants (surface active agents) are a broad category of activator adjuvants designed to improve or facilitate the dispersing/emulsifying, absorbing, spreading, sticking and/or pest-penetrating properties of the spray mixture. Pure water will stand as a droplet, with a small area of contact with the waxy leaf surface. Water droplets containing a surfactant will spread in a thin layer over a waxy leaf surface (Bakke 2007).

Post-emergence herbicide effectiveness depends on spray droplet retention and herbicide absorption by weed foliage. Adjuvants and spray water quality influence post-emergent herbicide efficacy (USDA Custer National Forest 2006). Because post-emergence herbicide effectiveness is greatly influenced by plant factors such as age, size and the growing conditions encountered before application, herbicide performance can vary. A way to minimize the variations in post-emergence herbicide performance is to use an adjuvant or surfactant in the spray solution. Surfactants generally improve the effectiveness of post-emergence herbicides. Typically, surfactants are not added to herbicides that are soil applied (pre-emergence) (Zollinger 2012). Surfactants used on both Forests include non-ionic surfactants, methylated or ethylated vegetable oils, nitrogen sources, and organosilicone/silicone surfactants.

Non-ionic surfactants (NIS) are all-purpose surfactants comprised of linear or nonyl-phenol alcohols and/or fatty acids. This class of surfactant reduces surface tension of water and improves spreading, sticking and herbicide uptake (USDA Custer NF 2006). Often, non-ionic surfactants will have additional additive properties, as described on their label.

Methylated or Ethylated vegetable (seed) oils (MSO) are produced by reacting fatty acids from seed oils (corn, soybean, sunflower, and canola) with an alcohol to form esters. The methyl or ethyl esters produced by this reaction are combined with surfactants/emulsifiers to form esterified seed oil. These surfactants reduce surface tension of water and improve herbicide uptake by improving herbicide distribution on the leaf surface (USDA Custer NF 2006). Adverse

environmental conditions such as low humidity, hot weather, lack of rain, drought-stressed weeds, or weeds not actively growing due to some environmental stress favor the use of MSO. These oils are more effective than non-ionic surfactants as an adjuvant to post-emergence herbicides (Zollinger 2012).

Nitrogen sources typically consist of premixed combinations of various forms of nitrogen and surfactants. They generally are used with herbicides recommending the addition of ammonium sulfate or 28 percent nitrogen. These surfactants reduce surface tension of water and improve leaf surface spreading (Miller and Westra 1998). They are used primarily with broadleaf herbicides.

Fertilizers containing ammonium nitrogen have increased the effectiveness of herbicides like glyphosate, and 2, 4-D amine. Fertilizer applied with other herbicides may reduce weed control or cause crop injury. Some fertilizers enhance non-target plant growth to stimulate competition from weed species re-establishing. Fertilizers should be used with herbicides only as indicated on the label or where experience has proven acceptability (USDA Custer NF 2006).

Organosilicones and silicone surfactants are two types of nonionic surfactants. Organosilicone surfactants drastically reduce surface tension of water to the point where the herbicide droplets thin and coalesce to form a thin layer on the leaf surface (known as "superspreading"). In addition, this class of surfactant provides improved effectiveness through maximum rainfastness (Tu et al. 2001).

See Table J-2 for details about adjuvants, categories, product names, and other information.

Table J-2. Adjuvant type, class, product, and product manufacturer.

ADJUVANT TYPE	CATEGORY	PRODUCT NAME	PRODUCT MFG.	PRINCIPAL FUNCTIONING AGENTS	USE RANGE	SIGNAL WORD	COMMENTS
Activator	Non-ionic surfactant (NIS)	Activator 90	Loveland	Alkylphenol ethoxylate, alcohol ethoxylate and tall oil fatty acid	0.125–0.5%	Caution	Low foam, biodegradable, non- flammable
		R-11	Wilbur-Ellis	Alkylphenol ethoxylate, butyl alcohol, dimethylpolysiloxane	0.063–1%	Warning	Spreader, activator
		Spreader 90	Loveland	Alkylpolyethoxy ethers and ethoxylated derivatives	8–64 oz/ 100 gal	Warning	Spreader
		Super Spread 90	Wilbur-Ellis	Alkyl aryl polyoxyethylene glycols and free fatty acids	0.25–0.5%	Caution	Spreader
Activator	Basic Blend *and* Methylated or Ethylated Vegetable Oil *and* Nonionic Surfactant *and* Nitrogen Source	Renegade	Wilbur-Ellis	Modified vegetable oil, ammonium solution, nonionic surfactant	1–2.5%	Warning	Unique blend, high load of Nitrogen
Activator	Methylated or Ethylated Vegetable Oil	MSO with Leci-Tech	Loveland	Methylated seed oils plus emulsifying surfactants	1–2 pt/A	Caution	MSO and non-ionic
Activator	-	Syl-tac	Wilbur-Ellis	Organosilicone/ modified vegetable seed oil	0.125–0.375%	Caution	-

Table J-2. (Cont'd)

ADJUVANT TYPE	CATEGORY	PRODUCT NAME	PRODUCT MFG.	PRINCIPAL FUNCTIONING AGENTS	USE RANGE	SIGNAL WORD	COMMENTS
Activator	Methylated or Ethylated Vegetable Oil *and* Organo-Silicone Surfactant	Phase	Loveland	Methylated seed oil plus organosilicone surfactant	0.125–0.5%	Caution	-
Activator *and* Utility Modifier	Nonionic Surfactant *and* Buffering Agent or Acidifier	Super Spread 7000, LI 700	Wilbur-Ellis	Alkyl aryl polyoxyethylene, ethoxylated alcohols, aliphatic polycarboxylate	0.25–4 pt/100 gal	Caution	-
Utility Modifier	Colorant	Hi-Light	Becker-Underwood	Proprietary blue colorant	6–32 oz/100 gal	Caution	-
		Bullseye	Milliken Chemical	Proprietary blue colorant	0.5 oz/gal	None	-
Utility Modifier	Water Conditioning Agent *and* Buffering Agent or Acidifier	Bronc Max	Wilbur-Ellis	AMS/ammonium alkyl aryl sulfonates, polycarboxylic acid	0.125–1%	Caution	Ammonium sulfate (AMS) replacement
Utility Modifier	Water Conditioning Agent	Choice Weather Master	Loveland	Blend of salts of polyacrylic, hydroxy carboxylic, propionic acids, phosphate ester, ammonium sulfate	0.25–0.5%	Caution	AMS, water conditioner

APPENDIX K:
CARIBOU-TARGHEE NATIONAL FOREST AND CURLEW NATIONAL GRASSLAND PERSONNEL SAFETY AND EMERGENCY SPILL RESPONSE PLAN FOR THE USE OF HERBICIDES IN THE CONTROL OF INVASIVE PLANTS

APPENDIX K: CARIBOU-TARGHEE NATIONAL FOREST AND CURLEW NATIONAL GRASSLAND PERSONNEL SAFETY AND EMERGENCY SPILL RESPONSE PLAN FOR THE USE OF HERBICIDES IN THE CONTROL OF INVASIVE PLANTS

A licensed applicator will supervise and instruct each applicator in the safe use of particular herbicides so as to protect themselves and the environment. Topics to be covered include first aid, hygiene, personal protective equipment, safe handling and proper application, transportation, storage, spill management, and disposal. Licensed applicators will maintain a daily application log for herbicides applications under his/her supervision.

Safety instructions will be documented with Job Hazard Analyses (JHAs) and tailgate safety sessions. Signed forms will be kept in the project file. A copy of the Health and Safety Code Handbook 6709.11 and the Pesticide Use Handbook 2109-14 will be provided and reviewed with employees.

General Application

At each site the certified applicator will ensure that:

Herbicides are applied according to the label or according to Forest/Wilderness prescriptions, whichever is more restrictive.

- Crews will periodically calibrate application equipment. Calibration will be documented and provided as part of herbicide application records.
- Application records will meet all FS and State requirements and any circumstances which may influence the actual application shall be recorded. This requirement shall be met through the timely completion of treatment records following the Forest Service National Protocol for Weed Treatment Record keeping (FACTS).
- The necessary personal protective equipment is provided and used.
- All full and empty herbicide containers are accounted for and managed accordingly.
- All safety and health requirements are complied with.
- Workers are informed of any required Return Entry Intervals (REI), if any. If necessary, post restricted entry notices at the boundary of the treatment site.

A copy of the product label and safety data sheet (SDS) for each herbicide applied will be reviewed and available to each person participating in herbicide applications. Copies of the SDS and labels will be maintained within the facility where the herbicide is permanently or temporarily stored and maintained in the vehicle from which herbicides are applied.

Employees will receive basic training in Hazardous Communications, Hazardous Waste Operator (Hazwoper) General Awareness, and appropriate pesticide storage, mixing, use, decontamination, disposal, and spill management procedures (FSM 2161.42).

First Aid

- Each crew (or vehicle) will be provided a first-aid kit of sufficient size including emergency eyewash solution.
- Each employee should have a change of clothing with them every day
- Skin contact: Wash exposed area thoroughly with soap and water. Remove saturated clothes and wash contaminated body areas with mild detergent and water. Bag contaminated clothing in closed plastic bags or containers and store for transport away from potential contact with personnel.
- Eye contact: Wear splash goggles or face shield during mixing operations and application. If eye contact does occur, immediately flush with water for at least 15 minutes using appropriate eye wash solution. Transport to a physician, provide physician with a copy of the label and SDS sheet.
- If swallowed: Irrigate mouth and throat with clean water. Induce vomiting only as directed by the label or physician.
- Poison Control Center Phone Numbers:
- Boise Poison Control Center: 1-800-860-0620
- National Poison Control Center: 1-412-681-6669

Hygiene

- Do not smoke, chew tobacco, or eat while spraying. Wash hands before engaging in these activities, and before using the restroom.
- All hygiene materials will be stored in closed containers that prevent contamination with herbicides.
- Each crew (or vehicle) will be provided with:
    - A portable eye wash unit capable of delivering 15 minutes of low pressure clean eye wash water. Note: make sure eye wash water is fresh, bacteria in old water is worse than the chemical.
    - A minimum 5-gallon supply of clean water for washing and eye rinse water. Eye rinse water should be in a separated container from general wash water.
    - Adequate soap and towels for washing and drying.
    - Separate drinking water containers for hauling and storing drinking water while in the field. Rinse water will be kept separated from the drinking water.

Personal Protective Clothing (FSH 6709.11)

More stringent requirements may apply on a product-specific basis. Personal Protective Equipment (PPE) regulations specific to herbicide use can be found on labels for herbicides and adjuvants being used and will be the primary guidelines, as allowed for by FSH 6709.11.

Personal Protective Equipment will be documented in a Job Hazard Analysis (Form FS-6700-7). Specialized Personal Protective Equipment, such as nitrile gloves, rubber coveralls, and back protectors will be purchased by the program and made available to any employee who wishes to utilize it.

Caring for Personal Protective Clothing

- If herbicides get on clothing, change clothes as soon as possible. Don't wait until the end of the day or until the job is finished. Launder only clothing contaminated with water-soluble low-toxicity pesticides. Do not mix with other clothing while laundering.
- On a daily basis, launder clothing worn during herbicide applications. Herbicide residues in clothing can build up and become more difficult to remove.
- Protective equipment should be washed and dried separately from normal laundry. Avoid additional contact when removing safety clothing.
- Pre-rinse clothing. Pre-rinsing reduces the amount of herbicide in clothing before laundering and minimizes contamination of laundry equipment. Because herbicide formulations usually contain some detergent, it is not necessary to add detergent when pre-rinsing.
- Wash in hot water (140 degrees), use a normal wash cycle and a heavy-duty liquid detergent.
- After every load of herbicide-contaminated clothing, run the machine through a complete cycle with hot water and detergent.
- Line dry laundered garments outdoors.
- Use of disposable protective clothing eliminates the need to launder. Leather items cannot be decontaminated (e.g. boots). Heavily contaminated clothing should not be laundered. The clothing should be placed in plastic bags and disposed of as herbicide-contaminated waste.

Mixing and Loading of Herbicides

- Personnel handling, mixing or applying herbicides will wear protective clothing and/or equipment as recommended by the manufacturer and required by the label and FS Health and Safety Handbook.
- Mixing and application of herbicides will be done by or under the supervision of a licensed applicator. Crews will mix only the quantity of herbicide anticipated to be needed each day.
- The most hazardous part of applying herbicides occurs during mixing and loading. At these times, the operator is handling the herbicide in its most concentrated form. The following precautions will be implemented:
    - Read and follow the label directions.
    - Wear appropriate protective clothing as described above.
    - Never eat, drink, or smoke while handling herbicides. Before eating or drinking, or using the restroom, always wash hands thoroughly.
    - Do not mix indoors.
    - Do not mix in the wind. If you must, never have the wind in your face.

- Select a mixing and loading location where, if a spill were to occur, herbicide could be easily contained and would not be likely to enter ground or surface water.
- Always measure accurately, do not exceed label rates.
- When pouring, keep the container well below eye level. Always use a pump for large drums.
- When adding water to the tank, always keep hose or pipe above the level of the mixture.
- Use catch basins or containment pads when pouring or mixing herbicides.
- Keep measuring jugs clean and stored properly when not in use.
- Triple rinse mixing jugs, measuring containers, catch basins and empty herbicides containers. Add rinse water to sprayer.
- Clean up drips and spills immediately. Use absorbent material to soak up spills. Place absorbed material in separate containers or plastic bags for disposal. Never hose down a spill.
- Keep first aid equipment and at least a 5-gallon supply of clean water readily available, including soap and eye wash equipment.

Transportation

The licensed applicator is responsible for the safe transportation of herbicides. These general safety precautions should be followed to minimize incidents and to mitigate their effects when they do occur.

- Transport from the storage area only the quantity needed for the project, and return any leftover herbicides to the storage area at the end of the project.
- Do not leave vehicles that are transporting herbicides unattended unless it is in a locked or otherwise secure area.
- Transport herbicides with the labeled "warning" on the container facing outward and totally isolated from drivers, passengers, food, or clothing. If the herbicide has been transferred to an unlabeled container, warning labels must be attached to the new container. Warning labels may be obtained from the Boise or Sawtooth Hazardous Materials Coordinator (Forest Safety Officer).
- Herbicide concentrate containers will be transported in secure compartments.
- When traveling by watercraft, all herbicide concentrate will be transported in watertight compartments and floatable containers that are securely fastened to the craft.
- Secure containers to prevent tipping or excess jarring during transit.
- Check to ensure that containers and spray equipment containing herbicides do not leak before and periodically during transport.
- Make periodic checks during transport to ensure that no spillage has occurred.
- Cover containers to protect them from direct sunlight while in transit to the work site and place them in the shade upon arrival. Excessive heat can cause expansion resulting in container rupture or overflow when opened.

- The specific procedure described in the project safety plans, which are to be used if an accident or spill occurs, shall accompany each shipment of herbicides.
- Do not mix, store or apply herbicides in galvanized steel or unlined steel containers or spray tanks. Highly flammable hydrogen gas could be generated.

Emergency spill plan (FSH 2109-14 Chapter 60)

Prior to beginning operation, the following will be reviewed with the applicators or crews, and placed in the mixing area, storage area, and vehicle.

1. A list of key personnel or agencies, including telephone numbers for potential emergency notification.

- Local physicians familiar with diagnosis and treatment of herbicide exposure problems
- Local ambulance service
- Emergency room locations
- Poison Control Center: 1-800-222-1222
- State DEQ, ESA contacts per direction in NPDES permits and consultation agreements
- Notification and source of direction for disposal action on spills:
- Contact Forest and Regional Pesticide Coordinators (Regional Supplement FSH 6709.12)
    - Spills involving at least one pint of herbicide **concentrate** and/or five gallons of **mixed** herbicide will be reported to the Ranger District in which work is being conducted. The information will then be forwarded to the appropriate Forest Safety Officer.
    - Spills involving 5 gallons or less of herbicide **concentrate** call: Dept. of Health and Welfare
    - Bureau of Hazardous Material 450 West State Street Boise, ID 837201, 208-334-5879
    - Spills involving more than 5 gallons of herbicide **concentrate** contact your local fire department or Idaho State Communications: 1-800-682-8000
    - Location of disposal site for contaminated material: Envirosafe Services of Idaho, Inc., Grandview, Idaho, 1-800-727-9969

2. Spill Kits: A spill kit with directions for use will be strategically placed where spills are most likely to occur and where they can be accessed without traversing a spill site. At least one spill cleanup kit will be available for each crew traveling into the field. A table should list the contents of the kit. The following list recommends contents for spill kits. A vehicle type spill kit will be available at temporary storage facilities.

3. Vehicle Kits

   Vehicle Kit (Transporting up to 50 gallons of product)

- Instructions
- 1 pair rubber or neoprene boots or overshoes
- 2 pair neoprene gloves
- 1 pair unvented goggles
- 1 pair of coveralls

- 1 dust pan
- 1 shop brush
- 1 shovel either in the vehicle or in the kit
- 30 pounds of absorbent material
- 1 polyethylene or plastic tarp
- 1 pint liquid detergent
- 6 heavy duty polyethylene bags with ties (minimum 30-gallon size)
- 1 portable eyewash container
- blank labels, duct tape, and permanent markers
- ABC-type fire extinguisher
- 1 garden hose
- 1 backflow hose attachment

River Corridor/ Lake and Backcountry Kit (Transporting 5–20 gallons of product)

- Instructions
- 1 shovel
- 1 dozen heavy duty polyethylene bags with ties (minimum 30-gallon size)
- 1 pair unvented goggles
- 10 pounds of absorbent material
- 2 pair neoprene gloves
- 1 pair of coverall
- blank labels, duct tape, and permanent markers

4. ***For Supplemental Information Needed on Hazards and Reactions:*** Call Chemtrek at 1-800-424-9300. They are an information contact only; do not call them merely to report a spill. For example, if a truck carrying herbicides crashes and ignites, field crews may want to know if any special hazards exist from herbicide fumes—Chemtrek is the appropriate company to call.

Spill Containment and Cleanup

The licensed applicator is responsible for ensuring all cleanup of application operation and spills. After a spill occurs, specific procedures should be followed for cleanup and decontamination of the spill site. In most cases, spill size will dictate the procedure to be followed. The response may vary from a change of personal clothing for minor spills, to decontamination of a road, stream, or ditch bank.

- For any spill, the first step is check for personal injury. The immediate effort should be to assist injured personnel.
- Remove injured personnel from the site to a safe area.
- Remove contaminated clothing from the injured, and the rescuer if necessary, and wash the individuals with detergent and water or clean as specified by the manufacturer.
- Immediately administer first aid and seek medical assistance for injured personnel.

Actions following a spill involving less than 5 gallons of herbicide concentrate (always wear appropriate protective clothing):

1. Determine the extent of the spill.
2. Stop or control the source of the spill. Prevent further leakage by repositioning the herbicide container or by applying a seal to the leak with duct tape, putty or other materials from the repair/patch kit.
3. Separate leaking containers from other containers.
4. If necessary rope off the area and post warning signs to keep unprotected personnel from entering.
5. Confine the spill to prevent it from spreading. Encircle the spill with a dike of absorbent material. If necessary, divert the spill flow away from sensitive areas.
6. Do not flush the spill into a ditch, sewer, drain, or off the road.
7. For liquid spills:
    a. Spread absorbent material around the perimeter of the spill and sweep/shovel toward the center.
    b. Absorbent material must be disposed of in the same manner as waste pesticide. Shovel spill material into leak proof container for disposal. Label all containers properly and legibly.
8. For dry spills:
    a. Immediately cover powders or dusts with polyethylene plastic or a tarpaulin to prevent the materials from becoming airborne. Spreading can also be minimized by dampening the dust with a fine mist of water; do not liquefy!
    b. Clean up by rolling the tarp back little by little while sweeping. Ensure that dust remains dampened.
    c. Shovel the material into a plastic bag or recovery container.
    d. Seal the bags or recovery containers and identify the waste pesticide. Label all bags and containers properly and legibly.
    e. Set the bags or drums aside for subsequent disposal or relabeling if the pesticide can still be used.
9. All contaminated clothing will be removed and washed and dried separately from other clothing.
10. Notify the appropriate individuals or agencies on the notification list. Follow NPDES permit requirements if it occurs within or adjacent to Waters of the Unites States. Check ESA consultation requirements for required notifications where appropriate.

11. Write a report summarizing the spill. Include the following information:
    a. Date, time and cause of the spill
    b. Location and path of the spill
    c. What was spilled and in what quantity (amount of active ingredient)
    d. Pertinent weather conditions that may affect the spill.
    e. Actions taken
    f. People involved

Decontamination

In some cases, the small amount of herbicide remaining after the cleanup process on the road surface or storage area floor must be decontaminated. Soil, roadways, tools, and nonporous surfaces should be decontaminated in the following manner.

Soil: Heavily contaminated soil should be removed to a depth of at least 2 inches below the contaminated zone and placed in leak proof drums for disposal.

Roadways, floors, and other nonporous surfaces: Spread the appropriate decontamination material on the spill and work it into the surface using a coarse broom. Allow the decontaminant to sit for 2 hours. Pick up the decontamination material by spreading fresh absorbent material around the perimeter of the spill area, sweeping it toward the center, and shoveling it into plastic bags or drums.

Wood or other porous material: Discard or destroy porous material and equipment such as brooms.

Decontamination Solution: If any questions arise about decontamination solutions, the herbicide manufacturer should be contacted.

Mild alkalis are soda ash (sodium carbonate); baking soda (sodium bicarbonate); household ammonia; and limestone (calcium carbonate). For safety, a preliminary test should be made on which very small amounts of the herbicide and alkali are mixed and observed to make sure the reaction is not too vigorous.

Disposal

Empty herbicide containers are never completely empty. Never leave containers at the application site. Never give herbicide containers away. **Do not use empty containers for unauthorized purposes**. Container labels describe disposal requirements and must be followed. Where triple rinsing is required by the label, triple rinse empty containers as follows:

1. Empty the container into the spray tank. Let it drain for at least 30 seconds.
2. Fill the container one-fourth full of water. Replace the lid or cap and rotate the container. Invert the container so the rinse reaches all inside surfaces.
3. Drain the rinse water into the spray tank. Let it drain at least 30 seconds.

4. Repeat the rinse process two more times for a total of three rinses.
5. Crush and punch holes or render the container unusable.
6. Dispose of empty containers using Forest Service compound dumpsters or the EPA container recycling program if allowed by the label. Always follow label directions.

Temporary Storage Facilities

For the purpose of the weed management program, long term storage is the storage of any unused herbicide longer than the field season of use in an approved storage facility. As a standard practice, purchase only the amount of herbicide projected for use during the treatment season. The objective is to not have herbicides in long-term storage.

Herbicides that are being used will not be stored or left overnight except at temporary storage facilities approved by the official in charge of the operation or locked in the approved vehicle. Unused herbicide will be returned to the storage facility at the end of each work day. The following precautions will be taken for temporary storage:

- Identification and warning signs will be placed on buildings and trucks to advise the contents of the stored material.
- Herbicides will be protected from direct sunlight or inclement weather.
- At least 10 gallons of clean water and soap for decontamination of personnel will be available at each temporary storage site.
- An ABC-type fire extinguisher will be readily available at the storage facility.
- Herbicide containers will be stored in a secondary container or tray with 1½ times the volume of the stored herbicide container.
- Herbicides will not be stored above non-herbicide containers or equipment.
- Herbicides will be stored separately from Personnel Protective Equipment.
- A spill kit and personal protective equipment consistent with the amount of material being stored.
- Do not store pesticides with flammable materials such as mixed saw gas and oil.

Temporary storage facilities are to be inspected annually and the inspection checklist filled out (FSH 2109.14, 40 41.11).

APPENDIX L:
GLOSSARY

APPENDIX L: GLOSSARY

Abundance: The number of organisms in a population, combining density within inhabited areas and number and size of inhabited areas.

Adaptive management: A system of management practices based on clearly identified intended outcomes and monitoring to determine if management actions are meeting those outcomes; and, if not, to facilitate management changes that will best ensure that those outcomes are met or reevaluated. Adaptive management stems from the recognition that knowledge about natural resource systems is sometimes uncertain.

Adsorption: The adhesion of gas, liquid, or dissolved solid particles to a surface.

Alkaline: Having a pH greater than 7.0.

Allelopathy: The inhibition of growth in one plant species by chemicals produced by another plant. For example, other plants will often not grow underneath black walnut trees, since these trees produce a chemical inhibiting plant respiration.

Alluvial: Pertaining to material that is transported and deposited by running water.

ALS inhibitor: Herbicides that inhibit acetolactate synthase (ALS), the enzyme common to the biosynthesis of branch-chain amino acids. These include imazamox, imazapic, metsulfuron methyl, and chlorsulfuron.

Aquifer: A geologic formation or structure that transmits water in sufficient quantity to supply the needs for a water development, such as a well.

Basal: see Rosette

Best management practice (BMP): A practice or combination of practices, that is determined by a State (or designated area-wide planning agency) after problem assessment, examination of alternative practices, and appropriate public participation to be the most effective, practical (including technological, economic, and institutional considerations) means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals.

Biological control: Intentional actions to foster the reduction of pest populations by natural competitors, predators, or parasites (often referred to as agents), thereby providing a sustainable and highly selective solution to many widely spread infestations. Release of natural competitors might enhance control and reduce the rate of expansion of large existing infestations. While most often involving the use of insect agents, fungi, and other microbes, such as the bacterial insecticide Bacillus thuringiensis var. kurstaki (Btk) can also provide biological control. Target grazing is also biological control (see white paper).

Biomass: The total weight of all living organisms or specific group of organisms in a biological community.

Broadcast application: An herbicide application of over an entire area or field rather than only on rows, beds, or individual plants.

Buffer: A vegetative strip or management zone of varying size, shape, and character maintained along a stream, lake, road, recreation site, and different vegetation zone to mitigate the impacts of actions on adjacent lands, to enhance aesthetic values, or as a best management practice.

Candidate Species: Those plant and animal species that, in the opinion of the Fish and Wildlife Service, may become endangered or threatened.

Carrying capacity: The maximum population size that can be supported indefinitely by a given environment.

Channel aggradation: An increase in the elevation of the stream bed as a result of deposition of sediment.

Clay soil texture: A soil texture type consisting of 40 percent or more clay-sized particles, less than 40 percent silt-sized particles and less than 45 percent sand-sized particles.

Control: With respect to invasive species (plant, pathogen, vertebrate, or invertebrate species), control is defined as any activity or action taken to reduce the population, contain, limit the spread, or reduce the effects of an invasive species. Control activities are generally directed at established free-living infestations, and may not necessarily be intended to eradicate the targeted infestation in all cases.

Cover: canopy space occupied by a particular species, plant type, or community.

Cryptogamic soil crust: A community of cyanobacteria, mosses, and lichens on the soil surface, also known as biological soil crust. Biological soil crusts play important ecological roles in soil stabilization, carbon fixation, nitrogen fixation, and plant germination.

Designated use: Those uses specified in water quality standards for each water body or segment whether or not they are being attained.

Distribution: The spatial range of a species, usually on a geographic but sometimes on a smaller scale, or the arrangement or spatial pattern of a species over its habitat.

Disturbance: Any event, such as forest fire or insect infestations that alter the structure, composition, or functions of an ecosystem.

Diversion: The removal of water from its natural course or location by means of a ditch, canal, pipeline, or other conduit.

Drift: The movement of airborne particles by air motion or wind away from the intended target area.

Early detection: The process of finding, identifying, and quantifying new, small, or previously unknown infestations of aquatic or terrestrial invasive species prior to (or in the initial stages of) its establishment as free-living expanding population. Early detection of an invasive species is typically coupled with integrated activities to rapidly assess and respond with quick and immediate actions to eradicate, control, or contain it.

Ecological Stage: see successional stage

Ecosystem: A community of living organisms (plants, animals, and microbes) in conjunction with the nonliving components of their environment (i.e., air, water, and mineral soil), interacting as a system. These components are regarded as linked together through nutrient cycles and energy flows.

Emergence: The act of germinating seedling's breaking through the soil surface.

Ephemeral stream: A stream or portion of a stream that flows only in direct response to precipitation. It receives little or no water from springs and no long-continued supply from snow or other sources. Its channel is at all times above the water table.

Endangered Species: Any species in danger of extinction throughout all or a significant portion of its range. This does not include a species of the Class Insecta determined by the Secretary to be a pest whose protection under the provisions of the Endangered Species Act of 1973, as amended, would present an overwhelming and overriding risk to humans.

Endangered Species Act (ESA): The ESA provides for the conservation of threatened and endangered species of plants and animals. The ESA requires Federal agencies to ensure that actions (including pesticide use) they authorize, fund, or carry out are not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction of adverse modification of the species' critical habitat. The ESA also amended FIFRA to define imminent hazard to include situations involving unreasonable hazard to the survival of a species declared by the Secretary of the Interior to be endangered or threatened.

Endemic: A plant or animal that occurs naturally in a certain region and whose distribution is relatively limited geographically.

Eradication: With respect to invasive species (plant, pathogen, vertebrate, or invertebrate species), eradication is defined as the removal or elimination of the last remaining individual invasive species in the target infestation on a given site. It is determined to be complete when the target species is absent from the site for a continuous time period (that is, several years after the last individual was observed). Eradication of an infestation of invasive species is relative to the time-frame provided for the treatment procedures. Considering the need for multiple treatments over time, certain populations can be eradicated using proper integrated management techniques.

Establishment: Initiation of a free-living, reproducing population of an invasive species.

Estimated environmental concentration: The predicted concentration of a pesticide within an environmental compartment based on estimates of qualities released, discharge patterns and inherent disposition of the pesticide (fate and distribution) as well as the nature of the specific receiving ecosystems.

Exposure scenario: Exposure scenarios consider both the toxicity of a given chemical and the mechanism by which an organism may encounter it. The application rate and method influences whether a person, animal or non-target plant could be adversely affected by exposure to a particular herbicide.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA): This act provides the authority for the registration, distribution, sale, shipment, receipt, and use of pesticides. The Forest Service may only use pesticides registered or otherwise permitted in accordance with this Act. The FIFRA directs the Secretary of Agriculture, in cooperation with the Administrator of the U. S. Environmental Protection Agency (EPA), to implement research, demonstration, and education programs to support adoption of Integrated Pest Management (IPM), and to make information on IPM widely available to pesticide users, including Federal agencies. Federal agencies shall use IPM techniques in carrying out pest management activities and shall promote IPM through procurement and regulatory policies and other activities.

Floodplain: The lowland and relatively flat areas adjoining inland waters that are covered by its waters during flooding.

Forb: A broad-leaved herb that is not a graminoid.

Graminoid: Grasses which are botanically, any plant of the Gramineae family. Grasses are characterized by narrow leaves with parallel veins; by leaves composed of blade, sheath, and ligule; by jointed stems and fibrous roots; and by inconspicuous flowers usually arranged in spikelets.

Half-life: The time required for half of something to undergo a process. As used in this document, it is the amount of time for half the herbicide to break down, becoming ineffective.

Hazard quotient (HQ): The Hazard Quotient is the amount of herbicide or additives to which an organism may be exposed over a specified period divided by that estimated daily exposure level at which no adverse health effects are likely to occur. An HQ less than or equal to one indicates an extremely low level of risk; therefore, an HQ less than or equal to one is presumed to indicate a level of exposure below the level of concern (LOC) for adverse health effects.

Herbicide: Any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant.

Hydrolysis: The chemical breakdown of a compound due to reaction with water. Infiltration: The movement of water into the soil through pores or other openings.

Infestation: An invasive species population within a specified area.

Integrated Pest Management (IPM): A pest (in this context an invasive species) control strategy based on the determination of an economic, human health, or environmental threshold that indicates when a pest population is approaching the level at which control measures are necessary to prevent a decline in the desired conditions (economic or environmental factors). In principle, IPM is an ecologically-based holistic strategy that relies on natural mortality factors, such as natural enemies, weather, and environmental management, and seeks control tactics that disrupt these factors as little as possible. Integrated pest management techniques are defined within four broad categories: (1) biological, (2) cultural, (3) mechanical and physical, and(4) chemical techniques.

Intermittent stream: Streams which, in general, flow during wet seasons and are dry during dry seasons. Flow is derived principally from surface runoff, but during wet seasons receives a contribution from groundwater.

Interstitial: referring to an opening or space, especially open spaces between plants.

Introduction: The initial movement of a species to any location outside of its documented native geographical range.

Invasive plant management: Any activity that directly intervenes to minimize the spread and adverse effects of an invasive species, including preventing, controlling, containing, eradicating, surveying, detecting, identifying, inventorying, and monitoring invasive species; rehabilitating and restoring affected sites; and providing technical outreach and educational activities related to invasive species. Management actions in the National Forest System are based upon species-specific or site-specific plans (including forest plans, integrated pest management plans, watershed restoration plans, and so forth), and support the accomplishment of plan goals and objectives and achieve successful restoration or protection of priority areas identified in the respective plan(s).

Invasive species: Executive Order 13112 defines an invasive species as “an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.” The Forest Service relies on Executive Order 13112 to provide the basis for labeling certain organisms as invasive. Based on this definition, the labeling of a species as “invasive” requires closely examining both the origin and effects of the species. The key is that the species must cause, or be likely to cause, harm and be exotic to the ecosystem it has infested before we can consider labeling it as “invasive”. Thus, native pests are not considered “invasive”, even though they may cause harm. Invasive species infest both aquatic and terrestrial areas and can be identified within any of the following four taxonomic categories: Plants, Vertebrates, Invertebrates, and Pathogens. Additional information on this definition can be found in Executive Order 13112.

Invasive species management: Activities to prevent, control, contain, eradicate, survey, detect, identify, inventory, and monitor invasive species; includes rehabilitation and restoration of affected sites and educational activities related to invasive species. Management actions are

based upon species-specific or site-specific plans (including forest plans, IPM plans, watershed restoration plans, and so forth), and support the accomplishment of plan goals and objectives and achieve successful restoration or protection of priority areas identified in the respective plan(s).

Inventory: Invasive species inventories are generally defined as the observance and collection of information related to the occurrence, population or infestation of the detected species across the landscape or with respect to a more narrowly-defined area or site. Inventory attributes and purposes will vary, but are typically designed to meet specific management objectives which need information about the extent of an invasive species infestation. Inventories are typically conducted to quantify the extent of, and other attributes related to, infestations identified during survey activities.

Landtype (US Forest Service usage): Visually identifiable unit areas resulting from homogeneous geomorphic and climatic processes and having defined patterns of soils and vegetative potentials. Landtype units range in size from about one-tenth to one square mile. Their size and composition depend upon the significance of physical characteristics which can be readily interpreted to identify hazard, capability and productivity potentials that are reliable for land use planning purposes. Landtype units generally have uniform management response characteristics and so can be used to identify areas for which zoning and resource allocation decisions can be made.

Leaching: The process by which materials in the soil (such as nutrients or pesticides) are washed downward into the soil by the movement of water.

LC50 median lethal concentration: The statistically derived concentration of a pesticide in an environmental medium expected to kill 50 percent of test organisms in a given population.

Level of concern (LOC): An estimate of exposure above which there may be adverse effects; in risk assessments this is defined as a hazard quotient (HQ) of more than one.

Listed species: Any species of fish, wildlife, or plant officially designated as endangered or threatened by the Secretary of the Interior or Commerce.

Litter: The uppermost slightly decayed layer of organic matter on the forest floor or, more generally, beneath any plants.

Loamy soil texture: A soil that is a mixture of sand, silt, and clay-sized particles.

Lowest observed effect level (LOEL): The lowest exposure concentration associated with an adverse effect.

Maximum acceptable toxicant concentration (MATC): A value that is calculated through aquatic toxicity tests to help set water quality regulations for the protection of aquatic life. Using the results of a partial life-cycle chronic toxicity test, the MATC is reported as the geometric mean between the No Observed Effect Concentration (NOEC) and the Lowest Observed Effect Concentration (LOEC).

Mechanical control: Physical removal of invasive species by hand-pulling small infestations before flowers have bloomed, tilling larger infestations for several years, removing infested trees, squashing insect pests, etc.

Monitoring: For the purposes of invasive species program performance and accountability, the term "monitoring" refers to the observance and recording of information related to the responses to treating an invasive species infestation, and reported as treatment efficacy. By monitoring the treatment results over time, a measure of overall programmatic treatment efficacy can be determined and an adaptive management process can be used in subsequent treatment activities.

Monoculture: the cultivation or growth of a single crop or organism especially on agricultural or forest land.

Mortality: Refers to the rate of death of a species in a given population or community.

Municipal Watershed: A watershed that serves a public water system as defined in the Safe Drinking Water Act of 1974, as amended (42 U.S.C. §§ 300f, et seq.); or as defined in state safe drinking water statutes or regulations.

Mycorrhiza: A symbiotic association between a fungus and the roots of vascular plants.

Native Species: A species living or growing naturally in a particular place or region; indigenous, not introduced.

Niche: (1) The role played by (occupation or profession) and the address of a particular species in its ecosystem; (2) the range of conditions, resource levels and densities of other species allowing survival, growth and reproduction of organisms or species.

No observed adverse effect level (human health risk assessment)/no observed adverse effect concentration (ecological risk assessment) (NOAEL/NOAEC): Effects that are attributable to treatment but do not appear to impair the organisms ability to function and clearly do not lead to such impairment.

Nonnative (introduced) species: Any organism that is not native to the ecosystem being considered.

Nonpoint source pollution: Diffuse sources of water pollution that originate from many indefinable sources and normally include agricultural and urban runoff, runoff from construction activities, and so forth. In practical terms, nonpoint sources do not discharge at a specific, single location (such as a single pipe). Nonpoint source pollutants are generally carried over or through the soil and ground cover via stormflow processes. Unlike point sources of pollution (such as industrial and municipal effluent discharge pipes), nonpoint sources are diffuse and can come from any land area

Non-selective herbicide: Chemicals or formulations that destroy or prevent plant life in general without regard to species.

Non-target species: Plant species not singled out for management or control, may be native or nonnative.

Noxious weed: The term "noxious weed" is defined for the federal government in the Plant Protection Act of 2000 and in some individual State statutes. For purposes of this chapter, the term has the same meaning as found in the Plant Protection Act of 2000 as follows: The term "noxious weed" means any plant or plant product that can directly or indirectly injure or cause damage to crops (including nursery stock or plant products), livestock, poultry, or other interests of agriculture, irrigation, navigation, the natural resources of the United States, the public health, or the environment. The term typically describes species of plants that have been determined to be undesirable or injurious in some capacity. Federal noxious weeds are regulated by USDA-Animal and Plant Health Inspection Service under the Plant Protection Act of 2000, which superseded the Federal Noxious Weed Act of 1974. State statues for noxious weeds vary widely, with some States lacking any laws defining or regulating noxious weeds. Depending on the individual State law, some plants listed by a State statute as "noxious" may be native plants which that State has determined to be undesirable. When the species are native, they are not considered invasive species by the Federal Government. However, in most cases, State noxious weed lists include only exotic (non-native) species.

Overland Flow: The rain storm or snow melt runoff water which flows over the ground surface as a thin layer, as opposed to the channelized (concentrated) runoff which occurs in rills and gullies.

Peak flow: The maximum volume of flow attained at a given point in a stream during a runoff event.

Percolation: The downward movement of water within a soil, especially the downward flow of water in saturated or nearly saturated soil.

Perennial stream: A stream that has permanently present surface water. Flows occur throughout the year except possibly during extreme drought or during extreme cold when ice forms.

Persistence: The length of time an herbicide remains active in the soil.

Physiological: Characteristic of or appropriate to an organism's healthy or normal biological and chemical functioning.

Photodegradation: Degradation by means of radiant energy (as light).

Photolysis: Chemical decomposition by the action of radiant energy (as light).

Plant Community: The species that occur together in space and time.

Plausible effects: The analysis focuses on whether effects that are possible based on risk assessments are plausible, given site conditions, herbicide application methods and Design

Criteria. Design Criteria are used to minimize or eliminate the plausibility of effects identified in the risk assessments.

Population: Any group of individuals, usually of a single species, occupying a given area at the same time.

Primary constituent element: A physical or biological feature essential to the conservation of a species for which its designated or proposed critical habitat is based on, such as space for individual and population growth, and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and habitats that are protected from disturbance or are representative of the species historic geographic and ecological distribution.

Prevention: Prevention measures for invasive species management programs include a wide range of actions and activities to reduce or eliminate the chance of an invasive species entering or becoming established in a particular area. Preventative activities can include projects for education and awareness as well as more traditional prevention activities such as vehicle/equipment cleaning, boat inspections, or native plant restoration plantings. Restoration activities typically prevent invasive species infestations by improving site resilience, and reducing or eliminating the conditions on a site that may facilitate or promote invasive species establishment.

Range: see distribution

Rapid Response: With respect to invasive species (plant, pathogen, vertebrate, or invertebrate species), rapid responses are defined as the quick and immediate actions taken to eradicate, control, or contain infestations that must be completed within a relatively short time to maximize the biological and economic effectiveness against the targeted invasive species. Depending on the risk of the targeted invasive species, rapid response actions may be supported by an emergency situation determination and emergency considerations would include the geographic extent of the infestation, distance from other known infestations, mobility and rate of spread of the invasive species, threat level and potential impacts, and available treatments.

Reference dose (RfD): A defined level that is not believed to be associated with any adverse effect. Both chronic and acute RfDs are characterized in risk assessments.

Regime: A prevailing pattern of events over time, especially of disturbance and climate.

Residual Activity: An herbicide that prevents the growth of plants when present in the soil. Soil residual effects may be temporary or relatively permanent.

Resilience: Capacity of an ecosystem to respond to a perturbation or disturbance by resisting damage and recovering quickly.

Restoration and rehabilitation: Following a disturbance, the active or passive management of an ecosystem or habitat to restore ecosystem structure and function and prevent re-invasion by

improving site resilience and reducing or eliminating the conditions on a site that might facilitate or promote invasive species establishment.

Restored: With respect to performance specifically, the invasive species program is driven by an outcome-based performance measure centered on 'restoration'. An area treated (see "treatment" definition) against invasive species has been 'restored' when the targeted invasive species defined in the project plan was controlled or eradicated directly as a result of the treatment activity. In some instances, actions taken across particular areas to prevent the establishment and spread of specific invasive species are also included in this treatment definition. 'Restored' acres are a subset of 'treated' acres, which are tracked annually to determine the effectiveness of treatments. Preventing, controlling, or eradicating invasive species assists in the recovery of the area's resilience and the capacity of a system to adapt to change if the environment where the system exists has been degraded, damaged, or destroyed (in this case by invasive species); and helps to reestablish ecosystem functions by modifying or managing composition and processes necessary to make terrestrial and aquatic ecosystems sustainable, and resilient, under current and future conditions (as described in FSM 2020). In most cases, this is a performance measure defined in the project plan, and project managers have the flexibility to set the parameters for determining when the treated areas have been restored. Absence of an individual invasive species organism, whether through eradication or prevention efforts, is most often the criteria used to determine when acres have been restored. Monitoring treatment efficacy is critical to reporting invasive species management performance.

Resilience: The capacity of an ecosystem to absorb disturbance and reorganize while undergoing change, so as to still retain essentially the same function, structure, identity, and feedbacks. By working toward the goals of diverse native ecosystems that are connected and can absorb disturbance, it is expected that over time, management would create ecological conditions that support the abundance and distribution of native species within a geographic area to provide for native plant and animal diversity.

Rhizomatous: Having a persistent underground root system from which a plant can produce new shoots even if the original plant is cut down.

Riparian area: Geographically delineable areas with distinctive resource values and characteristics that are comprised of the aquatic and riparian ecosystems.

Riparian ecosystems: A transition area between the aquatic ecosystem and the adjacent terrestrial ecosystem; identified by soil characteristics or distinctive vegetation communities that require free or unbound water.

Riparian habitat conservation area (RHCA): Portions of watersheds where riparian-dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines. RHCAs include traditional riparian corridors, wetlands, intermittent headwater streams, and other areas where proper ecological functioning is crucial to maintenance of the stream's water, sediment, woody debris, and nutrient delivery systems.

Riparian management objective (RMO): Quantifiable measures of stream and stream-side conditions that define good anadromous fish habitat, and serve as indicators against which attainment, or progress toward attainment, of the goals will be measured.

Risk assessments: A qualitative evaluation of the probability that the use of herbicide may pose a risk to human health or the environment. They contain the following:

- ***Hazard Characterization.*** What are the dangers inherent with the active ingredient?
- ***Exposure assessment.*** Who could come into contact and how much?
- ***Dose response assessment.*** How much is too much?
- ***Risk characterization.*** Indicates whether or not there is a plausible basis for concern
- ***Risk quotient.*** Risk Quotients are calculated by dividing exposure estimates by the acute and chronic ecotoxicity values.

Rosette: The basal or early leaves of a plant, before bolting.

Sediment load: The quantity of sediment, measured in dry weight or by volume, transported through a stream cross-section in a given time. Sediment discharge consists of both suspended load and bedload.

Sediment yield: The amount of sediment per unit area removed from a watershed by flowing water during a specified period of time.

Selective herbicide: A chemical that is more toxic to some plant species than to others (may be a function of dosage or mode of application).

Sensitive species: Those plant and animal species identified by a regional forester for which population viability is a concern, as evidenced by: (1) Significant current or predicted downward trends in population numbers or density, or (2) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Seral: The stage of succession of a plant or animal community that is transitional. If left alone, the seral stage will give way to another plant or animal community that represents a further stage of succession.

Soil condition: Description of the status of a soil's physical, chemical, and biological properties at any point in time. This may be a qualitative or quantitative description.

Soil productivity: The inherent capacity of the soil resource to support appropriate site-specific biological resource management objectives, which includes the growth of specified plants, plant communities, or a sequence of plant communities to support multiple land uses.

Sorption coefficient: A measure of the strength at which a chemical adheres to soil in preference to remaining dissolved in water. The higher the number, the more readily an herbicide binds to soil particles.

Spray adjuvants: is a catchall phrase for substances added to an herbicide or spray mix to aid mixing and applying or to improve the efficacy of an herbicide application.

Survey: An invasive species survey is a process of systematically searching a geographic area for a particular (targeted) invasive species, or a group of invasive species, to determine if the species exists in that area. It is important to know where and when surveys have occurred, even if the object of the survey (target species) was not located. Information on the absence of an invasive species can be as valuable as information on the presence of the species, and can be used as a foundation to an early detection system. Unlike inventories, surveys typically do not collect additional detailed attributes of the infestation or the associated site.

Structure: The list of species and their relative abundance in a community. Also, spatial arrangement both horizontally and vertically. Structure might reveal a pattern, or mosaic, or total randomness of vegetation. (University of Salzburg, AUT, FS Ecosystem Management Terms)

Succession: The natural replacement, in time, of one plant community with another. Conditions of the prior plant community (or successional stage) create conditions that are favorable for the establishment of the next stage.

Successional stage: A stage of development of a plant community as it moves from bare ground to climax. For example, the grass-forb stage of succession precedes the woody shrub stage.

Susceptible: see vulnerable. Also, referring to plants not tolerant of herbicide.

Talus: Rock fragments that have accumulated at the base of a cliff or slope.

Target species: An individual invasive species or population of invasive species, which has been prioritized for research or management action based upon environmental, economic, or human impacts, risk assessments, or other decision support tools.

Threatened species: Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and that the appropriate Secretary has designated as a threatened species. (Some states also have declared certain species as threatened through their regulations or statutes.)

Tolerant: Capable of withstanding effects. For example, grass is tolerant of 2,4-D to the extent that this herbicide can be used selectively to control broadleaf weeds without killing the grass.

Total maximum daily load (TMDL): A calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that load among the various sources of that pollutant.

Translocation: Transfer of sugars or other materials such as 2,4-D from one part to another in plants.

Treatment: Any activity or action taken to directly prevent, control, or eradicate a targeted invasive species. Treatment of an invasive species infestation may not necessarily result in the elimination of the infestation, and multiple treatments on the same site or population are sometimes required to affect a change in the status of the infestation. Treatment activities typically fall within any of the four general categories of integrated management techniques: Biological treatments, Cultural treatments, Mechanical treatments, or Chemical treatments. For example, the use of domestic goats to control invasive plants would be considered a biological treatment; the use of a pesticide to control invasive fishes would be characterized as a chemical treatment; planting of native seeds used to prevent invasive species infestations and restore a degraded site would be considered a cultural treatment technique; developing an aquatic species barrier to prevent invasive species from spreading throughout a watershed would be considered a physical treatment; cleaning, scraping, or otherwise removing invasive species attached to equipment, structures, or vehicles would be considered a mechanical treatment designed to directly control and prevent the spread of those species.

Turbidity: The amount of solid particles that are suspended in water and that cause light rays shining through the water to scatter. Turbidity makes the water cloudy or even opaque in extreme cases.

µg: Microgram, a unit of mass equal to one millionth of a gram.

Vector: Routes or means of introducing invasive species to an area: pathways for invasion. For example, roadways, trails, streams and wind are all vectors for invasion.

Viable population: A population that has the estimated numbers and distribution of reproductive individuals to ensure the continued existence of the species throughout its existing range (or range required to meet recovery for listed species) within the planning area.

Vigor: active healthy well-balanced growth especially of plants.

Vulnerable: being at risk, especially a plant community at risk of being degraded in quality though the invasion of aggressive, non-native species.

Volatilization: Evaporation or vaporization of an herbicide compound (changes from liquid to a gas) at ordinary temperatures on exposure to the air.

Watershed: The catchment area of land draining into a river, river system, or body of water; the drainage basin contributing water, organic matter, dissolved nutrients, and sediments to a stream or lake. The United States Geological Survey created a hierarchical system of 6 levels of hydrologic units, each described by a unique Hydrologic Unit Code (HUC).

Watershed, 4th-level: A watershed defined at the “sub-basin” scale. The HUC contains 8 digits, and the average watershed size is 700 square miles.

Watershed, 5th-level: A watershed defined at the "watershed" scale. The HUC contains 10 digits, and the watershed size generally ranges from 40,000 to 250,000 acres.

Watershed, 6th-level: A watershed defined at the "sub-watershed" scale. The HUC contains 12 digits, and the watershed size generally ranges from 10,000 to 40,000 acres.

Water solubility: A measure of how readily a chemical or substance will dissolve in water.

Water table: The upper surface of the groundwater or that depth below which the soil is saturated with water.

Wetland: Those areas that are inundated by surface or ground water with a frequency sufficient to support and that, under normal circumstances, do or would support a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds.