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Medicine Bow Landscape Vegetation Analysis Project

Draft Environmental Impact Statement

Forest Service Medicine Bow-Routt National Forests and Thunder Basin National Grassland
Laramie and Brush Creek/Hayden Ranger Districts June 2018

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Cover photo: Matrix of beetle-killed stands surrounded by resilient stands that were previously harvested (provided by U.S. Forest Service).

Medicine Bow Landscape Vegetation Analysis Project
Draft Environmental Impact Statement
Albany and Carbon Counties, Wyoming

Lead Agency: USDA Forest Service

Cooperating Agencies: Wyoming State Forestry Division, Wyoming Game and Fish Department, Wyoming Department of Environmental Quality, Wyoming State Historic Preservation Office, Cheyenne Board of Public Utilities, Wyoming Department of Agriculture, Carbon County, Little Snake River Conservation District, Laramie Rivers Conservation District, Medicine Bow Conservation District, Saratoga-Encampment-Rawlins Conservation District, Bureau of Land Management, and U.S. Fish and Wildlife Service.

Responsible Official: Russell Bacon, Forest Supervisor
2468 Jackson St., Laramie, WY 82070

For Information Contact: Melissa Martin, Planning and Information Program Manager
2468 Jackson St., Laramie, WY 82070
307-745-2371

Abstract: The purpose of the Medicine Bow Landscape Vegetation Analysis (LaVA) Project is to respond to changed forest vegetation conditions presented by the bark beetle epidemic experienced on the Medicine Bow National Forest. The need for the project is defined by existing, desired, and predicted conditions for forested vegetation and the threats to forest values they pose. Two alternatives were analyzed—no action and the modified proposed action—as authorized by section 104(1) of the Healthy Forests Restoration Act.

The proposed project is a hazardous fuels reduction project as defined by the Healthy Forests Restoration Act, section 101(2) and is subject to subparts A and C of 36 CFR part 218 (project-level pre-decisional administrative review process). It is important that reviewers provide their comments at such times and in such a way that they are useful to the Agency's preparation of the environmental impact statement. Therefore, comments should be provided prior to the close of the comment period and should clearly articulate the reviewer's concerns and contentions. The submission of timely and specific comments can affect a reviewer's ability to participate in subsequent administrative review or judicial review. Comments received in response to this solicitation, including names and addresses of those who comment, will be part of the public record for this proposed action. Comments submitted anonymously will be accepted and considered; however, anonymous comments will not provide the respondent with standing to participate in subsequent administrative or judicial reviews.

Send Comments to: Melissa Martin, Planning and Information Program Manager
2468 Jackson St., Laramie, WY 82070

Date Comments Must Be Received: August 20, 2018

Summary

The Medicine Bow Landscape Vegetation Analysis (LaVA) project area includes most of the Snowy Range and Sierra Madre Mountain Ranges in the Medicine Bow National Forest. The Medicine Bow National Forest has experienced epidemic levels of mountain pine beetle and spruce bark beetle infestations since the mid- to late 1990s, and post-epidemic conditions have dramatically changed the cover type, diversity, and structural stages of the forested vegetation. High tree mortality levels have also moved the Medicine Bow away from desired conditions outlined in the 2003 revised Medicine Bow National Forest Land and Resource Management Plan (forest plan). Identified gaps between existing and forest plan desired conditions within the LaVA project area include:

- Heavy fuels have accumulated in conifer stands which does not protect communities, infrastructure, and municipal watersheds from wildfires.
- Heavy tree mortality has reduced biodiversity across the Medicine Bow National Forest, including suitable habitat for wildlife species. Given this reduction, there is a need to accelerate habitat recovery through vegetation treatments.
- Existing forested structural stages, age classes, and cover types do not meet forest plan desired conditions. Consequently, there is a need to accelerate regeneration through stand initiation treatments which improve resilience to future epidemics.
- The existing jackstrawed condition in much of the beetle-killed conifer stands does not provide recreation and livestock access and satisfaction for hunting and other recreation activities. There is a need to reduce the heavy buildup of dead and down material through fuel reduction and salvage treatments.
- The existing condition of overhead hazard trees, caused by the bark beetle epidemics, does not provide for public and employee safety and lower the risk of wildfire in wildland-urban interface areas.
- The existing condition of tree mortality has moved the Medicine Bow National Forest away from the desired conditions for a suitable timber base in Management Areas 5.13 and 5.15 (timber emphases). There is a need for treatments to support the future regeneration of merchantable tree species to meet desired conditions, standards, and guidelines for these two management areas.

The purpose of the LaVA Project is to respond to the conditions outlined above. The need for the project is defined by existing, desired, and predicted conditions for forested vegetation and the threats posed by the existing and predicted conditions.

The proposed project is a hazardous fuels reduction project as defined by the Healthy Forests Restoration Act, section 101(2) and is subject to subparts A and C of 36 CFR part 218 (project-level pre-decisional administrative review process).

Cooperating Agencies

Medicine Bow National Forest personnel have cooperated with numerous State and Federal agencies since March 2017 to develop the LaVA proposed action, including Wyoming State Forestry Division, Wyoming Game and Fish Department, Wyoming Department of Environmental Quality, Wyoming State Historic Preservation Office, Cheyenne Board of Public Utilities, Wyoming Department of Agriculture, Carbon County, Little Snake River Conservation District, Laramie Rivers Conservation District, Medicine Bow Conservation District, Saratoga-Encampment-Rawlins Conservation District, Bureau of Land Management, and U.S. Fish and Wildlife Service.

Public and Agency Involvement and Issues

The notice of intent initiating the scoping process (40 CFR 1502.7) for the draft environmental impact statement was published in the Federal Register on July 21, 2017. During the scoping period, which closed on August 21, 2017, Medicine Bow National Forest personnel engaged in numerous outreach efforts: hosting open house meetings, publishing news releases, and disseminating a detailed scoping document for public review and comment. In January 2018, Medicine Bow personnel hosted four additional public engagement sessions to apprise the public of project progress and to solicit additional feedback.

The July 2017 scoping effort and the feedback from the January 2018 public engagement sessions generated 58 comment letters. The Medicine Bow National Forest interdisciplinary team and the responsible official reviewed them and identified project issues. In most cases, the issues were used to modify, clarify, or augment the proposed action. In some cases, the interdisciplinary team also developed indicators or ways of measuring environmental effects. The indicators will be monitored over the life of the LaVA project and will be useful in judging differences among actions and resource values, as well as demonstrating responsiveness to public concerns.

- Issue 1: The proposed action should include more site specificity
- Issue 2: A range of alternatives is warranted for a project of this scope and scale
- Issue 3: Additional public engagement is warranted
- Issue 4: An implementation strategy needs to include meaningful ways for the public to engage on individual treatments
- Issue 5: The scope and scale of the project is too large
- Issue 6: Proposed action road estimates should be reduced
- Issue 7: Inventoried roadless areas and unroaded areas should be protected
- Issue 8: Impacts to recreation

Issues 1 through 4 were addressed by existing law, regulation, and policy or by the development of project design features and adaptive implementation and monitoring framework. Issues 5 through 8 were addressed similarly but also resulted in minor modifications to the proposed action and the development of issue indicators.

Alternatives Analyzed in Detail

The Healthy Forests Restoration Act, title I, section 104 requires development of a proposed action, a no-action alternative, and an additional action alternative if one is proposed during scoping or the collaborative process and meets the purpose and need for the project. No alternatives that met the purpose and need for the project were proposed during scoping or the collaborative process (project analysis file, scoping disposition). Therefore, only a no-action alternative and a modified proposed action were analyzed in detail.

Alternative 1: No Action

The no-action alternative assumes the modified proposed action would not be implemented in the analysis area. This alternative represents no attempt to actively respond to the issues, the purpose and need for action, or concerns identified during public scoping and public engagement sessions for this project. There would be no effort to modify existing conditions, unless authorized by other decisions. Current management plans would guide management of the project area and ongoing management programs would be implemented. These other projects would proceed under separate environmental analyses or authorities.

Alternative 2: Modified Proposed Action

The following modifications were made to the original proposed action to address concerns raised during the July 2017 scoping effort:

- eliminating 10 miles of proposed, permanent road construction
- developing a new treatment opportunity area map to better reflect where temporary road construction is, and is not, allowed per forest plan direction

Alternative Description: Medicine Bow National Forest personnel propose to conduct vegetation management activities on National Forest System lands, including inventoried roadless areas, within the Sierra Madre and Snowy Range Mountain Ranges of the Medicine Bow National Forest. Vegetation management activities, including prescribed fire, mechanical, and hand treatment methods, could be applied on up to 360,000 acres to make areas more resilient to future disturbance; protect, restore, and enhance forest ecosystem components; supply forest products to local industries; provide for human safety; reduce wildfire risk to communities, infrastructure, and municipal water supplies; and improve, protect, and restore wildlife habitat. Specific treatments would be developed and authorized for implementation over a 10 to 15 year period beginning in 2019 and would be completed within approximately 20 years of the project decision. A combination of commercial timber sales, service contracts, stewardship contracts, cooperative authorities, partner capacity, and Forest Service crews would be used to implement the project.

The modified proposed action is intended to address continually changing forest conditions by incorporating principles of adaptive management. In doing so, this alternative proposes up to 360,000 acres could be treated within pre-established treatment opportunity areas (613,000 acres) rather than identifying site-specific treatment units. During project implementation, Medicine Bow personnel would cooperate with other agencies, local governments, interested stakeholders, and organizations to identify specific treatment units. Specific objectives for each treatment unit would be determined prior to ground-disturbing activities using existing vegetation conditions and a series

of project-specific field review forms. The sum of all treatments, regardless of roadless status, would not exceed 360,000 acres and would be dependent on such things as staffing, funding, site-specific resource conditions, and project design features. LaVA project implementation would be guided by an adaptive implementation and monitoring framework, as described in appendix A.

Specific activities associated with the modified proposed action include:

- up to 95,000 acres of stand initiating or even-aged treatment methods
- up to 165,000 acres of uneven-aged or intermediate treatments
- up to 100,000 acres of other vegetation treatments, including prescribed fire, mastication, and hand thinning
- constructing not more than 600 miles of temporary road, as necessary, to access treatment areas

Environmental Consequences

The following table presents the major conclusions, by resource, for the alternatives analyzed in detail.

Table 1. Summary of effects comparisons between alternatives

Resource	Effects from No Action	Effects from Modified Proposed Action
Timber	No human-caused impacts beyond the existing condition. Natural processes would continue. Growth may stagnate where stand density is high. Conifer stands with high mortality and minimal regeneration may shift to shade-tolerant species in the long-term. Conifer encroachment would continue to negatively affect aspen regeneration.	Vegetation treatments would provide resilience to future epidemics. High mortality stands would accelerate in growth and production through stand initiation treatments. Vegetation treatments would result in more favorable conditions for regeneration of stands to conform to forest plan desired conditions.
Fire and fuels	Fuels and resulting fire behavior potential would continue to be influenced by heavy buildup of falling dead trees as well as regeneration of young understory trees. Heavy fuel loads would increase fire severity causing negative impacts on other resources.	Mechanical vegetation treatments, prescribed burning, and fuels reduction activities would move the analysis area toward forest plan desired conditions. Fuel loads would be reduced. Harvests and thinning of beetle-killed and live trees would decrease canopy fires by increasing crown spacing.

Resource	Effects from No Action	Effects from Modified Proposed Action
Wildlife	In the short and mid-term, species dependent on habitat consisting of young, dense forest, snags, and heavy buildup of woody material would thrive while species dependent on less dense and open mature forest would not until late successional stages are reached.	Water, foraging habitat, roosting habitat, breeding and nesting habitat, and prey animals would be sufficient to support populations for management indicator species. May impact individuals but is not likely to cause a trend toward Federal listing or a loss of viability in the planning area for Rocky Mountain Region sensitive species including olive fly catcher, flammulated owl, and purple martin. May affect and is likely to adversely affect Canada lynx (federally listed species). LaVA implementation is not likely to meet forest plan wildlife security guidelines in all cases. There are 51,700 acres of security areas that could be removed temporarily by vegetation management.
Aquatic species	Tree mortality caused by the bark beetle epidemics could positively affect large woody debris recruitment to stream channels as trees fall down. Increased mortality of riparian trees due to mountain pine beetle activity could reduce shading and potentially increase water temperatures.	Moderate degree of impact to rainbow, brown, and brook trout. May result in impacts to mountain sucker, Colorado River cutthroat, wood frog, leopard frog, boreal toad, individuals but is not likely to result in a loss of viability in the planning area, nor cause a trend toward Federal listing.
Botany	No impacts to botanical species above those already incurred under the existing condition.	No effect for federally listed plant species. May adversely affect individuals, but not likely to cause a trend toward Federal listing or a loss of viability for Rocky Mountain Region sensitive plant species. No loss of viability for plant species of local concern.
Range and livestock management	There would be higher rates of damage to fences in coniferous stands. Aging shrub and grass stands that are, or are becoming, dense and decadent will provide less forage for livestock than they did at earlier seral stages. Movement of grazing permittees and cattle across the range will be increasingly difficult and dangerous.	Removal of dead trees through harvest or prescribed fire would prolong the life of some fences and improve access to watering facilities. Loss of natural livestock barriers may occur, causing more labor time to herd livestock. Burned areas may need to be deferred from livestock use or rested.
Noxious weeds and other invasive plants	Noxious weeds would continue to increase in coniferous forest stands with high tree mortality due to the increased amount of sunlight and water available for understory plants. Access to inventory and treat weeds in stands with a lot of dead and downed trees would be difficult and dangerous.	Ground disturbance from mechanical vegetation treatments and prescribed burns would increase invasive plant species in the project area. Project design features included in this project reduce that risk.

Resource	Effects from No Action	Effects from Modified Proposed Action
Hydrology	There would be no human-caused increases in sediment beyond that of the existing condition and those carried forward through natural processes. These natural processes would include an increase in the risk of adverse effects to watershed condition from large-scale wildland fires and the subsequent induced erosion and sedimentation.	The LaVA Project has been designed to minimize effects to water resources through the adaptive implementation and monitoring framework. This framework includes monitoring of best management practices, design features, and temporary roads to ensure actual treatments meet desired condition. The framework will ensure compliance with the forest plan direction for hydrologic resources.
Soils	High-severity wildfire could result in an increased potential for impacts to soils.	In the short-term, effects to soils from harvest operations and prescribed burning would include erosion; compaction; rutting and displacement; degradation of the litter layer; lack of coarse woody debris; and spread of invasive weeds.
Air quality and climate change	No direct effects through continuation of the existing condition. Potential impacts to air quality later due to resulting build-up of forest fuels, which could cause more smoke during wildfires.	Thinning and fuel reduction would decrease large-scale wildfire risks. Carbon emissions would not exceed the Council on Environmental Quality thresholds. Changes to climate would be immeasurable.
Transportation	No direct effects to the existing transportation system.	No mid-term or long-term negative effects would occur on the existing transportation system. Temporary roads would be closed and reclaimed within three years of individual project completion.
Recreation	There may be short-term or lasting adverse impacts to Medicine Bow National Forest visitors and to developed recreation, dispersed recreation, wilderness, and inventoried roadless areas as a result of implementing the no-action alternative. Recreation access within beetle-killed stands would worsen over time as dead or dying trees fall into a jackstrawed matrix.	Nonmotorized and motorized recreationists who use the Pelton Creek Trailhead could experience substantial, short-term impacts during project implementation. Other short-term effects to recreationists would vary depending on the proximity of treatment units to the recreation activity and time of year.
Lands and special uses	No measurable direct, indirect, or cumulative effects to special use permits and no significant alteration of permitted use patterns.	Prescribed fire, mechanical, and hand treatments would not significantly alter authorized use patterns.
Heritage resources	Large-scale wildfires and heavy tree mortality could destroy cultural resources. Wildfires could render dating methods inaccurate or alter the visual appearance of sites.	Reduction in adverse direct effects to significant cultural resources under section 106 requirements.
Scenic resources	If no action is taken, existing visual evidence of some modifications would decrease over time, while increasing density of young pine stands may limit viewing distance.	The recent mountain pine beetle epidemic, response actions, and wildfires have altered scenery in parts of the project area. The modified proposed action would add to some of these effects by increasing acreage of young and open forest. With implementation of project-specific design features and adherence to forest plan guidelines, proposed activities would meet assigned scenic integrity objectives.

Resource	Effects from No Action	Effects from Modified Proposed Action
Roadless characteristics	Potential wildfires could adversely affect soil productivity and water quality. The resulting smoke of these potential wildfires could adversely affect air quality.	Mechanical treatment, prescribed burning, or both could cause short-term soil compaction and displacement, loss of some individual plants and their localized habitat (including Rocky Mountain Region sensitive species), introduction of weeds, short-term effects on water and air quality, and increases in unauthorized off-highway vehicle use.
Socioeconomics	No major changes to socioeconomic conditions.	Harvests would increase the number of jobs and income over the next 5 to 10 years and contribute to the local economy. Effects would not disproportionately or negatively affect low income and minority populations. Positive effects would result from increased economic opportunities.

Decision Framework

Based on the purpose and need for the project and the effects of the alternatives, the responsible official will make the following determinations:

- whether the proposal addresses scoping issues, is responsive to law, regulation, policy and forest plan direction, and meets the purpose of and need for action
- whether the information in this analysis is sufficient to implement the modified proposed action
- monitoring and project design features necessary to achieve project objectives

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Chapter 1. Purpose of and Need for Action

Document Structure

The Forest Service has prepared this draft environmental impact statement in compliance with the National Environmental Policy Act and other relevant Federal and State laws and regulations. This environmental impact statement discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four chapters:

- Chapter 1, Purpose and Need for Action, includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Medicine Bow National Forest personnel informed the public of the proposal and how the public responded.
- Chapter 2, Alternatives, including the Proposed Action, provides a more detailed description of the agency's proposed action and a no-action alternative. The alternatives were developed based on issues raised by the public and other agencies. This section also provides a summary table of the environmental consequences associated with each alternative.
- Chapter 3, Affected Environment and Environmental Consequences, describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area.
- Chapter 4, Administrative Material, lists team members who helped prepare the draft environmental impact statement, the collaborators and stakeholders who participated in LaVA project development, and those receiving the notice of availability for release of the draft environmental impact statement.
- Appendix A is adaptive implementation and monitoring framework developed in conjunction with LaVA cooperating agencies. It outlines the process for identifying, refining, implementing, and monitoring individual vegetative treatments on the Snowy and Sierra Madre Mountain Ranges over the next 10 to 15 years.
- The index is a systematic analysis of the contents in the draft environmental impact statement to help the reader find a specific topic.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at Medicine Bow-Routt National Forests and Thunder Basin National Grassland, 2468 Jackson Street, Laramie, WY 82070.

Chapter Summary

The Medicine Bow Landscape Vegetation Analysis (LaVA) project area includes most of the Snowy Range and Sierra Madre Mountain Ranges in the Medicine Bow National Forest. The post-epidemic conditions of the bark beetle infestations have dramatically changed the cover type, diversity, and structural stages of the forested vegetation. The high tree mortality levels have caused the Medicine Bow National Forest to move away from desired conditions outlined in the 2003 revised Medicine Bow National Forest Land and Resource Management Plan (forest plan).

The purpose of the LaVA Project is to respond to changed forest vegetation conditions presented by the bark beetle epidemic experienced on the Medicine Bow National Forest. The need for the project is defined by existing, desired, and predicted conditions for forested vegetation and the threats to forest values they pose.

This project is being conducted under the Healthy Forests Restoration Act which allows for expedited environmental analysis and designation of priority treatment areas that reduce the risk or extent of, or increase the resilience to, insect or disease infestation. The project area lies within the boundaries of designated, priority landscape areas for treatment of insects and diseases, as identified under the Healthy Forests Restoration Act, section 602.

Synopsis of the Modified Proposed Action[1]

Medicine Bow National Forest personnel propose to authorize vegetation management activities on up to 360,000 acres of National Forest System lands, including portions of inventoried roadless areas. Vegetation treatments would include stand initiating or even-aged treatments that would not exceed 95,000 acres, uneven-aged or intermediate treatments that would not exceed 165,000 acres, and other vegetation treatments (prescribed fire, mastication, and hand thinning) that would not exceed 100,000 acres. Other proposed activities include:

- tree cutting, shrub cutting, or both with a variety of treatment methods
- cutting of encroaching conifers
- prescribed and maintenance burning
- hazard tree clearing along critical linear structures
- utilizing National Forest System roads, reconstructing National Forest System roads, or both
- constructing temporary roads
- decommissioning temporary roads
- utilizing and reconstructing existing open and closed National Forest System roads to access treatment units
- developing field validation checklists, project design features, and an adaptive implementation and monitoring framework
- conducting regeneration surveys, noxious weed control, native grass seeding, and road maintenance

Decision Framework

The LaVA Project purpose and need (page 15) provides the focus and scope of the modified proposed action, as related to national and forest-level policy and direction. Given this purpose and need, the responsible official (forest supervisor) will review the modified proposed action, the issues identified during scoping, the range of alternatives, and the environmental consequences of

[1] Following the July 2017 scoping effort for the LaVA Project, Medicine Bow National Forest personnel modified the proposed action in response to public and agency comments. Modifications to the proposed action are detailed in chapter 2.

the alternatives analyzed in detail. This information forms the basis for the responsible official to make the following determinations:

- whether the proposal addresses scoping issues, is responsive to law, regulation, policy and forest plan direction, and meets the purpose of and need for action
- whether the information in this analysis is sufficient to implement the modified proposed action
- what monitoring and project design features are necessary to achieve project objectives

Project Area

The LaVA project area is located in Albany and Carbon Counties, Wyoming. The project area stretches from the Colorado-Wyoming border north across the Snowy Range and Sierra Madre Mountain Ranges from approximately 25 miles west of Laramie, Wyoming to about 25 miles east of Baggs, Wyoming. It encompasses approximately 850,000 acres of National Forest System lands – the entirety of the Snowy Range and Sierra Madre portions of the Medicine Bow National Forest, Brush Creek/Hayden and Laramie Ranger Districts. For purposes of analyzing the proposed action, the project area is divided into 14 accounting units which are discussed in more detail in chapter 2.

Healthy Forests Restoration Act

Every five years, Congress passes a bundle of legislation, commonly called the "Farm Bill", which sets national agriculture, nutrition, forestry, and conservation policy. Among the 2014 Farm Bill provisions that pertain to the Forest Service is section 8204, which amends Title VI of the Healthy Forests Restoration Act (16 U.S.C. 6591) by adding sections 602 (Designation of Treatment Areas) and 603 (Administrative Review) to address qualifying insect and disease infestations on National Forest System lands.

Section 602(b)(1) requires the Secretary of Agriculture to designate treatment areas if requested by the governor of a State. On May 20, 2014, Secretary Tom Vilsack announced the designation of approximately 45.6 million acres of National Forest System lands across 94 national forests in 35 states to address insect and disease threats that weaken forests and increase the risk of forest fire.

On March 22, 2017, the Chief of the Forest Service designated an additional 84 watersheds (751,283 acres) on the Medicine Bow National Forest to address insect and disease threats. This designation includes the majority of the Medicine Bow National Forest (figure 1) and the entirety of the LaVA project area. As such, analysis and documentation of the LaVA Project is being carried out in accordance with Section 602(d). Projects within the designated areas must “reduce the risk of, or increase the resilience to, insect or disease infestation” (Section 602(d)(1)). One of the many purposes of the LaVA Project is to increase resilience to insect infestation and other natural disturbances, as described further on page 15.

Healthy Forests Restoration Act section 104 requires collaboration with State and local governments and Indian Tribes, and participation of interested persons, during the preparation of authorized projects. Collaborative processes associated with this project are described on page 22.

The proposed project is a hazardous fuels reduction project as defined by the Healthy Forests Restoration Act, section 101(2) and is subject to subparts A and C of 36 CFR part 218 (project-level pre-decisional administrative review process). In addition to this pre-decisional review process, the act provides for expedited National Environmental Policy Act reviews and guidance on judicial review. This authority for expedited review, as directed by Congress, does not change or exempt the Forest Service from complying with any other existing law, regulation, or policy such as the National Environmental Policy Act, the Endangered Species Act, the Clean Water Act, the Clean Air Act, the National Historic Preservation Act, agency Roadless Rules, or any other law, regulation, or policy applicable to the project area.

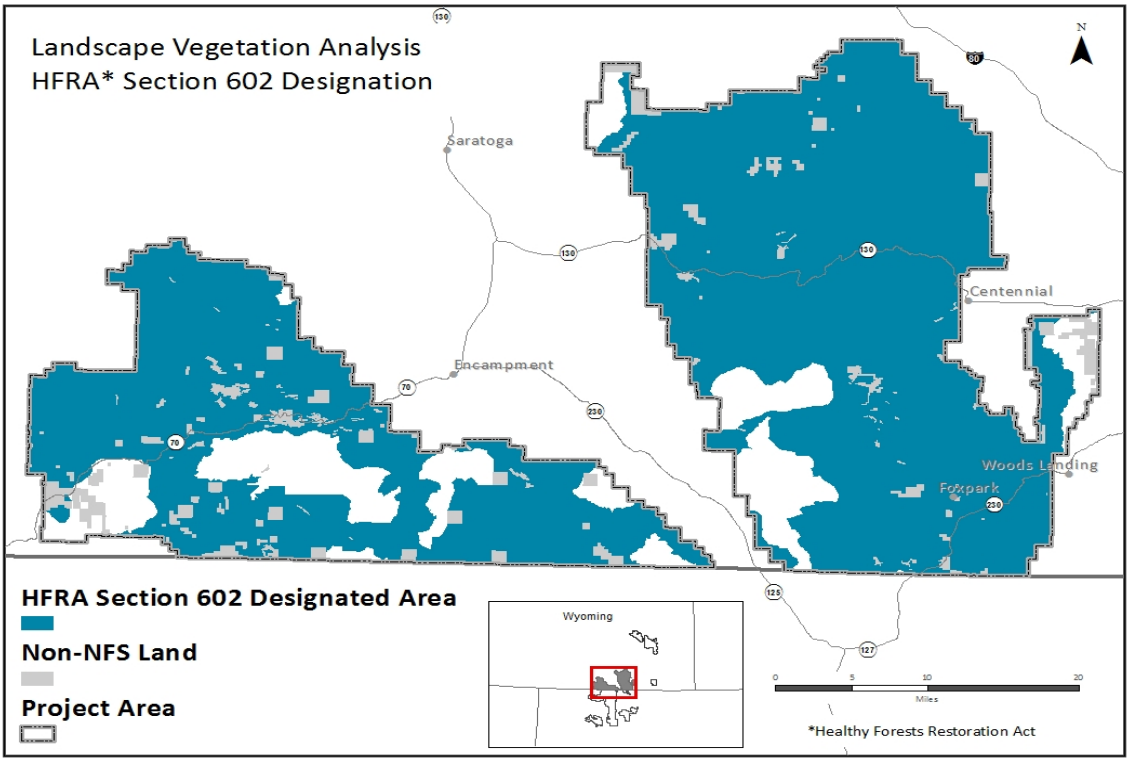

Figure 1. LaVA project area and the Healthy Forests Restoration Act, section 602 designation area

Forest Plan

Management of the Medicine Bow National Forest is authorized under the forest plan. Development of forest plans is required by the rules implementing the Forest and Rangeland Renewable Resources Act of 1974, as amended by the National Forest Management Act of 1976. Forest plans set forth goals and objectives of management actions and further direct these actions through standards and guidelines.

The LaVA project analysis tiers to the final environmental impact statement for the forest plan (USDA Forest Service 2003b). Chapter 2 of the forest plan assigns a management emphasis to each management area within the Medicine Bow National Forest. Land management practices that are appropriate in one management area may be constrained in another. The LaVA project area includes all or parts of 22 management areas (see table 8 on page 20)

Background

Historically, forested vegetation conditions on the Medicine Bow National Forest have consisted of homologous structural stages and age classes of lodgepole pine, Engelmann spruce, and subalpine fir. This lack of forest diversity has made stands more vulnerable to insect and disease epidemics. Bark beetle epidemics on the Medicine Bow began in the late 1990s and ended in 2015. As of 2016, the majority of the forested vegetation on the Snowy and Sierra Madre Ranges had been affected by the bark beetle epidemics (figure 2).

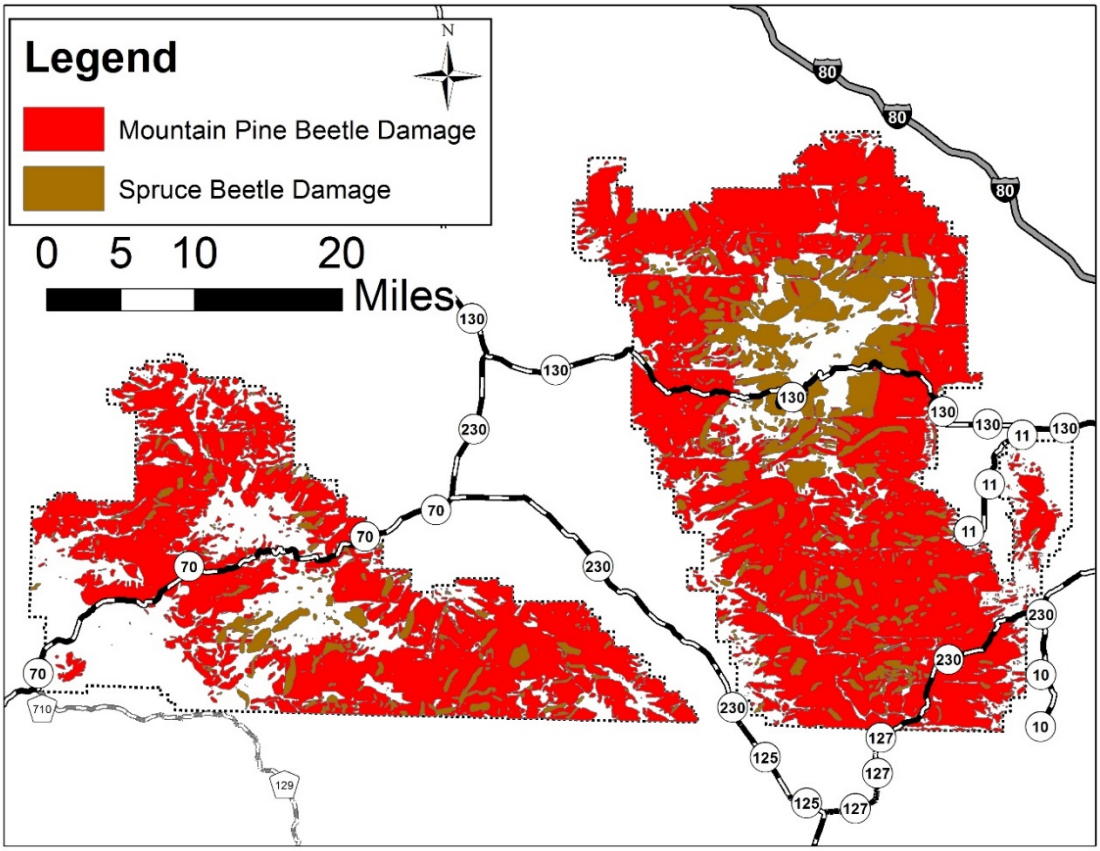

Figure 2. Mountain pine beetle and spruce beetle mortality on the Medicine Bow National Forest, sampled 2000-2016

Within the LaVA project area, tree mortality from the mountain pine beetle and spruce beetle epidemics have affected roughly 605,000 and 101,700 acres, respectively, while other insect and disease outbreaks have affected an additional 52,000 acres. The bark beetle epidemics caused mortality mainly in trees larger than 7 inches in diameter. Between 2000 and 2016, ninety-two percent of very large lodgepole pine and 88 percent of large lodgepole pine experienced mortality, while 42 percent of very large Engelmann spruce and 35 percent of large Engelmann spruce experienced mortality (table 2). Bark beetle populations have now returned to endemic levels while leaving a changed landscape where a once green forest is intermixed with stands of live, dead, and declining trees. Mortality of some small and medium aspen may be due to herbivore foraging.

Table 2. Insect and disease mortality by tree species and tree size on the Medicine Bow National Forest, sampled 2000 to 2016

Tree Species	Establishing	Small 5 to 10 inches	Medium 10 to 15 inches	Large 15 to 20 inches	Very Large 20 to 25 inches
Lodgepole	0%	9%	49%	88%	92%
Subalpine fir	0%	5%	14%	14%	16%
Engelmann spruce	0%	7%	12%	35%	42%
Aspen	0%	24%	29%	14%	9%

Hazardous Fuel Loading and Protection of Infrastructure

Fallen dead trees (jackstraw), infested early in the epidemic, and regeneration of understory vegetation have created heavy surface and ladder fuel loading conditions which decrease the range of fire suppression tools and increase the risk of a catastrophic wildfire scenario. Between 2016 and 2017, the Beaver Creek, Broadway, Snake, and Keystone Fires demonstrated that current fuel conditions in beetle-killed pine stands are likely to result in fire behavior with increased rates of spread, fireline intensity, and risk to responders (figure 3).

The LaVA project area is within Albany and Carbon County communities at risk. These are areas in which there is community prioritization for protection of infrastructure and human resources. Fuel models within these communities indicate moderately changing environmental conditions (table 2), including increased conifer litter; heavy, coarse fuels; and jackstrawed conditions. These conditions could lead to increased threats to communities from large-scale wildfires, increased rates of fire spread, and hotter, more potentially damaging fire. Given these post-epidemic conditions, and increased risks to human health and safety, there is a demonstrated need to conduct fuels reduction treatments to protect these resources and other values at risk.

Figure 3. Keystone Fire at Rob Roy Reservoir, July 2017

Table 3. Hazardous fuel types in Albany and Carbon County communities at risk

Fuel Model	Fuel Description	Acres	% of LaVA Area	Acres in Carbon and Albany Communities at Risk
Timber understory fuels 5 (TU5)	Heavy forest litter with a shrub or small tree understory	196,164	21.92	39,617
Timber litter 3 (TL3)	Moderate load conifer litter, light load of coarse fuels	346,893	38.76	64,771
Timber understory 1 (TU1)	Low load of grass, shrub with litter, or both	148,950	16.64	31,355

Protection of Municipal Supplies

Rob Roy Reservoir, Lake Owen, and Hog Park Reservoir are Medicine Bow National Forest waterbodies that provide water for the City of Cheyenne's public water supply. Runoff from the project area also contributes to drinking water supplies for the residents of Cheyenne, Albany, Baggs, Centennial, Dixon, Elk Mountain, Encampment, Jelm, Laramie, Medicine Bow, Riverside, Rock River, Ryan Park, Savery, Centennial, Elk Mountain, and Saratoga. The existing high fuel conditions pose a risk to municipal water supply infrastructure from the increased potential for large-scale wildfire events and subsequent runoff that would deliver heavy sedimentation loads to filtration systems. To conform to the forest plan desired condition for watershed protection and water yield (USDA Forest Service 2003a, page 1-19), there is a need to provide fuels reduction treatments which reduce incidents of large-scale wildfires and protect municipal water supplies.

Restoration of Wildlife Species Habitat

General Wildlife Species Habitat

Currently, a common habitat feature across the project area landscape is tree mortality from insects and disease. These habitat changes have created an immediate (1 to 10 years) and substantial loss of mature and older-aged conifer forest in stands where tree mortality was high. Generally, there is a large increase in understory production by existing grasses, forbs, and shrubs but little change in understory plant diversity where bark beetles have killed a large portion of conifers within a stand (Stone and Wolfe 1996). Time since death of beetle-killed trees is an important factor determining usefulness of these trees for wildlife (Chan-McCleod 2006). Wildlife species that require mature forest cover are less affected in three to five years. As stands continue to break up over time they become less favorable to mature forest species. Wildlife species that thrive in open, edge, or coarse woody debris habitat benefit in the mid and long-term. Salvage harvesting of beetle-killed stands could rejuvenate stands more quickly.

Hiding cover for wildlife is also a critical component to vegetation management. Guidelines within the forest plan state that wildlife hiding cover areas should be greater than 250 acres and over ½ mile from roads or motorized trails (USDA Forest Service 2003a, page 1-40). To conserve or promote wildlife security and hiding cover and move toward this guideline, there is a need to improve habitat conditions by restoring conifer stands with vegetation treatments that provide resilience to future epidemics. Furthermore, to conserve habitat, there is a need to reduce fuels in both aspen and conifer stands to lessen the risk of high-intensity, stand-replacing, wildfires which further reduce hiding cover.

Forestwide desired conditions state that critical habitats identified through project implementation are managed to perpetuate habitat conditions needed for threatened, endangered, and sensitive wildlife species and other wildlife species (USDA Forest Service 2003a, page 1-14). In areas of heavy mortality where critical habitats are moving away from desired conditions, there is a need to provide vegetation treatments that improve wildlife habitat in priority areas.

Threatened and Endangered Species Habitat

Canada lynx and Preble's meadow jumping mouse are the only federally threatened or endangered wildlife species within the LaVA project area. Given the limited available habitat, and the development of wildlife project design features, the LaVA Project is not expected to impact Preble's meadow jumping mouse.

The Southern Rockies Lynx Amendment (USDA Forest Service 2008) guides the management of habitat for Canada lynx by amending the forest plan (2005 amendment). The LaVA project area contains 10 lynx analysis units in their entirety and portions of two more (figure 4). The Southern Rockies Lynx Amendment provides a standard to maintain 30 percent or less of the habitat in any lynx analysis unit in a currently unsuitable condition. Modeling of lynx habitat in the lynx analysis units within the LaVA project area indicate the Blackhall Mountain (37 percent), Diamond Park (34.6 percent), and Red Elephant Mountain (36.5 percent) units all exceed the 30-percent standard for unsuitable habitat. The standards state unsuitable habitat can exist when stand-replacing fire, insect epidemics, or certain vegetation management projects cause a loss of habitat. Under the existing condition of heavy fuels, it is likely large-scale wildfires, such as the Beaver Creek, Broadway, Snake, and Keystone Fires, would continue to reduce suitable lynx habitat over time without management interventions to reduce fuel loadings caused by tree mortality.

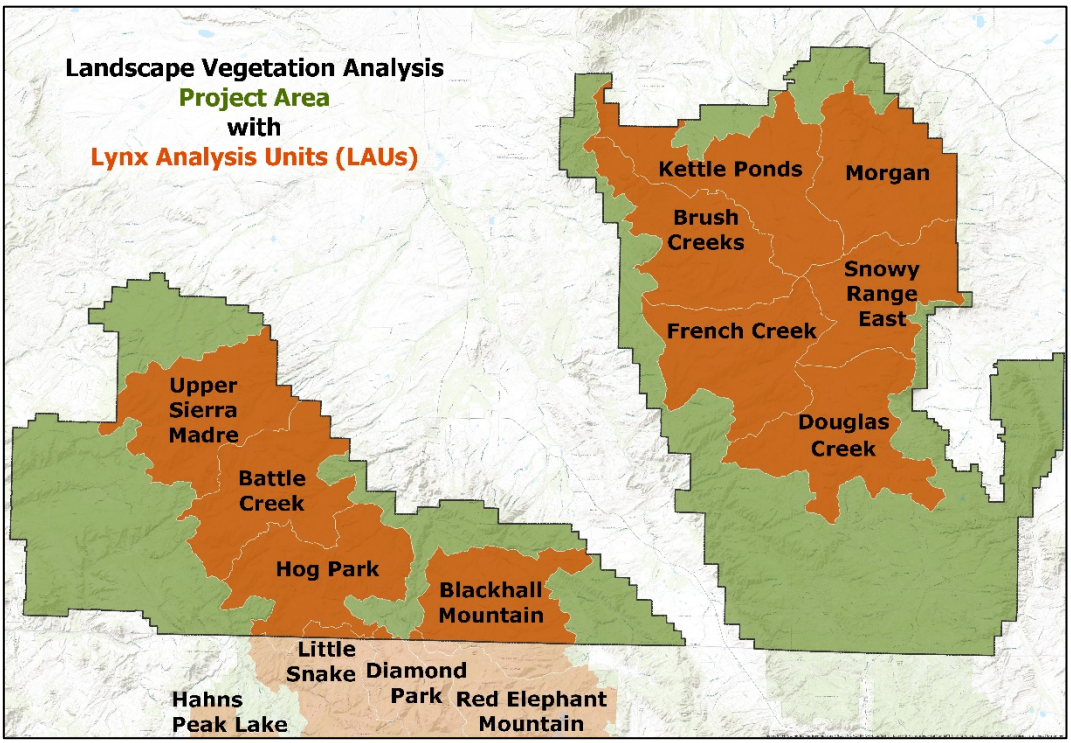

Figure 4. Lynx analysis units within the LaVA project area

Canada lynx prey on snowshoe hare and red squirrel which forage within mature stands on the understory conifer seedlings and cone seeds on the forest floor. Heavy bark beetle mortality in mature conifer stands removes the seed source for these prey species and creates unsuitable lynx habitat. Best available science has demonstrated that abundance of red squirrel and snowshoe hare declines as a function of heavy tree mortality (Stone 1995). Within the LaVA project area, large (15 to 20 inches in diameter at breast height) and very large (20 to 25 inches in diameter at breast height) trees are estimated at high mortality from the bark beetle epidemics (table 2). In conifer stands with a lack of or limited understory, accelerating regeneration through stand initiation treatments would meet the need of moving toward Southern Rockies Lynx Amendment standards for suitable habitat beyond the existing condition.

Resilience and Regeneration

Forested stands that were harvested or thinned between 1970 and 1990 have been resilient to the bark beetle infestations that began in the late 1990s. These younger stands remain green and healthy as they regenerate next to the expansive areas of beetle-killed conifers (see cover photo). Opening gaps in the canopy through vegetation treatments, as a stand-initiating disturbance, exposes the ground to sunlight beneath conifer trees and allows seedlings to regenerate. Where beetle-infested trees have already fallen, and in locations of previous harvest or wildfire, sunlight has reached the ground, allowing stand initiation and regeneration of green lodgepole pine. Shaded areas within these beetle-killed stands encourage initiation and regeneration of mixed conifer. The rate of regeneration of conifers is influenced by conditions of the slope, aspect, as well as soil type and moisture which vary by project site. Given that areas of past vegetation treatments have been more resilient to insect and disease infestation, there is a need to accelerate forested vegetation to conform to forest plan desired conditions for structural stage, age class, and cover type (USDA Forest Service 2003a, table 1-9, pages 1-35 and 1-36).

Resiliency of forested rangelands to risks of future insect and disease outbreaks is also important for providing the forage necessary to support livestock as prescribed in allotment management plans. With the downfall of beetle-killed trees, the availability of forage would decrease because livestock are unable to move and graze in jackstrawed conditions.

Forestwide direction in the forest plan (USDA Forest Service 2003a, page 1-9) provides for the maintenance of current levels of grazing opportunities on suitable rangelands to achieve desired conditions (USDA Forest Service 2003a, page 1-20). To conform to desired conditions prescribed in allotment management plans for forage availability, there is a need to provide vegetation treatments and fuel reductions which allow for livestock to access forage within the Medicine Bow National Forest.

Diversity Among Structural Stages, Age Class, and Cover Types

Lodgepole pine is the dominant tree species among vegetation cover types within the project area, followed by spruce-fir, aspen, and other species less than notable in frequency (figure 6 and figure 7). The bark beetle epidemic has contributed to an existing condition where distribution of cover types (lodgepole, spruce-fir, ponderosa pine, and aspen) are moving away from forest plan desired conditions for forest age and structure (USDA Forest Service 2003a, page 1-21).

The grey highlighted percentages in table 4 and table 6 demonstrate how the desired structural stages for lodgepole pine, spruce-fir, ponderosa pine, and aspen are not in conformance with forest plan 50-year desired conditions. Structural stages are defined in the forest plan (page G-43) in terms of tree age (size) and the extent of canopy closure created. Examples of structural stages are shown in figure 5. The deficit of structural stage 2 cover types shown in table 4 and their stronger resilience to bark beetle epidemics demonstrates the current need to provide vegetation treatments that accelerate regeneration of young stands.

Table 4. Existing conditions versus 50-year desired conditions by cover type for structural stage 2

Cover Type	Existing Condition	Desired Condition	Difference
Lodgepole	6%	16%	-10%
Spruce/fir	5%	15%	-10%
Ponderosa	0%	6%	-6%
Aspen	3%	12%	-9%

Table 5. Existing conditions versus 50-year desired conditions by cover type for structural stage 3

Cover Type	Existing Condition	Desired Condition	Difference
Lodgepole	58%	36%	22%
Spruce/fir	22%	21%	1%
Ponderosa	58%	16%	42%
Aspen	66%	26%	40%

Table 6. Existing conditions versus 50-year desired conditions by cover type for structural stage 4

Cover Type	Existing Condition	Desired Condition	Difference
Lodgepole	36%	23%	13%
Spruce/fir	18%	28%	44%
Ponderosa	42%	45%	-3%
Aspen	31%	17%	14%

Figure 5. Examples of habitat structural stages 2, 3, and 4

In figure 5, the upper left photo is habitat structural stage 2, lodgepole pine seedlings. Habitat structural stage 3 (upper right photo) is lodgepole pine saplings and pole-size lodgepole pine. Habitat structural stage 4 (bottom center photo) is mature lodgepole pine.

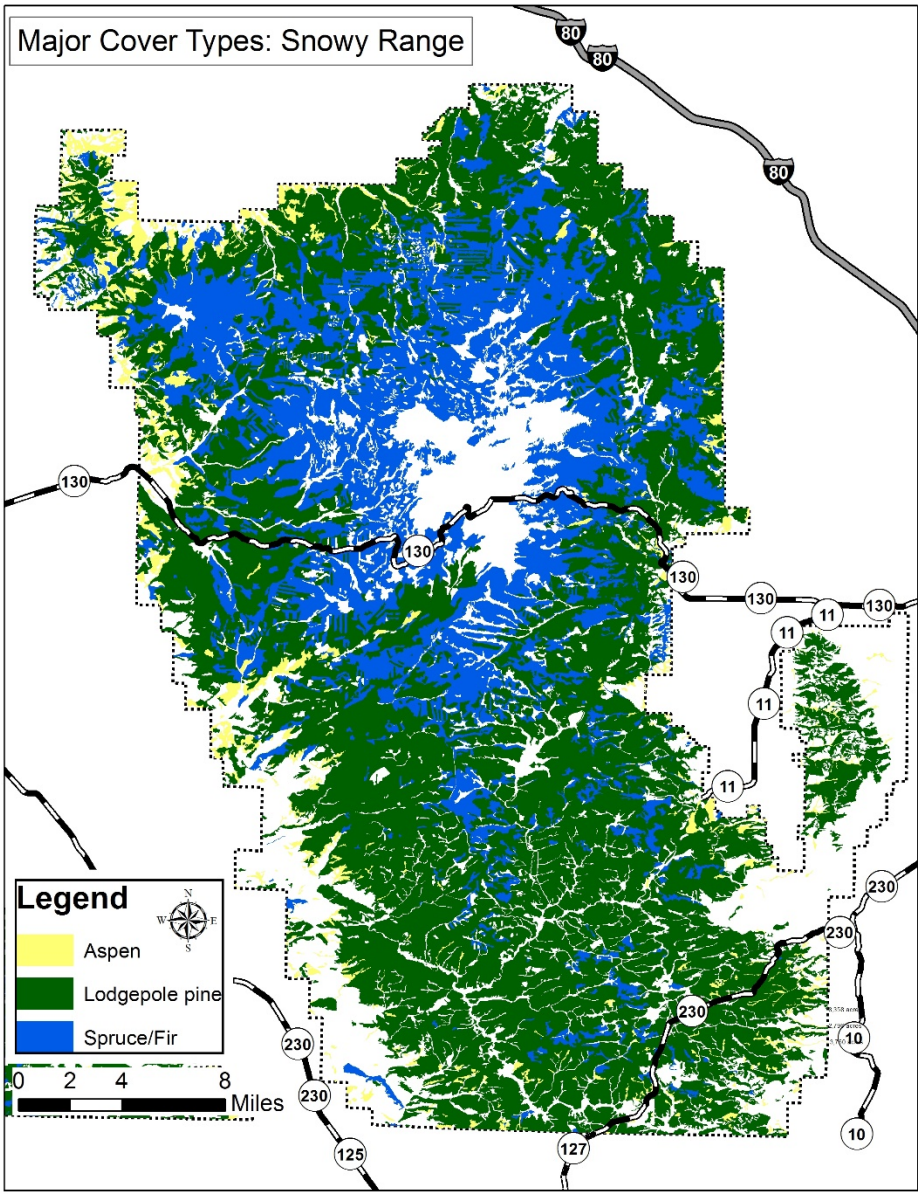

Figure 6. Major tree cover types of the Snowy Range

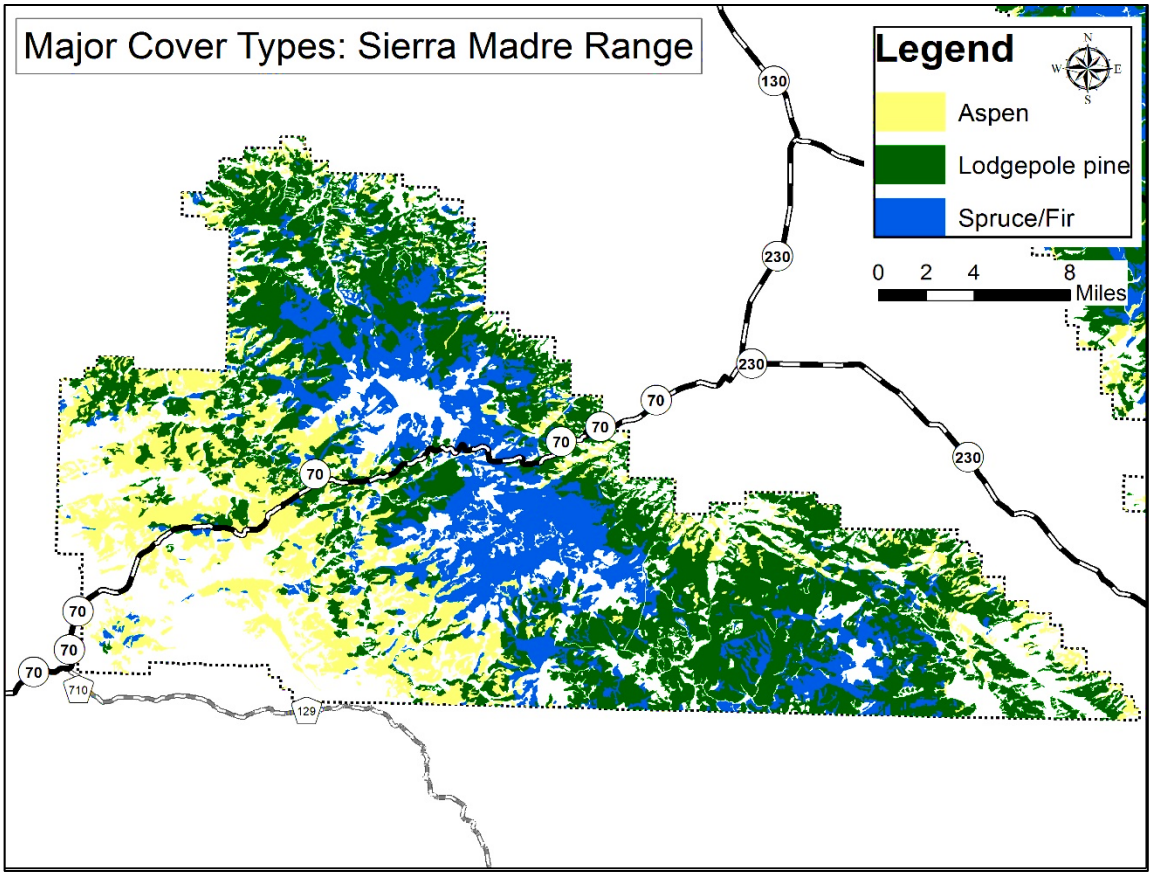

Figure 7. Major tree cover types of the Sierra Madre

Recreation Access

The existing condition of heavy bark beetle tree mortality limits access to public recreation destinations in the backcountry, along trails, dispersed camping areas, and hunting and fishing areas. The heavy buildup of fallen trees, commonly referred to as jackstraw (figure 8), creates a condition where horseback riders, hunters, hikers, mountain bikers, backpackers, campers, fisherman, kayakers, and other recreationists have an increasingly limited capability of navigating across the Medicine Bow National Forest. Climbing over, under, and through the jackstrawed downfall is difficult and dangerous. This could reduce the number of hunters able to access large portions of the backcountry, reduce the number of big game animals harvested, and lead to increases even farther above existing herd objectives. The forestwide desired condition for recreation (USDA Forest Service 2003a, pages 1-13, 1-14, and 1-16) states winter and summer, motorized and nonmotorized recreation opportunities should be managed in such a way as to provide visitors with continued accessibility. Desired conditions in the forest plan also provide for a 64 percent allocation for winter motorized recreation, as well as increased areas for cross-country ski use. To meet these desired conditions, there is a need to provide vegetation and fuel reduction treatments to remove barriers to recreation access in frontcountry and backcountry areas.

Figure 8. Jack-strawed conditions in lodgepole

Human Safety

The standing dead trees create overhead safety hazards for contractors, outfitters, grazing permittees, the visiting public, and Forest Service employees. Hazard trees currently exist along roads, fences, ditches, campgrounds, facilities, parking areas, trails, and backcountry areas. These overhead hazards (snags), likely to exist for the next 10 to 15 years, create an increased risk to injury of fire personnel and severely limit safe fire suppression. In 2014, a firefighter was injured by a falling tree on the Holroyd Fire in an area of beetle-killed trees similar to conditions found in the LaVA project area.

The heavy buildup of fallen trees also creates a strategic navigation and safety issue for hunters, hikers, firefighters, and other employees. These existing conditions are out of conformance with safety guidance for hazard trees as well as maintenance standards in Forest Service manuals, handbooks, policies, and the forest plan (USDA Forest Service 2003a, goal 4, subgoal 4.a, page 1-12 and goal 1, subgoal 1.c, strategy h, page 1-6; Trails Management Handbook: Forest Service Handbook 2309.18). To reach a desired safety condition, there is a need to reduce the number of hazard trees in priority areas.

Merchantability of Forest Products

Within the LaVA project area, Management Areas 5.13 and 5.15 are prescribed for the production of merchantable timber and other wood products; Management Areas 1.13, 1.2, and 2.2 are not designated for timber harvest; and the remaining management areas are designated for minimal timber harvest (see table 8). Within the LaVA project area, Management Areas 5.13 and 5.15 contain 413,885 acres suitable for timber production, while the remaining management areas

contain no suitable acres. Under forest plan direction, all management areas within the project area can receive fuel reduction treatments.

With the lower merchantability of mixed-conifer species, the forest plan direction in Management Areas 5.13 and 5.15 is to provide lodgepole pine regeneration as the predominant cover type in future stand composition. The post-epidemic lodgepole stands, left untreated, would allow the continued regeneration of mixed conifer which would deplete the merchantability within the suitable timber base. This change in forest vegetation cover types would create future conditions that are not in conformance with forest plan desired conditions, standards, and guidelines for the provision of wood products.[2] To continue to provide forest products and meet the desired conditions in the forest plan, there is a need within the LaVA project area to promote regeneration of merchantable species through vegetation treatments.

Purpose and Need for Action

The purpose of the LaVA Project is to respond to changed forest vegetation conditions presented by the bark beetle epidemics experienced on the Medicine Bow National Forest. The need for the project is defined by existing, desired, and predicted conditions for forested vegetation and the threats posed by existing and predicted conditions. The approach is to actively manage forest vegetation using tree cutting, prescribed burning, or hand treatments, consistent with the goals outlined in the Governor's Task Force on Forests (Final Report 2015), Western Bark Beetle Strategy (July 2011), Wyoming Statewide Forest Resource Strategy (2010), the Healthy Forests Restoration Act and Farm Bill Amendment (2003 and 2014), and the forest plan. Goals include promoting recovery from the insect infestations, improving the resiliency of green stands to future disturbances, helping protect forested areas on adjacent private and state land, and providing for human safety. General goals will be adapted during implementation to fit conditions at the local project scale where treatments are needed based on forest plan direction, foreseeable conditions, local environment, and social and economic concerns.

The discussion in the background section (page 5) identified gaps between the existing and desired conditions of the Medicine Bow National Forest within the LaVA project area as follows:

- Heavy fuels have accumulated in conifer stands which does not protect communities, infrastructure, and municipal watersheds from wildfires.
- Heavy tree mortality has reduced biodiversity across the forest, including suitable habitat for wildlife species. Given this reduction, there is a need to accelerate habitat recovery through vegetation treatments.
- Existing forested structural stages, age classes, and cover types do not meet forest plan desired conditions. Consequently, there is a need to accelerate regeneration through stand initiation treatments which provide resilience to future epidemics.

[2] "Desired Condition for Timber Management", page 1-16; goal 2, subgoal 2.c, objective 1, strategy b, page 1-9; Management Area 5.13: vegetation standard 1 and guidelines 1-3, pages 2-59 to 2-60; Management Area 5.15: vegetation standard 1 and guidelines 1, 2, and 3, pages 2-59 and 2-60.

- The existing jackstrawed condition within much of the beetle-killed conifer stands does not provide recreation and livestock access and satisfaction for hunting and other recreation activities. There is a need to reduce the heavy buildup of dead and down material through fuel reduction and salvage treatments.
- The existing condition of overhead hazard trees, caused by the bark beetle epidemics, does not meet the desired condition of providing for public and employee safety and lowering the risk of wildfire in wildland-urban interface areas.
- The existing condition of tree mortality has moved the Medicine Bow National Forest away from the desired conditions for a suitable timber base in Management Areas 5.13 and 5.15 (timber emphases). There is a need to provide treatments to support the future regeneration of merchantable tree species to conform to desired conditions, standards, and guidelines for these two management areas.

The identified gaps between the existing and desired conditions, the purpose and need of the LaVA Project, and relevant guidance from the applicable laws, regulations and policies, including the forest plan, are presented in table 7.

Table 7. Purpose and need and guidance from forest plan direction and other policies

Purpose	Need	Relevant Forest Plan Direction and Other Guiding Policies
Mitigate hazardous fuel loading	Treat hazardous fuels to minimize the potential for large, high-intensity and high-severity wildfires and treat hazardous fuels to reduce fire behavior and the possibility of fires spreading onto adjacent lands of other ownership.	Forest plan forestwide direction: Desired condition for fire and fuels management (page 1-18) Fuel treatment guidelines 1-2 (page 1-49) Goal 1, subgoal 1.b, strategy b. (page 1-4). Goal 1, subgoal 1.c, objective 2, strategies a, c, d, and e (pages. 1-5 to 1-6). Other guiding policy and direction: Healthy Forests Restoration Act Federal Land Assistance, Management, and Enhancement Act of 2009 Guidance for implementation of federal wildland fire management policy (February 2009)

Purpose	Need	Relevant Forest Plan Direction and Other Guiding Policies
Provide for recovery of forest products	Promote vegetation management to recover merchantable products. Provide commercial forest products to local industries at a level commensurate with forest plan direction and goals.	Forest plan components: Desired condition for timber management (page 1-16) Goal 2, subgoal 2.c, objective 1, strategy b (page 1-9) Forest plan management area direction: Management Area 5.13: vegetation standard 1 and guidelines 1, 2, and 3 (pages 2-59 to 2-60) Management Area 5.15: vegetation standard 1 and guidelines 1, 2, and 3 (pages 2-59 to 2-60) Other guiding policy and direction: Healthy Forests Restoration Act Multiple Use and Sustained Yield Act of 1960
Enhance forest and rangeland resiliency to future insect and disease infestations	Increase age class, structural, and vegetative diversity across the landscape. Promote forest and rangeland conditions to improve forage and wildlife habitat. Actively accelerate recovery and regeneration of forest ecosystems.	Forest plan forestwide direction: Desired condition for timber management (page 1-16) Goal 1, subgoal 1.c, objective 3, strategies f and g. (page 1-6) Silviculture standards 1-7 and guidelines 1-5 (pages 1-35 to 1-40) Insects and disease guidelines 1-3 (page 1-50) Desired conditions for habitat structural stages-end of 5th decade (Table 1-4, page 1-21) Other guiding policy and direction: Healthy Forests Restoration Act Insect and disease treatment area designation under section 602 of the Agriculture Act of 2014 (Farm Bill) Forest and Rangeland Renewable Resources Act of 1974 (RPA) as amended by the National Forest Management Act of 1976 (NFMA) Forest Service Handbook 2409.26 Silvicultural Practice Handbook Forest Service Handbook 3409.11 Forest Pest Management Handbook Western Bark Beetle Strategy (USDA Forest Service 2011)

Purpose	Need	Relevant Forest Plan Direction and Other Guiding Policies
Protect infrastructure and municipal water supplies and restore wildlife habitat	Treat vegetation adjacent to infrastructure and lands of other ownership. Treat vegetation to protect municipal water supplies and infrastructure. Treat vegetation where fire and insect and disease is identified as a threat to the habitat of wildlife species of concern. Treat vegetation to restore priority areas of wildlife habitat.	Forest plan forestwide direction: Goal 1, subgoal 1.c, objectives 1-4, strategies a through j (pages 1-5 to 1-6) Desired conditions: watershed protection and water yield (pages 1-19 to 1-20) Goal 4, subgoal 4.a, objective 7, strategy a (pages 1-12 to 1-13) Biological diversity guideline 4 (1-32) Other guiding policy and direction: Healthy Forests Restoration Act Forest Service Manual 2500 - Watershed and Air Quality Management Clean Water Act of 1977 Southern Rockies Lynx Amendment standards and guidelines (2003 forest plan FEIS, appendix I, pages I-13 to I-15) Watershed Conservation Practices Handbook (Forest Service Handbook 2509.25)
Provide recreation access	Promote a quality hunting experience. Promote recreation accessibility in forested areas.	Forest plan components: Goal 1, subgoal 1c, objective 3, strategy f Forestwide desired condition for recreation and scenery management (pages 1-16 to 1-17) Forest plan management area direction: Management Area 4.2: wildlife guideline 1 (page 2-53) Management Area 5.12: desired condition (page 2-56) Management Area 1.31: desired condition (page 2-11) Management Area 2.1: desired condition (page 2-23) Management Area 2.2: wildlife standard 1 (page 2-31) Management Area 3.31: desired condition (page 2-33) Management Area 3.56: desired condition (page 2-47)

Purpose	Need	Relevant Forest Plan Direction and Other Guiding Policies
Provide for human safety	Treat hazard trees in areas not covered by the forestwide hazard tree decision notice (August 12, 2008). Treat hazard trees within and outside the wildland-urban interface. Increase the extent of defensible space around resources at risk. Create fuel breaks to slow or stop the progress of wildfires.	Forest plan forestwide direction: Insects and disease standard 1 (page 1-49) Goal 4, subgoal 4.a (page 1-12) Goal 1, subgoal 1.c, strategy h (page 1-6) Other guiding policy and direction: Healthy Forests Restoration Act Trails Management Handbook: Forest Service Handbook 2309.18 2009 Continental Divide National Scenic Trail Comprehensive Plan, trail standards (page 22).

Table 8. Management areas and management themes in the LaVA project area

Management Areas and Themes	Acres	Full Suite of Tools - Treatment Opportunity Areas[3]	Limited Suite of Tools - Treatment Opportunity Areas	No Treatment
1.13 Wilderness	78,910	0	0	78,910
1.2 Recommended Wilderness	27,974	0	12,320	15,653
1.31 Backcountry Recreation Year-round Nonmotorized	27,524	12,281	0	15,243
1.33 Backcountry Recreation, Summer Nonmotorized with Winter Snowmobiling	38,541	10,898	0	27,644
2.1 Special Interest Areas	16,619	0	10,627	5,992
2.2 Research Natural Areas	2,410	0	1,650	760
3.31 Backcountry Recreation, Year-round Motorized	55,024	37,186	0	17,838
3.33 Backcountry Recreation, Summer Motorized with Winter Nonmotorized	3,828	3,820	0	8
3.4 National River System	1,285	991	0	294
3.5 Forested Flora or Fauna Habits, Limited Snowmobiling	30,599	26,348	0	4,252
3.54 Special Wildlife Areas (Sheep Mountain)	16,990	16,947	0	43
3.56 Aspen Maintenance and Enhancement	30,280	25,932	0	4,348
3.58 Crucial Deer and Elk Winter Range	54,396	52,824	0	1,572
4.2 Scenery	14,864	14,581	0	283
4.3 Dispersed Recreation	2,072	2,072	0	0
5.12 General Forest and Rangeland, Rangeland Vegetation Emphasis	18,671	18,225	0	446
5.13 Forest Products	132,047	130,066	0	1,981
5.15 Forest Products, Ecological Maintenance and Restoration Considering the Historic Range of Variability	281,840	224,389	0	57,451
5.41 Deer and Elk Winter Range	8,650	6,764	0	1,886
8.21 Developed Recreation	3,881	3,047	0	833

[3] See DEIS Chapter 2 for a description of Treatment Opportunity Areas (TOAs)

Management Areas and Themes	Acres	Full Suite of Tools - Treatment Opportunity Areas[3]	Limited Suite of Tools - Treatment Opportunity Areas	No Treatment
8.22 Ski-based Resources, Existing and Potential	1,364	1,364	0	0
8.6 Administrative Sites	952	775	0	177
National Forest System land subtotal	**848,726**	**588,513**	**24,597**	**235,616**
State, private, and lands of other ownership	**45,970**	**0**	**0**	**0**
Total	**894,696**	**588,513**	**24,597**	**235,616**

Public Involvement

Collaboration with interested agencies, communities, the public, and Indian tribes is important to the Medicine Bow National Forest and is also required by the Healthy Forests Restoration Act (section 104). The information provided below outlines how Medicine Bow National Forest personnel have engaged, to-date, with multiple entities, as part of the LaVA project planning effort.

Cooperating Agencies

Medicine Bow personnel have cooperated with numerous State and Federal agencies since March 2017 to develop the LaVA proposed action. These cooperating agencies include Wyoming State Forestry Division, Wyoming Game and Fish Department, Wyoming Department of Environmental Quality, Wyoming State Historic Preservation Office, Cheyenne Board of Public Utilities, Wyoming Department of Agriculture, Carbon County, Little Snake River Conservation District, Laramie Rivers Conservation District, Medicine Bow Conservation District, Saratoga-Encampment-Rawlins Conservation District, Bureau of Land Management, and U.S. Fish and Wildlife Service.

The Endangered Species Act requires the Forest Service to consult with U.S. Fish and Wildlife Service personnel on projects that may affect a federally listed species. U.S. Fish and Wildlife Service personnel provided comments in response to scoping for the LaVA Project, including recommendations for project design features to minimize adverse effects to listed species. The LaVA interdisciplinary team considered these recommendations in the development of the proposed action.

Medicine Bow National Forest personnel held monthly meetings with the cooperating agencies during proposal development to gather input on the LaVA Project. Cooperators also submitted comments in response to scoping. Collaboration with State, Federal, and County representatives will continue throughout planning and implementation of the LaVA Project to refine the proposed action and to minimize potential environmental effects.

Scoping Efforts

The notice of intent initiating the scoping process (40 CFR 1502.7) for the draft environmental impact statement was published in the Federal Register on July 21, 2017. The notice of intent asked for public comments on the proposed action from July 21, 2017 to August 21, 2017. As part of the scoping process, Medicine Bow personnel also mailed scoping postcards to 1,200 organizations and individuals including adjacent landowners; federally recognized Tribes; and Federal, State, and local government representatives. To inform the general public of the proposal, the scoping package was posted to the Medicine Bow-Routt National Forests and Thunder Basin National Grassland website on July 24, 2017. A news release was also prepared and an article was published in the Laramie Boomerang on August 1, 2017. Finally, Medicine Bow personnel hosted 6 open house meetings between August 2017 and January 2018. Formal scoping meetings were held in Laramie on August 8, 2017 and in Saratoga on August 10 2017. Check-in meetings were held in Saratoga on January 23, 2018 and January 24, 2018 and in Laramie on January 30, 2018 and January 31, 2018. Forest Service and cooperating agency personnel were available to answer questions related to the proposal at both the formal scoping and check-in meetings. Fifty-eight comment letters and emails were received during the formal scoping period. This information was used to modify the proposed

action, develop project design features, and develop the adaptive implementation and monitoring frameworks.

Tribal Governments

The Forest Service regularly consults with Tribal governments regarding projects authorized under the National Historic Preservation Act and the National Environmental Policy Act. Tribal consultation is currently being conducted for this project via multiple means. Tribal governments were consulted when it was determined a programmatic agreement would be necessary for projects that will be implemented on National Forest System lands in the State of Wyoming. Initial letters of invitation to participate in the development of the proposed action were sent on February 24, 2017. Currently, no representatives from the Tribes have responded with an expression of interest in participating.

If the proposed action is selected for implementation, Tribal authorities would continue to be consulted when specific project locations associated with LaVA treatments are identified during the implementation phase. This would permit Tribal representatives to submit location-specific comments where desirable.

Issue Development and Resolution

The Medicine Bow interdisciplinary team and responsible official reviewed the 58 comment letters received during the 2017 and 2018 scoping efforts and identified the issues discussed below. In most cases, the issues were used to modify, clarify, or augment the proposed action, as allowed for at 36 CFR 220.5(e)(1 and 2). However, in some cases, the interdisciplinary team also developed indicators[4] or ways of measuring environmental effects. These indicators will be monitored throughout the life of the LaVA Project and will be useful in judging differences among actions and resource values as well as demonstrating responsiveness to public concerns.

Issues 1 through 4 were addressed by existing law, regulation, and policy or by the development of project design features and an adaptive implementation and monitoring framework. Issues 5 through 8 were addressed similarly but also include identified indicators, as outlined in table 9, table 10, table 11, and table 12.

Issue 1 - The proposed action should include more site-specificity

Commenters said the proposed action must explicitly delineate where vegetation management will occur, what type of activities will occur, where roads will be constructed, and the resulting impacts of such activity on important Medicine Bow National Forest resources.

Issue Resolution: The roughly 850,000-acre LaVA analysis area has been broken into 14 accounting units to lend site specificity to the analysis. The accounting units are being used to augment existing condition descriptions and to enhance the ability to disclose environmental effects. During LaVA implementation, site specificity will be further enhanced by completion and approval of mandatory field review forms prior to execution of individual treatments. This review process will delineate treatment activities, including temporary road locations, if necessary, and identification of

[4] Indicators are defined as measures used to characterize the status of different resource areas and monitor their response to potential stresses introduced by the proposed action. Indicators should represent the best available science and evaluate impact significance within the context of the National Environmental Policy Act.

project design features that will be applied to minimize impacts to important forest resources. Information about individual treatments will be shared with the public on an annual basis to demonstrate responsiveness to public concerns as well as to demonstrate compliance with applicable laws, regulations, and policies, as described in Appendix A, Adaptive Implementation and Monitoring Framework.

Issue 2 - A range of alternatives is warranted for a project of this scope and scale

Commenters stated the draft environmental impact statement should include a range of alternatives for reaching management objectives, including an alternative that focuses on the wildland-urban interface, wildlife, and fuels and excludes roadless areas.

Issue Resolution: The LaVA Project is being conducted under the Healthy Forests Restoration Act. Section 104(1) of the act limits the range of alternatives to be analyzed to a proposed action and a no action alternative unless an additional alternative is proposed during scoping or the collaborative process.

Alternative suggestions provided through the public involvement process were analyzed in relation to the purpose of and need for the project. The rationale for dismissing them from further consideration is documented in chapter 2. Other public comments were addressed by modifying the proposed action, as allowed for at 36 CFR 220.5(e)(1) and by developing project design features, mandatory field review forms, and an adaptive implementation and monitoring framework (see appendix A).

Issue 3 - Additional public engagement is warranted

Some commenters did not feel adequately notified about the comment period for the proposed action and indicated Medicine Bow personnel should provide additional opportunities for the public to learn about the project.

Issue Resolution: Medicine Bow National Forest personnel hosted additional public engagement sessions in January of 2018 to increase public awareness and understanding of the project: two in Saratoga, Wyoming on January 23 and 24 and two in Laramie, Wyoming on January 30 and 31. Medicine Bow employees will continue to work with cooperating agencies to develop future public engagement efforts and encourage active public involvement throughout the analysis process.

Issue 4 - An implementation strategy needs to include meaningful ways for the public to engage on individual treatments

Attendees of the January 2018 public engagement sessions expressed a desire to influence, and stay informed of, proposed treatments throughout the 10- to 15-year lifespan of the LaVA Project.

Issue Resolution: In conjunction with cooperating agencies, Medicine Bow personnel have developed processes to outline how individual treatments will be identified, designed, and implemented as well as opportunities for stakeholder engagement. These processes are documented the adaptive implementation and monitoring framework (appendix A).

Issue 5 - The scope and scale of the project is too large

Commenters expressed concern about the scope and scale of the proposed action and its compliance with the forest plan.

Issue Resolution: A comprehensive adaptive implementation and monitoring framework has been developed to ensure treatments, when considered individually and cumulatively, do not exceed parameters established in the record of decision for the LaVA Project or direction contained in the forest plan. The framework incorporates principles from a variety of existing monitoring protocols, such as the Watershed Condition Framework and the 2016 monitoring plan for the Medicine Bow-Routt National Forests and Thunder Basin National Grassland. These documents outline indicators to measure the condition and dynamics of broad landscapes, such as the LaVA analysis area and represent the best available science information. As such, relevant indicators (table 9) and monitoring protocols from these documents have been incorporated into the LaVA adaptive implementation and monitoring framework to ensure that project implementation remains in compliance with the LaVA record of decision and the forest plan.

Table 9. Indicators for issue 5 – project scope and scale

Resource	Indicators
Watershed condition and trends	Equivalent clearcut area; effectiveness of best management practices; effectiveness of project design features.
Impacts to wildlife habitat, including threatened, endangered, sensitive species habitat	Habitat improvement (acres); wildlife security areas (acres); Southern Rockies Lynx Amendment criteria, including unsuitable habitat (percent treated); suitable habitat (percent treated); precommercial thinning (acres treated); wildland-urban interface treatments (acres treated); and multi-story mature stands (acres treated).
Changes to major vegetation types	Cover type; ecological site conditions; age class; size class; structural stages of vegetation, including shrubland, grassland, and forest vegetation (including aspen).

Issue 6 - Proposed action road estimates should be reduced

Commenters stated that the draft environmental impact statement should fully discuss the effects of road construction, including disclosing the specific location of each road. Commenters also recommended using existing road networks wherever possible and reclaiming roads deemed necessary for vegetative management immediately after treatment to minimize environmental impacts.

Issue Resolution: The 10 miles of permanent roads proposed in the July 2017 scoping document were removed from the proposed action in response to this concern. Analysis assumptions developed for the LaVA Project are to use existing road networks wherever possible and to reclaim temporary roads within three years of their use. Project design features for temporary road construction have also been developed to minimize the effects of temporary roads on other resources (appendix A, attachment 3).

Table 10. Indicators for issue 6 – proposed road estimates

Resource	Indicators
Temporary road miles	Miles constructed annually and cumulatively; Miles rehabilitated annually and cumulatively

Issue 7 - Inventoried roadless areas and unroaded areas should be protected

Commenters stated the Forest Service should avoid treatments in inventoried roadless areas and other unroaded areas to minimize resource impacts, particularly to wildlife and watersheds.

Issue Resolution: Project design features were developed with cooperating agencies to protect inventoried roadless area characteristics and values and areas with minimal road systems. Chapter 3 discloses effects to inventoried roadless area characteristics from implementing both the no-action alternative and the modified proposed action. During project implementation, all treatments proposed in inventoried roadless areas would undergo further review by the Rocky Mountain Regional Office of the Forest Service prior to ground-disturbing activities.

Table 11. Indicators for issue 7 – inventoried roadless areas

Resource	Indicators
Inventoried roadless area characteristics	Acres proposed for treatment; proposed treatment types; and anticipated effects

Issue 8 - Impacts to recreation

Commenters were concerned that the LaVA Project, if fully implemented, has the potential to negatively impact recreation opportunities on the Snowy Range and Sierra Madre Mountain Ranges.

Issue Resolution: Project design features were developed with cooperating agencies to protect recreation resources (appendix A, attachment 3). The following indicators were also developed to measure potential impacts to the recreation resource from LaVA project implementation.

Table 12. Indicators for issue 8 – recreation and visitor satisfaction

Resource	Indicators
Recreation and visitor satisfaction	Hunter satisfaction; hunting accessibility; and trail safety and condition

Based on the modifications to the proposed action, through the process of issue resolution outlined above, the responsible official determined there are no key issues that warrant the development of a new action alternative for the LaVA Project. Modifying a proposed action to address issues, rather than developing new action alternatives, is authorized at 36 CFR 220.5(e)(1). A streamlined range of alternatives is further authorized under the Healthy Forests Restoration Act, title I, section 104 which requires development of a proposed action, a no-action alternative, and an additional action alternative if one is proposed during scoping or the collaborative process and meets the purpose and need for the project. No alternatives that met the purpose and need for the project were proposed during scoping or the collaborative process (project analysis file, scoping disposition).

Chapter 2. Alternatives, Including the Proposed Action

Chapter Summary

The modified proposed action includes:

- stand initiation or even-aged treatment that would not exceed 95,000 acres
- shelterwood, uneven-aged, or intermediate treatment that would not exceed 165,000 acres
- green tree, shrub, and grassland treatments that would not exceed 100,000 acres
- tree cutting, shrub cutting, or both with a variety of treatment methods
- cutting of encroaching conifers
- prescribed burning
- slash treatments
- hazard tree clearing along critical linear structure
- utilizing National Forest System roads, reconstructing National Forest System roads, or both
- constructing up to 600 miles of temporary roads
- temporary road decommissioning

A no-action alternative was analyzed in detail. Other action alternatives were also considered but, for various reasons, were not analyzed in detail.

Introduction

This chapter presents the alternatives considered in detail: no action and the modified proposed action. The no-action alternative assumes current management would continue, while the modified proposed action proposes a range of vegetation treatments over a 10- to 15-year period. The chapter discusses adaptive management and how management activities under the modified proposed action would be selected by considering conditions and decision-making triggers during the implementation phase. The no-action alternative and modified proposed action are described and compared by defining their differences and providing a clear basis for choice by the decision maker and the public. Information used to compare the no-action alternative and the modified proposed action is based on the environmental, social, and economic effects of implementing each alternative as well as the issue indicators identified in chapter 1.

Alternatives Considered in Detail

This draft environmental impact statement considers two alternatives in detail: no action and the modified proposed action. To focus the disclosure of environmental consequences, issues and comments raised during scoping and the January 2018 public engagement sessions have been addressed in the development of the modified proposed action, project design features, and implementation and monitoring protocols.

While the National Environmental Policy Act requires a range of alternatives, the Healthy Forests Restoration Act (Title I, section 104) specifically limits the range of alternatives required during the environmental analysis to a maximum of three: the proposed action by the agency, the no-action alternative, and an additional action alternative if one is proposed during scoping or the collaborative process and meets the purpose of and need for the project. Medicine Bow National Forest personnel modified the 2017 LaVA proposed action based on comments and concerns gathered during scoping and the collaborative process, as allowed for at 36 CFR 220.6. Therefore, no other action alternatives were developed and analyzed in detail.

Alternative 1 – No Action

The no-action alternative assumes no implementation of the modified proposed action would take place within the project area. Current management plans would continue to guide management of the LaVA project area and ongoing management programs would be implemented. Expected program operations would include, but not be limited to: resource inventories; administration of livestock grazing and special use permits; recreation operations; monitoring and surveys; facility, road, and trail maintenance; decommissioning of nonsystem, unauthorized travel routes under previous decisions; and law enforcement. Roadside hazard trees would be removed from maintenance level 2 through 5 roads as authorized by the forestwide hazard tree environmental assessment (2008). Hazard trees could be felled along system trails but the hazard tree environmental assessment does not authorize removal of resulting fuel concentrations. No additional timber harvest, salvage, silvicultural treatments, or changes to the existing designated road and motorized trail systems would be implemented to accomplish project goals.

Alternative 2 – The Modified Proposed Action (Agency Preferred)

The following modifications have been made from the initial proposed action to the modified proposed action to address concerns raised during the July 2017 scoping effort:

- eliminating 10 miles of permanent road construction proposed in the July 2017 Scoping Document
- developing a new treatment opportunity area map to better reflect where temporary road construction is and is not allowed under 2003 forest plan direction.

Medicine Bow National Forest personnel propose to conduct vegetation management activities on National Forest System land, including inventoried roadless areas, within the Sierra Madre and Snowy Range Mountain Ranges.

Vegetation management activities, including prescribed fire and mechanical (using mechanized equipment) and hand treatment methods (use of chainsaws), would be applied to meet the following purposes:

- increase resiliency to future disturbance
- protect, restore, and enhance forest ecosystem components
- supply forest products to local industries
- provide for human safety
- reduce wildfire risk to communities, infrastructure, and municipal water supplies
- improve, protect, and restore wildlife habitat

Specific treatments would be developed and authorized for implementation over a 10 to 15 year period beginning in 2019. Implementation activities would be completed within approximately 15 to 20 years of the project decision.

Thinned stand of trees with cut logs and slash piles

The modified proposed action would address continually changing forest conditions using principles of adaptive implementation and monitoring (see appendix A). This alternative proposes an acreage ceiling of up to 360,000 acres that could be treated within pre-established treatment opportunity areas (page 32) rather than identifying site-specific treatment units. During adaptive implementation, Medicine Bow National Forest staff would cooperate with other agencies, local governments, interested stakeholders, and organizations to identify specific treatment units. Specific objectives of each treatment unit would be determined prior to any ground-disturbing activities using existing vegetation conditions and a series of project-developed field review forms. The sum of all treatments, regardless of whether they were in an inventoried roadless area, would not exceed the acreage ceiling and would be dependent on such things as staffing, funding, site-specific resource conditions, and project design features.

Specific activities associated with the modified proposed action include:

- up to 95,000 acres of stand initiation or even-aged treatments
- up to 165,000 acres of shelterwood, uneven-aged, or intermediate treatments
- up to 100,000 acres of green tree, shrub, and grassland treatments, including prescribed fire, mastication (mechanical fuel reduction), and hand thinning
- constructing no more than 600 miles of temporary road, as necessary, to access treatment areas

The total acres for the above treatments would not exceed the 360,000-acre maximum, and treated acres would be calculated based on the primary treatment. For example, if a stand-initiation treatment is conducted and the same unit is burned to initiate regeneration, treated acres would only be counted once not twice. In this example, the acres treated would count toward the stand-initiation cap.

Inventoried Roadless Areas

Roughly 125,200 acres of inventoried roadless areas have been identified for potential treatments. No temporary road construction would occur in inventoried roadless areas. Prior to implementation, proposed treatments in inventoried roadless areas would require regional office reviews for conformance to exceptions in the 2001 Roadless Area Conservation Rule. Detailed treatment proposal information specific to inventoried roadless areas is included in the project record.

Road and Access Information

The modified proposed action includes constructing no more than 600 miles of temporary road, as necessary, to access treatment areas. Temporary roads would be utilized for administrative use only and closed to the public. Some roads would be closed during big game parturition. However, some roads would evaluated on an individual basis in parturition areas to allow hauling where impacts would be minimal. Over the 15- to 20-year implementation period of the LaVA Project, temporary roads would be reclaimed within three years of project completion to preclude future motorized use and to restore ecological function in the affected area. Methods for reclaiming temporary roads may include the following:

- re-contouring the road
- ripping and scarifying the roadbed
- removing culverts
- installing drainage features
- creating physical barriers to preclude motorized travel
- scattering wood and rock debris onto the road
- applying seed and mulch to the area
- posting signs

The modified proposed action also includes utilizing existing open and closed National Forest System roads, reconstructing existing open and closed National Forest System roads, or both to access treatment units. Reconstruction may include road blading, culvert installation or replacement, and gravel surfacing. Closed National Forest System roads would be for administrative access only and would be returned to a closed status with the method of closure being determined at time of closure. A combination of commercial timber sales, service contracts, stewardship contracts, cooperative authorities, partner capacity, and Forest Service crews would be used to implement the project.

Other Activities

Other activities associated with the modified proposed action include slash treatments (for example, lop and scatter, pile burning, chipping), noxious weed control, native grass and forb seeding, and road maintenance associated with implementing vegetation treatments.

Example of lop and scatter slash treatment in an aspen stand

Project Design Features and Analysis Assumptions

Project design features and analysis assumptions have been developed for the LaVA Project to reduce or prevent potential undesirable effects resulting from management activities and to ensure consistent analysis of project effects, respectively. Project design features are a component of the modified proposed action. Project design features were developed using guidance from the State of Wyoming best management practices, the Watershed Conservation Practices Handbook, forest plan standards and guidelines, and other environmental protections required by applicable laws, regulations, and policies. The design features include protection for the following resources within the LaVA project area: recreation, amphibians and fisheries, public safety, hydrology and wet areas, rare plant species and sensitive ecosystems, invasive weeds, soils, wildlife, temporary road construction, landings, and skid trails, inventoried roadless areas, old growth, scenic resources, infrastructure, rangeland resources, and heritage resources. Project design features specific are listed in appendix A, attachment 3. Analysis assumptions are outlined in chapter 3.

Treatment Opportunity Areas

Treatment opportunity areas are locations where selected vegetation treatment options could be proposed during the adaptive implementation and monitoring phase of the LaVA Project. The treatment opportunity areas were established by considering places where the implementation of vegetation treatments would conform to applicable laws, regulations, policies, and forest plan direction. By identifying known legal constraints, we reduced the number of areas that contain treatment opportunities. The LaVA analysis includes two types of treatment opportunity areas: full suite of tools (brown) and limited suite of tools (grey) (see figure 9).

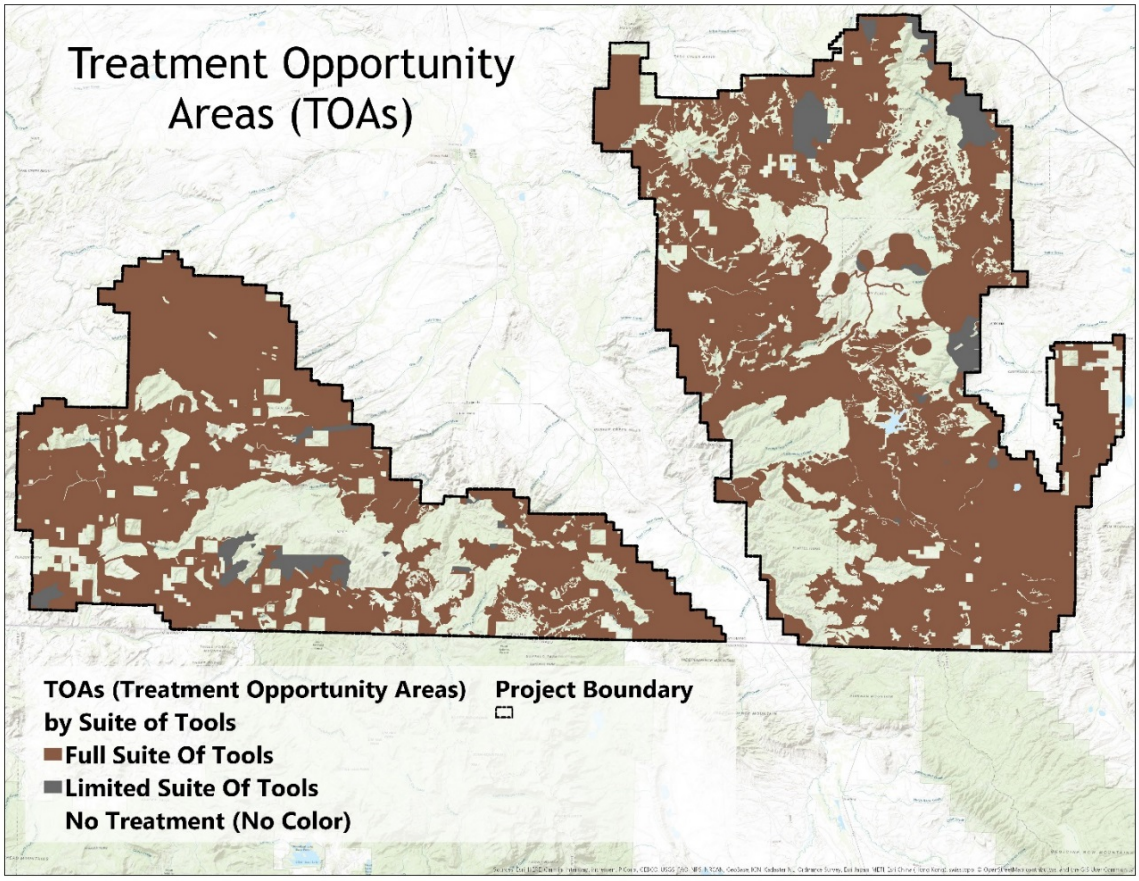

Figure 9. Treatment opportunity areas showing the full suite and limited suite of tools in the LaVA project area

Full Suite of Tools (shown in brown in figure 9)

These treatment opportunity areas total 588,513 acres (table 13) and include areas with site-specific opportunities for treatments using mechanical equipment, prescribed fire, and hand tools. Due to limitations in the 2003 forest plan for implementing vegetation treatments, the full suite of tools are excluded in the following management areas: wilderness, semi-primitive (Management Area 1.13), recommended for wilderness (Management Area 1.2), special interest areas (Management Area 2.1), research natural areas (Management Area 2.2), and mapped and inventoried old growth in ecological restoration (Management Area 5.15).

Full-suite-of-tools treatment opportunity areas also exclude portions of inventoried roadless areas where treatment justifications were not provided by cooperating agencies and Forest Service staff. The forest plan and the Healthy Forests Restoration Act prohibit vegetation management practices in designated wilderness areas.

Limited Suite of Tools (shown in grey in figure 9)

These treatment opportunity areas total 24,597 acres (table 13) and include areas with site-specific opportunities for treatments using prescribed fire and hand tools only. These areas exclude the following forest plan management areas: Management Area 1.13 - Wilderness, Semi-Primitive and Management Area 5.15 – Ecological Restoration (inventoried old-growth). They also exclude portions of inventoried roadless areas where treatment justifications were not provided by cooperating agencies and Forest Service staff. Although the 2003 forest plan allows fire and fuel practices in designated wilderness areas, the Healthy Forests Restoration Act prohibits such practices. The 2003 forest plan also restricts such practices in mapped and inventoried old growth in Management Area 5.15. Finally, limited-suite-of-tools treatment opportunity areas within inventoried roadless areas were restricted to areas where treatment justifications were provided by cooperating agencies and Forest Service staff.

Table 13. Summary of full- and limited-suite-of-tools treatment opportunity areas for the LaVA Project

Analysis Area Acres	Full Suite of Tools Acres	Limited Suite of Tools Acres	Total TOA Acres	No Treatment Acres	IRA TOA Acres*
848,726	588,513	24,597	613,110	235,616	124,287

TOA = treatment opportunity areas; IRA = inventoried roadless area. *The inventoried roadless area treatment opportunity acres are a subset of the total treatment opportunity area acres.

Collectively, the two treatment opportunity areas comprise 613,110 acres which means roughly 73 percent of the analysis area is available for treatment activities during LaVA project implementation. Areas with no treatment total 235,616 acres or 27 percent of the analysis area. Roughly, 125,200 acres of inventoried roadless areas have been identified as potential treatment opportunity areas out of a total of 230,240 acres of inventoried roadless areas within the LaVA project area. Roadless treatment opportunity areas are based on both cooperating agency and input from Medicine Bow National Forest resource specialists.

Vegetation Treatment Options

Under the modified proposed action, the stand initiation-even-aged; shelterwood-uneven-aged-intermediate; and green tree-shrub-grassland treatments would be selected through adaptive management from the vegetation treatment options presented in table 14, table 15, and table 16.

Stand-initiation and Even-aged Treatment Options (up to 95,000 treatment acres)

Stand-initiation treatments would remove all vegetation within the treated unit. Regeneration of open space from seed, sprouts, and advanced regeneration would occur following treatments. Generally, an even-age class of trees would occur after stand replacement. Stand initiation, as a structural stage, ends when the tree canopy becomes continuous and trees begin to compete with each other for light and canopy space.

Under the modified proposed action, the vegetation treatment options for stand initiation shown in table 14 would be considered for implementation when tree mortality is between 50 to 100 percent, insect and disease levels are moderate to high, or both.

Shelterwood, Uneven-aged Treatments, and Intermediate Treatment Options (up to 165,000 treatment acres)

Shelterwood is a method of regenerating an even-aged stand using a sequencing of different, distinct types of cutting: (1) an optional preparatory cut to enhance conditions for seed production, (2) an establishment cut to prepare the seed bed and to create a new age class, and (3) a removal cut to release established regeneration from competition with the overstory. Cutting may be done uniformly throughout the stand (uniform shelterwood), in groups or patches (group shelterwood), or in strips (strip shelterwood). A removal cut falls into the stand-initiation structural stage described in the previous section.

Intermediate treatments are a collective term for any treatment designed to enhance growth, quality, vigor, and composition of the stand after establishment or regeneration and prior to final harvest. Intermediate treatments are commonly prescribed by professional foresters to improve species composition and wildlife habitat, regulate stand density, increase mast production, enhance timber quality and forest health, and promote and establish desirable advanced regeneration.

Uneven-aged treatments are methods of regenerating a forest stand and maintaining an uneven-aged structure by removing some trees in all size classes either singly, in small groups, or in steps.

Under the modified proposed action, the adaptive treatment options in table 15 would be considered for implementation when tree mortality is between 30 to 49 percent, when insect and disease levels in stands are low, or both.

Green Tree, Shrub, and Grassland Treatment Options (up to 100,000 acres)

Under the modified proposed action, the vegetation treatment options in table 16 could take place within green tree, shrub, and grasslands. Because reducing fuels to protect infrastructure in areas identified by Community Wildfire Protection Plans is a priority, green tree, shrub, and grasslands treatment options could be prescribed regardless of mortality and insect and disease levels. In forested areas, these activities would be considered for implementation in stands with less than 30 percent mortality, with low to moderate insect and disease levels, or both.

For all the vegetation treatment options in table 14, table 15, and table 16, slash treatments could include prescribed burning, lop and scatter, machine and hand pile and burn, mastication, machine trampling, or roller chopping. Slash treatments would be determined before or after the primary vegetation treatments are implemented based upon ground conditions, silvicultural objectives, and other site-specific objectives. Within identified wildland-urban interface areas or areas that have a fire concern, most slash will be removed from the unit either by harvesting techniques, such as whole tree skidding or mastication, or be piled following vegetation treatment for later burning. Slash treatment outside fire concern areas will often leave most of the slash in treatment areas. Within these treatment areas, slash could be lopped and scattered, machine trampled, roller chopped, or other methods that leave slash in place while condensed by hand or mechanized equipment. Leaving slash in place can increase favorable microsite conditions for regeneration of tree species, increase nutrient cycling, reduce sediment transportation, increase soil moisture, and address other resource concerns.

Under the modified proposed action, removal of trees or shrubs would be conducted with mechanical methods including but not limited to harvesting machinery, mastication equipment, or bull dozers. Within identified wildland-urban interface areas, fuels treatments are the highest priority. Vegetation treatments in wildland-urban interface areas would be implemented to achieve fuels objectives, regardless of percentages of mortality or insect and disease presence. Any of the vegetation treatment options in table 14, table 15, and table 16 could be used.

Table 14. Vegetation treatment options for stand initiation or even-aged treatments

Adaptive Management: Vegetation Treatment Options	Regeneration Objective	% Overstory Removal	Current[1] Mortality	Current Insect and Disease level	Site Prep	Slash treatment
Clearcut: This treatment can remove all the trees from the stand, producing a fully exposed microclimate for the development of a new age class.	Yes (even-aged)	Up to 100%	50 to 100%	Moderate to high	Yes	Varies
Coppice: This treatment removes all of the trees (aspen) from the stand and the majority of the regeneration that occurs is from sprouts or root suckering.	Yes (even-aged)	Up to 100%	50 to 100%	Moderate to high	Yes	Varies
Stand-replacing prescribed fire: This treatment kills all or most of the living canopy (trees). It produces a fully exposed microclimate and initiates succession or regrowth.	Yes (even-aged)	Up to 100%	50 to 100%	Moderate to high	Yes	Varies
Final shelterwood removal cut: This is a final removal cut that releases established regeneration from the competition with the overstory after there is no longer a need for shelter under the shelterwood regeneration method.	Yes (even-aged)	Up to 100%	50 to 100%	Moderate to high	Yes	Varies
Seed tree cut (preparatory): This treatment removes trees to enhance conditions for seed production, develop wind firmness for a future seed-tree seed cut, or both.	Yes (even-aged)	Up to 100%	50 to 100%	Moderate to high	Yes	Varies
Overstory removal: This treatment removes trees constituting an upper canopy layer to release understory trees. The primary source of regeneration is advanced reproduction.	Yes (even-aged)	Up to 100%	50 to 100%	Moderate to high	Yes	Varies
Two-aged clearcut: This is a two–aged regeneration harvest that removes sufficient trees to produce an exposed microclimate for the development of a new age class.	Yes (even-aged)	Up to 90%	50 to 100%	Moderate to high	Yes	Varies
Two-aged coppice cut: This treatment for aspen stands removes the majority of trees from a stand, leaving at least 10 percent. The majority of the regeneration that occurs is from sprouting or root suckering.	Yes (even-aged)	Up to 90%	50 to 100%	Moderate to high	Yes	Varies

[1] Calculations of the percentage of current mortality could include fire, blowdown, insect and disease, and other natural disturbance events.

Table 15. Vegetation treatment options for shelterwood, uneven-aged, or intermediate treatments

Adaptive Management: Vegetation Treatment Options	Regeneration Objective	% Overstory Removal	Current[1] Mortality	Current Insect and Disease level	Site Prep	Slash treatment
Shelterwood preparatory cut: This treatment removes some overstory trees except those needed for shelter or seed production. It prepares the seed bed and creates a new age class in a moderated microenvironment.	Yes (even-aged)	Up to 40%	30 to 49%	Low to moderate	Yes	Lop and scatter
Shelterwood establishment cut: This treatment removes some overstory trees except those needed for shelter or seed production. It prepares the seed bed and creates a new age class in a moderate microenvironment.	Yes (even-aged)	Up to 80%	30 to 49%	Low to moderate	Yes	Lop and scatter
Thinning: The objectives vary depending on the objectives for the stand. Objectives may include promoting a healthier stand, reducing forest fuels associated with high-severity wildfires, producing future sawtimber, or creating conditions suitable to meet future wildlife habitat, such as old growth forest	No	varies	30 to 49%	Low to moderate	Not usually	Lop and scatter
Sanitation: The objective is to remove trees infected with undesirable insects or diseases to reduce the likelihood of insects or diseases spreading to other trees in the stand. After treatment, a fully stocked stand with a reduced amount of insects and diseases remains.	Not usually but may occur	varies	30 to 49%	Low to moderate	Not usually	Varies
Improvement cut: The objective is to harvest less desirable trees of any species in a stand of poles or larger trees, primarily to improve the composition and quality of the remaining trees.	No	Less than 30%	30 to 49%	Low to moderate	Not usually	Varies
Liberation cut: The objective is to remove older overtopping trees that are competing with desired sapling trees.	No	Up to 100%	30 to 49%	Low to moderate	Not usually	Varies
Release and weed: The objective is to remove undesirable competing vegetation from stands of young desirable trees.	No	Less than 30%	30 to 49%	Low to moderate	Not usually	Varies

Adaptive Management: Vegetation Treatment Options	Regeneration Objective	% Overstory Removal	Current[1] Mortality	Current Insect and Disease level	Site Prep	Slash treatment
Non-stand-replacing prescribed fire: broadcast burning, jackpot burning. This treatment is a prescribed burning activity where fire is applied to most or all of an area (broadcast burning) or concentrations of fuels (jackpot burning) within well-defined boundaries for reduction of fuel hazard, as a resource management treatment, or both.	Possible	Less than 30%	30 to 49%	Low to moderate	Not usually	Does not apply
Uneven-aged group selection: The objective is to cut small groups within stands to establish new age classes.	Yes (uneven-aged)	100% in groups	30 to 49%	Low to moderate	Varies	Varies
Uneven-aged, single-tree selection: The objective is to uniformly remove individual trees of all size classes throughout a stand, creating or maintain a multi-age structure to promote the growth of remaining trees and to provide space for regeneration.	Yes (uneven-aged)	Less than 30%	30 to 49%	Low to moderate	Not usually	Lop and scatter

[1] Calculations of the percentage of current mortality could include fire, blowdown, insect and disease, and other natural disturbance events.

Table 16. Vegetation treatment options for green tree, shrub, and grassland treatments

Adaptive Management: Vegetation Treatment Options	Regeneration Objective	% Overstory Removal	Current[1] Mortality	Current Insect and Disease level	Site Prep	Slash treatment
Conifer removal from aspen, shrub, or meadows: The objective is to remove conifers from aspen, shrub, or meadow areas where large numbers of conifers have not historically occurred; to enhance aspen stands, shrubs, or meadows; or both.	No	Varies	Does not apply	Does not apply	No	Varies
Mountain shrub and sage brush treatment: The objective is to reduce shrub cover in stands of dense or decadent shrubs using prescribed fire or mechanical methods. Treatment will increase age class diversity of shrubs, create a greater mosaic of openings in the shrub canopy, and promote increased cover and production of grasses and forbs.	Varies	Does not apply	Does not apply	Does not apply	Possible	Varies

Adaptive Management: Vegetation Treatment Options	Regeneration Objective	% Overstory Removal	Current[1] Mortality	Current Insect and Disease level	Site Prep	Slash treatment
Grass and forb treatment: The objective is to remove decadent areas of grass and forbs and increase grass and forb production.	Yes	n/a	Does not apply	Does not apply	Possible	Does not apply
Coppice cut: This treatment removes all the aspen trees from the stand. The majority of the regeneration that occurs is from sprouts or root suckering.	Yes (even-aged)	Up to 100%	Less than 30%	Does not apply	Varies	Varies
Two-age coppice cut: This treatment removes the majority of aspen trees from a stand, leaving at least 10 percent. The majority of the regeneration that occurs is from sprouting or root suckering	Yes (even-aged)	Up to 90%	Less than 30%	Does not apply	Varies	Varies
Shelterwood preparatory cut: This treatment removes some overstory trees except those needed for shelter or seed production. It prepares the seed bed and creates a new age class in a moderated microenvironment.	Yes (even-aged)	Up to 40%	Less than 30%	Low to moderate	Yes	Lop and scatter
Shelterwood establishment cut: This treatment removes some overstory trees except those needed for shelter or seed production. It prepares the seed bed and creates a new age class in a moderated microenvironment.	Yes (even-aged)	Up to 80%	Less than 30%	Low to moderate	Yes	Lop and scatter
Thinning: The objectives vary depending on the objectives for the stand. Objectives may include promoting a healthier stand, reducing forest fuels associated with high-severity wildfires, producing future sawtimber, or creating conditions suitable to meet future wildlife habitat, such as old growth forest	No	Varies	Less than 30%	Low to moderate	Not usually	Lop and scatter
Sanitation: The objective is to remove trees infected with undesirable insects or diseases to reduce the likelihood of insects or diseases spreading to other trees in the stand. After treatment, a fully stocked stand with a reduced amount of insects and diseases remains.	Not usually but may occur	Varies	Less than 30%	Low to moderate	Not usually	Varies

Adaptive Management: Vegetation Treatment Options	Regeneration Objective	% Overstory Removal	Current[1] Mortality	Current Insect and Disease level	Site Prep	Slash treatment
Salvage: The objective is to harvest trees that have experienced mortality or damage from a fire, flood, wind event, insects and diseases, or other natural disaster.	Not usually but may occur	Varies	Less than 30%	Low to moderate	Not usually	Varies
Improvement cut: The objective is to harvest less desirable trees of any species in a stand of poles or larger trees, primarily to improve the composition and quality of the remaining trees.	No	Less than 30%	Less than 30%	Low to moderate	Not usually	Varies
Liberation cut: The objective is to remove older overtopping trees that are competing with desired sapling trees.	No	Up to 100%	Less than 30%	Low to moderate	Not usually	Varies
Release and weed: The objective is to remove undesirable competing vegetation from stands of young desirable trees.	No	Less than 30%	Less than 30%	Low to moderate	Not usually	Varies
Non-stand-replacing prescribed fire: broadcast burning, jackpot burning. This treatment is a prescribed burning activity where fire is applied to most or all of an area (broadcast burning) or concentrations of fuels (jackpot burning) within well-defined boundaries for reduction of fuel hazard, as a resource management treatment, or both.	Possible	Less than 30%	Less than 30%	Low to moderate	Not usually	Does not apply
Uneven-aged group selection: The objective is to cut small groups within stands to establish new age classes.	Yes (uneven-aged)	100% in groups	Less than 30%	Low to moderate	Varies	Varies
Uneven-aged, single-tree selection: The objective is to uniformly remove individual trees of all size classes throughout a stand creating or maintain a multi-age structure to promote the growth of remaining trees and to provide space for regeneration.	Yes (uneven-aged)	Less than 30%	Less than 30%	Low to moderate	Not usually	Lop and scatter

[1]Calculations of the percentage of current mortality could include fire, blowdown, insect and disease, and other natural disturbance events.

Adaptive Management

Adaptive management has been adopted by Federal land management agencies since the late 1970s and provides a post-decision response to conditions, circumstances, or information based on observed impacts of the implemented activities (NEPA Task Force Report to the Council on Environmental Quality-Modernizing NEPA Implementation, 2003). Adaptive management is defined as: "a system of management practices based on clearly identified outcomes and monitoring to determine whether management actions are meeting desired outcomes and, if not, facilitating management changes that will best ensure outcomes are met or re-evaluated." Adaptive management recognizes that "knowledge about natural resources is sometimes uncertain at the time of a project decision (43 CFR, 46.30)."

In a 1997 study, the Council on Environmental Quality concluded the environmental protection afforded by a traditional National Environmental Policy Act process of "predict-mitigate-implement" had shortcomings because the process did not account for "unanticipated changes in environmental conditions, inaccurate predictions, or subsequent information that may affect original environmental protections (Council on Environmental Quality 1997)." Based on this study, the Council on Environmental Quality concluded the adaptive management model—predict-mitigate-implement-monitor-adapt—was a significant improvement over traditional environmental analysis models.

While not all Federal actions are conducive to incorporating adaptive management into the National Environmental Policy Act process, some Federal actions are more effectively implemented by considering changing resource conditions within the ecosystem and how project activities would be more effectively implemented to meet the purpose and need. The LaVA project would be implemented over a 10- to 15-year period across a broad landscape with many changing conditions over time (post-epidemic changes in vegetation). Therefore, adaptive management was chosen as the appropriate model to conduct the environmental analysis and to guide implementation of the LaVA Project.

LaVA Adaptive Implementation and Monitoring Framework

The LaVA adaptive implementation and monitoring framework (appendix A) defines the range of vegetative prescriptions and design features for treatment implementation and provides a mechanism for monitoring and documenting LaVA Project compliance. The framework includes documents that would be reviewed and validated for each individual project authorized throughout LaVA implementation. On-the-ground conditions at the time of implementation will determine how the tools are used and applied.

The framework includes the following:

- **Pre-implementation and project implementation checklists:** These checklists would be completed at appropriate phases of project implementation to ensure treatments remain within the constraints of the environmental impact statement and future record of decision and to ensure treatment caps are not exceeded over the life of the project. The checklists are in appendix A as attachments 1 and 5, respectively.

- **Decision-making triggers for adaptive implementation**: In response to public comments, decision-making triggers for implementation of the LaVA Project are identified in appendix A, attachment 2. The decision-making triggers correspond to the issue tables discussed in chapter 1 within the "Issue Development and Resolution" section. Yellow-light triggers indicate a resource has the potential to be negatively impacted by treatment proposals, demonstrating the need for more rigorous project design features, a change in management approach, or slowing the pace of implementation. Red-light triggers correspond with a legal standard or project standard that cannot be exceeded. Red-light triggers demonstrate a need to either discontinue treatment proposals or to consider other treatment options. Triggers are commitments in an adaptive management plan that specify actions to be taken and the timing of those actions based on pre-treatment field reviews and monitoring. Triggers improve certainty that particular actions will be taken in the future.
- **Project design features:** Project design features are methods to minimize harm on resources such as recreation, amphibians and fisheries, hydrology and wet areas, rare plant species and sensitive ecosystems, soils, wildlife, inventoried roadless areas, old growth, scenery, rangeland vegetation, and heritage. Design features would also include best management practices for constructing and locating temporary roads, landings, skid trails, and any project activities within and surrounding riparian areas, wetland areas, or both. Site-specific design features would be applied when monitoring surveys or management activities demonstrate a need to implement them. Project design features are outlined in appendix A, attachment 3.
- **Vegetation treatment options:** Site-specific prescriptions would be selected from the vegetation treatment options tables outlined above, based on the current conditions found in the project area, project objectives, and feedback from cooperating agencies and the public. Treatments would be identified by specialists to narrow the gap between existing and desired vegetation conditions on the ground to carry out site-specific objectives. Examples include wildland-urban interface and fuels reduction treatments to protect communities, wildlife habitat restoration treatments to improve habitat, timber harvest or thinning treatments to provide resilience, among others. Vegetative treatment option tables are also incorporated into appendix A, attachment 4.

The following diagrams depict the adaptive implementation and monitoring framework that will be used to identify vegetation treatments and their locations over the life of the LaVA Project. The diagrams start out broad, conveying the overarching implementation and monitoring concept, and become more detailed to convey how individual treatments would move from ideas, to packaged projects for implementation, to discussion topics in a monitoring report.

Diagram 1 depicts LaVA adaptive implementation and monitoring over the project's 15- to 20-year lifespan. This is a visualization of the LaVA Project several years into implementation; for example, year 4 of implementation. The group of different-sized circles demonstrates how multiple projects may be implemented simultaneously across the LaVA landscape and will be in various stages of completion. For example, some projects will be in the monitoring phase, while others are being implemented and additional projects are just beginning. Finally, the large yellow circle interconnecting the example projects is meant to illustrate the coordination and collaboration that will occur with the public and cooperating agencies throughout LaVA implementation. It is also meant to illustrate the adaptive management principles that will be incorporated to continually improve on project design and implementation. The callout circle shows how an individual project's life cycle, as depicted in diagram 2, connects to the longer LaVA implementation cycle.

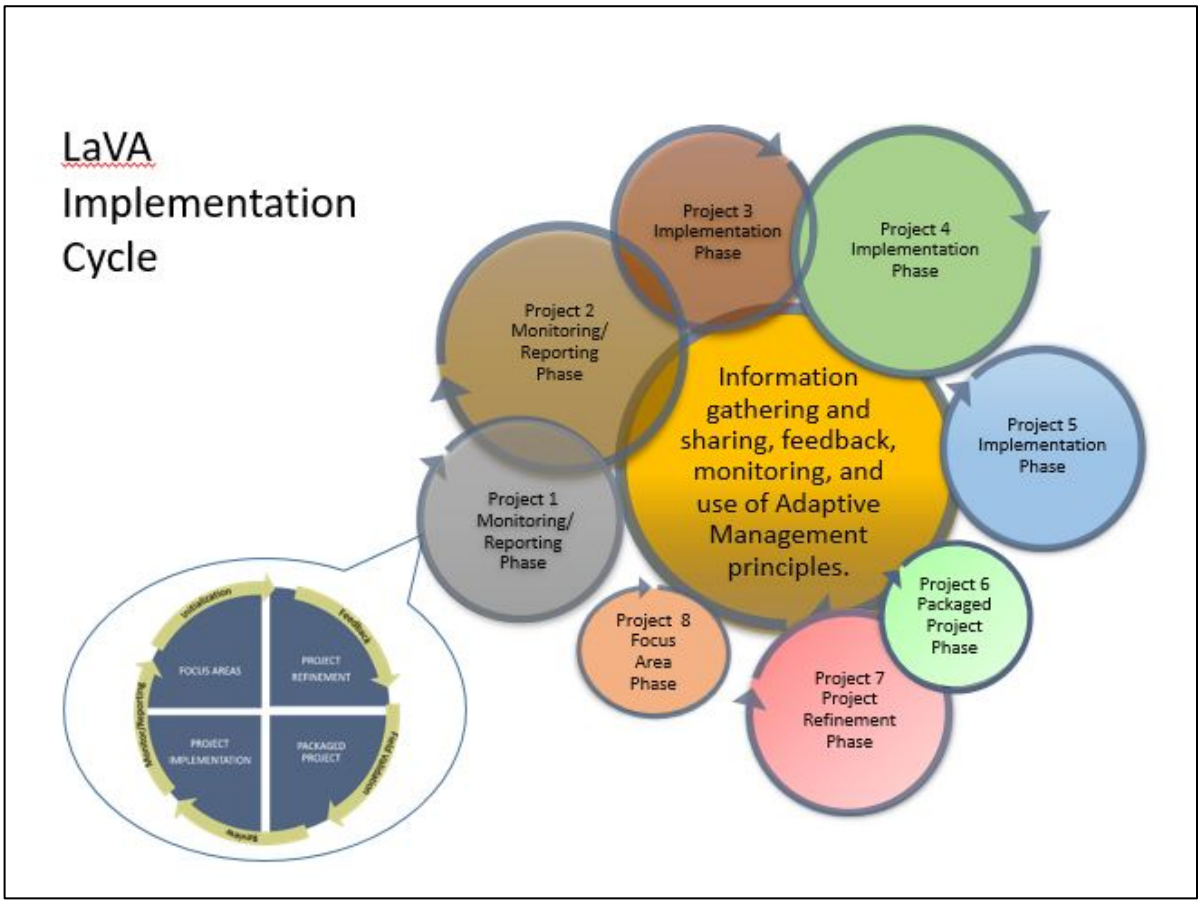

Diagram 1. LaVA adaptive implementation and monitoring framework – LaVA implementation cycle

Diagram 2 depicts the life cycle for a project. It shows how one of the projects shown in diagram 1 would be formulated and implemented. The outer circle with arrows depicts the five action phases that will be utilized as projects are developed. The actions will involve internal Forest Service personnel, cooperating agencies, and the public.

The inner blue quadrants represent products or results that would be realized at the end of each action phase. For example, focus areas would be identified at the end of the initialization phase; projects would be refined at the end of the feedback phase; and so on. Additional information on each of the action phases and products is in the "Framework Details" section.

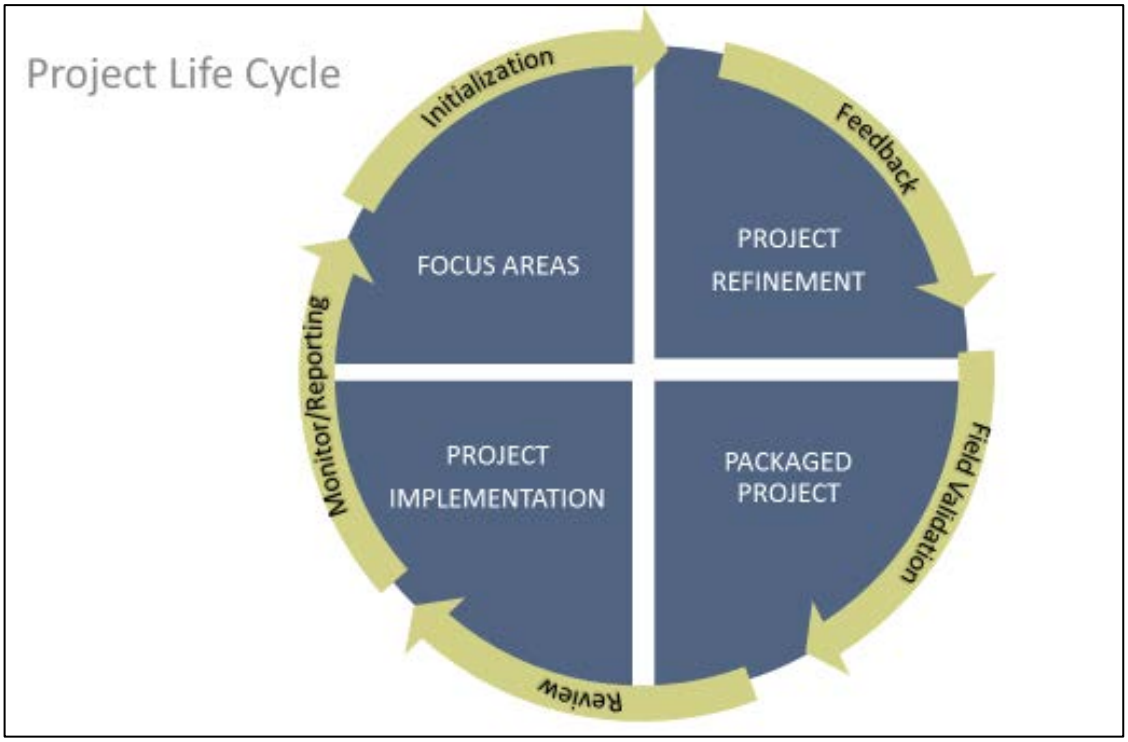

Diagram 2. LaVA adaptive implementation and monitoring framework – project life cycle

Diagrams 3 and 4 show the process for identifying and implementing a project within the LaVA area. The diagrams further explain and depict the project life cycle shown in diagram 2.

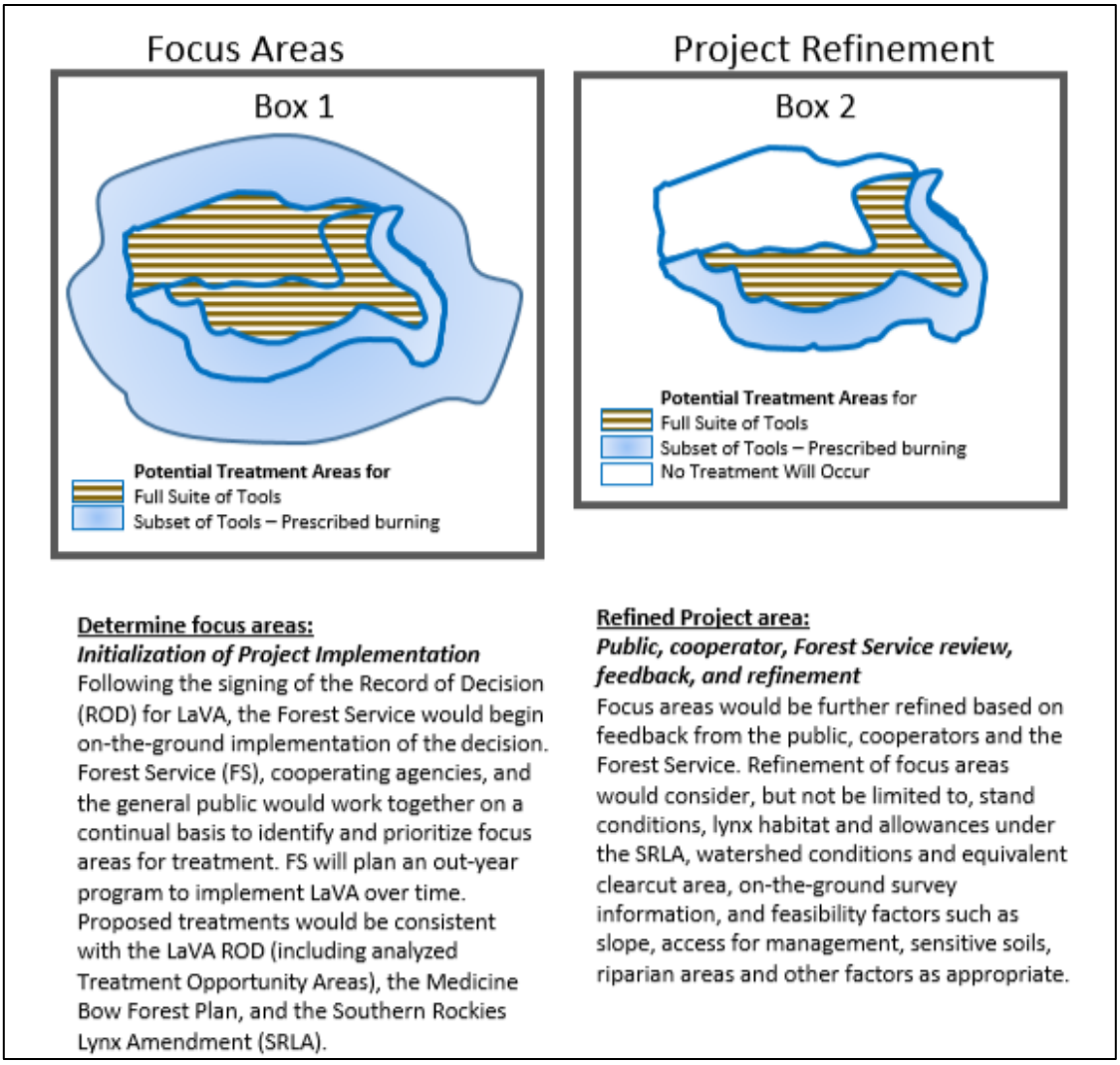

Diagram 3. Example project implementation for the Medicine Bow Landscape Vegetation analysis

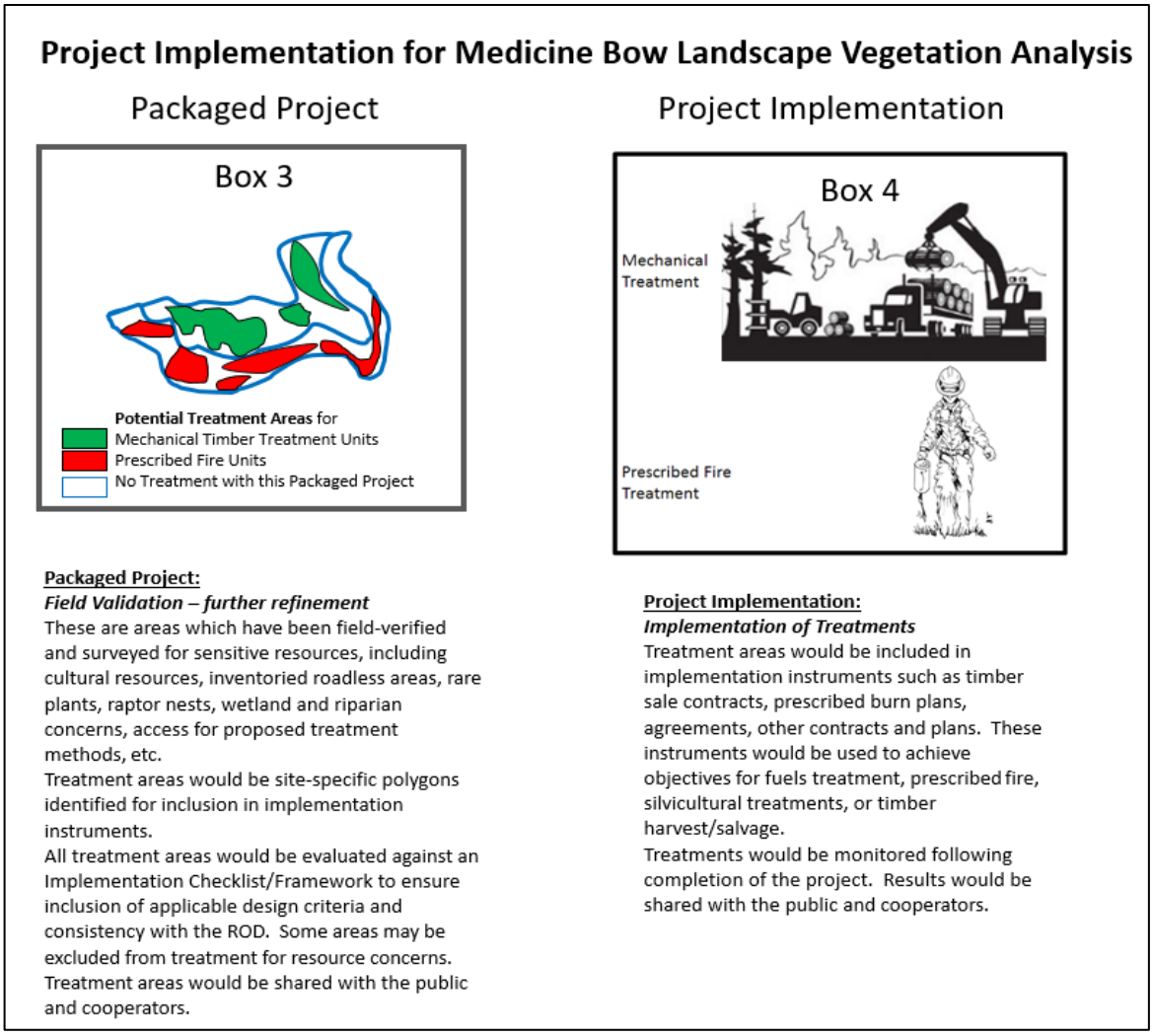

Diagram 4. Project implementation for the Medicine Bow landscape vegetation analysis

Sufficiency Review

Forest Service policies for implementing regulations under the National Environmental Policy Act outline a procedure for review of actions awaiting implementation when new information or changes occur and should be considered for correction, supplementation, or revision (Forest Service Handbook 1909.15, section 18). If new information or changed circumstances relating to the environmental impacts of a proposed action or decision come to the attention of the responsible or deciding official after a decision has been made and prior to implementation, the official must review the information carefully to determine its importance. If, after an interdisciplinary review and consideration of new information within the context of the overall project or decision, the responsible official determines a correction, supplement, or revision to an environmental document is not necessary, implementation should continue and the results of the interdisciplinary review are to be documented in the project file.

Ground conditions may change over the 15- to 20-year implementation period of the LaVA Project. Substantive changes in conditions would require Medicine Bow National Forest personnel to conduct a National Environmental Policy Act sufficiency review. Changes in adaptive management

(design features) to minimize harm to resources would remain within the scope of the environmental analysis. If the environmental analysis did not include an analysis of new environmental impacts under these changed conditions, the responsible official may request a supplemental information report. The report would include reviews and analysis of changed conditions from the interdisciplinary team members and document whether a correction, supplement, or revision of the environmental impact statement is needed. The annual monitoring review with public and agency stakeholders would be considered in determining future environmental analysis sufficiency.

Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by National Environmental Policy Act to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). The alternatives identified below were analyzed by Medicine Bow National Forest personnel during the environmental analysis process but were eliminated from detailed study as described below.

Iterative Development of the Modified Proposed Action

On July 21, 2017, Medicine Bow National Forest personnel published a notice of intent in the Federal Register initiating the scoping period (40 CFR 1501.7) for the LaVA Project proposed action. At the same time, Medicine Bow personnel also distributed a detailed scoping document for public review and comment. The notice of intent and the scoping document included 1,000 miles of temporary road construction and 10 miles of permanent road construction as part of the LaVA proposed action. On July 26, 2017, the Medicine Bow National Forest personnel published an amended scoping document reducing the proposed temporary road mileage from 1,000 miles to 600 miles. This reduction was in response to immediate feedback from the public as well as a more detailed analysis of the existing transportation system. In addition to reducing temporary road miles, we also revised the treatment opportunity area map associated with the proposed action to depict forest plan management areas wherein temporary road construction is not allowed. Following the close of the scoping comment period on August 21, 2018, we again re-evaluated the transportation component of the proposed action and determined that the 10 miles of proposed permanent road construction were not needed to achieve the purpose of and need for the project. Therefore, permanent road construction was removed from the proposal.

Modifying a proposed action, rather than developing a new alternative, is allowed by 36 CFR 220.5(e)(1). In such cases, the incremental changes made to the proposed action may be considered as alternatives considered but eliminated from detailed study and must be included or incorporated by reference in the draft environmental impact statement, in accord with 40 CFR 1502.21.

Proposed Action, Excluding Inventoried Roadless Areas

Following scoping, some commenters stated Medicine Bow National Forest personnel should consider an alternative that excludes management activities in inventoried roadless areas so as to maintain natural landscapes without constructed and maintained roads. This alternative was eliminated from detailed study because it does not meet the purpose of the project. Specifically, excluding inventoried roadless areas from the proposed action would forgo opportunities to

enhance forest and rangeland resiliency to future insect and disease infestations; provide for the protection of infrastructure and restoration of wildlife habitat; and mitigate hazardous fuel loading on roughly 27 percent (230,240 acres) of the LaVA analysis area. Removing such a large land base from the proposed action would not allow a landscape-scale analysis of, and response to, changed forest vegetation conditions presented by insect and disease epidemics, which is the primary purpose of the project. No temporary roads would be constructed in inventoried roadless areas and all projects would need to meet the exemptions outlined in the 2001 Roadless Rule (36 CFR 294.13(b)(1-4)) before they would be authorized for implementation.

Hazardous Fuels Reduction Focused Around Homes

Commenters requested an alternative aimed at reducing hazardous fuels in the project area. These comments relied entirely on the work on Dr. Jack Cohen and were focused on reducing the risk of wildfire damage to homes by the reducing fine fuels in the immediate vicinity of homes. This alternative was eliminated from detailed study because it does not meet the purpose and need of the project ("Purpose of and Need for Action" section, chapter 1). Specifically, it does not address enhancing forest and rangeland resiliency to future insect and disease infestations; providing for the recovery of forest products; protecting infrastructure and municipal water supplies; and restoring wildlife habitat. For these reasons, this alternative was eliminated from detailed study.

No New System Roads and No Temporary Roads

No New System Roads

In response to public, cooperating agency, and other stakeholder comments from scoping, this alternative modified the 2017 LaVA proposed action (notice of intent and scoping) by eliminating the 10 miles of new system road construction from consideration. If necessary, road construction to meet vegetation management objectives from this decision would be analyzed and documented in subsequent decisions. These subsequent decisions would be subject to public review and comment and the Forest Service administrative review processes (36 CFR 218).

No Temporary Roads

Public and other stakeholder comments identified the amount and location of roads, specifically temporary roads, as a major concern. The deciding official considered an additional alternative proposal to remove all temporary road mileage from consideration. It was determined the removal of temporary road miles would not meet the purpose and need of the project. Temporary roads would be addressed in the following ways within the project analysis:

- constructing not more than 600 miles of temporary road to complete vegetation management activities
- implementing project design features to reduce effects to other resources during and after implementation
- utilizing the existing road system to the greatest extent possible
- documenting effects of temporary roads to each resource

Comparison of Alternatives

This following tables provide a concise summary of the effects and outcomes of implementing the no-action alternative and the modified proposed action. Information in table 17 is focused on resources and effects where different levels of effects, outcomes, or outputs can be distinguished quantitatively or qualitatively among alternatives. Table 18 through table 23 provide information relative to the issue indicators identified in chapter 1. These indicators have been incorporated into the decision-making triggers table (appendix A, attachment 2) and will be monitored over the life of the LaVA Project. Comparison of effects and outcomes are more fully discussed in chapter 3.

Table 17. Comparison of effects between the proposed action and the no-action alternative

Resource	Effects from No Action	Effects from Modified Proposed Action
Timber	No impacts from project implementation; resources would be subject to natural processes. Conifer stands with high mortality and minimal regeneration or seed sources may not recover their cover-type component in the long term. Stands could shift to shade-tolerant species like subalpine fir. There would be a reduction in the ability to manage commercially viable species now and in the future.	Vegetation treatments would provide resilience to future insect and disease epidemics. Stand initiation treatments would cause heavy beetle-killed stands to accelerate in growth and production. In the short term, the number of standing live trees and standing snags would be reduced through the implementation of vegetation treatments. In the long term, there would be an increase in cover type, structural stage, and age-class diversity and a reduction in woody debris allowing establishment of vegetation. Aspen stands would have increased regeneration with the removal of conifers. Prescribed burning and fuels reductions would decrease ground litter and some understory vegetation while promoting growth of the overstory and acceleration of mature tree growth. Lodgepole pine would regenerate and increase from pole size to medium and large sizes with potentially less presence of dwarf mistletoe. Salvage harvest and thinning would protect pockets of Engelmann spruce and healthy, vigorous aspen in wetter sites. Reduced competition and stress on remaining trees would occur as a result of thinning operations. Vegetation treatments would result in more favorable conditions for regeneration of commercially viable species.
Fire and fuels	No impacts due to project implementation; resources would be subject to natural processes. Fuels and resulting fire behavior potential would continue to be influenced by heavy buildup of falling dead trees as well as regeneration of young understory trees. This heavy fuel load could increase the total heat output.	Mechanical vegetation treatments, prescribed burning, and fuels reduction activities would move the analysis area, including wildland-urban interface areas, toward forest plan desired conditions for fire and fuels management. Fuel loads would be reduced along with total heat output during potential wildfires. Precipitation would extinguish fires more rapidly. Harvests and thinning of beetle-killed and live trees would decrease canopy fires by increasing crown spacing. Effects of smoke emissions from broadcast and pile burning would affect air quality in the short term.

Resource	Effects from No Action	Effects from Modified Proposed Action
Wildlife	There would be no effects beyond the existing condition to wildlife because no treatments or new roads would be implemented. Habitat would continue to be provided for management indicator species, Rocky Mountain Region sensitive wildlife species, and threatened, endangered, and proposed species	Wildlife habitat quality would improve, in general, as stands regenerate post-treatment. Water, foraging habitat, roosting habitat, breeding and nesting habitat, and prey animals would be sufficient to support populations for management indicator species. May impact individuals but is not likely to cause a trend toward Federal listing or a loss of viability in the planning area for Rocky Mountain Region sensitive species including olive fly catcher, flammulated owl, and purple martin. May affect and is likely to adversely affect Canada lynx (federally listed species). Habitat for, and abundance of, snowshoe hare and red squirrel (prey species for Canada lynx) would decline for a period of time until cover and food sources regenerate. Forest plan wildlife security guidelines may not be met in all cases. There are 51,700 acres of security areas that could be removed temporarily by vegetation management.
Aquatic species	No direct or indirect adverse effects on sediment filtering, fish populations, or fish habitat from management actions. Tree mortality caused by the bark beetle epidemics could positively affect large woody debris recruitment to stream channels as trees fall down. Increased mortality of riparian trees due to mountain pine beetle activity could reduce shading and potentially increase water temperatures. Aquatic sensitive species: No impact for the boreal toad, northern leopard frog, wood frog, Colorado River cutthroat trout, or mountain sucker. Aquatic federally listed threatened and endangered species: No federally listed fish or amphibian species within the analysis area. Aquatic management indicator species: Low degree of impact for management indicator species.	There would be a potential reduction in shade, sediment filtering, and large woody debris in area streams. Effects would be minimized through design features that establish a protective buffer limiting activities within the water influence zone (water influence zone 4) and precludes harvest of streamside trees. Short-term increases in sediment would occur due to road construction and reconstruction activities. The modified proposed action would be expected to have a moderate degree of impact for aquatic management indicator species: common trout: rainbow, brown, and brook. The degree of impact would be attributable to the relative size of treatment areas The modified proposed action could result in impacts to aquatic sensitive species individuals (boreal toad, northern leopard frog, wood frog, mountain sucker, and Colorado River cutthroat trout) but is not likely to result in a loss of viability in the planning area, nor cause a trend toward Federal listing. Design criteria and applicable forest plan standards will minimize impacts to these species in riparian and wetland areas. Exact location of temporary roads is currently unknown but there would be potential for direct effects to aquatic habitats and fish and amphibian populations. Roads constructed through, or parallel to, wetlands would impact amphibians and their habitats. Road construction impacts could be mitigated through proper road planning, design, and location. In addition, best management practices and forest plan standards would help mitigate the effects of construction.

Resource	Effects from No Action	Effects from Modified Proposed Action
Botany	No impacts due to implementation; existing conditions would continue. There are no federally listed threatened or endangered plant species or suitable habitat found on the Snowy Range or Sierra Madre.	No effect for federally listed plant species. May adversely affect individuals, but not likely to cause a trend toward Federal listing or a loss of viability for Rocky Mountain Region sensitive plant species. No loss of viability for plant species of local concern.
Rangelands and livestock management	Where conifer stands with high tree mortality form natural barriers between grazing allotments and pastures, the increase in forage that results from more sunlight reaching the forest floor may weaken the natural barrier effect as cattle seek out that forage. However, as trees continue to fall, the integrity of those natural barriers would be restored in many areas by the physical barrier of fallen trees. Some transitory forage would be available in untreated timber stands with high tree mortality, but the availability of that forage would decline as trees continue to fall, blocking access by livestock. Moving cattle through conifer stands with high tree mortality would continue to be dangerous and would become more difficult as more trees fall. These conditions would persist over the long-term without treatment. Falling trees would continue to cause significant damage to fences and spring developments located within tree stands that have moderate to high tree mortality and make maintenance of those improvements increasingly hazardous. Risk of large-scale wildfire damage to livestock, fences, range improvements, and rangeland vegetation would increase over time.	There would be potential for large swaths of natural livestock barriers between allotments and pastures to be lost to timber harvest until regenerated trees are large enough to shade out understory forage plants and provide a visual barrier to livestock travel, which could take decades. Would likely result in the need to construct new fence or increase rider management to keep livestock within pastures or allotments for the authorized grazing seasons. Timber harvest would produce transitory livestock forage over a 15- to 20-year period. Forage would likely also increase in aspen stands and in shrublands where prescribed fire or other shrub and tree thinning treatments occur. Maintaining livestock distribution and trailing cattle could be difficult in some locations in the short term during harvest operations; but in the longer term, moving cattle through harvested stands will be easier than trying to move them through untreated stands with numerous downfall trees. Timber harvest activities could damage fences; however timber sale contracts identify fences as protected structures, and sale purchasers are therefore responsible for repair of damaged fences. Proposed fenceline clearing would prolong the life of existing fences and make maintenance easier and less dangerous for permittees. Prescribed burn projects in shrublands and aspen in locations normally utilized by the permitted livestock could require some rest from livestock grazing during the growing season to promote recovery of desirable species. This would result in some impact to permittees either in construction or maintenance of temporary fencing or more rider and herder time to keep livestock out of treated areas. Risk of large scale wildfire would be lower in areas with a mosaic of timber harvest, prescribed burn units, or both reducing the likelihood of damage to infrastructure or death of livestock.

Resource	Effects from No Action	Effects from Modified Proposed Action
Noxious weeds and other invasive plants	Noxious weeds would continue to increase in coniferous forest stands with high tree mortality due to the increased amount of sunlight and water available for understory plants. Access to inventory and treat weeds in stands with many dead and downed trees would be difficult and dangerous.	Ground disturbance from mechanical vegetation treatments and prescribed burns would increase invasive plant species in the project area. Design features included in this project reduce that risk.
Hydrology and soils	No effects due to from the no-action alternative. Risk of large-scale, high-severity wildfires in the existing beetle-killed stand conditions could cause increased risk of runoff, erosion, changes to soil chemical, physical, and biological properties, and sedimentation.	Effects associated with this project that may reduce soil quality and lead to reduced soil functions in localized areas include: Compaction; Rutting and displacement; Severely burned soils; Degradation of the litter layer and soil organic matter caused by increased decomposition rates and lack of appropriate annual litter contributions; Lack of coarse woody debris; Possible invasive plant species incursions (see the botany specialist report for more details); Increased erosion and sediment in streams from 600 miles of temporary road within stream connected disturbed areas and from harvest units, landings, and skid trails as well as areas of prescribed burning. These negative effects to the soil and watershed resources would occur over the short term (2 to 7 years and 4 to 10 years) and be minimized through the implementation of soil and water resource protection measures (best management practices, wetness index ratings, and equivalent clearcut area thresholds). Soils with impaired or unsatisfactory condition are not expected to be further impaired by the proposed activities. Impacts to water resources will occur (for example, sedimentation from temporary road construction). The magnitude of these impacts is highly uncertain given the absence of spatial and temporal details of proposed treatments. To account for this limitation, the project has been designed to treat the maximum amount of acres possible in any watershed without exceeding the 25 percent equivalent clearcut area threshold established in the regional Watershed Conservation Practices Handbook (USDA Forest Service 2006). This analysis assumes observed trends from past best management practices effectiveness monitoring would be similar for this project's proposed management activities. Projections show that this alternative would result in water quality effects from 372 miles of temporary roads, 12,068 acres of mechanical treatment and 6,583 acres of fuel treatments.

Resource	Effects from No Action	Effects from Modified Proposed Action
Air quality and climate change	No effects through continuation of the existing condition	Thinning overstocked stands would increase forest resilience and decrease the potential for large-scale wildfire. The LaVA Project would not generate sufficient carbon emissions to meet the Council on Environmental Quality threshold for quantitative emissions analysis. The modified proposed action and project activities would be implemented within about 15 years. The amount of climate change that would occur over that period is within the natural weather disturbance that occur over a 15-year period, so there would be no measureable change to disclose in the draft environmental impact statement due to climate change. The effects of climate change would be realized in potential future vegetation management projects, which would be subject to future, site-specific environmental analyses and decisions.
Transportation	There would be no additional roads and, therefore, no direct effects to the existing transportation system. Indirect effects include fewer opportunities to provide additional maintenance, reconstruction, and road closings.	There would be no mid-term or long-term effect of temporary road construction on the existing transportation system. All temporary roads would be closed and reclaimed within three years after project implementation. Short-term effects on the existing transportation system could include traffic and congestion and temporary road closures during the project implementation phase.
Recreation	No effects from the no-action alternative. Recreation access in beetle-killed stands would worsen over time as dead or dying trees fall into a jackstrawed matrix. Because no open roads would be closed, the public would still have access to the areas they have typically used.	Nonmotorized recreationists who use the Medicine Bow National Forest around the Pelton Creek Trailhead would experience substantial, short-term impacts during project implementation. Motorized recreationists who ride trails that pass through proposed cutting units would also experience substantial short-term impacts. Both types of trail users would encounter effects of logging operations and vegetation treatment types including slash piles; technically created openings; and noise, dust, and traffic from heavy machinery and log trucks. Other short-term effects to recreationists would vary depending on the proximity of treatment units to the recreation activity and time of year. Recreational road and trail use may be temporarily affected by timber hauling, equipment access, and harvest activities.
Lands and special uses	Minimal to no direct, indirect, or cumulative effects to special use permits and easements.	Same as no action

Resource	Effects from No Action	Effects from Modified Proposed Action
Heritage resources	High tree mortality and subsequent tree fall could destroy cultural resources. Heavy fuel loads could increase the risk of a wildland fire destroying flammable or heat-sensitive cultural materials. A high-severity wildfire could increase erosion, resulting in the loss of context for archaeological material, the loss or alteration of surficial and subsurface archaeological features, and increased exposure of artifacts to vandals and collectors.	Low risk of direct or indirect impacts to cultural resources. Timber harvest and fuels treatment would decrease the potential for damage to sites from dead and dying trees. Treatments would avoid adversely affecting historic properties. New cultural resources would be protected until proper analysis could be conducted. Work in the vicinity of the discovery would cease until the findings were evaluated by a qualified archaeologist and proper protection measures are implemented. Some road closures would provide added protection to historic properties.
Scenery	Over the short term, the foreground and middle ground landscape would be dominated by standing beetle-killed trees which decrease scenic quality. Over the mid-term, fallen trees would dominate the landscape. Over the long term, scenic quality would improve from the existing condition.	Over the short term, numerous treated areas in the foreground of travelways and recreation sites would have low scenic quality. Scenic integrity would improve over time as understory vegetation obscures the appearance of timber salvage. Over the mid- and long term, scenic quality would increase as trees regenerate. Precommercial thinning would maintain a green, forested landscape and accelerate the maturity of stands providing an increase in scenic quality over the mid- and long term. Removal of homogenous areas of dead trees would enhance scenic quality over the mid- and long term. Temporary roads constructed to access units would be rehabilitated to a natural appearing landscape after completion of treatments to meet scenic integrity objectives.
Roadless characteristics	None of the nine Roadless Area Conservation Rule characteristics would be adversely affected. No change in the near future. However, there is a greater risk of a large, high-severity wildfire than with the proposed action. Wildfire could adversely affect soil productivity and water quality. Smoke could adversely affect air quality.	Similar to effects of the no-action alternative. Large-scale wildfire risk would be reduced through fuels treatments which could have positive effects on soil productivity as well as water and air quality over the mid or long term.

Resource	Effects from No Action	Effects from Modified Proposed Action
Socioeconomic consequences	No direct effects on the local economy (employment or labor income) would occur as a result of no action. However, economic consequences of inaction may include increased cost of managing wildfires and protecting values at risk from wildfires (water supplies, homes, businesses). Other costs could include damage to infrastructure from fallen hazard trees. Planned commercial timber harvests would continue to contribute to the local economy and provide a return of revenue to the Treasury or agency. Effects would not disproportionately affect low income and minority populations.	Displacement of forest visitors and seasonal homeowners due to smoke, risk of falling trees, and damage to infrastructure by large-scale wildfires would be less likely because the modified proposed action would decrease the number of standing beetle-killed trees and fuel buildup and it would include following community wildfire protection plans. Value would also be added by restoring ecosystem services. Planned commercial timber harvests would continue to contribute to the local economy and provide a return of revenue to the Treasury or agency. Effects would not disproportionately affect low-income and minority populations. Low-income individuals could benefit from new project-related economic opportunities in the analysis area.

Table 18. Comparison of watershed condition and trends impacts (by indicators) between the modified proposed action and the no-action alternative

Indicators	Alternative 1 – No Action	Alternative 2 – Modified Proposed Action[1]
Equivalent clearcut area	No additional equivalent clearcut area would occur beyond the existing condition.	To maintain functioning watersheds and avoid impairment of streams, all activities implemented under the modified proposed action would not exceed the 25 percent threshold for equivalent clearcut area at the 6th-level watershed scale.
Effectiveness of project design features and best management practices	No best management practices or project design features would be implemented under the no-action alternative.	Environmental impacts from the modified proposed action would be minimized through use of project design features and best management practices. These features would be monitored annually to document their effectiveness and management actions would be altered accordingly during the adaptive management process on a treatment-specific basis.

Table 19. Comparison of impacts to wildlife habitat, including threatened, endangered, sensitive species habitat (by indicators) between the modified proposed action and the no-action alternative

Indicators	Alternative 1 – No Action	Alternative 2 – Modified Proposed Action[1]
Habitat improvement and wildlife security areas (acres)	No additional acres of wildlife habitat improvement or security areas would be restored.	Habitat improvement – see table 17. There would a short-term effect on up to 51,700 acres of wildlife security until stands regenerate after treatment. In the mid to long term, wildlife security areas would likely increase in acres by accelerating growth and density of conifers in beetle-killed stands. Stand-initiation treatments would accelerate growth of the understory and provide additional wildlife hiding cover over time. Thinning treatments could potentially reduce hiding cover and affect wildlife security in some areas.
Southern Rockies Lynx Amendment criteria - Unsuitable habitat (percent treated) - Suitable habitat (percent treated) - Precommercial thinning (acres treated) - Wildland-urban interface treatments (acres) - Multi-story mature stands (acres treated)	No additional habitat restoration treatments to move toward suitability for Canada lynx or prey species.	Canada lynx habitat: In the mid-term and long term, vegetation treatments in the LaVA project area would create additional areas of suitable habitat. Lynx analysis units which are over the 30 percent unsuitable habitat threshold would move toward Southern Rockies Lynx Amendment standards and guidelines. Dense horizontal cover in early succession conifer would be accelerated through stand initiation in stands with heavy tree mortality.

Table 20. Comparison of impacts to major vegetation types (by indicators) between the modified proposed action and the no-action alternative

Indicators	Alternative 1 – No Action	Alternative 2 – Modified Proposed Action[1]
Cover type and structural stages of vegetation, including shrubland, grassland, and forest (including aspen), vegetation	Vegetation cover types and structural stages would be subject to natural processes under the existing condition. The major change in cover type in conifer stands affected by the bark beetle epidemic is early succession of spruce/fir and even-aged stands of lodgepole pine. Aspen stands would continue to decline. The forest would remain less resilient to future insect and disease epidemics.	The proposed action would move forested vegetation toward the forest plan desired conditions which include a diversity of structural stages and cover types including lodgepole pine, spruce/fir, ponderosa pine, and aspen cover (forest plan, table 1-4, page 1-22).
Ecological site conditions	No change from the existing condition beyond that of natural processes.	Short-term effects to air and water quality are likely to occur during implementation and diminish over time.

Indicators	Alternative 1 – No Action	Alternative 2 – Modified Proposed Action[1]
Size class and age class	Size classes and cover types would be subject to natural processes under the existing condition. Regenerating stands would likely stagnate under conditions of continued fire suppression. Even-aged stands would regenerate in areas of heavy tree mortality and lack diversity and resilience to future insect and disease epidemics.	The proposed action would provide diversity in size and age classes through even-aged and uneven-aged vegetation treatments. This diversity would increase resilience to future insect and disease epidemics and regeneration treatments would accelerate growth and maturity in increase diversity over time.

Table 21. Comparison of impacts to temporary road construction between the modified proposed action and the no action alternative

Indicators	Alternative 1 – No Action	Alternative 2 – Modified Proposed Action[1]
Miles constructed annually and cumulatively	NA	Temporary road construction will be tracked over the life of the project through pre-implementation and project implementation checklists (see appendix A, attachments 1 and 5, respectively).
Miles rehabilitated annually and cumulatively	NA	Same as above

Table 22. Comparison of impacts to recreation (by indicators) between the modified proposed action and the no-action alternative

Indicators	Alternative 1 – No Action	Alternative 2 – Modified Proposed Action[1]
Hunter satisfaction (Wyoming Game and Fish Department survey information)	Minimal or no impact to hunter satisfaction	Over time, hunter satisfaction should improve as a result of hazard tree removal activities and removal of jackstrawed vegetation.
Hunting accessibility	Lack of accessibility in some hunting areas due to jackstrawed lodgepole pine stands	Accessibility would be negatively impacted in site-specific areas for short periods of time, but an overall improvement to access would be realized over the long-term with the proposed vegetation treatments.
Trail safety and condition	Under the existing condition, trail safety and condition improvements would be limited to maintenance activities.	Under the modified proposed action, trail safety and conditions would be improved by removal of adjacent jackstrawed dead and down conifers and cutting of overhead beetle-killed trees. The proposed vegetation treatments could reduce the maintenance needs for annual tree removal on some trails and reduce the backlog of hazard tree removal needs along trails.

Table 23. Comparison of impacts to inventoried roadless areas (by indicators) between the modified proposed action and the no-action alternative

Indicators	Alternative 1 – No Action	Alternative 2 – Modified Proposed Action[1]
Acres proposed for treatment	No change	Roughly 125,200 acres of inventoried roadless areas have been identified as potential treatment opportunity areas out of a total of 230,240 acres of inventoried roadless areas within the LaVA project area. Projects in inventoried roadless areas will be tracked and monitored over the life of the LaVA project.
Proposed treatment types	No change	See table 14, table 15, and table 16 for proposed vegetation treatment options. Treatment caps would be tracked and monitored over the life of the LaVA project.
Anticipated effects	See table 17	See table 17

Chapter 3. Affected Environment and Environmental Consequences

Chapter Summary

The LaVA project area coincides with the Secretary of Agriculture, Chief of the Forest Service, and the Governor of Wyoming priority landscapes for treatment of insects and diseases identified under the Healthy Forests Restoration Act. In the Snowy Range and Sierra Madre Mountains, impacts of the bark beetle epidemic have changed forested cover types as well as diversity and structural stages of forest vegetation. High levels of tree mortality have caused departures from forest plan desired conditions for lodgepole pine and mixed conifer settings for timber management, wildlife habitats, recreation, and other multiple uses.

Forest plan objectives and forest conditions are not uniform across the project area. Therefore, the interdisciplinary team used accounting units to describe similar values in the fourteen landscapes across the mountain ranges. Each accounting unit is based on analysis units for Canada lynx and a logical composite of 7th-level watersheds originating on the Medicine Bow National Forest. This scale is useful for tracking how implementation moves resource conditions toward or away from forest plan desired conditions reflected by the purpose and need. A detailed description of affected environment and analysis of direct, indirect, and cumulative effects is provided in each specialist report located in the project file.

Introduction

This chapter begins by outlining analysis assumptions, explaining the rationale behind accounting units, and providing a discussion of the affected environment at the accounting unit scale. Each resource section provides the affected environment and environmental consequences of the alternatives on the biological, physical, and social environment. Direct and indirect effects of the no-action alternative and the modified proposed action were analyzed over the planning period (1 to 15 years). Project design features have been incorporated into the modified proposed action to minimize environmental consequences of project implementation (appendix A – attachment 3).

Cumulative effects take into account past, present, and reasonably foreseeable activities from other actions combined with direct and indirect effects of the LaVA Project. The area analyzed for cumulative effects is the LaVA project area for all resources unless otherwise noted. Cumulative effects are disclosed under each resource topic.

Analysis Assumptions

The following analysis assumptions were developed to ensure consistent effects analyses by Forest Service resource specialists.

- No more than 360,000 acres would be treated over the life of the LaVA Project; treatments would occur only in the pre-established treatment opportunity areas.
- Project implementation would occur year-round.
- Individual treatments would not be implemented until pre-implementation and project implementation checklists have been completed and a responsible official has authorized the treatment.
- Forest plan standards would be followed (USDA Forest Service 2003a).
- Deviations from forest plan guidelines are allowed. The effects of guideline deviations must be documented in this environmental impact statement and rationale for their authorization must be documented in the LaVA record of decision.
- Watershed conservation practices (Forest Service Handbook 2509.25) w be followed (USDA Forest Service 2006a)
- National best management practices for water quality management on National Forest System lands, volume 1: national core best management practices technical guide (FS-990a) would be followed (USDA Forest Service 2012c)
- Project design and implementation would comply with applicable State and Federal laws.
- All temporary roads associated with project implementation would be reclaimed within 3 years of project completion, unless the interdisciplinary team recommends, and a line officer decides, complete obliteration would cause more damage than a less complete technique.
- System roads will be used whenever possible to avoid the need for temporary road construction. Project implementation will use the minimum amount of temporary road construction necessary to achieve resource objectives.
- Level one roads may be used to access treatment areas. These roads will be closed and returned to level one status after treatments are complete.
- Existing man-made and natural features will be used, whenever possible, instead of building additional control lines for prescribed fire.
- Vegetation treatments may occur in the water influence zone in wildland urban-interface areas. If necessary, specific design features would be developed at the time of implementation to ensure protection of area resources.
- Sedimentation is the water quality impairment most likely to result from the proposed activities. Roads, especially those close to water, are the dominant vector for sediment delivery to stream channels or wetland and fen resources.
- Equivalent clearcut area has been modeled at the 6^{th}-level watershed scale and may not exceed 25 percent per watershed.

Basis for Accounting Units

Resource specialists describe conditions and conduct analysis at different scales: airsheds, viewsheds, and watersheds, for example. However, describing effects for the LaVA project area using a mixture of scales would be confusing and difficult.

The interdisciplinary team considered the scales at which the Forest Service consults with, and reports to, other agencies and organizations when determining an appropriate scale for reporting the effects of the modified proposed action to resources. Accounting units for the LaVA analysis were developed by overlaying lynx analysis units with 7th-level watershed boundaries. Accounting unit boundaries required only minor mapping adjustments to address locations where these boundaries did not coincide. Fourteen accounting units (figure 10) form the basis for disclosure of existing conditions, affected resources, and the environmental consequences in this chapter. Table 24 and table 25 provide an overview of the accounting units.

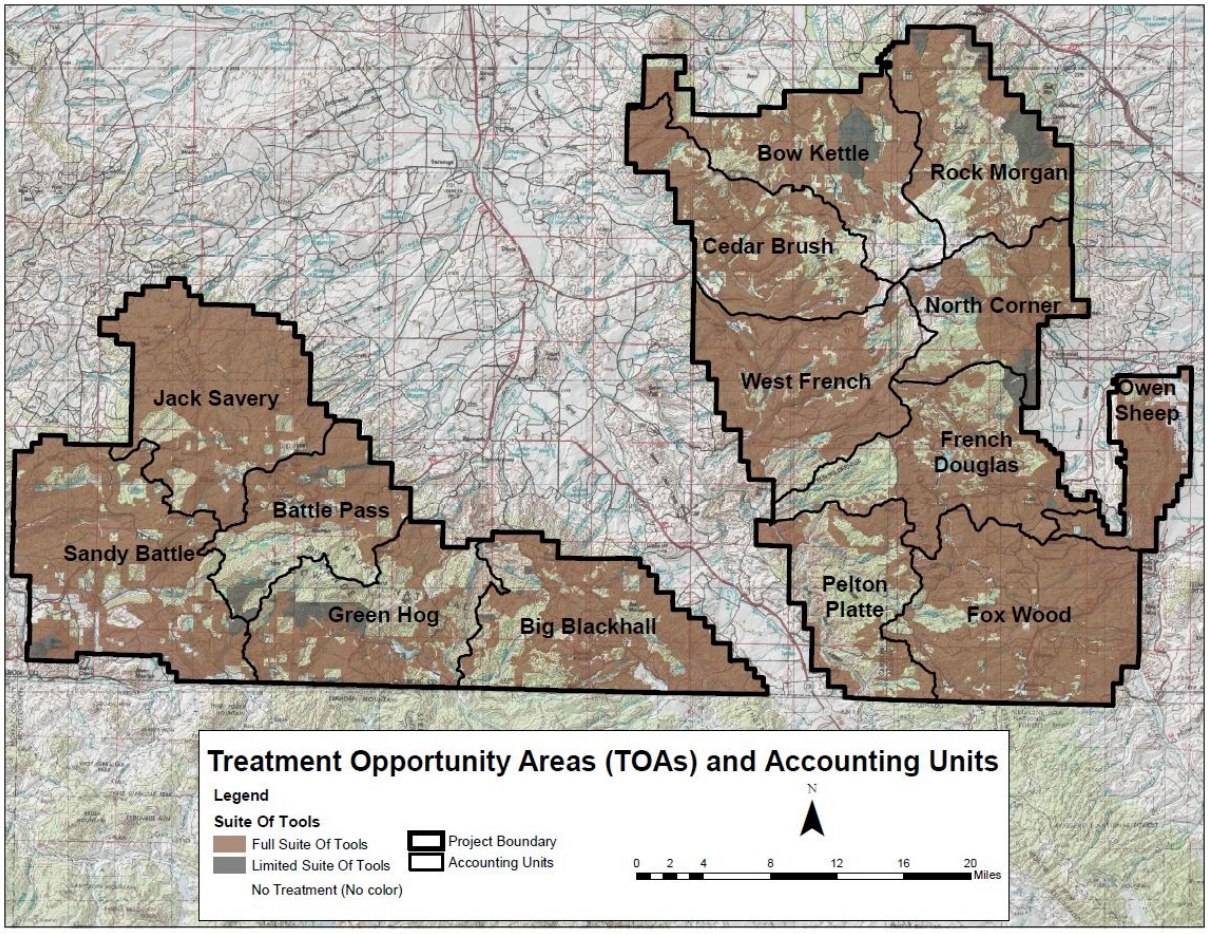

Figure 10. Treatment opportunity areas and accounting units in the LaVA project area

Accounting Units in the Snowy Range

There are nine accounting units in the Snowy Range: Rock Morgan, Bow Kettle, Cedar Brush, North Corner, West French, French Douglas, Owen Sheep, Pelton Platte, and Fox Wood.

Rock Morgan

The Rock Morgan accounting unit is 60,712 acres of National Forest System lands, the majority of which is located on the Laramie Ranger District in Carbon County. The accounting unit contains 28,840 acres of full-suite treatment opportunity areas; 7,778 acres of limited-suite treatment opportunity areas; and 24,841 acres of no-treatment areas.

Lands of other ownership include State trust lands south of Coyote Hill, private lands near the community of Morgan, and other isolated private inholdings near White Rock. Carbon County identified Morgan, Sand Lake, Wood Edge, White Ranch Cabins, and White Rock Estates as communities at risk and wildland-urban interface areas.

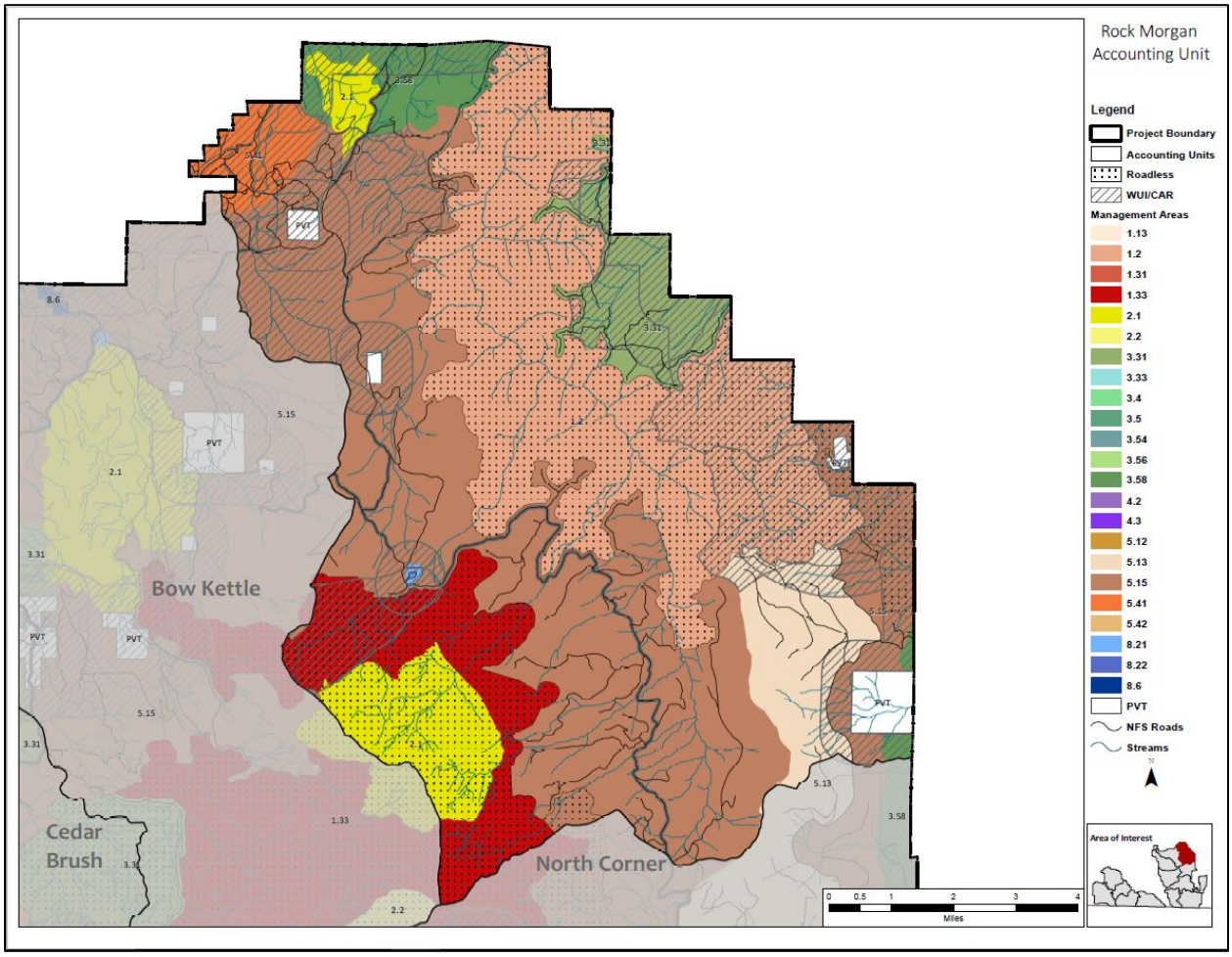

Figure 11. Rock Morgan accounting unit

The Rock Morgan accounting unit includes the Morgan lynx analysis unit and watersheds tributary to Rock Creek, the Medicine Bow River, and smaller drainages along the eastern face of the Snowy Range. The Rock Creek National Recreation Trail traverses the area from north to south along Rock Creek, the major stream in the accounting unit.

The predominant management areas in the accounting unit are 5.13 Forest Products Emphasis and 5.15 Ecological Restoration. Management Areas 1.33, 3.31, 3.58 and 5.41 are also represented. The Rock Creek Inventoried Roadless Area and Management Area 1.2 (recommended for wilderness) make up approximately 5,611 acres of the area. The Ribbon Forest and White Rock Canyon Special Interest Areas are represented in this accounting unit.

Bow Kettle

The Bow Kettle accounting unit is at the extreme northern end of the Snowy Range. It is made up of 59,455 acres of National Forest System lands in Carbon County. The accounting unit is located on the Brush Creek/Hayden Ranger District and contains 36,849 acres of full-suite treatment opportunity areas; 5,080 acres of limited-suite treatment opportunity areas; and 17,526 acres of no-treatment areas.

Lands of other ownership include State trust and wildlife lands and isolated private inholdings along the Medicine Bow National Forest boundary and throughout the accounting unit. Carbon County identified Cherokee Trails and Overlook-Turpin as communities at risk and wildland-urban interface areas.

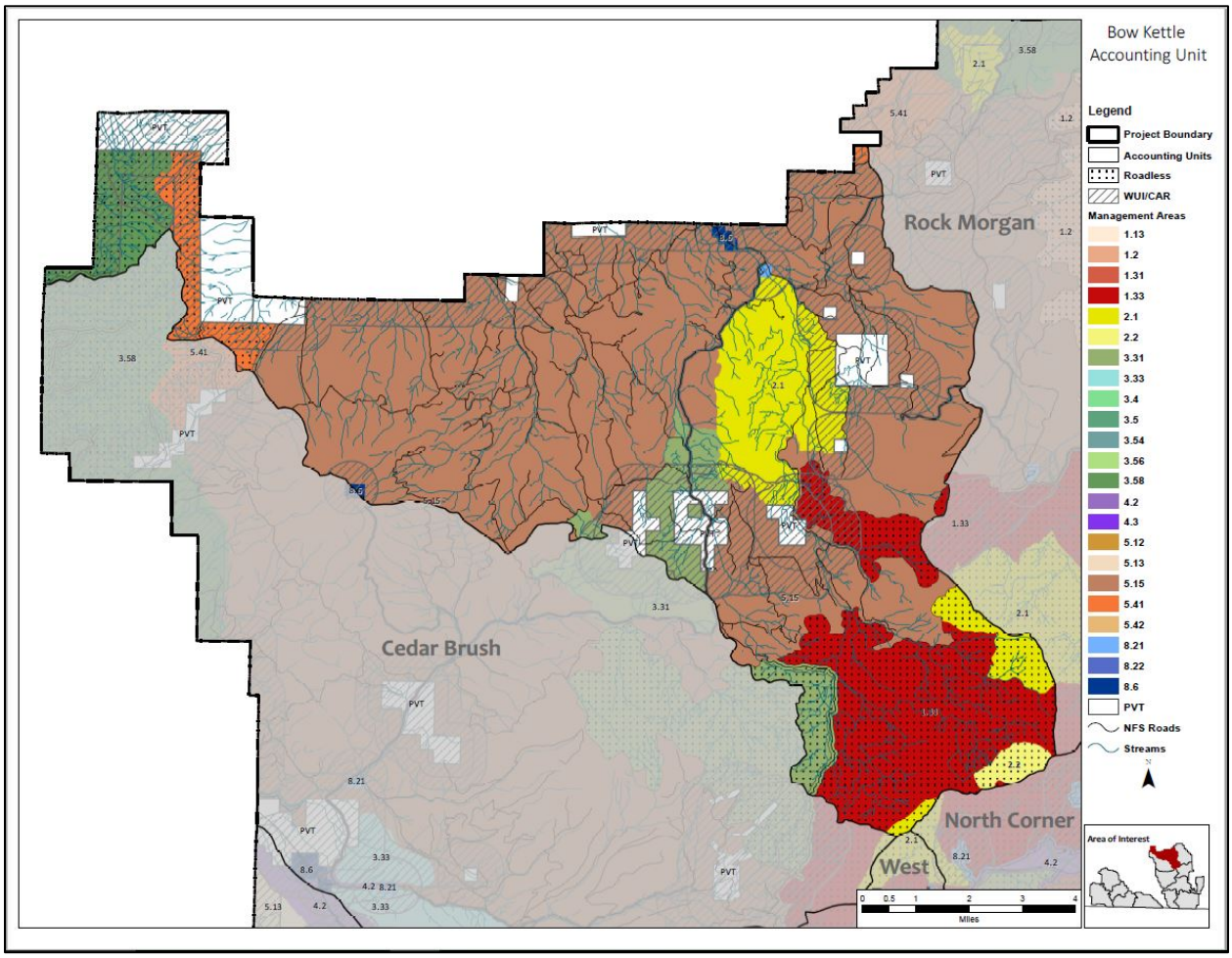

Figure 12. Bow Kettle accounting unit

The Bow Kettle accounting unit includes the Kettle Ponds lynx analysis unit and watersheds tributary to the Medicine Bow River and Pass Creek. The Kettle Ponds Special Interest Area highlights distinctive glacial features. Brown's Peak Research Natural Area is located at high elevations at the southeast corner of the unit.

The predominant management areas are 5.15 Ecological Restoration and 2.1 Special Interest Areas. Management Areas 1.33, 3.31, 3.58, 5.41, 8.21 and 8.6 are also represented. The Snowy Range Inventoried Roadless Area and small parts of the Medicine Bow Peak and Ribbon Forest Inventoried Roadless Areas are a part of the unit.

Cedar Brush

The Cedar Brush accounting unit is in the northwest edge of the Snowy Range. It is made up of 57,725 acres of National Forest System lands in Carbon County. The accounting unit is located on the Brush Creek/Hayden Ranger District and contains 43,064 acres of full-suite treatment opportunity areas; 1,132 acres of limited-suite treatment opportunity areas; and 13,527 acres of no-treatment areas.

Lands of other ownership include State trust lands and private inholdings along the Medicine Bow National Forest boundary and in the vicinity of Mullison Creek. Carbon County identified Gold Hill, Mullison Park cabins and Tenmile as communities at risk and wildland-urban interface areas.

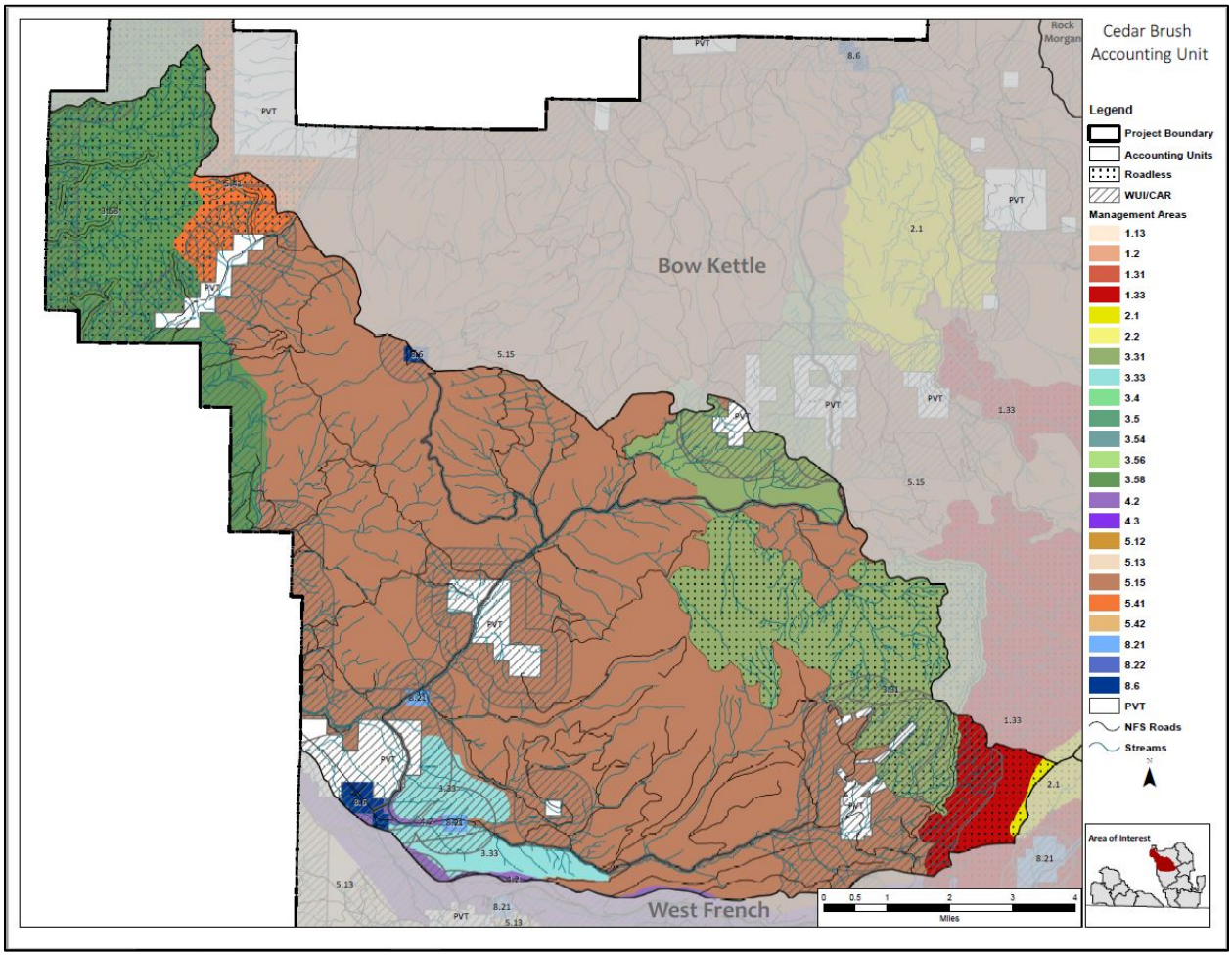

Figure 13. Cedar Brush accounting unit

The Cedar Brush accounting unit includes the Brush Creek lynx analysis unit and watersheds tributary to Cedar Creek. The predominant management areas are 5.15 Ecological Restoration and 3.58 Crucial Deer and Elk Winter Range. Management Areas 1.33, 3.31, 3.33, 4.2, 5.41 and 8.6 are also represented. The Pennock Mountain and Campbell Lake Inventoried Roadless Areas and small parts of the Snowy Range Inventoried Roadless Area are in the unit.

North Corner

The North Corner accounting unit is at the eastern edge of the Snowy Range above the Centennial Valley. It is made up of 44,908 acres of National Forest System lands in Albany County. The accounting unit is located on the Laramie Ranger District and contains 21,880 acres of full-suite treatment opportunity areas; 7,904 acres of limited-suite treatment opportunity areas; and 15,125 acres of no-treatment areas.

Lands of other ownership include limited patented mining claims primarily along Centennial Ridge. Albany County identified Aspen Country, Rainbow Valley and Lower Libby, and Towner Lake and Snowy Range Lodge as communities at risk and wildland-urban interface areas. There are numerous Forest Service and privately owned developments and structures (see table 24).

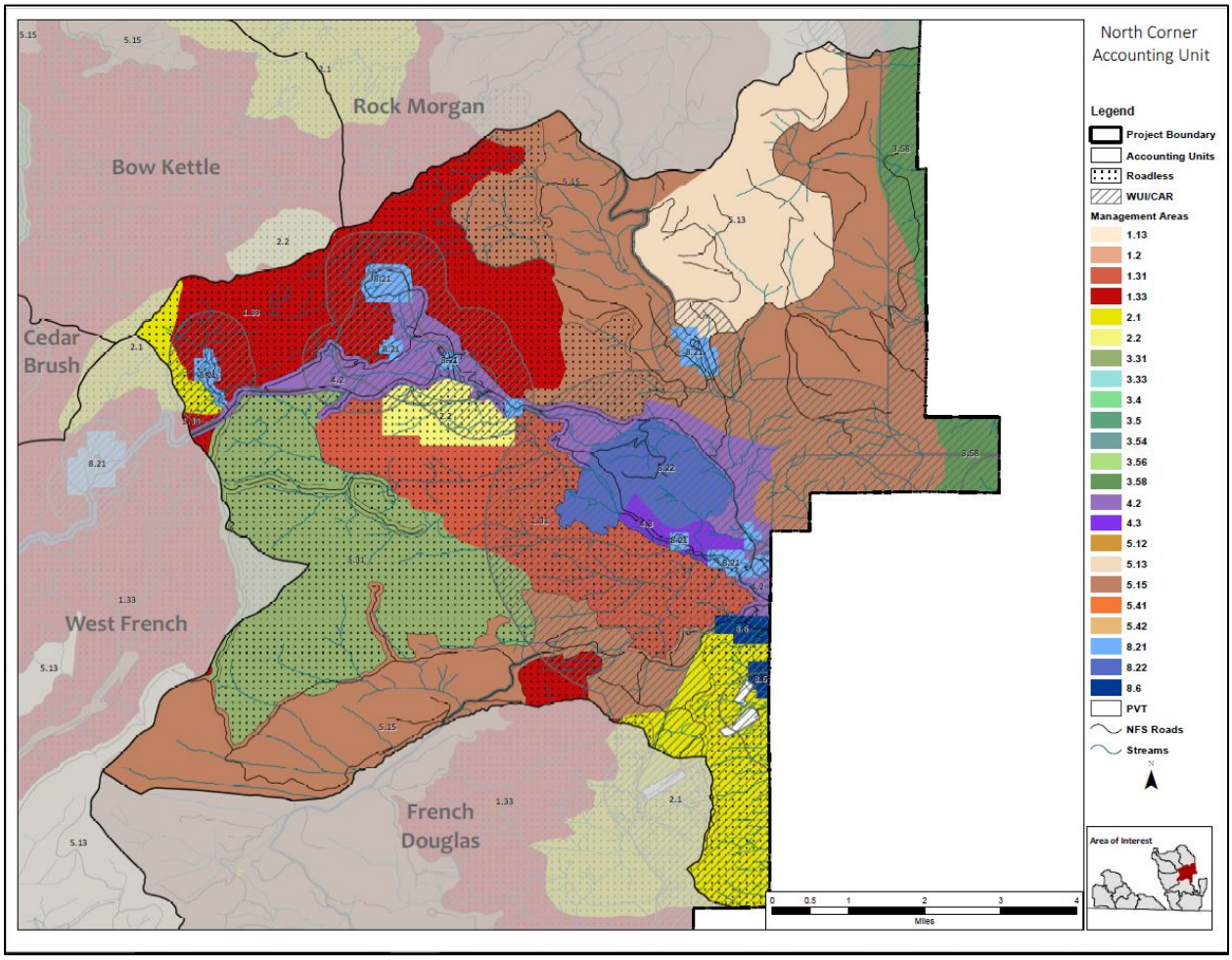

Figure 14. North Corner accounting unit

The North Corner accounting unit includes the Snowy Range East lynx analysis unit and watersheds tributary to the North Fork of the Little Laramie River. The Centennial Ridge Special Interest Area highlights the mining history of this area, and the Snowy Range Research Natural Area is located in the unit. The Snowy Range Scenic Byway enters the Medicine Bow National Forest at Centennial Visitor Center.

The predominant management areas are 5.15 Ecological Restoration and 5.13 Forest Products. Management Areas 1.33, 3.31, 4.2, 4.3, 3.58, 5.41, 8.21 and 8.6 are also represented. The Libby Flats and Snowy Range Inventoried Roadless Areas and a small portion of the Middle Fork Inventoried Roadless Area are in the unit.

French Douglas

French Douglas is centered on Rob Roy Reservoir in the Snowy Range. It is made up of 63,119 acres of National Forest System lands in Albany and Carbon Counties. The accounting unit is located on the Laramie Ranger District and contains 38,389 acres of full-suite treatment opportunity areas; 2,203 acres of limited-suite treatment opportunity areas; and 22,526 acres of no-treatment areas.

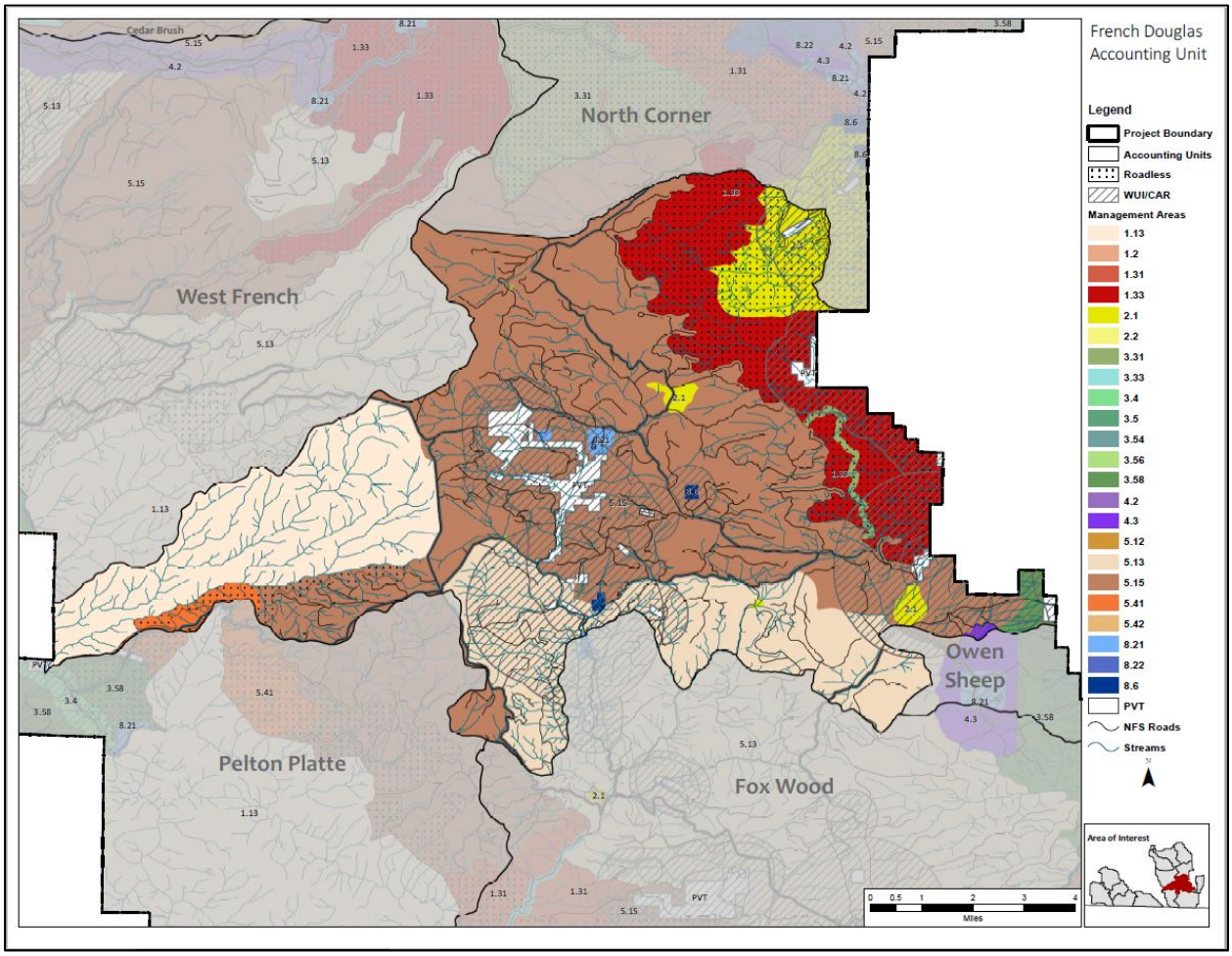

Figure 15. French Douglas accounting unit

Lands of other ownership include numerous patented mining claims associated with placer-mined drainages and hardrock claims. Albany County identified Albany and the greater Keystone area as communities at risk and wildland-urban interface areas. There are numerous Forest Service and privately owned developments and structures in this accounting unit. The Keystone Fire burned areas west and south of Rob Roy Reservoir in 2017.

The French Douglas accounting unit includes the Douglas Creek lynx analysis unit and watersheds tributary to Douglas Creek and the North Platte River. A few drainages, tributary to the Little Laramie River, flow from the eastern margin of the accounting unit. The Douglas Creek, Horse, Creek and Muddy Park Tie Hack Special Interest Areas highlight the railroad tie-hacking history of this area. Cinnabar Park and Hidden Gardens Special Interest Areas highlight distinctive natural features.

The predominant management areas are 5.15 Ecological Restoration and 5.13 Forest Products. Management Areas 1.33, 3.31, 3.4, 4.3, 3.58, 5.41, 8.21 and 8.6 are also represented. The Middle Fork Inventoried Roadless Area and several parcels of the Savage Run Addition Inventoried Roadless Area are part of the unit.

Owen Sheep

The Owen Sheep accounting unit encompasses Sheep Mountain and a limited number of adjacent lands on the eastern and southern end of the Centennial Valley. It is made up of 22,535 acres of National Forest System lands in Albany County. The accounting unit is located on the Laramie Ranger District and contains 22,535 acres of full-suite treatment opportunity areas; 0 acres of limited-suite treatment opportunity areas; and 0 acres of no-treatment areas.

Lands of other ownership include State trust and wildlife lands and private lands near Fox Creek. Albany County identified Fox Creek and Woods Landing as communities at risk and wildland-urban interface areas. The Squirrel Creek Fire burned through the southern portion of the accounting unit in 2012.

Small streams draining Sheep Mountain flow into Fox Creek, the Little Laramie River, and Lake Hattie. The southernmost edge of the unit is included in a lynx connectivity unit, but none is in a lynx analysis unit.

The Sheep Mountain Game Reserve was added to the Medicine Bow National Forest by presidential proclamation in 1924. The predominant management areas are 3.54 Sheep Mountain Special Wildlife Area and 5.41 Deer and Elk Winter Range. Management Area 8.21 is designated around Lake Owen. The Sheep Mountain Inventoried Roadless Area makes up the majority of the accounting unit.

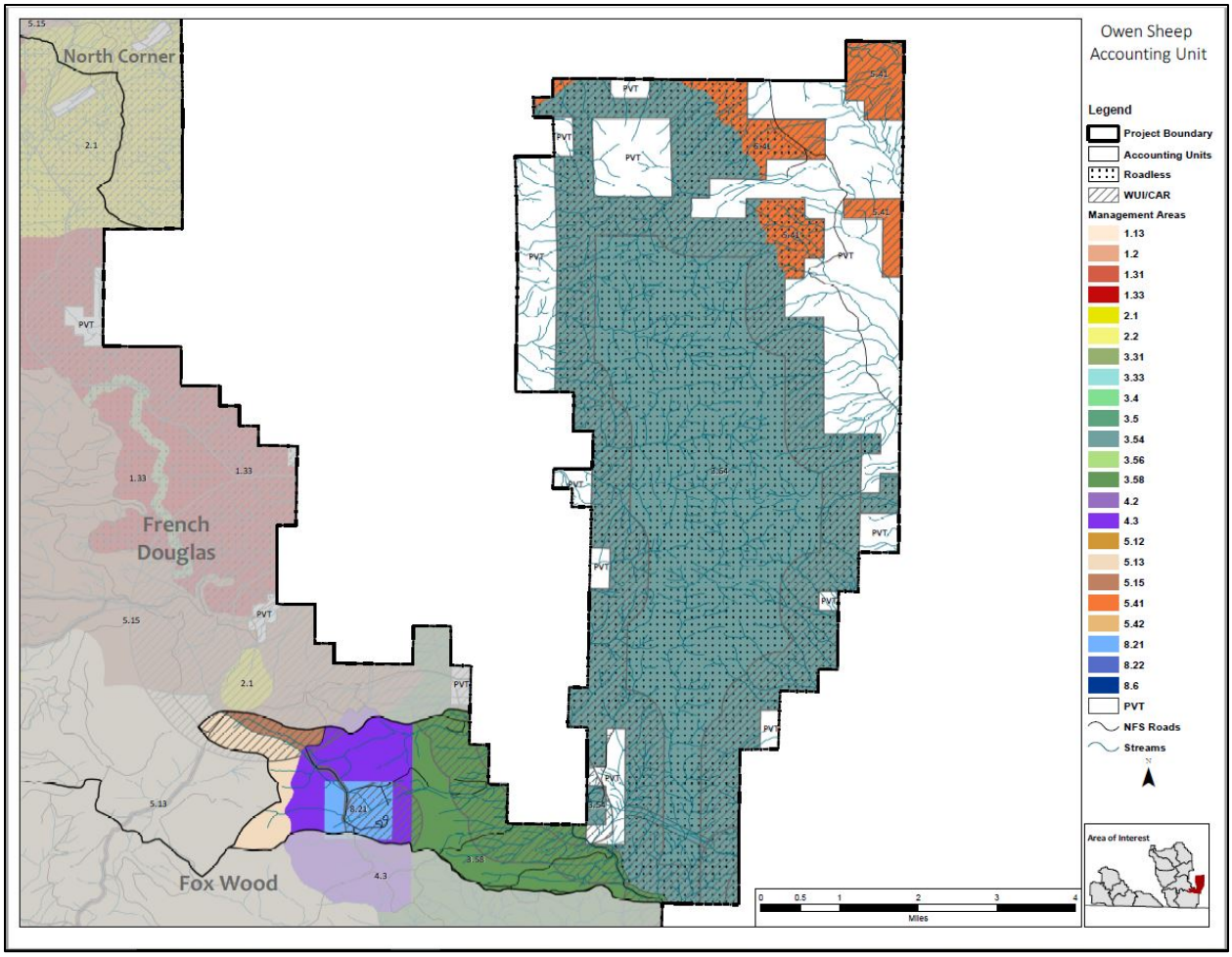

Figure 16. Owen Sheep accounting unit

West French

West French occupies the west slope of the Snowy Range in the Barrett Creek and French Creek watersheds. It is made up of 68,869 acres of National Forest System lands in Albany and Carbon Counties. The accounting unit is located on the Brush Creek/Hayden Ranger District and contains 50,882 acres of full-suite treatment opportunity areas; 678 acres of limited-suite treatment opportunity areas; and 17,308 acres of no-treatment areas.

Lands of other ownership include primarily private ranch and residential lands near Ryan Park and French Creek. Carbon County identified French Creek Ranch, Ryan Park, and Tenmile as communities at risk and wildland-urban interface areas. The Snowy Range Scenic Byway traverses this unit past many of the Snowy Range recreation areas and facilities.

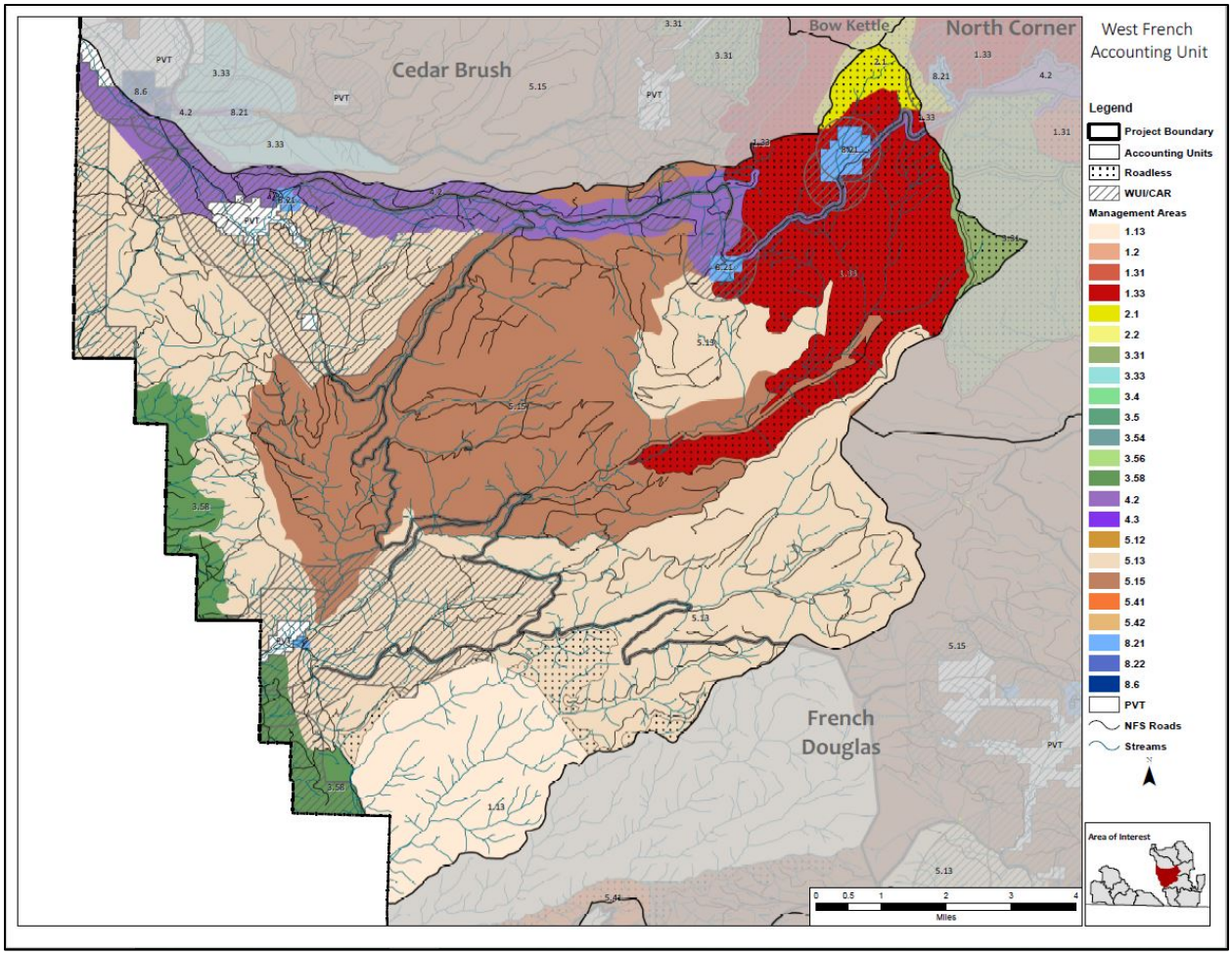

Figure 17. West French accounting unit

The West French unit includes the French Creek lynx analysis unit. French Creek and Barrett Creek provide water for agricultural use and fisheries.

The predominant management areas are 5.13 Forest Products and 5.15 Ecological Restoration. Management areas 1.33, 3.31, 3.33, 4.2, 3.58, 8.21, and 8.6 are also represented. A small part of the Medicine Bow Peak Special Interest Area is in the northeast portion of the unit. Parts of the French Creek and Savage Run Addition Inventoried Roadless Areas are in this accounting unit.

Pelton Platte

Pelton Platte occupies the southwest portion of the Snowy Range including Pelton Creek and the Platte River Wilderness. It is made up of 48,969 acres of National Forest System lands in Albany and Carbon Counties. The accounting unit is located on the Laramie Ranger District and contains 17,493 acres of full-suite treatment opportunity areas; 2,077 acres of limited-suite treatment opportunity areas; and 29,399 acres of no-treatment areas.

Lands of other ownership include homestead and patent lands near the A-A Ranch and Boat Creek. The counties did not identify communities at risk and wildland-urban interface areas.

This accounting unit is not included in a lynx analysis unit, but portions are included in a lynx connectivity unit that links habitat areas in Colorado and Wyoming between the Sierra Madre and Snowy Range Mountains. The North Platte River is a designated wild and scenic river and blue-ribbon trout fishery.

The predominant management areas are 1.13 Wilderness and 3.58 Crucial Deer and Elk Winter Range. Management areas 3.4, 5.41, 5.15, and 8.21 are also represented. The Platte Canyon Research Natural Area is located within the wilderness boundary. The Savage Run Addition and Platte River Addition Inventoried Roadless Areas are in this unit.

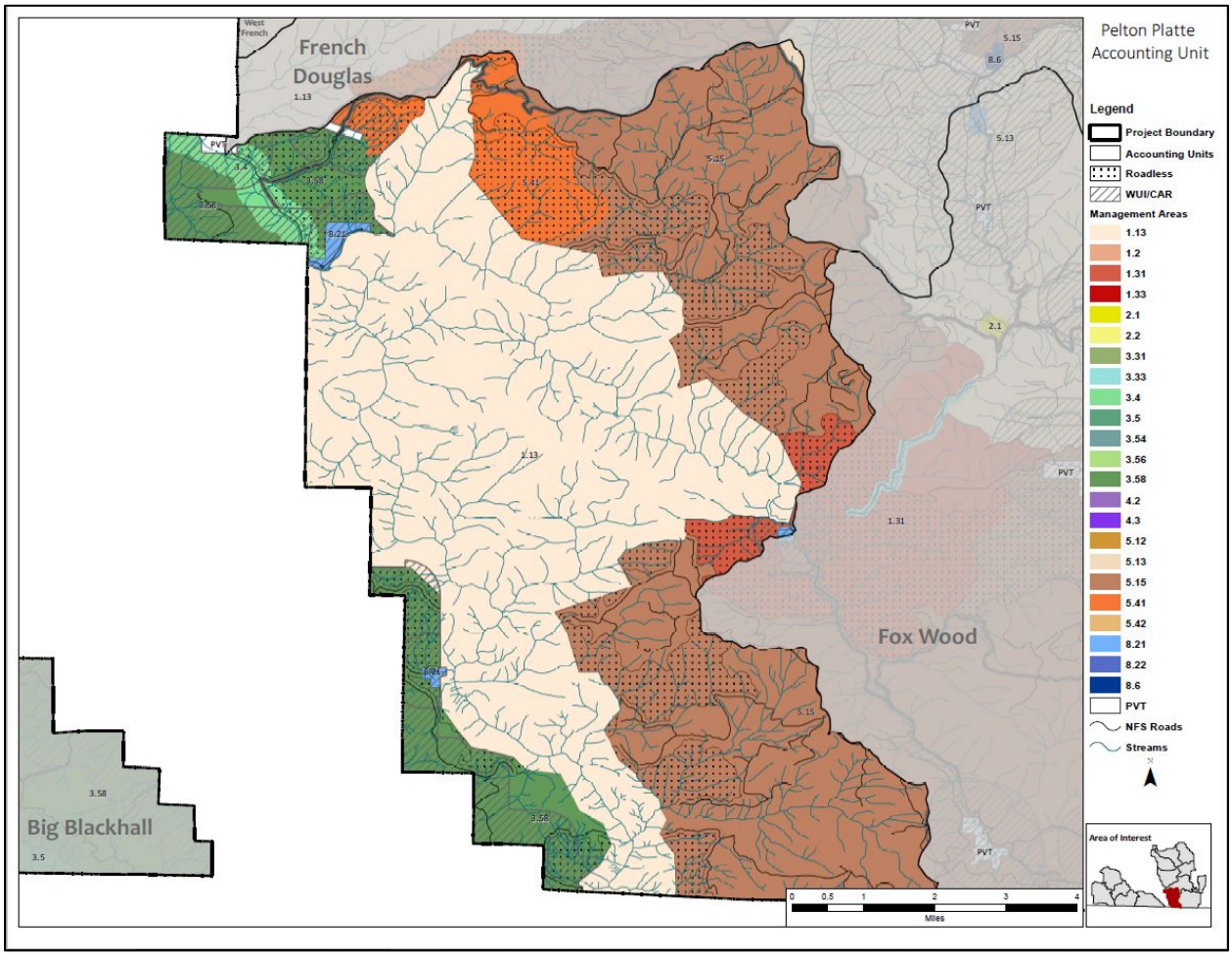

Figure 18. Pelton Platte accounting unit

Fox Wood

The Fox Wood accounting unit occupies the southeast flank of the Snowy Range adjacent to the Colorado border in the Boswell Creek and Woods Creek watersheds. It is made up of 82,585 acres of National Forest System lands, primarily in Albany County. The accounting unit is located on the Laramie Ranger District and contains 76,675 acres of full-suite treatment opportunity areas; 160 acres of limited-suite treatment opportunity areas; and 5,750 acres of no-treatment areas.

Lands of other ownership include primarily patented lands near the historical logging and mining communities. Albany County identified Woods Landing, WyColo and Fox Park, greater Keystone area, Foxborough and Valhalla, Porter Creek, and Lake Creek as communities at risk and wildland-urban interface areas.

The unit is not included in a lynx analysis unit, but portions are included in a lynx connectivity unit that links habitat areas in Colorado and Wyoming between the Sierra Madre and Snowy Range Mountains.

The predominant management areas are 5.13 Forest Products, 5.15 Ecological Restoration, and 3.58, Crucial Deer and Elk Winter Range. Management Areas 1.31, 4.3, 8.21 and 8.6 are also represented in the unit. The Illinois Creek and Platte River Addition Inventoried Roadless Areas are in this accounting unit.

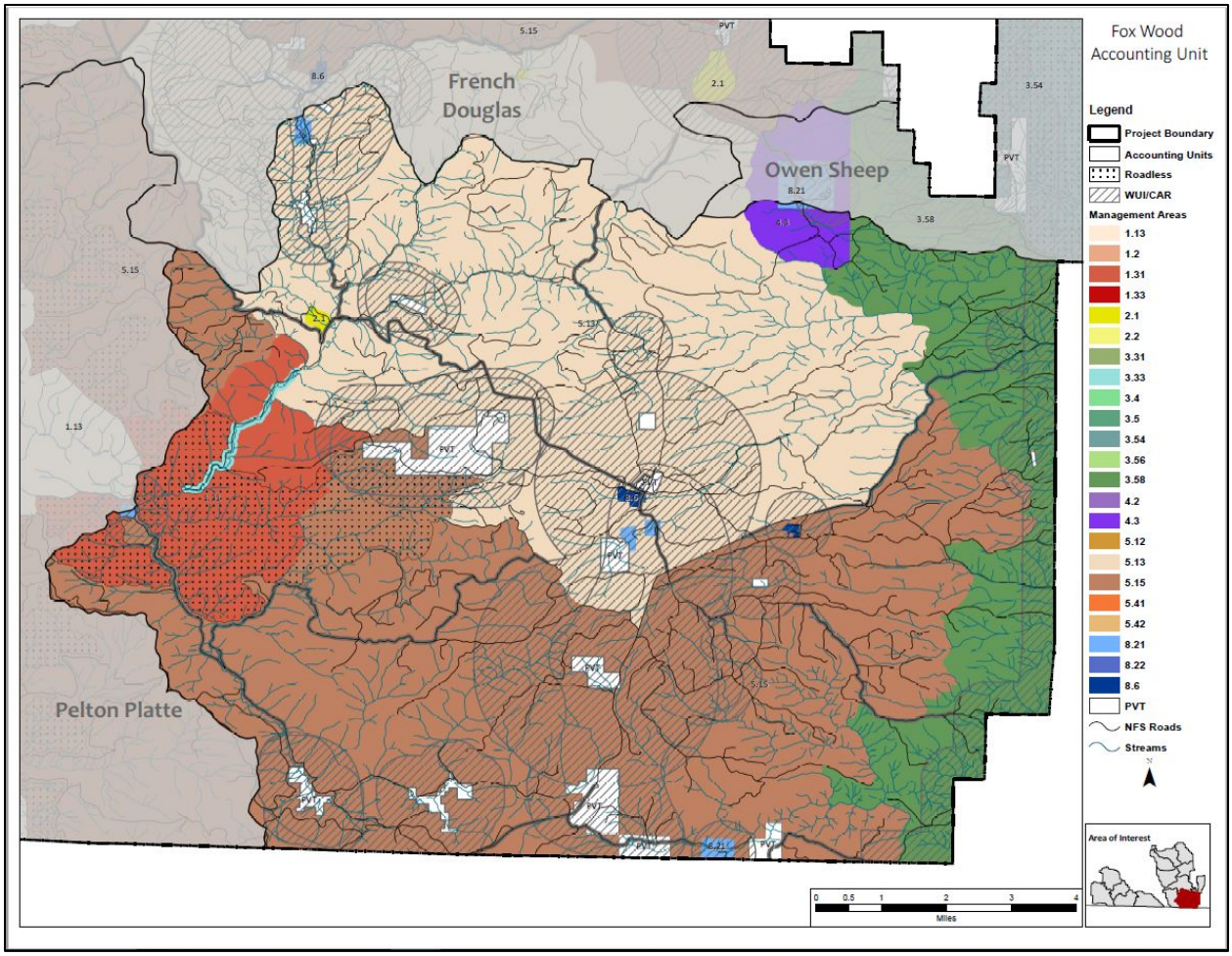

Figure 19. Fox Wood accounting unit

Accounting Units in the Sierra Madre

There are five accounting units in the Sierra Madre: Battle Pass, Green Hog, Big Blackhall, Sandy Battle, and Jack Savery.

Battle Pass

The Battle Pass accounting unit occupies the eastern flank of the Sierra Madres above the community of Encampment. It is made up of 44,551 acres of National Forest System lands, in Carbon County. The accounting unit is located on the Brush Creek/Hayden Ranger District and contains 21,290 acres of full-suite treatment opportunity areas; 5,528 acres of limited-suite treatment opportunity areas; and 17,533 acres of no-treatment areas.

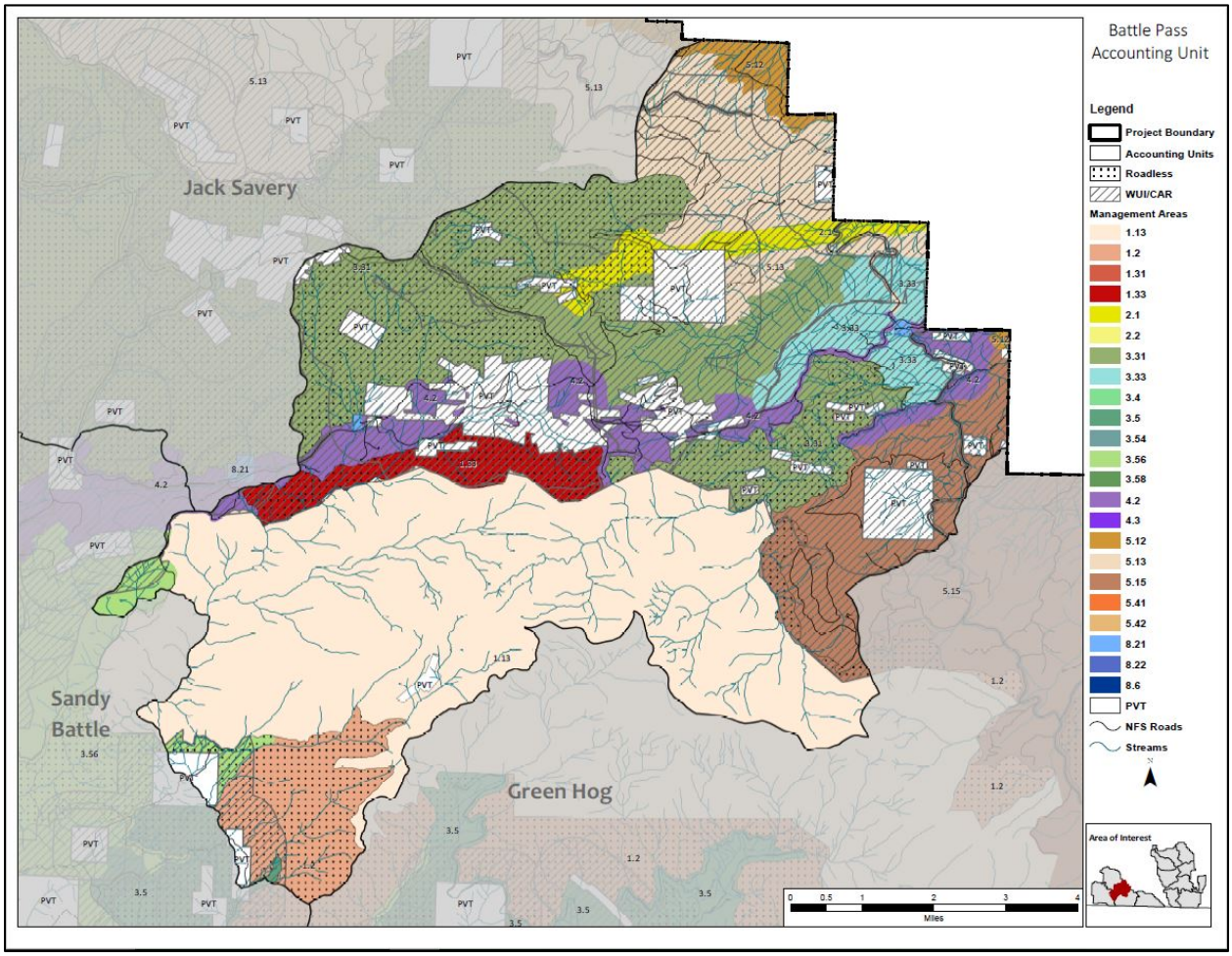

Figure 20. Battle Pass accounting unit

Lands of other ownership include State trust lands and a large number of patented mining claims near the Battle town site. Carbon County identified the Encampment municipal watershed, Battle Lake Rambler, Ferris-Haggerty, and Sierra Madre subdivision as communities at risk and wildland-urban interface areas.

This accounting unit includes the Battle Creek lynx analysis unit. The Battle Pass Scenic Highway traverses the area.

The predominant management areas are 1.33 Nonmotorized and 3.31 Motorized Backcountry Recreation. Management areas 3.33, 4.2, 5.12, 5.13, 5.41, 5.15, and 8.21 are also represented. The Tramway Trail Special Interest Area highlights this feature from the copper mining boom. The Bridger Peak, Little Snake, Mowry Peak, and Huston Park Addition Inventoried Roadless Areas are located partially in this unit.

Green Hog

The Green Hog accounting unit occupies the central Sierra Madre Mountains from the Colorado border to the town of Riverside. It is made up of 61,915 acres of National Forest System lands in Carbon County. The accounting unit is located on the Brush Creek/Hayden Ranger District and contains 29,885 acres of full-suite treatment opportunity areas; 4,333 acres of limited-suite treatment opportunity areas; and 27,697 acres of no-treatment areas.

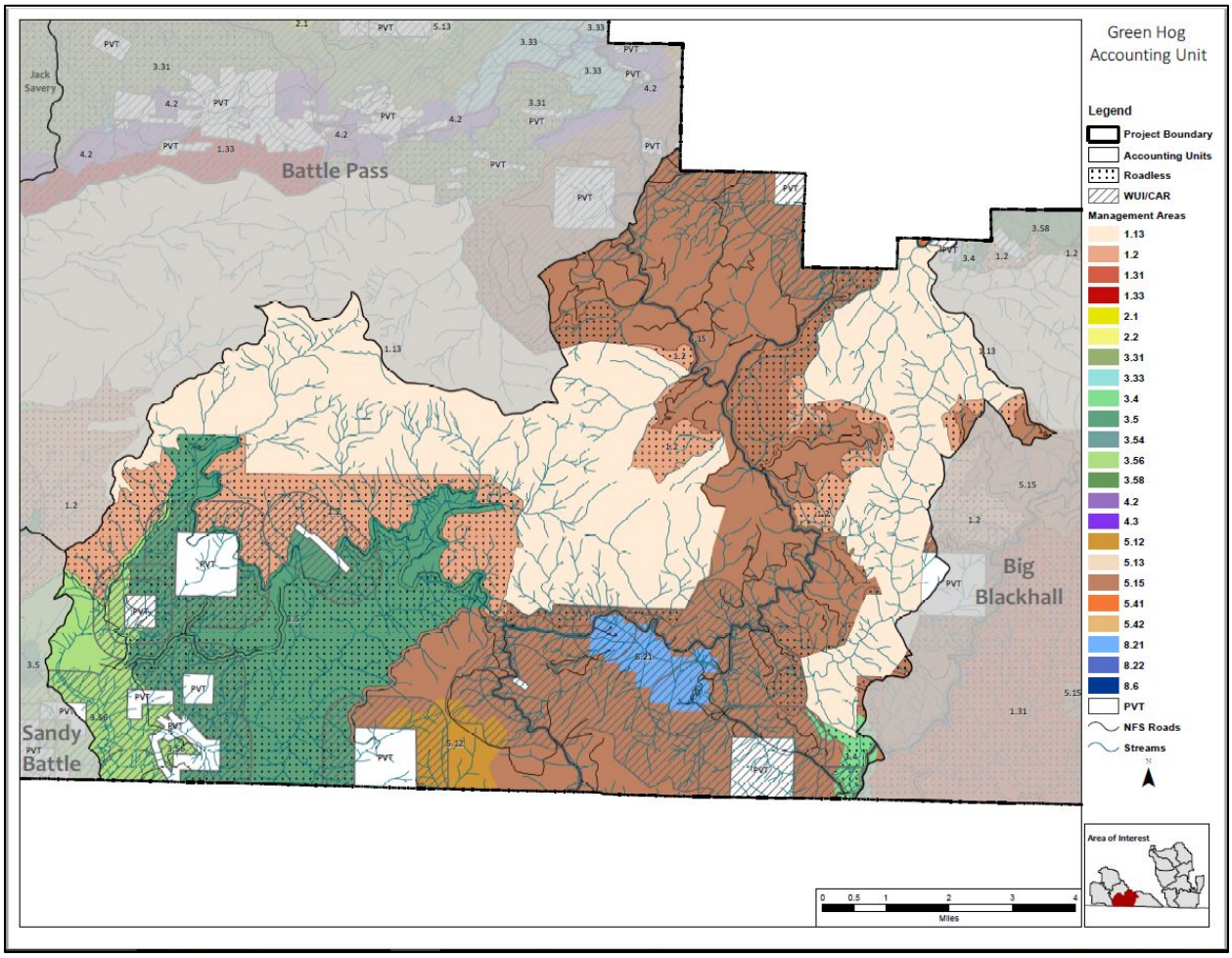

Figure 21. Green Hog accounting unit

Lands of other ownership include State trust lands and private ranching lands near the West Branch of Little Snake River. Carbon County identified Hog Park Reservoir and Mattern Ranch as communities at risk and wildland-urban interface areas. Hog Park Reservoir is managed by the City of Cheyenne Board of Public Utilities as part of their water collection, distribution, and storage system.

This unit includes the Hog Park and Little Snake lynx analysis units.

The predominant management areas are 5.15 Ecological Restoration and 1.13 Wilderness. Management areas 3.5, 3.56, 5.12 and 8.21 are also represented. The Encampment River Addition, Huston Park Addition, and Solomon Creek Inventoried Roadless Areas are in this unit.

Big Blackhall

Big Blackhall is in the southern Sierra Madre Mountains adjacent to the Colorado border in the upper North Platte Valley. It is made up of 68,629 acres of National Forest System lands in Carbon County. The accounting unit is located on the Brush Creek/Hayden Ranger District and contains 47,491 acres of full-suite treatment opportunity areas; 589 acres of limited-suite treatment opportunity areas; and 20,549 acres of no-treatment areas.

Lands of other ownership include State trust lands and patented homestead and mining lands. Carbon County identified Big Creek Park and special use cabin, Jerry Park, and the Newsboy Claim as communities at risk and wildland-urban interface areas.

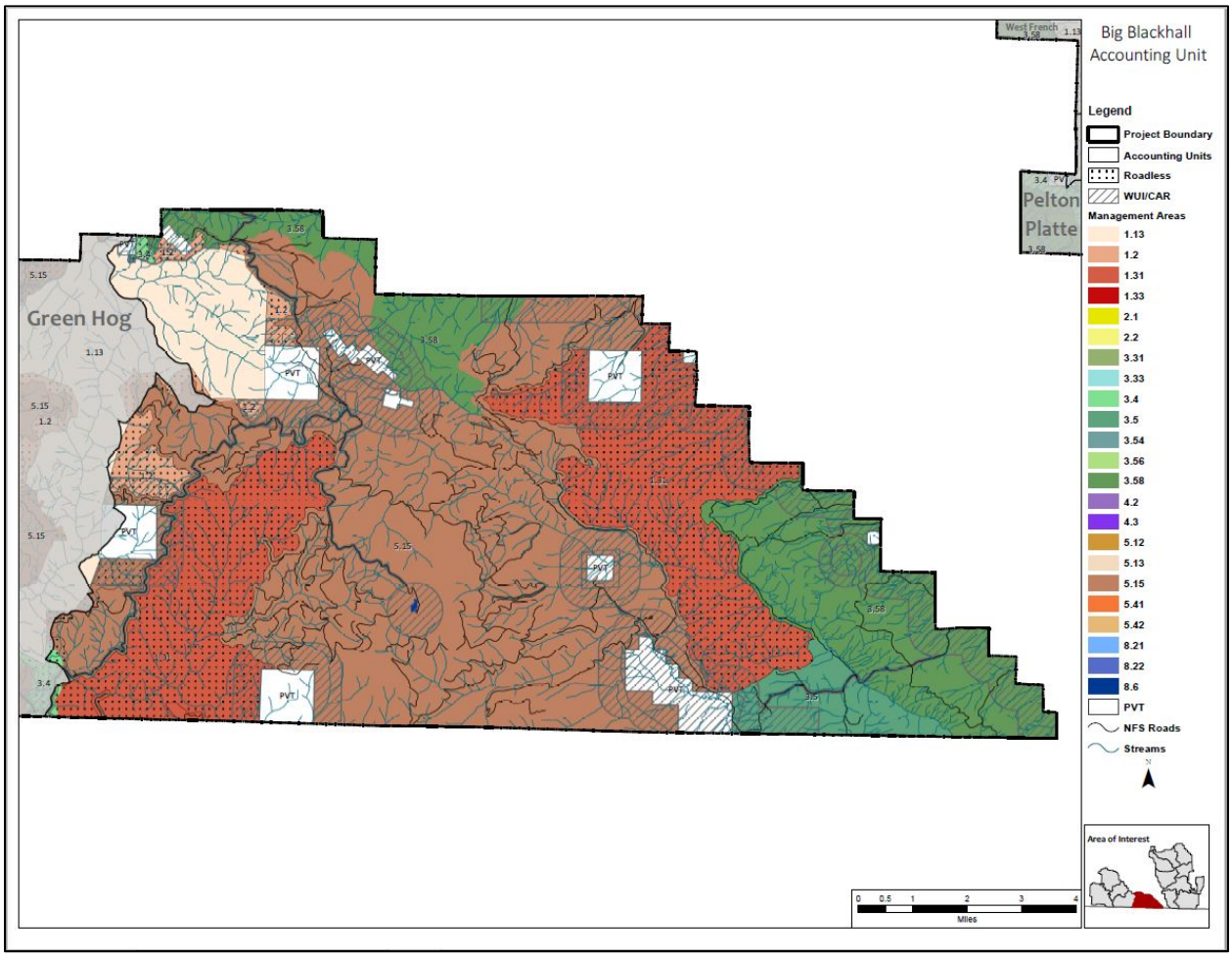

Figure 22. Big Blackhall accounting unit

This unit includes the Blackhall Mountain lynx analysis unit and portions of the North Gate lynx connectivity unit. The predominant management areas are 5.15 Ecological Restoration and 1.31 Backcountry Nonmotorized Recreation. Management areas 1.13, 3.5, and 3.58 are also represented. The Bear Mountain and Encampment River Addition Inventoried Roadless Areas are in this accounting unit.

Sandy Battle

The Sandy Battle accounting unit occupies the western bulk of the Sierra Madre Mountains adjacent to the Colorado border. It is made up of 82,830 acres of National Forest System lands in Carbon County. The accounting unit is located on the Brush Creek/Hayden Ranger District and contains 64,867 acres of full-suite treatment opportunity areas; 6,713 acres of limited-suite treatment opportunity areas; and 11,250 acres of no-treatment areas.

Lands of other ownership include larger acreages of State trust lands and patented homestead and mining lands. Carbon County identified Ferris-Haggerty, Fletcher Peak, Three Forks Lodge, Stemp Springs, Belvidere, Mill Creek, Sandstone Work Center, Forest Edge Ranch, and High Savery as communities at risk and wildland-urban interface areas.

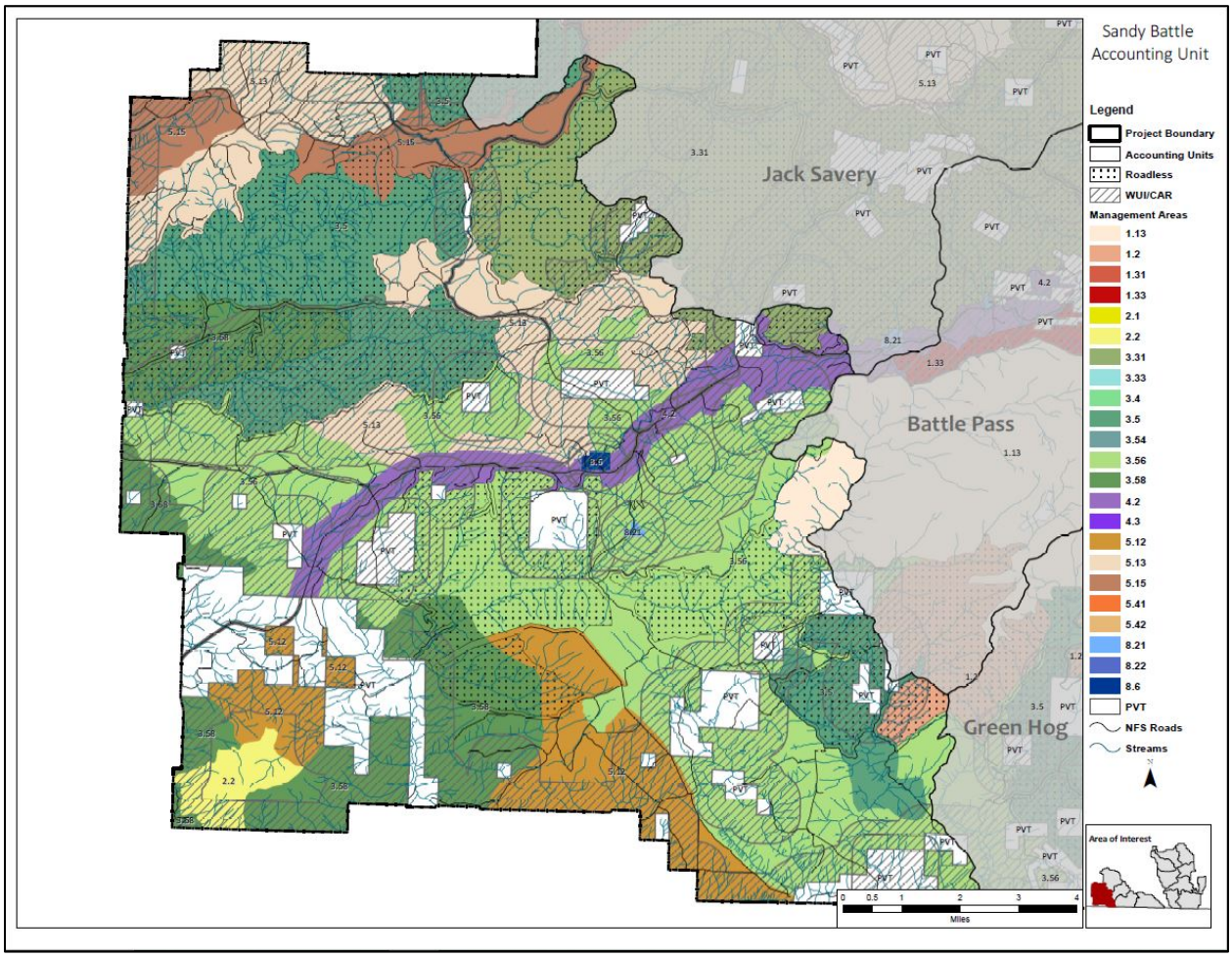

Figure 23. Sandy Battle accounting unit

The Battle Pass Scenic Byway traverses this accounting unit. There are no lynx analysis units or connectivity units in the unit. The primary drainages are the North Fork Little Snake River and Big and Little Sandstone Creeks.

The predominant management areas are 3.56 Aspen Maintenance and Enhancement and 5.13 Forest Products. Management Areas 3.31, 3.5, 3.58, 5.12, and 5.15 are also represented. The unit includes all or portions of several inventoried roadless areas: Battle Creek, Little Snake, Big Sandstone, Little Sandstone,

Singer Peak, Strawberry Creek, and Deep Creek. The Battle Mountain Research Natural Area highlights this distinctive geologic feature and its vegetation community.

Jack Savery

The Jack Savery accounting unit occupies the northern extent of the Sierra Madre Mountains. It is made up of 75,390 acres of National Forest System lands in Carbon County. The accounting unit is located on the Brush Creek/Hayden Ranger District and contains 63,046 acres of full-suite treatment opportunity areas; 6,469 acres of limited-suite treatment opportunity areas; and 5,876 acres of no-treatment areas.

Lands of other ownership include State trust lands and patented mining lands. Carbon County identified High Savery, Jack Creek, Mill Creek, and Ferris-Haggerty as communities at risk and wildland-urban interface areas.

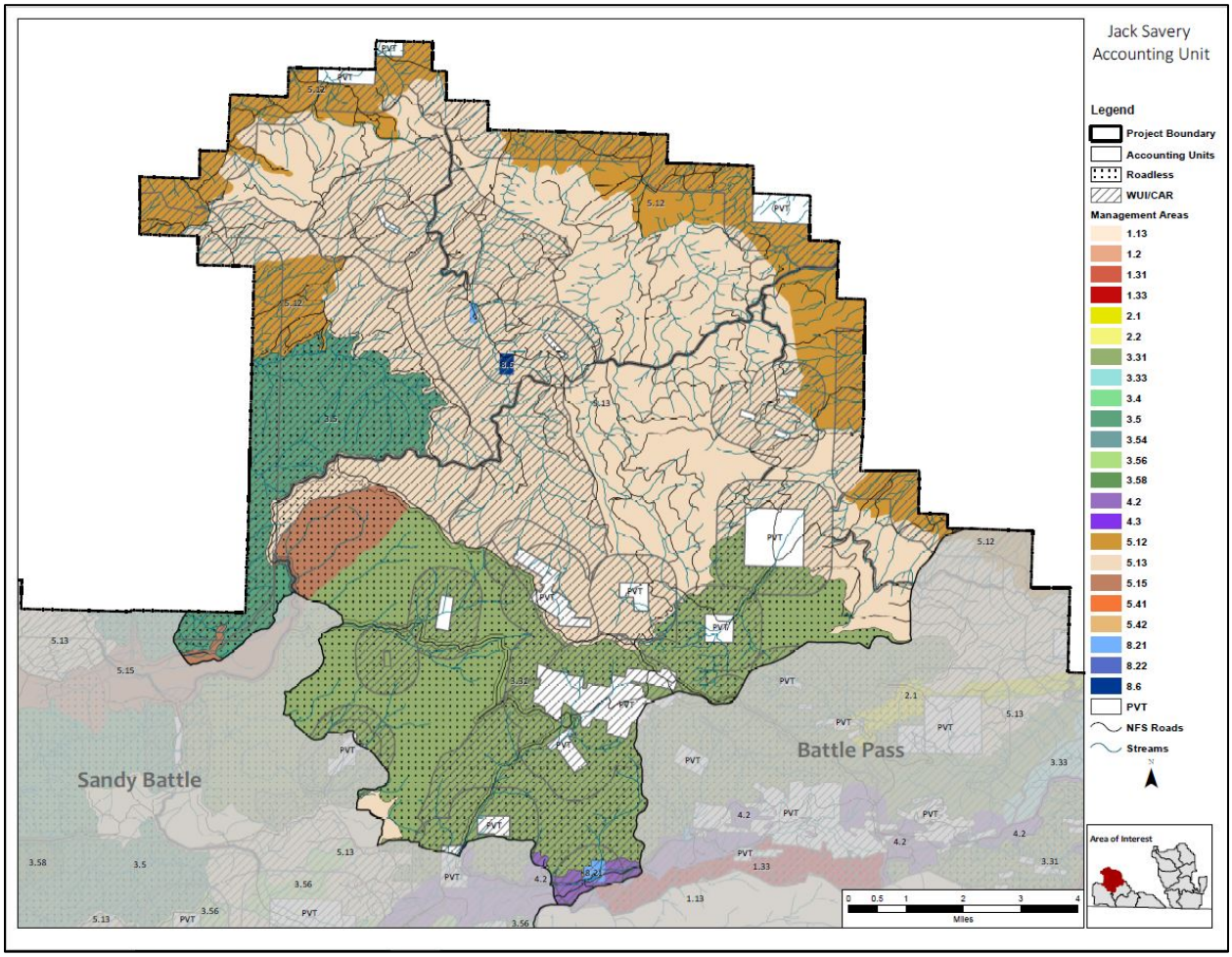

Figure 24. Jack Savery accounting unit

This accounting unit includes the Upper Sierra Madre lynx analysis unit. North Fork Savery Creek, Jack Creek, and Spring Creek are the primary drainages. The Continental Divide National Scenic Trail traverses the unit.

The predominant management areas are 5.13 Forest Products and 5.12 Rangeland Vegetation. Management areas 3.31, 3.5, and 8.6 are also represented. The Deep Creek, Mowry Peak, and Strawberry Creek Inventoried Roadless Areas are partially located in this unit.

Table 24. Characteristics of LaVA accounting units in the Snowy Range

Accounting Unit	Size (acres)	Communities at Risk and Wildland-urban Interface Areas	Infrastructure	Lynx Analysis Unit	Primary Drainage	Forest Plan Management Areas (Top 2)	Inventoried Roadless Area
Rock Morgan	60,712	Morgan, Woodedge, White Rock Estates, White Ranch Cabins, Sand Lake	Sand Lake Reservoir, Deep Creek Campground, Rock Creek National Recreation Trail	Morgan	Rock Creek	5.15, 5.13	Rock Creek, Snowy Range
Bow Kettle	59,455	Overlook-Turpin, Cherokee Trails	Bow River Campground, Bow River Work Center, Turpin Reservoir	Kettle Ponds	Medicine Bow River	5.15, 2.1	Snowy Range, Campbell Lake; Pennock Mountain
Cedar Brush	57,724	Tenmile, Mullison Park Cabins, Gold Hill, Overlook-Turpin	Lincoln Park Campground, South Brush Campground, Kenneday Peak Lookout	Brush Creeks	Cedar Creek	5.15, 3.58	Snowy Range, Campbell Lake; Pennock Mountain
North Corner	44,908	Centennial, Rainbow Valley and lower Libby, Aspen Country, Towner Lake and Snowy Range Lodge	Centennial Visitor Center, Libby Creek Recreation Area campgrounds and picnic grounds, Nash Fork Campground, North Fork Campground, Brooklyn Lake Campground, Brooklyn Lake Lodge, Mountain Meadows Guest Ranch, Sugarloaf Recreation Area, Green Rock Picnic Ground, Snowy Range Ski Area, Glacier Lakes Ecosystem Experiments site, scenic byway	Snowy Range East	North Fork Little Laramie	5.15, 5.13	Libby Flats, Middle Fork

Accounting Unit	Size (acres)	Communities at Risk and Wildland-urban Interface Areas	Infrastructure	Lynx Analysis Unit	Primary Drainage	Forest Plan Management Areas (Top 2)	Inventoried Roadless Area
French Douglas	63,119	Albany, greater Keystone area, Fox Creek	Keystone Work Center, Rob Roy Campground, Spruce Mountain Lookout, Rob Roy Reservoir	Douglas Creek	Douglas Creek	5.15, 5.13	Middle Fork, Savage Run Additions
Owen Sheep	22,535	Lake Owen, Fox Creek, Woods Landing, Wild Horse Ranch	Lake Owen, Lake Owen Recreation Site, Rail Trail	N/A	Fox Creek	3.54, 3.58	Sheep Mountain
West French	68,869	Ryan Park, French Creek Ranch	Silver Lake Campground, Glacier Lakes Ecosystem Experiments site, French Creek Campground, Ryan Park Campground, snow survey cabin, Libby Flats Overlook, Mirror Lake Picnic Ground, Lake Marie, scenic byway	French Creek	French Creek	5.13, 5.15	French Creek, Snowy Range, Libby Flats, Savage Run Additions
Pelton Platte	48,969	None	Six Mile Campground, Pelton Creek Campground	N/A	North Platte River, Pelton Creek	5.15, 3.58	Platte River Additions, Savage Run Additions
Fox Wood	82,585	Woods Landing, Jelm, WyColo and Foxpark, greater Keystone area, Foxborough and Valhalla, Porter Creek, Lake Creek	Chimney Park Scout Camp, Pelton Creek Campground, Rail Trail	Snowy Range connectivity	Boswell Creek, Woods Creek	5.15, 5.13, 3.58	Illinois Creek, Platte River Additions

Table 25. Characteristics of LaVA accounting units in the Sierra Madre

Accounting Unit	Size (acres)	Communities/WUI	Infrastructure	Lynx Analysis Unit	Primary Drainage	Forest Plan Management Areas (Top 2)	Inventoried Roadless Area
Battle Pass	44,351	Encampment municipal water supply, Battle Lake Rambler, Sierra Madre subdivision	Scenic byway, Bottle Creek Campground, Continental Divide National Scenic Trail	Battle Creek	Cow Creek, North Fork Encampment River	5.13, 3.31	Bridger Peak, Mowry Peak, Huston Park Additions, Little Snake
Green Hog	61,915	Hog Park Reservoir, Mattern Ranch, Water Valley Ranch	Hog Park Campground and Picnic Ground, Hog Park Reservoir, Continental Divide National Scenic Trail	Hog Park, Little Snake	Encampment River	5.15, 3.5	Encampment River Additions, Huston Park Additions, Little Snake, Solomon Creek
Big Blackhall	68,629	Big Creek Park, Newsboy, Water Valley Ranch, Jerry Park, Skyline, Big Creek special use cabin	Blackhall Lookout	Blackhall Mountain, North Gate connectivity	Big Creek	5.15, 3.58	Bear Mountain, Encampment River Additions
Sandy Battle	82,830	Ferris-Haggerty, Fletcher Peak, Three Forks Lodge, Stemp Springs, Belvidere, Mill Creek, Sandstone WC, Forest Edge Ranch, High Savery	Scenic byway, Lost Creek Campground, Sandstone Work Center, Belvidere Ditch	N/A	Cottonwood Creek, North Fork Little Snake, Big and Little Sandstone Creeks	3.56, 5.13	Battle Creek, Little Snake, Big Sandstone, Little Sandstone, Singer Peak, Strawberry Creek, Deep Creek
Jack Savery	75,390	High Savery, Jack Creek, Mill Creek, Ferris-Haggerty	Continental Divide National Scenic Trail, Jack Creek Campground, Jack Creek Work Center and Guard Station	Upper Sierra Madre	North Fork Savery Creek, Jack Creek	5.13, 5.12	Strawberry Creek, Deep Creek, Singer Peak, Bridger Peak, Mowry Peak

Biological Resources

Timber

Affected Environment

Ranging in elevation from approximately 7,000 to 12,000 feet, the LaVA project area is predominantly timbered with open grass meadows. Past disturbances including fire, natural succession, wind throw, insect and disease, and vegetation management are primarily responsible for the vegetation patterns within the project area. Forested vegetation cover types in the project area are dominated by lodgepole pine, followed by spruce-fir (Engelmann spruce and subalpine fir), aspen, willow, Douglas-fir, limber pine, cottonwood, and ponderosa pine, respectively. The acres and size class distribution of each cover type is depicted in table 26 and table 27. The cover types, as plant communities, are segregated along gradients of elevation and topography, which directly affect important plant growth determinants such as temperature, effective precipitation, and hydrologic regime.

Table 26. Existing dominant species in the Sierra Madre Mountain Range

Species	Acres	% of Mountain Range
Forbs and grasses	135,680	34
Barren	4,044	1
Shrub	10,810	3
Aspen	54,869	14
Ponderosa pine (PP)	0	0
Douglas-fir (DF)	730	0
Lodgepole pine (LP)	132,682	33
Spruce-fir (SF)	61,102	15
Limber pine (LM)	56	0
Cottonwood	202	0

Table 27. Existing dominant species in the Snowy Range Mountain Range

Species	Acres	% of Mountain Range
Forbs and grasses	131,743	23
Barren	4,344	1
Shrub	3,811	1
Willow	13,523	2
Aspen	22,916	4
Ponderosa pine (PP)	162	0
Douglas-fir (DF)	6,476	1
Lodgepole pine (LP)	269,957	47
Spruce-fir (SF)	120,223	21
Limber pine (LM)	957	0
Rocky Mountain juniper	33	0
Cottonwood	255	0

Dominant Cover Types

Lodgepole Pine

The lodgepole pine cover type on the Sierra Madre Range primarily consists primarily of mid-successional stages. This cover type ranges from pure lodgepole pine stands to lodgepole pine with aspen, subalpine fir, Engelmann spruce and Douglas-fir. Forty-four percent of the cover type is classified as open (less than 40 percent crown cover), 41 percent is classified as moderately closed (40 percent to 70 percent crown cover), and 10 percent is classified as closed (greater than 70 percent crown cover). Five percent of the cover type is classified as shrub-seedling previously treed (table 28).

Table 28. Lodgepole pine stand structure characteristics: Sierra Madre Range

Crown Cover	Total Acres	% of Area	Habitat Structural Stage	Total Acres	Cover Type	Acres with Mortality	Structural Stage with Mortality
< 40%	58,643	44	2	6,826	5%	608	9%
40% - 70%	53,868	41	3	67,379	51%	50,073	74%
>70%	13,344	10	4	58,476	44%	42,175	72%

The lodgepole pine cover type on the Snowy Range, primarily, consists of mid successional stages (table 29). This cover type ranges from pure lodgepole pine stands to lodgepole pine with aspen, subalpine fir, Engelmann spruce and Douglas-fir. Sixty percent of the cover type is classified as open (less than 40 percent crown cover), 31 percent is classified as moderately closed (40 percent to 70 percent crown cover), and 3 percent is classified as closed (greater than 70 percent crown cover). Six percent of the cover type is classified as shrub-seedling previously treed.

Table 29. Lodgepole pine stand structure characteristics: Snowy Range

Crown Cover	Total Acres	% of Area	Habitat Structural Stage	Total Acres	Cover Type	Acres with Mortality	Structural Stage with Mortality
< 40%	163,294	60%	2	16,067	6%	1,816	11%
40% - 70%	83,581	31%	3	166,529	62%	98,986	59%
>70%	7,013	3%	4	87,359	32%	46,194	53%

Engelmann Spruce/Subalpine Fir

The Engelmann spruce and subalpine fir cover type on the Snowy Range primarily consists of late successional stages. This cover type ranges from high-elevation Engelmann spruce and subalpine fir to a mix of Engelmann spruce subalpine fir and lodgepole pine at lower elevations around 9,000 feet. Forty-seven percent of the cover type is classified as open (less than 40 percent crown cover), 46 percent is classified as moderately closed (40 percent to 70 percent crown cover), and 2 percent is classified as closed (greater than 70 percent crown cover). Five percent of the cover type is classified as shrub-seedling previously treed (table 30).

Table 30. Spruce/fir stand structure characteristics – Snowy Range

Crown Cover	Total Acres	% of Area	Habitat Structural Stage	Total Acres	Cover Type	Acres with Mortality	Structural Stage with Mortality
< 40%	56,094	47%	2	6,429	5%	1,747	27%
40% - 70%	54,912	46%	3	30,842	26%	16,893	55%
>70%	2,786	2%	4	82,950	69%	50,313	61%

The Engelmann spruce/subalpine fir cover type on the Sierra Madre Range primarily consists of late successional stages). This cover type ranges from high-elevation Engelmann spruce and subalpine fir to a mix of Engelmann spruce, subalpine fir, and lodgepole pine at lower elevations around 9,000 feet. On the west side of the Sierra Madre range, the spruce/fir cover type transitions to a mix of lodgepole and aspen at lower elevations. Forty-seven percent of the cover type is classified as open (less than 40 percent crown cover), 41 percent is classified as moderately closed (40 percent to 70 percent crown cover), and 5 percent is classified as closed (greater than 70 percent crown cover). Five percent of the cover type is classified as shrub-seedling previously treed (table 31).

Table 31. Spruce/fir stand structure characteristics - Sierra Madre

Crown Cover	Total Acres	% of Area	Habitat Structural Stage	Total Acres	Cover Type	Acres with Mortality	Structural Stage with Mortality
< 40%	28,465	47%	2	3,208	5%	432	13%
40% - 70%	2,661	41%	3	10,185	17%	4,466	44%
>70%	2,816	5%	4	47,707	78%	13,709	29%

Aspen

The aspen cover type on the Sierra Madre Range primarily consists of mid-successional stages (table 32). When mixed with conifer cover types, aspen is found along meadows and drainages. In the western portion of the Sierra Madre range aspen becomes the dominate cover type and is found on all aspects. Forty-six percent of the cover type is classified as open (less than 40 percent crown cover), 50 percent is classified as moderately closed (40 percent to 70 percent crown cover), and 1 percent is classified as closed (greater than 70 percent crown cover). Three percent of the cover type is classified as shrub-seedling previously treed.

Table 32. Aspen stand structure characteristics - Sierra Madre Range

Crown Cover	Total Acres	% of Area	Habitat Structural Stage	Total Acres	% of Cover Type	Acres with Mortality	Percentage of Structural Stage with Mortality
< 40%	24,793	46%	2	1,444	3%	558	39%
40% - 70%	27,436	50%	3	35,229	65%	6,796	19%
>70%	685	1%	4	17,685	33%	5,214	29%

The aspen cover type on the Snowy range, primarily, consists of mid successional stages (table 33). On the Snowy Range, aspen is primarily found along drainages, wet meadows, and other wet areas. This cover type is a minimal component of the tree cover types on the Snowy Range. Forty-five percent of the cover type is classified as open (less than 40 percent crown cover), 44 percent is classified as moderately closed (40 percent to 70 percent crown cover), and 9 percent is classified as closed (greater than 70 percent crown cover).Three percent of the cover type is classified as shrub-seedling previously treed.

Table 33. Aspen stand structure characteristics - Snowy Range

Crown Cover	Total Acres	% of Area	Habitat Structural Stage	Total Acres	% of Cover Type	Acres with Mortality	Percentage of Structural Stage with Mortality
< 40%	10,245	45%	2	704	3%	306	433%
40% - 70%	10,015	44%	3	13,792	60	6,130	44%
>70%	1,952	9%	4	8,420	37%	3,590	43%

Old Growth

Roughly 145,330 acres of old growth are identified within the project area. These stands have most likely been affected by the bark beetle activity but will remain as mapped old growth to meet forest plan standards and guidelines. Stands affected by insects are expected to lose canopy closure but would retain other characteristics of old-growth stands. Mapped and inventoried old growth stands within Management Area 5.15 (Forest Products, Ecological Maintenance and Restoration) have been excluded from the proposed vegetation treatments (103,814 acres). Treatments can be conducted within old growth stands outside of Management Area 5.15 (41,516 acres) as long as treatments maintain or promote old growth characteristics.

Insects and Disease

Mountain pine beetle, spruce beetle subalpine fir decline, dwarf mistletoe, aspen insects and diseases and other insect and diseases have cause mortality and loss of tree growth within the project area (table 34).

Table 34. Insect and disease damage, 2000 to 2016

Cause	Acres
mountain pine beetle	605,034
spruce beetle	101,693
Douglas-fir beetle	9,757
western balsam bark beetle	7,146
engraver beetles	20
spruce budworm	1,230
aspen insects and diseases	16,415
sub alpine fir mortality	14,327
five needle pine decline	3,130

Mountain pine beetle has caused mortality in pines including ponderosa, limber and lodgepole pine. Within the analysis areas, this beetle has caused, approximately, 605,034 acres of damage primarily in lodgepole pine stands. Currently, most stands on the Medicine Bow are at endemic levels. Only 600 acres of limber pine within Carbon and Albany Counties show signs of infestation, and there is no new activity in lodgepole pine or ponderosa pine (Aerial Detection 2016).

Spruce beetle, also a bark beetle, occurs within the natural range of their principle host species, Engelmann spruce. Within the analysis area, spruce beetle has infested around 101,693 acres. Aerial surveys performed by the Forest Service Forest Health Protection group in 2016 showed 240 acres of spruce beetle activity in Carbon and Albany Counties. (Aerial Detection 2016)

Subalpine fir decline is caused by mortality from a variety of agents and is often detected at low levels across large acres. Over time, the low levels of mortality can accumulate into heavier levels of overstory mortality. Currently, 21,473 acres of subalpine fir within the analysis area have or are experiencing mortality.

Aspen insects and disease have case mortality to aspen within the project area. These damaging agents include Marssonina leaf blight, unknown defoliation and sudden aspen decline. 16,415 acres of aspen within the project area has been affected by SAD/defoliation (2000-2016 FHP).

Dwarf mistletoes are parasitic plants that grow on conifers, slowing and distorting growth and leading to early death. Infection by these plants is the most common and economically damaging forest disease in most of the western states (USDA 2009). Within the project area, lodgepole pine and ponderosa pine are most affected and mistletoe infestations have been observed throughout the area. Witches brooms and increased litter fall can be caused by mistletoe and can lead to an increase in vertical fuel continuity causing surface fires to transition to stand-replacing crown fires (Kipflmueller 1997). Dwarf mistletoes can be managed through different silvicultural practices; the most effective is even-aged management and the least effective is uneven-aged management. Without management, the spread of dwarf mistletoe would slow the growth of and could cause mortality to lodgepole (Kipfmueller 1997).

Environmental Consequences

Direct and Indirect Effects

The effects analysis focuses on the three dominant treed cover types represented on the Sierra Madre and Snowy Ranges: lodgepole pine, spruce/fir, and aspen. However, all cover types within the LaVA project area may be subject to vegetation management.

No-action Alternative

Lodgepole Pine

Current stand conditions would persist in the short term. Areas where the majority of the overstory is dead would succumb to windthrow, resulting in high levels of dead and down trees on the ground (figure 25, middle photo). Due to the increased sun exposure from windthrow, increases in grass and forb production and germination of lodgepole pine seedlings would be expected (upper left photo). Seeds from closed cones on dead trees would have a steep decline in viability after 15 years. This could limit natural regeneration.

Areas with canopy mortality less than 30 to 50 percent would create partially shaded conditions. This would favor the establishment of more shade-tolerant species in the understory, such as subalpine fir (Collins 2010). In the long-term, these stands would persist as a lodgepole pine cover type; however, the percentage of subalpine fir in the understory would be higher due to the gradual deterioration of canopy cover (figure 25, upper right photo). Over time, subalpine fir would move into a dominant canopy position, further suppressing regeneration of shade-intolerant species.

Without treatment, most low-mortality stands containing small-diameter trees would reach maximum tree carrying capacity and growth would stagnate (lower left photo), limiting future availability of commercial products.

Figure 25. Lodgepole pine stand conditions under the no-action alternative

In figure 25, the upper right photo shows greater than 50 percent mortality with lodgepole pine regeneration occurring. The middle photo shows windthrow of dead lodgepole pine. The upper right photo shows subalpine fir regenerating under lodgepole pine in partially shaded conditions. The lower left photo shows stagnated stand of lodgepole pine and the lower right photo shows a previously managed stand with low mortality.

Engelmann Spruce/Subalpine Fir

Windthrow to both live and dead trees would be expected in areas where overstory canopy cover has been lost (figure 26, left photo). Stands with multi-stratum canopies would see intermediate canopies grow into the overstory.

In the short term, stands with greater abundance of subalpine fir in the understory would see a decrease in the presence of Engelmann spruce within the stand (right photo). In the long term, Engelmann spruce would regain the dominant position in the spruce/fir stands until the next disturbance occurs.

Figure 26. Spruce/fir cover type conditions under the no-action alternative

In figure 26, the left photo shows overstory Engelmann spruce and subalpine fir mortality. The middle photo shows a single-storied spruce-fir stand and the right photo shows multi-storied spruce-fir stand with a predominantly subalpine fir understory.

Aspen

Aspen stands along the edge of mature, conifer stands containing significant mortality could expand due to more light reaching the forest floor. Individual tree growth could increase as the availability of light and nutrients increases. Conifer and shrub encroachment into aspen stands would not be managed, which could inhibit aspen regeneration (figure 27, upper left photo). Gradual deterioration of stands could lead to regeneration failure and potential loss of aspen clones (Debyle 1985) (figure 27, upper right photo).

Figure 27. Aspen cover type conditions under the no-action alternative

In figure 27, the upper left photo shows conifer encroachment in aspen. The upper right photo shows a decadent aspen stand with low levels of regeneration. The lower left photo shows damage by browsing and trampling, and the lower right photo shows a multi-storied stand with mortality and active regeneration.

High-intensity wildfires could burn hot enough to completely kill aspen clones and roots; this could result in the death of the clone. Low-intensity wildfires could benefit aspen through removal of encroaching conifers. In areas where reproduction is occurring, browsing of aspen by native and nonnative ungulates could be concentrated, resulting in the mortality of aspen regeneration (lower left photo).

Modified Proposed Action

Lodgepole Pine

Stand initiation treatments would be prescribed where stands have 50 percent or greater mortality, high levels of insects and diseases, or both or where the stands have reached culmination of mean annual increment. Stand initiation treatments would result in high disturbance and could be effective in putting stands with high mortality or insect and diseases back into production more rapidly than if treatments were not performed. Opening of the stand and scarification of the soil would create conditions that promote lodgepole pine regeneration (figure 28, upper photos).

Prescribed burning of standing dead lodgepole pine trees would most likely not consume all of the standing dead and weaken the base of dead trees resulting in deadfall. In areas where lodgepole pine and aspen are intermixed, the dead fall could create a natural barrier which could help prevent browsing of aspen regeneration.

Figure 28. Lodgepole pine cover type conditions under the modified proposed action.

In figure 28, the upper left photo shows a lodgepole pine clearcut. Upper right photo shows lodgepole pine overstory removal. Lower left photo shows lodgepole pine thinning (mastication). Lower right photo shows a lodgepole pine stand 15 years after precommercial thinning.

Shelterwood, intermediate or uneven-aged treatments would be conducted where stands have 30 to 49 percent mortality, low to moderate levels of insects and diseases, or both. Shelterwood treatments would result in 40 percent to 80 percent of the stand being removed and regeneration occurring with varying results. In stands with less removal, light conditions would favor regeneration of shade-tolerant species, such as subalpine fir.

Shade-intolerant species, such as lodgepole pine, would be favored to regenerate in stands with higher percentages of removal. If the residual overstory is not removed, stands would develop two distinct age classes. Intermediate treatments, including thinning (lower left photo), sanitation, salvage, improvement and liberation cutting, and release and weed treatments, would increase the health and growth of the residual stand.

Green tree treatments would be conducted where stands have less than 30 percent mortality, low to moderate levels of insects and diseases, or both. The effects of green tree treatments are the same as those listed above for shelterwood, intermediate and uneven-aged treatments.

Engelmann Spruce/Subalpine Fir

Stand initiation treatments would be conducted where stands have greater than 50 percent mortality, high levels of insects and diseases, or both. Stand initiation treatments within the Engelmann spruce/subalpine fir cover type would include shelterwood and irregular shelterwood silviculture systems. Under a three-step shelterwood system, about one-third of the volume of the stand is removed in each step. In an irregular shelterwood system, the final overstory removal is not completed and the overstory remains, creating a two-storied or two-aged stand.

Removal of 1/3 of the stand would create shaded to partial shaded conditions suitable for regeneration of Engelmann spruce and subalpine fir (figure 29, left photo). Scarification of the soil during harvesting operations would create conditions favorable for germination of Engelmann spruce and subalpine fir. If stands have more than 30 to 40 percent of the basal area removed, they could succumb to windthrow and establishment of spruce and fir seedlings could be difficult due to unfavorable microsite conditions.

Shelterwood, intermediate or uneven-aged treatments would be conducted where stands have 30 to 49 percent mortality, low to moderate levels of insects and diseases, or both. Shelterwood treatments in these stand conditions would have similar effects to those listed in the stand initiation treatment types. Intermediate treatments, including thinning, sanitation, salvage, improvement and liberation cutting, and release and weed treatments, would increase the health and growth of the residual stand (figure 29, middle photo).

Single tree selection and group selection silvicultural systems would create or maintain uneven-aged stand characteristics with trees of varying size and age classes intermingled on the same site.

- Single tree selection would:
  - ♦ Favor regeneration of more shade tolerant subalpine fir over spruce.
  - ♦ Retain forest cover over the entire stand, with gaps occurring where medium and large sized trees were removed.
  - ♦ Increase the likelihood of residual tree damage from harvesting operations.
- Group selection would:
  - ♦ Harvest all the trees within a designated area, generally less than 2 acres in size (right photo).
  - ♦ Create small groups of even-aged tree with multiple age groups within a stand.
  - ♦ Result in openings generally less than two times the height of mature trees, creating favorable microsite conditions for Engelmann spruce regeneration.
  - ♦ Maintain forest cover, except for periods of time after group cuts are completed.
  - ♦ Minimize damage from harvesting operations, as compared to single tree selection.

Figure 29. Spruce/fir cover type conditions under the modified proposed action.

In figure 29, the left photo shows a spruce shelterwood silvicultural system. The middle photo shows thinning Engelmann spruce and subalpine fir. The right photo shows group selection cutting.

Green tree treatments would be conducted where stands have less than 30 percent mortality, low to moderate levels of insects and diseases, or both. The effects of green tree treatments are the same as those listed above for shelterwood, intermediate and uneven-aged treatments.

Aspen

Stand initiation treatments would be conducted where stand conditions have greater than 50 percent mortality, high levels of insects and diseases, or both. Stand initiation treatments would result in high disturbance and be effective at regenerating aspen clones. Opening of the stand and scarification of the soil would create conditions preferable to aspen suckering (figure 30, left photo).

Aspen stands in advanced level of decay may not produce large number of suckers in response to stand initiation treatments (DeByle 1985). Two-aged coppice cutting, in which a small portion of the aspen stand remains after harvest, could result in high levels of regeneration and a two aged

structure (middle photo). However, partial cutting, leaving greater percentages of standing trees, may result in a decrease in the amount of regeneration and increase the possibility of damage to residual trees.

Figure 30. Aspen cover types under the modified proposed action

In figure 30, the left photo is a coppice cut. The middle photo shows two-aged coppice regeneration. The right photo shows conifer removal.

Intermediate or uneven-aged treatments would be conducted where stands have 30 to 49 percent mortality, low to moderate levels of insects and diseases, or both. Intermediate treatments, including thinning, sanitation, salvage, improvement and liberation cutting, and release and weed treatments, would increase the health and growth of the residual stand. Damage to residual trees would result in the presence of insects and disease and sunscald damage could result from intermediate treatments.

Green tree and conifer removal treatments would be conducted where stands have less than 30 percent mortality, low to moderate levels of insects and diseases, or both. The effects of green tree treatments are the same as those listed above for intermediate and uneven-aged treatments.

Conifer removal treatments within aspen stands would most likely result in an increase of aspen regeneration due to soil disturbance and an increase in sunlight reaching the forest floor (figure 30, right photo). Damage to residual trees from operations could increase the presence of insects, disease, and sunscald damage.

At a localized level, there would be the potential for ungulates to browse the sprouts and suckers created by treatments. This could cause damage and potentially lead to the loss of stands if aspen experienced multiple disturbances in a short period.

The increase in aspen regeneration would create structural diversity at the stand and landscape level. Aspen stands within, or adjacent to, conifer treatment units would see an increase in clone growth and size growth due to disturbance from the treatments and an increase in sunlight reaching the forest floor.

Prescribed Fire

Within the lodgepole pine cover type, stand-replacing prescribed fire would remove the majority of the overstory canopy, allowing more light to reach the forest floor and fire would expose mineral soil, creating conditions favorable for lodgepole pine regeneration. Within the aspen cover type, stand-replacing prescribed fire would disturb the stand killing the overstory and stimulating suckering (DeByle 1985). Within the Engelmann spruce/fir cover type, stand-replacing prescribed fire would not be recommended as a treatment.

Non-stand-replacing prescribed fire treatments, broadcast burning and jackpot burning, would produce highly variable effects. Jackpot burning would remove piled or accumulated forest floor residue while having minimal impact on the overstory canopy. Some understory and overstory canopy would most likely be consumed or experience mortally from these burns.

Broadcast burning would also remove forest floor residue but would have a greater impact on the understory and overstory canopy than jackpot burning. Removal of forest residue would create conditions suitable for regeneration of tree species, increase herbaceous growth, remove ladder fuels, and open canopy conditions.

Low to moderate levels of tree mortality from prescribed burning would be anticipated. Conditions would be created in which remaining trees would experience an increase in growth from additional sources of light, water, and nutrients.

Some areas of high tree mortality may occur. Small areas of high mortality could result in patches of even-aged regeneration, creating an uneven-aged stand. Large areas of high mortality would return the stand to the stand-initiation stage.

Slash treatment

For all treatment types, slash treatments may include prescribed burning, lop and scatter, machine and hand pile and burn, mastication, machine trampling, or roller chopping. Piling and burning slash would reduce forest fuels. Treatment methods that leave slash in place could increase favorable microsite conditions for regeneration of tree species, increase nutrient cycling, reduce sediment transportation, increase soil moisture, and address other resource concerns.

Old Growth

Vegetation treatments in designated old growth would maintain or enhance characteristics of old growth by using appropriate silvicultural systems, such as individual tree selection. Other silvicultural treatment systems that leave or create structural elements of old growth could be applied, including irregular shelterwood, green and dead tree retention, and thinning in a patchy manner to release younger trees. No treatment of designated old growth is also a silvicultural treatment option.

Cumulative Effects of the Modified Proposed Action

The combination of vegetation treatments, bark beetles, and other insects and disease effects across the project area would result in a variety of stand structures. Implemented stand-initiation treatments, in conjunction with tree mortality, would move habitat structural stages from mid and late seral (stages 3 and 4) to structural stage 1 or 2, thus moving forest structure toward the 50-year desired conditions. Intermediate and uneven-aged treatments would create favorable growing conditions for residual trees. This would move stands into larger size classes and develop characteristics of mid and late seral structural stages.

In combination, the proposed treatments in the LaVA Project would increase structural diversity at the landscape scale and at the stand scale when uneven-aged treatments are applied. Varying the size of treatments from large areas (stands with high mortality and high insect and disease levels) to small areas (stands with low mortality and low insect and disease levels) would also increase the structural diversity of the landscape. Increasing the structural diversity at the stand and landscape

scale would increase resilience to future insect and disease epidemics and other natural disturbances.

The overlapping disturbance of bark beetle mortality, vegetation management, and fire would have varying effects in the lodgepole pine cover type. Post-fire conifer recruitment could diminish due to:

- loss of seed source from beetle mortality of lodgepole that produce nonserotinous cones;
- lodgepole that produce serotinous cone releasing seed due to heating of exposed cones on tree limbs;
- removal of live, mature, cone-bearing lodgepole pine; and
- burning of the seed stored in the logging slash and duff layer during fire events.

Fire and Fuels

Affected Environment

Fire History

Around the late 1600s to mid-1700s, large fires burned in the Snowy Range (6,175 and 3,705 acres, respectively) (Kipfmueller and Baker 2000). Much larger fires likely occurred, but there are no existing records for the period when the area was settled by early residents who harvested large tracts of timber. These fire events and past management activities initiated the extensive even-aged forests that exist today.

From 2000 to 2017, there have been 130 fires in the analysis area, ranging in size from 0.1 to 10,799 acres. On June 30, 2012, the Squirrel Creek Fire occurred on the southeast side of the Snowy Range, northwest of the town of Jelm, consuming approximately 10,799 acres. Over 600 acres were identified for prescribed burning within the North Wildland-urban Interface Project area. Additional recent wildfires of note are the Snake and Broadway Fires of 2016 which were 2,565 acres and 2,121 acres, respectively. The 2,527 Keystone Fire occurred in 2017. It threatened the communities of Keystone, Moores Gulch, and Rambler Wyoming and the municipal watershed for the city of Cheyenne, Wyoming.

Most of the conifer forests in the analysis area typically have long fire return intervals with high fire intensity episodes, and numerous smaller, less severe fires that occur between these large intense fires. Estimates of fire return intervals are often shorter because most of the fire events recorded include more than just stand-replacing fires (Dillion, Knight, and Meyer 2005). The longest fire return intervals are found at the higher elevations, ravines, and north slopes. Fire return intervals on the Medicine Bow National Forest can be from 25 to 700 years depending on the stand, (Hawkes 1980, Kipfmueller 1997). Fire return intervals can be accelerated by natural disturbance such as the recent pine beetle outbreak. In lodgepole, pine beetle outbreaks are most often a stand-replacing event as fire usually follows the outbreak within 15 years (Samman et al. 2000). Other recent disturbances, such as dwarf mistletoe, drought conditions, spruce bark beetle, and wildfire events, suggest forest conditions are nearing stand-replacement intervals.

Fire Regime

The natural fire regime is a general classification of the role fire would play across the landscape in the absence of human intervention but including the influence of aboriginal burning (Agee 1993, Brown 1995). The elements that make up a fire regime—fire frequency and fire severity—are related to the types of vegetation on the landscape. Fire frequency is often described as fire return interval. Severity correlates to fire type and its effects on the overstory vegetation, such as low severity, mixed severity or stand replacement.

Five fire regime groups, expressed as fire frequency and severity, are described in table 35. Within the five fire regime groups listed, dominant cover species respond to fire occurrence and intensity in different ways. The fire regime group and effect of fire related to dominant cover species found in the analysis area are briefly addressed below (Fire Effects Information System 2002).

Engelmann spruce is usually associated with fire regime group V, is easily killed by both surface and crown fire. Most crown fire will kill Engelmann spruce trees. Long-range spotting (up to half a mile) can be associated with this tree species inhibiting suppression efforts. This species is also susceptible to surface fire, as the fine fuels that often concentrate under mature trees burn slowly and girdle the thin-barked bole or char the shallow roots.

Subalpine fir is usually associated with fire regime group IV or V. It is one of the least fire-resistant western conifers and is easily killed by both surface and crown fire. Subalpine fir forests are normally subject to highly destructive canopy fires that occur at 100-year intervals or longer. Such fires typically kill all subalpine fir trees. Long-range spotting can be associated with this tree species inhibiting suppression efforts. Subalpine fir is also susceptible to surface fires because fine fuels that often concentrate under mature trees burn slowly and girdle the thin-barked bole.

Table 35. Fire regimes in the LaVA project area

Fire Regime Group	Frequency in Years (Fire Return Interval)	Severity
I	0 to 35	Low severity
II	0 to 35	Stand replacement severity
III	35 to 100 or more	Mixed severity
IV	35 to 100 or more	Stand replacement severity
V	More than 200	Stand replacement severity

Lodgepole pine is usually associated with fire regime group III or IV. It is more damaged by surface fire than thicker-barked species such as ponderosa pine or Douglas-fir. Because its thin bark has poor insulating properties, many trees are killed from surface fires as a result of cambial heating. Some trees may survive a low-intensity surface fire, which will have the effect of actually thinning the stand. Seeds are well protected from heat inside closed cones (serotinous).

Ponderosa pine is usually associated with fire regime group I or II and is rated very resistant to fire. No conifer species is better adapted to survive surface fires, which often char, but do not kill, mature trees because of fire adaptations. Ponderosa pine cannot survive crown fire, but mature trees can survive a considerable amount of scorching. Surface fire often kills interior ponderosa pine

seedlings and saplings depending on the severity. Young trees in open canopies acquire fire-resistant traits rapidly, and six-year-old saplings often survive low-severity surface fire.

Rocky Mountain Douglas-fir is usually associated with fire regime group III. The effects of fire on Rocky Mountain Douglas-fir vary with fire intensity and tree size. Saplings are often killed by surface fire because their low branching allows fire to transition from the surface into the crown. Photosynthetically active bark, resin blisters, closely spaced flammable needles, and thin twigs and bud scales are additional characteristics that combine to make saplings vulnerable to surface fires. Rocky Mountain Douglas-fir saplings are more susceptible to mortality from surface fires than ponderosa pine saplings. Chance of survival generally increases with tree size. Because they have thicker bark and larger crowns, large trees can withstand proportionally greater bole and crown damage than small trees.

Quaking aspen is usually associated with fire regime group III or IV, depending upon the amount of conifer encroachment. Small-diameter quaking aspen are usually top killed by low-severity surface fire. Research indicates that as diameter at breast height increases beyond 6 inches (15 centimeters), quaking aspen becomes increasingly resistant to fire mortality. Large quaking aspen may survive low-severity surface fire but usually show fire damage. Moderate-severity surface fires will top kill most quaking aspen, although large-stemmed trees may survive. High-intensity surface fire in quaking aspen top kills aspen of all size classes. Low- to moderate-intensity surface fire does not damage quaking aspen roots as they are insulated by soil.

Sagebrush is usually associated with fire regime group II. Presettlement fire return intervals in mountain big sagebrush communities varied from 15 to 25 years. Specifically, for mountain big sagebrush, fire return interval is estimated from 15 to 40 years. For example, mountain big sagebrush sites in southwestern Idaho show evidence of about 3 to 5 fires per century prior to 1910. Very frequent fire suppresses mountain big sagebrush establishment, while long fire return intervals promote tree invasion into mountain big sagebrush communities. Wyoming big sagebrush ignites readily and burns intensely. Regeneration is slow to re-establish on a burned area, especially when compared to other big sagebrush subspecies, mainly because of the relatively drier sites it occupies. In southwestern Montana, Wyoming big sagebrush seedlings were still absent from a prescribed burn site six years after fire.

Condition Class

Condition class is a classification of the amount of departure from the historical fire regime (Hann and Bunnel 2001) that a landscape or vegetative type has. When fire regimes are compared to the amount of departure from reference conditions, a degree of departure or lack of departure can be classified. Departure can occur through human manipulation or intervention, whether it is intended or not, of historical fire cycles, such as fire suppression, grazing or road building. There are three classifications based on low departure (condition class 1), moderate departure (condition class 2), and high departure (condition class 3), from the natural or historic fire regime (Hann and Bunnel 2001).

Table 36. Fire regime condition class

Condition Class	Fire Regime
1	Fire regimes are within historical range, and risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within historical range.
2	Fire regimes have been moderately altered from historical range. The risk of losing key ecosystem components is moderate. Fire frequency has departed from one or two return intervals (increased or decreased). These results in moderate change to the following: fire size, intensity and severity, and landscape patterns. Vegetation attributes have been moderately altered from the historical range.
3	Fire regimes have been significantly altered from historical range. The risk of losing key ecosystem components is high. Fire frequency has departed by multiple return intervals. These results dramatic changes to the following: fire size, intensity and severity, and landscape patterns. Vegetation attributes have been significantly altered from the historical range.

Within the treatment opportunity areas, the dominate vegetation type of concern from a fuels standpoint is the lodgepole pine stands with a spruce-fir component. These fuel types are generally fire regime IV and condition classes 2 and 3 (table 35 and table 36). Brushy vegetation, which is also a fuels concern, generally is Fire Regime I and II condition class 2 and 3. Approximately, 91 percent of all treatment opportunity areas are within the condition class 2 and 3.

To summarize, the treatment opportunity areas have a moderate to high departure from reference conditions (condition classes 2 and 3) and the possibility exists for a stand replacing event (fire regime IV). Conifer forests, especially beetle-killed lodgepole pine or lodgepole pine with a fir understory, at this latitude can experience mixed-severity type fires throughout the life of the stand, and most fires will be small in size. The most prominent fire event would be associated with the long return interval, stand-replacement fire events. This is typical of fire regimes IV and would likely be the disturbance event that occurs at stand culmination. Stand conditions in the treatment opportunity areas are likely nearing culmination, due to stand age, beetle activity, and other disease such as dwarf mistletoe. Evidence supporting is the recent, large, stand-replacing fires in the area: Gramm 2003, Isabel 2005, Squirrel Creek 2012, Broadway 2016, Snake 2016, and Keystone 2017.

Fire Weather

The analysis area receives most of its precipitation during the winter months in the form of snow. The climate of the analysis area can be summarized by cool, short summers and long, snowy winters. The summer can be dry until mid-July and when associated southwest moisture becomes the predominant weather pattern, commonly referred to as monsoons. Often monsoons are characterized by thunderstorms that can produce lightning with little precipitation. September and October are associated with long dry periods. The winter in the analysis area can be characterized by heavy snow accumulations. Fire weather modeling is detailed in the Fuels Specialist Report in the LaVA project file.

Fuel Modeling

Fire behavior fuel models are the basic building blocks used to depict many aspects of fire behavior. Photo series for quantifying forest residues were utilized when determining the appropriate fuel model.

In the analysis, the standard fuel models are used to depict the existing conditions of the analysis area. These fuel models aide in simulating many aspects of fire behavior and are important contributors to fire behavior models such as BEHAVE Plus5 and WFDSS/FSPRO. These models assist in estimating surface fire hazard. For assumptions regarding crown fire hazard, accurate simulation of surface fire intensity is important (Scott and Rienhart 2001). Simple fire behavior descriptions are discussed in association with the assigned fuel models. Fire behavior is quantified in the "Fire Behavior" section.

Fuel models were assigned to the mature and beetle-killed vegetation that could be selected for harvest within the analysis area. Fuel models are simply tools to help realistically estimate fire behavior (Anderson, 1982). Fuel model processing provides analysis of the fire behavior and fire hazard and fuel transitions under the no-action alternative and modified proposed action.

Fuel Model Descriptions within the LaVA Project Area

Grass fuel model types (GR 1 and GR 2) represent the parks and meadow complexes within the analysis area. They have been grouped together and tend to be similar. They are typically associated with grass and sagebrush but can also be associated with some of the aspen component within the analysis area. Typically, the vegetation in these fuel models is not identified for treatment from a fuels standpoint. However, wildlife managers may incorporate these areas into treatments designed to benefit wildlife. There is a total of 21,055 acres of in the GR 1 and GR2 fuel model types within the LaVA project area. These combined fuel models cover the following acres by accounting unit: Battle Pass (896 acres), Big Blackhall (1,096 acres), Bow Kettle (478 acres), Cedar Brush (1,500 acres), Fox Wood (2,300 acres), French Douglas (845 acres), Green Hog (1,203 acres), Jack Savery (1,829 acres), North Corner (2,445 acres), Owen Sheep (9,098 acres), Pelton Platte (3,930 acres), Rock Morgan (2,541 acres), Sandy Battle (18,037 acres), and West French (5,345 acres).

Grass/shrubland fuel model types (GS 1 and GS 2) represent the grass/shrub components on the Medicine Bow National Forest such as sagebrush with a grass understory which one would expect to find on lower elevation drier slopes to higher-elevation parks. Most management actions associated with this fuel model would be prescribed burning for winter range or grazing improvement. Fire behavior in this group can be depicted as surface fires that move rapidly through cured grass and associated material, possibly with an open shrub overstory of sagebrush. Fire behavior in the complex is likely to be tempered by the greenness or "lushness" of the stand. Fire behavior may be moderate to high if vegetation is cured and available to burn. There are 86,455 acres in the GS 1 and GS2 fuel models in the LaVA project area. These combined fuel models cover the following acres by accounting unit: Battle Pass (2,681 acres), Big Blackhall (7,975 acres), Bow Kettle (3,093 acres), Cedar Brush (4,105 acres), Fox Wood (11,724 acres), French Douglas (2,529 acres), Green Hog (4,028 acres), Jack Savery (8,921 acres), North Corner (2,445 acres), Owen Sheep (9,098 acres), Pelton Platte (3,930 acres), Rock Morgan (2,541 acres), Sandy Battle (18,037 acres), and West French (5,345 acres).

Timber litter fuel type model 3 (TL3) is the most dominant feature with the analysis area and is within the timber group. TL3 is the best representative of bark-beetle-killed or other dry lodgepole pine. It is best described as closed canopy stands of short-needle conifer, though variations will exist. Numerous management actions are identified within the lodgepole pine and associated stands at risk from mountain pine beetle. Fire behavior in lodgepole pine is generally low-intensity

surface fire moving through the needle cast and associated compact litter layer. Heavier fuel concentrations or "jackpots" may encourage flare ups. Within the analysis area, these fires may likely be viewed as mixed severity. The fuel model TL3 can support crown fire but usually only under ideal conditions of high temperatures, low humidity, and wind. This would be considered a desired fuel type and will transition to an undesired fuel type as trees start to fall and new trees replace them in the stand. There are 114,026 acres in the TL3 fuel model type within the LaVA project area. These combined fuel models cover the following acres by accounting unit: Battle Pass (7,969 acres), Big Blackhall (7,474 acres), Bow Kettle (6,869 acres), Cedar Brush (6,223 acres), Fox Wood (18,564 acres), French Douglas (9,443 acres), Green Hog (4,541 acres), Jack Savery (18,712 acres), North Corner (5,748 acres), Owen Sheep (3,162 acres), Pelton Platte (671 acres), Rock Morgan (7,883 acres), Sandy Battle (7,920 acres), and West French (8,900 acres).

Timber understory fuel type model 5 (TU5) can best be described as forest types with down material present. The primary carrier of fire in TU5 is heavy forest litter with a shrub or small tree understory. Spread rate is moderate and flame length high. Within the analysis area, TU5 represents the likely dominant fuel model 5 to 15 years after the beetle epidemic. Fire behavior can be intense when spreading on the surface and will likely transition to the canopy producing passive crown fire (single tree or clumps of trees torching) if an overstory is present. Significant fire control problems can be associated with this complex due to the heavy surface fuel load and the dense shrub or small tree understory. There are 59,886 acres of in the TU5 fuel model type within the LaVA project area. These combined fuel models cover the following acres by accounting unit: Battle Pass (8,020 acres), Big Blackhall (2,290 acres), Bow Kettle (4,158 acres), Cedar Brush (4,100 acres), Fox Wood (2,406 acres), French Douglas (2,640 acres), Green Hog (4,037 acres), Jack Savery (11,616 acres), North Corner (6,778 acres), Owen Sheep (409 acres), Pelton Platte (193 acres), Rock Morgan (6,483 acres), Sandy Battle (4,898 acres), and West French (1,859 acres).

Timber understory fuel type model 1 (TU1) is classified in areas of low load and dry climate timber/grass/shrub vegetation. This fuel model would best be represented by aspen stands with little or no dead and down surface fuels or conifer encroachment. The primary carrier of fire in TU1 is low load of grass, shrubs with litter, or both. Fine fuel loading is as much as 1.3 tons per acre. Spread rate is low and flame length low. TU1 contains live herbaceous fuel load which is dynamic, meaning the live herbaceous fuel load is allocated between live and dead as a function of live herbaceous moisture content. The effect of live herbaceous moisture content on spread rate and intensity is strong and depends on the relative amount of grass and shrub load in the fuel model. There are 51,388 acres in the TU1 fuel model type within the LaVA project area. These combined fuel models cover the following acres by accounting unit: Battle Pass (5,076 acres), Big Blackhall (2,013 acres), Bow Kettle (2,651 acres), Cedar Brush (2,166 acres), Fox Wood (1,937 acres), French Douglas (2,493 acres), Green Hog (4,026 acres), Jack Savery (6,274 acres), North Corner (2,774 acres), Owen Sheep (643 acres), Pelton Platte (651 acres), Rock Morgan (3,205 acres), Sandy Battle (15,202 acres), and West French (2,276 acres).

Slash blowdown fuel type model 2 (SB2) is comprised of moderate dead and down activity fuel or light blowdown and is projected to be the fuel model under the no-action alternative in approximately five years after the mountain pine beetle epidemic. Fine fuel load is evenly distributed and depth is about 1 foot. Blowdown is scattered, with many trees still standing. Spread rate is moderate and flame length is moderate which would inhibit fire suppression efforts.

Slash blowdown fuel type model 1 (SB1) would be the dominate fuel model classification following the implementation of the modified proposed action. The primary carrier of fire in SB1 is light dead and down activity fuel. Spread rate is moderate and flame lengths are low which increases the probability of fire control. The fine fuel loading will probably be less than what the fuel loading is in this fuel model depending on subsequent slash treatments.

Fire Behavior

Fire behavior and fire hazards identify the availability of fuels to sustain a fire and relates directly to the functions of fuel, weather, and topography. The expected fire intensities measured in flame lengths can be compared to the likely control measures and suppression tactics and the probable success or failure can be determined. The effects of bark beetle induced tree mortality to fire behavior predictions can be extreme, as discussed below.

Surface fire behavior was modeled to understand the risk of fire spread and intensity under the existing and desired fuel type models within the LaVA project area. Measures reported in the fire behavior prediction model in table 37 are defined as follows:

- Rate of spread: The relative activity of a fire in extending its horizontal dimensions. It is expressed as rate of increase of the total perimeter of the fire, as rate of forward spread of the fire front, or as rate of increase in area, depending on the intended use of the information. Usually it is expressed in chains or acres per hour for a specific period in the fire's history. Generally, measured in chains per hour where 1 chain equals 66 feet.
- Flame length: Distance between the flame tip and the midpoint of the flame depth at the base of the flame (generally the ground surface); an indicator of fire intensity
- Spotting distance: Distance between spot fires (small isolated patches of fire from fuel particles transported by wind, convection currents, or gravity into unburned fuels) which may range from a few meters to tens of kilometers ahead of the flaming front.
- Transition to crown: Condition of fire intensity where a ground fire climbs through ladder fuels and reaches the crown (upper limbs) of the overstory.

Table 37. Fire Behavior for no-action (current conditions) and desired conditions

Measures	No Action	No Action	No Action	No Action	No Action	No Action	No Action Plus 5-10 years	Desired Condition	Desired Condition
Fuel model	GR1	GR2	GS1	GS2	TL3	TU5	SB2	TU1	SB1
Rate of spread (chains per hour)	14.5	49.5	21.2	29.3	1.2	10.4	15.2	2.6	6.2
Flame length (feet)	1.8	5.3	4.1	6.0	0.9	8.2	6.4	1.8	3.2
Spotting distance (miles)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Transition to crown	NA	NA	NA	NA	No	Yes	No	No	No

The fire behavior prediction table demonstrates the expected fire behavior conditions most conducive to fire growth. It is important to note the desired conditions of TU1, SB1, and TL3 have the lowest rates of spread and some of the lowest flame lengths and often allow for suppression using hand crews. Within 5 to 10 years, the TU5 fuel type model will be the most difficult to suppress from a fire behavior and safety standpoint.

Figure 31. Prescribed burn in TU 5 fuel model

When stand conditions are such that active bark beetle mortality is ongoing (foliage is transitioning from green to red to brown), there is a marked increase in fire intensity potential for all stands. Crown fire hazard is higher than in bark-beetle-affected stands within one to three years after the epidemic when most of the dead needles are retained on the standing killed trees, snags have fallen, and a new understory provides increased ladder fuels. During this same period, surface fire spread and intensity would also be higher in beetle-killed stands due to increased surface fuel loads.

Transitioning from standing dead to falling dead conditions is easily recognizable as that standing fuel loading starts to add significant volume to the surface fuel load. A marked increase in the surface fuel accumulation, approximately five years post infestation, can be noticed and is the result of normal decay and stand deterioration. As the process continues, fuel model distribution continues to transition from TL3 to TU5 and with some areas transitioning to fuel model SB2.

Slash blowdown fuel type model 2 (SB2) is categorized within the timber slash group and is characterized by moderate dead and down fuels or light blowdown. This fuel model is not currently abundant within the LaVA project area. However, there would be the potential for some stands under current conditions to transition towards the SB2 fuel model in which a wildfire then becomes very difficult to control.

To quantify the fire hazard in simple terms as it correlates to the timber stands, which are of significance to this assessment and project as a whole, the TL3 fuel model (a healthy lodgepole pine stand) exhibits very acceptable fire behavior while the TU5 and SB2 models (in stands affected by beetle kill or other disease) have dramatically increased fire behavior.

Fire Risk

Fire risk is generally defined as the probability of fire occurrence. It is important to analyze fire risk within the analysis area. Historical fire records can be used to determine probable risk of fire occurrence. Fire risk is a measure of fire starts on a 1,000 acre basis over a 10-year period (per decade). The fire risk value corresponds to a likelihood of fire starts, per 1,000 acres, per decade. The following are risk ratings and a range of values is used to categorize risk.

- Low risk: 0 to 0.49 – projects a fire every 20 or more years and thousand acres.
- Moderate risk: 0.5 to 0.99 – projects one fire every 11 to 20 years and thousand acres.
- High risk: at least 1.0 – projects at least one fire every 0 to 10 years and thousand acres.

The National Interagency Fire Management Integrated Database (NIFMID) contains fire records indicating that there have been a total of 291 fires in the analysis area over an 18-year period. This equates to a risk rating of low. The long-return-interval fire regimes in the analysis area have experienced numerous low-severity, low-intensity fires in calculating a high risk rating. However, the occurrence that will be significant will be large scale, high intensity and stand replacing as is typical of this fire regime. The likelihood of fire occurrence and stand-replacement events will increase as succession to late seral stages under post-epidemic conditions continues.

Environmental Consequences

Direct and Indirect Effects

No-action Alternative

Fuels and resulting fire behavior potential would continue to be heavily influenced by large amounts of falling dead timber as well as regeneration of young trees amongst the dead and down material. High-severity fire activity expected under the TU5 and SB2 models could cause negative impacts on other resources due to total heat output and residence time of the flaming front.

As the dead trees continue to fall, there would also be a reduction in sheltering from the canopy. Where canopy cover is decreased, increases in wind speed at the ground level would be expected (Whitehead et al. 2006). An increase in total solar input would also be expected and would affect fuel temperature and moisture content (Whitehead et al. 2006).

Transition toward a heavy fuel load of large-diameter ground fuels would occur. Some stands would transition from desired fuel types (TL3) to fuel models with risk of higher fire severity, including TU5 and SB2.

There would be an increased commitment of resources and risk to fire personnel. Dead trees would be more likely to fall and injure personnel.

The smoke generated from a fire that has no suppression action taken would be an indirect effect. Impacts of the smoke on the public could be considerable.

Modified Proposed Action

Direct and indirect effects would occur from prescribed burning and pile burning, mechanical treatments (salvage, commercial and precommercial thinning, and mastication), and temporary road construction.

Prescribed Burning and Pile Burning

Broadcast burning would benefit the fuels profile and subsequent fire behavior by lowering the fuel loading and producing more vigorous grasses and forbs that are generally more fire retardant (less dead and decadent fuel). Smoke generated during broadcast burning would be a direct effect. Smoke generated by broadcast burning as well as pile burning of conifer slash following the fuels and harvest treatments would be an indirect effect

Mechanical Treatments

Mechanical treatments could create substantial changes in how fire behaves on the landscape. Partial removal of standing trees could inhibit crown fire behavior by increasing crown spacing.

One of the primary influences on fire behavior resulting from mechanical operations is how the slash is treated. Slash treatments may be accomplished by lop and scatter, machine pile and burn, mastication, or chipping. Flame lengths would be lower in the units treated by piling and burning than under the lopping strategy. Except for precommercial thinning, if the slash was left untreated, passive crown fire would occur.

Precommercial thinning is one method of reducing the subsequent potential crown fire behavior. The residual slash could greatly increase the surface fuel loading and subsequent risk of wildfire on harvested sites. Fire behavior following precommercial thinning treatments could vary greatly, with both depth and loading playing a significant role. Lop and scatter treatments would increase the surface area exposed on dead and downed fuels and keep fuels on the ground. The result would be an increase in total fuel loading and calculated flame lengths and fireline intensity.

Temporary Road Construction

Under the modified proposed action, up to 600 miles of new temporary roads could be constructed. The number of accessible roads is a double-edged sword in terms of travel management and fire suppression. While roaded access (even temporary) to an area increases the risk of human-caused ignition, the same roads provide access to firefighting personnel and equipment, shortening response times, providing access during extended attack, and providing man-made fuel breaks to aid in fire suppression.

Given the high fire risk in the area (see fire risk analysis), additional road access could increase ignitions. Temporary roads probably would not add to the risk since they would be closed within three years after treatment completion. However, the benefit of a man-made fuel break would be expected to last as long as 20 years. Temporary roads could create a positive indirect effect on reducing fire spread by providing man-made fuel breaks.

Cumulative Effects

No-action Alternative

Although parts of the Medicine Bow National Forest would benefit from past harvest activity and current projects, including hazard tree removal, thinning units, and State Forestry fuel break and

defensible space projects, fire and fuel conditions in the analysis area would not move toward the forest plan desired condition to reduce fuel loadings and modify fire behavior. Other projects and natural processes would not manage hazardous fuel loadings, improve ingress and egress, or protect municipal water supplies from fire. However, the forest condition would remain within the natural ecological progression of this forest complex and associated fire regimes.

Modified Proposed Action

The proposed silvicultural treatments complement past projects in the forest plan area and would move the analysis area toward the desired condition for fire and fuels management. Treatments would manage hazardous fuel loadings; improve ingress and egress; and protect municipal water supplies, critical infrastructure, and communities within the wildland-urban interface from fire.

It is desirable to limit the expansion of the higher-severity fuel models TU5, SB1 and SB2 and promote and maintain the more desirable fuel models TL3 and TU1 which exhibits lower fire hazard. In all cases, both during and after the beetle epidemic, the modified proposed action would move the analysis area closer to the desired condition from a fire and fuels management standpoint.

Wildlife

Affected Environment

The information below focuses on wildlife species that occur or have the potential to occur in the LaVA project area. These species include threatened, endangered, and proposed species, Rocky Mountain Region sensitive species, management indicator species, and species of local concern. This section also discusses wildlife security areas, as these areas have been identified as an indicator, or way of measuring effects, for Issue 5 - Project Scope and Scale.

Threatened, Endangered, and Proposed Species

Section 7 of the Endangered Species Act of 1973, as amended, requires federal agencies to use their authorities to carry out programs to conserve threatened, endangered, and proposed species. Federal agencies are to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of listed or proposed species or result in the destruction or adverse modification of threatened, endangered, and proposed species critical habitat.

Canada lynx is the only threatened or endangered species that could be affected by the LaVA Project. This species prefers mature to late-successional spruce-fir forests for foraging habitat because these forests can support snowshoe hares and red squirrels, the primary prey species for lynx. Additional forest types, high elevation sagebrush and mountain shrub communities found adjacent or intermixed with forest habitats, and riparian and wetland shrub communities are also potentially important habitat in many parts of the Southern Rockies, including the Medicine Bow National Forest, as they may support alternative prey species. Recent lynx modelling information (2017) for the Medicine Bow National Forest suggests tree mortality as a result of the beetle epidemics was not as severe as originally predicted (2007); that is, mortality did not approach 100 percent for all medium- or larger-sized lodgepole trees. Therefore, more habitat is considered suitable for lynx than earlier predicted.

Rocky Mountain Region Sensitive Species

It is Forest Service policy to protect the habitat of species listed as Forest Service Rocky Mountain Region sensitive species from adverse modification or destruction and to protect individual organisms from harm or harassment as appropriate (Forest Service Manual 2670.3). Biological evaluations are prepared for each project authorized, funded, or conducted on National Forest System land to determine the possible effects the proposed activity may have on sensitive species (Forest Service Manual 2672.43). The biological evaluation process analyzes and documents those activities necessary to ensure management actions will not likely jeopardize the continued existence of the species. The following Rocky Mountain Region sensitive species occur, or have the potential to occur, in the project area:

American marten: American marten habitat consists primarily of dense, old forest with a complex understory and downed woody debris. The preferred habitat includes late-successional multi-storied stands of spruce-fir forest, multistoried lodgepole with an understory of subalpine fir, and other forest types with downed wood. Potential marten habitat across the Medicine Bow National Forest corresponds to spruce-fir forest of structural stages 4A through 4C and lodgepole pine of structural stages 4B and 4C (see Silviculture report). The bark beetle outbreak improved habitat in many areas of the Forest with the addition of coarse woody debris. This outbreak decreased habitat in some locations where tree mortality was high in single-story lodgepole pine stands. Over time, there will be a particular benefit during winter as martens rely on coarse woody debris for improved survival in a subnivian environment (Kozlowski 2008). American marten are also a management indicator species, as described below.

Northern goshawk: Northern goshawks breed in coniferous, deciduous, and mixed forests (Reynolds et al. 1992). Preferred habitat during the breeding season is older, tall forests where goshawks can maneuver in and below the canopy while foraging and where they can find large trees in which to nest (Squires and Ruggiero 1996). In the Rocky Mountains, goshawks frequently nest in dense stands of mature lodgepole pine or quaking aspen below 9,200 feet elevation (Squires and Ruggiero 1996). Because of its relatively large body size and wing span, the goshawk does not often use dense, young forest stands. Northern goshawks are relatively abundant and well-distributed across the Medicine Bow National Forest, with more than 300 recorded nests. Forestwide goshawk population trends appear stable; however, it is expected that the population will decline in the near future due to tree mortality from the previous bark beetle outbreak (Skorkowsky 2009). Northern goshawks are also a management indicator species, as described below.

Flammulated owl: Flammulated owls are known to occur in mid-elevation montane forests of ponderosa pine and Jeffrey pine during breeding season. They occur in stands of mature and older aspen on the west side of the Sierra Madre Range where these forest types are a large component of the landscape. The species is not known to occur in the lodgepole pine forests of Wyoming (Hayward and Verner 1994). There have been 22 observations of the flammulated owl within the analysis area; all occurred within the Sierra Madre Range. Because it is difficult to detect, the species may be more widespread in the limited ponderosa pine found on the Medicine Bow National Forest than recorded sightings indicate.

Purple martin: Purple martin is an uncommon species on the Medicine Bow, and it is unlikely there will ever be an established population. They commonly nest in aspen, spruce/fir, or mixed spruce/fir and aspen stands adjacent to a forest openings, and they in live or dead tree cavities excavated by woodpeckers (Reynolds et al. 2002). Purple martin have been known to breed in one area of the Sierra Madre Range in the past, with no known nesting attempts in recent years. They are not known to occur in the Snowy Range. Purple martin are a Tier III species of concern according to Wyoming Game and Fish Department, indicating that they are considered a species of greatest conservation need, third tier (falling in the moderate mitigation category – lowest priority).

Olive-sided flycatcher: The olive-sided flycatcher is associated with older spruce-fir forest with abundant snags. They prefer edges and openings with scattered trees, where they perch on the top of snags, flying up to capture passing insects from the air. Populations increase following fire because burned areas support high densities of these flycatchers as compared to other sites, as do natural openings around ponds, beaver ponds, and windfall. Forestwide songbird surveys have been completed since 2005; monitoring results indicate a relatively stable trend in observations since 2008.

Bighorn sheep: Bighorn sheep are a steep-mountain, high-elevation species that prefers long sight lines with open escape routes. There are two herds within the analysis area.

The Douglas Creek herd (in the southeast Medicine Bow Mountains) occupies the rocky areas and canyons that lie in and north of the North Platte Wilderness. The recent lack of large burns has left dense forest that reduces connectivity between this high elevation summer range and the lower wintering grounds. There are eight grazing allotments in the Medicine Bow Range, running from the tundra (where bighorns have been seen) to the northeast. The high-elevation allotments are currently vacant (though recent queries have been made about use for sheep).

The Encampment River herd has not flourished for unknown reasons. The herd's summer range overlaps several active grazing allotments occupied by sheep and *Chlamydia* has been found in the herd (Loose 2002; Cook et al. 1998). While the overall condition in the herd is poor, there is evidence that poor quality forage may be a contributing factor (Loose 2002), (Cook et al. 1998). The Wyoming Interagency Bighorn Working Group ranks this herd as lowest priority (of 3 classes) for investment in habitat improvement.

Hoary bat: Hoary bats occur throughout the Rocky Mountain region during the summer season and are one of the most widespread bats in North America. They typically have day and night roosts among foliage in deciduous trees at the edge of clearings. They forage in a variety of open habitats; so, this habitat is not limited. Summer distribution results indicate that flowing or open water and presence of cliffs and rock formations are important predictors of their distribution. There is evidence cottonwood riparian corridors may be declining due to western land and water management practices. To the extent this is true, habitat for hoary bats may be decreasing.

Boreal owl: Boreal owls forage in mature and older spruce-fir most of the year. Within the LaVA project area, mixed conifer and spruce/fir forest are the habitats capable of supporting boreal owl reproduction and year-round use. Large aspen trees can provide nesting sites but do not offer year-round foraging habitat due to snow crusting. Climax lodgepole pine stands are composed mostly of trees devoid of defects and internal decay in the upper tree bole. These lodgepole stands are single

canopy. Beetle-killed lodgepole stands have lost canopy cover, so only multi-storied lodgepole stands (mixed conifer) provide sufficient canopy cover for nesting and preventing snow crusting over prey habitat. Potential boreal owl habitat in the analysis area corresponds to stands characterized as lodgepole pine 4B and 4C and spruce-fir forest of structural stages 4A through 4C. There are more than 173,000 acres of habitat in the analysis area.

Pygmy shrew: Pygmy shrews are widespread across Canada and northern U.S. with an isolated population in Colorado and southeast Wyoming. The species is vulnerable because of its lack of dispersal ability, restriction to boreal habitat, and limited distribution. Less is known about the population trends of this species. Pygmy shrews have been recorded in the Centennial, Green Rock, June Creek areas of the Snowy Range and the Coon Creek area of the Sierra Madre (18 specimens trapped). There are approximately 36,000 acres of potential pygmy shrew habitat in the analysis area. Habitat consists of wet meadows, fens, slow streams and bog-margined ponds within 300 feet of spruce-fir or mixed-conifer forest at or above 9,000 feet. Where small groups of beetle-killed lodgepole trees exist within this spruce-fir habitat, pygmy shrew habitat could improve in quality with the increase in coarse woody debris over time.

Hudsonian emerald: The Hudsonian emerald is widespread and abundant in the northern part of its range (boreal forest and muskeg of Canada) but far less common in Colorado, the southernmost part of its range. A single record of this dragonfly was reported in 1937, in a location given only as Medicine Bow Mountains. In surveys of dragonflies in the Snowy Range, other emeralds were found, but not the Hudsonian. The species could be present and undetected, because identification and capture are difficult. The larvae are cryptically colored and difficult to catch in the dense bog vegetation they inhabit. Habitat that is apparently suitable is present, so management will assume the presence of the species at least until surveys are conducted.

White-tailed prairie dog: The white-tailed prairie dog is found from southern Montana, through western and southern Wyoming, western Colorado, and into northeastern Utah. Wyoming makes up approximately 71 percent of its range. The species naturally does not occupy forested lands, and there has been only one verified occurrence on the Medicine Bow National Forest; a colony of about 30 animals appeared in 2002 in an area that had recently burned in the Pelton Platte Accounting Unit (USDA 2003). The Forest Service's wildlife observation database shows several other historical observations on private lands adjacent to the Owen Sheep Accounting Unit and Rock Morgan Accounting Unit. The observations were recorded as not verified and are documented as uncertain reliability. Where the species could occur, it would be limited to lower elevations at the edge of the Medicine Bow National Forest. There is minimal potential for expansion onto National Forest System land because of increasing elevation and forested habitat, and because potential suitable habitat is minimal in size and isolated by topography from existing colonies.

Brewer's sparrow: Brewer's sparrows are widespread in the intermountain West and Great Basin and are a common summer resident on the Medicine Bow. Although they appear abundant in tall, vigorous sagebrush, no quantitative surveys have been conducted in the project area. Monitoring across the Medicine Bow between 2008 and 2016 demonstrates a steady or slight upward trend in record observations. Brewer's sparrow population changes are linked to alteration of sagebrush shrub steppe habitat (Holmes and Johnson 2005). On the Medicine Bow National Forest, primary influences include management activities that could have a transformative effect on sagebrush

habitat such as livestock grazing, alteration of natural fire regimes and invasion by exotic plants (Holmes and Johnson 2005).

Columbian sharp-tailed grouse: This subspecies of sharp-tailed grouse occurs in isolated pockets scattered across the western United States west of the Continental Divide. The species has previously been petitioned for listing twice under the Endangered Species Act and is thought to occupy less than 10 percent of their historic range (Hoffman et al. 2015). Habitat is limited within the project area, with only 1,350 acres occurring in the Sandy Battle Accounting Unit.

Greater sage-grouse: Greater sage-grouse are sagebrush-obligate species, inhabiting landscapes composed of a mosaic of tall sagebrush, low sagebrush, grass, and forbs. Breeding display grounds (leks) are open areas surrounded by dense sagebrush with 10 percent to 25 percent shrub cover available as nesting habitat. Nests are usually placed on the ground beneath big sagebrush with tall grass cover helping to conceal the nests. The project area contains 19,205 acres of priority and general habitat dispersed across 9 of the 14 accounting units, with the most habitat (11,793 acres) occurring in the Big Blackhall Accounting Unit. These habitats exist primarily along the Medicine Bow National Forest boundaries in both the Snowy Range and the Sierra Madre Range where sagebrush begins to dominate the landscape and dense forest is minimal or in isolated pockets.

Western bumble bee: Western bumble bees exist throughout most of the western United States. Western bumble bees are estimated to occur on the Medicine Bow National Forest and the project area, although their abundance and habitat use has not been quantified. On March 16, 2016, U.S. Fish and Wildlife Service personnel published a notice of petition findings regarding western bumble bee (U. S. Fish and Wildlife Service 2016). The petition presented substantial scientific or commercial information indicating the petitioned actions may be warranted and announced a plan to initiate a 12-month review of the status of these species.

Management Indicator Species

The Forest Service manual defines management indicator species as:

> "…plant and animal species, communities, or special habitats selected for emphasis in planning, and which are monitored during Forest Plan implementation in order to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent" (USDA Forest Service 1991).

The National Forest Management Act (NFMA) requires management indicator species be selected as part of the forest plan to estimate the effects of planning alternatives on fish and wildlife populations. Essentially, management indicator species are used as barometers to evaluate the effects of forest management on wildlife within the Forest.

The terrestrial management indicator species assessment prepared for the LaVA Project discusses distribution and status, habitat, existing conditions, direct, indirect, and cumulative effects as well as the rationale for the conclusions for each species. The following management indicator species occur, or have the potential to occur, in the project area: snowshoe hare, three-toed woodpecker, and golden-crowned kinglet.

Snowshoe hare: Snowshoe hares occur within an altitude range of approximately 8,000 to 10,990 feet (Armstrong 1972). Habitats that provide forage and cover needs of snowshoe hare include stands of relatively taller vegetation with a dense, multi-layered understory that maximizes cover and browse at both ground level and at varying snow depths throughout the winter (stems and branches from one to three meters above the ground). These habitats include spruce/fir, lodgepole, and some aspen stands in the analysis area. In addition, snowshoe hares have been found to use willow riparian areas, especially during summer (Wolff 1980, Beauvais 1997, Ruediger et al. 2000). Potential snowshoe hare habitat across the Medicine Bow National Forest corresponds to lodgepole (3B, 3C, 4B, and 4C), spruce-fir (3B-4C), and aspen structural stages (3B, 3C, 4B, and 4C) which contain horizontal cover. Across the Forest, there are more than 300,000 acres of potential snowshoe hare habitat among lodgepole, spruce-fir, and aspen stands with dense horizontal cover (USDA 2003). Much of this habitat has been impacted by the insect and disease outbreak.

Three-toed woodpecker: The three-toed woodpecker is primarily associated with high-elevation (above 8,900 feet) and old-growth conifer forests, specifically, spruce-fir and lodgepole habitats (Wiggins 2004; Cerovski 2004; Nicholoff 2003). Potential three-toed woodpecker habitat across the Medicine Bow corresponds to spruce-fir and lodgepole pine forest of structural stages 4A through 4C. The beetle epidemics created exceptional woodpecker habitat when beetles were in the process of infesting the stands. However, utility of this habitat has declined dramatically as the beetle outbreak subsided. Stands where the majority of trees have died do not currently provide suitable habitat. There are currently more than 255,000 acres of habitat in the LaVA project area. Due to its low abundance and transient nature, the species has a vast resource and habitat base to support the population on the Forest. Maintenance of live late-seral spruce-fir will provide a large number of areas containing high-quality breeding and foraging habitat. Results of monitoring data across the Medicine Bow between 2002 and 2015, strongly suggest the three-toed woodpecker population trend has varied in response to the level of the insect and disease outbreak.

Golden-crowned kinglet: Golden-crowned kinglets are associated with high-elevation coniferous forests, preferring to nest and forage within the interiors of dense, mature, old-growth stands. They are typically found in spruce-fir habitats having heavy canopy cover, often near streams. They can also be found, usually somewhat less abundantly, in mature lodgepole stands and mixed deciduous-conifer stands, especially those with a mature aspen component. Golden-crowned kinglets are sensitive to tree cutting and are less common in forests and stands that have been cut, partially cut, thinned, or in habitats with naturally open canopies. The species is also sensitive to prescribed and wildfires, especially those reducing the canopy cover. Availability of roost sites, such as tree cavities or squirrel nests, are critical in winter. Across the Medicine Bow, there are more than 200,000 acres of suitable habitat, spruce-fir within habitat structural stages 4A, 4B, and 4C and lodgepole habitat structural stages 4B and 4C. Other lodgepole pine stands are no longer suitable due to the loss of dense canopy as a result of the pine beetle outbreak.

Species of Local Concern

Species of local concern are species documented or suspected to be at risk at a forestwide scale, but which do not meet the criteria for regional sensitive species designation because they are reasonably secure within parts of their range in the Rocky Mountain Region. Species at the edge of their range may not merit regional sensitive species status but may be important elements of biological diversity for the national forest or national grassland unit (from Rocky Mountain Region

planning desk guide, chapter 27). The brown creeper is the species of local concern that occurs or has the potential to occur in the project area and be impacted by project implementation.

Brown Creeper: Brown creepers prefer expansive, unfragmented, mature stands with dense canopies containing large live trees, dead trees, or both (Hejl et al. 2002, Wiggins 2005a). Potential brown creeper habitat across the Medicine Bow National Forest corresponds to spruce-fir forest of structural stages 4A through 4C and lodgepole of stages 4B and 4C. There are more than 173,000 acres of lodgepole pine and spruce-fir habitat in the analysis area.

Wildlife Security Areas

The forest plan has guidelines to:

- maintain or increase security areas composed of blocks of hiding cover more than 250 acres over ½ mile from any roads or motorized trails that are open to motorized use (page 1-40);
- evaluate current and desired open road density at the geographic area scale and design projects, including road management to provide adequate security areas for wildlife and limit disturbances during parturition, nesting, and fledging periods (page 1-41);
- cluster disturbance in time and space to maintain security areas (Management Area 3.5, page 2-43), Close nonessential roads to enhance or develop large areas for wildlife security and nonmotorized recreation opportunities (Management Area 5.15, page 2-62); and
- identify and manage areas greater than 250 acres in size as needed to provide adequate wildlife security areas. (Management Area 5.15, page 2-64).

There are 123,000 acres of security areas in the LaVA project area and 51,700 acres of security areas in LaVA mechanical or prescribed fire treatment opportunity areas.

Environmental Consequences

Implementation of the LaVA project would have variable effects to terrestrial wildlife. Tree stands with high tree mortality and a sparse understory currently provide little habitat quality. Management that regenerates these stands would provide future habitat compared to what currently exists. This habitat restoration would occur from 20 to 80 or 100 years depending on the terrestrial wildlife species considered. Where management occurs in stands of green trees or with low to moderate amounts of tree mortality, habitat for wildlife dependent on old forest would decrease in quality or be removed for decades. Intermediate treatments that focus on areas that lack multi-story characteristics within old forest stands would benefit wildlife dependent on the dense cover typical of old forest stands. Intermediate treatments that simply remove a portion of the forest structure would reduce habitat quality for wildlife dependent on old forest characteristics while providing more foraging areas, for example, for other wildlife.

The tables below display potential effects and species determination information for threatened, endangered, and proposed species, Rocky Mountain Region sensitive species, management indicator species, and species of local concern. A detailed analysis of direct, indirect, and cumulative effects of the project on Canada lynx (threatened) is provided in the biological assessment in the project file. A detailed analysis of direct, indirect, and cumulative effects of the project on species of local concern, management indicator species, and Rocky Mountain Region sensitive species is provided in the biological evaluation, management indicator species, and species of local concern

report in the project file. These reports also consider protection measures including design features and other required protections under the forest plan or those required by law or policy.

The species in table 38 rely on forested habitat and the parameters chosen to evaluate change caused by proposed management of the forest and natural events reflect that habitat: percent tree mortality, condition of lynx habitat, etc. The species in table 39 rely on shrubland habitat. Therefore, aspects of beetle mortality in the forest or condition of lynx habitat would have little influence on habitat for these species.

Table 38. Potential effects of the modified proposed action to wildlife species that rely on forested habitat

Accounting Unit and Wildlife Species	% Habitat in Accounting Unit	% No Treatment Area in Habitat	% Forested with >50% Tree Mortality	Quality of Lynx Analysis Unit after Treatment	% Habitat Outside Wildland-urban Interface	Resulting Habitat Quality and Quantity
Battle Pass						
Canada lynx	High	Medium	Low	Low	High	Medium
American marten	High	High	Low	Low	Medium	Medium
Northern goshawk	Medium	Medium	Low	Low	High	Medium
Flammulated owl	Medium	Medium	Low	Low	High	Medium
Purple martin	Low	Medium	Low	Low	High	Low
Olive-sided flycatcher	Medium	Medium	Low	Low	High	Medium
Bighorn sheep	High	Medium	Low	Low	Medium	Medium
Hoary bat	Low	Medium	Low	Low	High	Low
Boreal owl	High	High	Low	Low	Medium	Medium
Pygmy shrew	Medium	Medium	Low	Low	Medium	Medium
Hudsonian emerald	Medium	Medium	Low	Low	Medium	Medium
Snowshoe hare	High	Medium	--	Low	Medium	Medium
Three-toed woodpecker	High	Medium	Low	Low	Medium	Medium
Golden-crowned kinglet	High	Medium	Low	Low	High	Medium
Brown creeper	High	High	Low	Low	Medium	Medium

Accounting Unit and Wildlife Species	% Habitat in Accounting Unit	% No Treatment Area in Habitat	% Forested with >50% Tree Mortality	Quality of Lynx Analysis Unit after Treatment	% Habitat Outside Wildland-urban Interface	Resulting Habitat Quality and Quantity
Big Blackhall						
Canada lynx	High	Low	Medium	Low	High	Medium
American marten	Medium	Medium	Medium	Low	Medium	Medium
Northern goshawk	High	Medium	Medium	Low	High	High
Flammulated owl	Low	Medium	Medium	Low	High	Medium
Purple martin	Low	Medium	Medium	Low	High	Medium
Olive-sided flycatcher	Low	Medium	Medium	Low	High	Medium
Bighorn sheep	Low	Medium	Medium	Low	High	Medium
Hoary bat	Low	Medium	Medium	Low	High	Medium
Boreal owl	Medium	Medium	Medium	Low	Medium	Medium
Pygmy shrew	Low	Medium	Medium	Low	High	Medium
Hudsonian emerald	Low	Medium	Medium	Low	High	Medium
Snowshoe hare	Medium	Medium	--	Low	Medium	Medium
Three-toed woodpecker	Medium	Medium	Medium	Low	Medium	Medium
Golden-crowned kinglet	Low	Medium	Medium	Low	High	Medium
Brown creeper	Medium	Medium	Medium	Low	Medium	Medium

Accounting Unit and Wildlife Species	% Habitat in Accounting Unit	% No Treatment Area in Habitat	% Forested with >50% Tree Mortality	Quality of Lynx Analysis Unit after Treatment	% Habitat Outside Wildland-urban Interface	Resulting Habitat Quality and Quantity
Bow Kettle						
Canada lynx	High	Medium	Low	Low	Medium	Low
American marten	High	Low	Low	Low	Medium	Low
Northern goshawk	Medium	Low	Low	Low	High	Medium
Flammulated owl	Low	Low	Low	Low	High	Low
Purple martin	Low	Low	Low	Low	High	Low
Olive-sided flycatcher	Low	Low	Low	Low	High	Low
Bighorn sheep	None	Low	Low	Low	--	None
Hoary bat	Low	Low	Low	Low	High	Low
Boreal owl	High	Low	Low	Low	Medium	Low
Pygmy shrew	Medium	Medium	Low	Low	Medium	Medium
Hudsonian emerald	Medium	Medium	Low	Low	Medium	Medium
Snowshoe hare	High	Low	--	Low	Medium	Low
Three-toed woodpecker	High	Low	Low	Low	Medium	Low
Golden-crowned kinglet	Medium	Low	Low	Low	High	Medium
Brown creeper	High	Low	Low	Low	Medium	Low

Accounting Unit and Wildlife Species	% Habitat in Accounting Unit	% No Treatment Area in Habitat	% Forested with >50% Tree Mortality	Quality of Lynx Analysis Unit after Treatment	% Habitat Outside Wildland-urban Interface	Resulting Habitat Quality and Quantity
Cedar Brush						
Canada lynx	High	Medium	Low	Medium	Medium	Medium
American marten	High	Low	Low	Medium	Medium	Low
Northern goshawk	High	Low	Low	Medium	High	Medium
Flammulated owl	Low	Low	Low	Medium	High	Low
Purple martin	Low	Low	Low	Medium	High	Low
Olive-sided flycatcher	Low	Low	Low	Medium	High	Low
Bighorn sheep	Low	Low	Low	Medium	High	Low
Hoary bat	Low	Low	Low	Medium	High	Low
Boreal owl	High	Low	Low	Medium	Medium	Low
Pygmy shrew	Medium	Medium	Low	Medium	Medium	Medium
Hudsonian emerald	Medium	Medium	Low	Medium	Medium	Medium
Snowshoe hare	High	Low	--	Medium	Medium	Low
Three-toed woodpecker	High	Low	Low	Medium	Medium	Medium
Golden-crowned kinglet	High	Low	Low	Medium	High	Medium
Brown creeper	High	Low	Low	Medium	Medium	Low

Accounting Unit and Wildlife Species	% Habitat in Accounting Unit	% No Treatment Area in Habitat	% Forested with >50% Tree Mortality	Quality of Lynx Analysis Unit after Treatment	% Habitat Outside Wildland-urban Interface	Resulting Habitat Quality and Quantity
Fox Wood						
Canada lynx	Medium	Low	Low	Medium	Low	Low
American marten	Low	Low	Low	Medium	Low	Low
Northern goshawk	Medium	Low	Low	Medium	Low	Low
Flammulated owl	Medium	Low	Low	Medium	Low	Low
Purple martin	Medium	Low	Low	Medium	Low	Low
Olive-sided flycatcher	Medium	Low	Low	Medium	Low	Low
Bighorn sheep	None	Low	Low	Medium	Low	None
Hoary bat	Medium	Low	Low	Medium	Low	Low
Boreal owl	Low	Low	Low	Medium	Low	Low
Pygmy shrew	Low	Low	Low	Medium	Low	High
Hudsonian emerald	Low	Low	Low	Medium	Low	High
Snowshoe hare	Medium	Low	--	Medium	Low	Low
Three-toed woodpecker	Medium	Low	Low	Medium	Low	Low
Golden-crowned kinglet	Low	Low	Low	Medium	Low	Low
Brown creeper	Low	Low	Low	Medium	Low	Low

Accounting Unit and Wildlife Species	% Habitat in Accounting Unit	% No Treatment Area in Habitat	% Forested with >50% Tree Mortality	Quality of Lynx Analysis Unit after Treatment	% Habitat Outside Wildland-urban Interface	Resulting Habitat Quality and Quantity
French Douglas						
Canada lynx	High	Medium	Low	Medium	Medium	Medium
American marten	Medium	Medium	Low	Medium	Medium	Medium
Northern goshawk	Medium	Medium	Low	Medium	Medium	Medium
Flammulated owl	Low	Medium	Low	Medium	Low	Low
Purple martin	Low	Medium	Low	Medium	Low	Low
Olive-sided flycatcher	Low	Medium	Low	Medium	Low	Low
Bighorn sheep	Low	Medium	Low	Medium	Low	Low
Hoary bat	Low	Medium	Low	Medium	Low	Low
Boreal owl	Medium	Medium	Low	Medium	Medium	Medium
Pygmy shrew	Medium	Low	Low	Medium	Low	Medium
Hudsonian emerald	Medium	Low	Low	Medium	Low	Medium
Snowshoe hare	High	Medium	Low	Medium	Medium	Medium
Three-toed woodpecker	Low	Medium	Low	Medium	Low	Low
Golden-crowned kinglet	Medium	Medium	Low	Medium	Medium	Medium
Brown creeper	Medium	Medium	Low	Medium	Medium	Medium

Accounting Unit and Wildlife Species	% Habitat in Accounting Unit	% No Treatment Area in Habitat	% Forested with >50% Tree Mortality	Quality of Lynx Analysis Unit after Treatment	% Habitat Outside Wildland-urban Interface	Resulting Habitat Quality and Quantity
Green Hog						
Canada lynx	Medium	Medium	Low	Low	Medium	Low
American marten	Medium	High	Low	Low	Medium	Medium
Northern goshawk	Medium	Medium	Low	Low	High	Medium
Flammulated owl	Medium	Medium	Low	Low	High	Medium
Purple martin	Medium	Medium	Low	Low	High	Medium
Olive-sided flycatcher	Medium	Medium	Low	Low	High	Medium
Bighorn sheep	High	Medium	Low	Low	High	Medium
Hoary bat	Medium	Medium	Low	Low	High	Medium
Boreal owl	Medium	High	Low	Low	Medium	Medium
Pygmy shrew	Low	High	Low	Low	High	Medium
Hudsonian emerald	Low	High	Low	Low	High	Medium
Snowshoe hare	High	Medium	Low	Low	Medium	Medium
Three-toed woodpecker	Medium	Medium	Low	Low	High	Medium
Golden-crowned kinglet	Medium	High	Low	Low	Medium	Medium
Brown creeper	Medium	High	Low	Low	Medium	Medium

Accounting Unit and Wildlife Species	% Habitat in Accounting Unit	% No Treatment Area in Habitat	% Forested with >50% Tree Mortality	Quality of Lynx Analysis Unit after Treatment	% Habitat Outside Wildland-urban Interface	Resulting Habitat Quality and Quantity
Jack Savery						
Canada lynx	Medium	Low	Low	Low	Low	Low
American marten	High	Low	Low	Low	Low	Low
Northern goshawk	Medium	Low	Low	Low	High	Medium
Flammulated owl	Low	Low	Low	Low	High	Low
Purple martin	Low	Low	Low	Low	High	Low
Olive-sided flycatcher	Low	Low	Low	Low	High	Low
Bighorn sheep	Low	Low	Low	Low	Low	Low
Hoary bat	Low	Low	Low	Low	High	Low
Boreal owl	High	Low	Low	Low	Low	Low
Pygmy shrew	Low	Low	Low	Low	Medium	High
Hudsonian emerald	Low	Low	Low	Low	Medium	High
Snowshoe hare	High	Low	--	Low	Low	Low
Three-toed woodpecker	High	Low	Low	Low	Low	Low
Golden-crowned kinglet	Low	Low	Low	Low	High	Low
Brown creeper	High	Low	Low	Low	Low	Low

Accounting Unit and Wildlife Species	% Habitat in Accounting Unit	% No Treatment Area in Habitat	% Forested with >50% Tree Mortality	Quality of Lynx Analysis Unit after Treatment	% Habitat Outside Wildland-urban Interface	Resulting Habitat Quality and Quantity
North Corner						
Canada lynx	High	Medium	Low	Medium	Medium	Medium
American marten	High	Medium	Low	Medium	Medium	Medium
Northern goshawk	Low	Medium	Low	Medium	Low	Low
Flammulated owl	Low	Medium	Low	Medium	Low	Low
Purple martin	Low	Medium	Low	Medium	Low	Low
Olive-sided flycatcher	Low	Medium	Low	Medium	Low	Low
Bighorn sheep	Low	Medium	Low	Medium	High	Low
Hoary bat	Low	Medium	Low	Medium	Low	Low
Boreal owl	High	Medium	Low	Medium	Medium	Medium
Pygmy shrew	Medium	Medium	Low	Medium	Medium	Medium
Hudsonian emerald	Medium	Medium	Low	Medium	Medium	Medium
Snowshoe hare	High	Medium	--	Medium	Medium	Medium
Three-toed woodpecker	High	Medium	Low	Medium	Medium	Medium
Golden-crowned kinglet	High	Medium	Low	Medium	Medium	Medium
Brown creeper	High	Medium	Low	Medium	Medium	Medium

Accounting Unit and Wildlife Species	% Habitat in Accounting Unit	% No Treatment Area in Habitat	% Forested with >50% Tree Mortality	Quality of Lynx Analysis Unit after Treatment	% Habitat Outside Wildland-urban Interface	Resulting Habitat Quality and Quantity
Owen Sheep						
Canada lynx	Negligible	Low	Medium	NA	Low	Low
American marten	Low	Low	Low	NA	Low	Low
Northern goshawk	High	Low	Low	NA	High	High
Flammulated owl	Low	Low	Low	NA	Medium	Low
Purple martin	Low	Low	Low	NA	Medium	Low
Olive-sided flycatcher	Low	Low	Low	NA	Medium	Low
Bighorn sheep	None	Low	Low	NA	--	None
Hoary bat	Low	Low	Low	NA	Medium	Low
Boreal owl	Low	Low	Low	NA	Low	Low
Pygmy shrew	Low	None	Low	NA	None	High
Hudsonian emerald	Low	None	Low	NA	None	High
Snowshoe hare	Medium	Low	Low	NA	Low	Low
Three-toed Woodpecker	Low	Low	Low	NA	Low	Low
Golden-crowned kinglet	Low	Low	Low	NA	Low	Low
Brown creeper	Low	Low	Low	NA	Low	Low

Accounting Unit and Wildlife Species	% Habitat in Accounting Unit	% No Treatment Area in Habitat	% Forested with >50% Tree Mortality	Quality of Lynx Analysis Unit after Treatment	% Habitat Outside Wildland-urban Interface	Resulting Habitat Quality and Quantity
Pelton Platte						
Canada lynx	Low	Medium	Low	Medium	High	Medium
American marten	Low	High	Low	Medium	High	Medium
Northern goshawk	Medium	High	Low	Medium	High	Medium
Flammulated owl	Medium	High	Low	Medium	High	Medium
Purple martin	Medium	High	Low	Medium	High	Medium
Olive-sided flycatcher	Medium	High	Low	Medium	High	Medium
Bighorn sheep	High	High	Low	Medium	High	High
Hoary bat	Medium	High	Low	Medium	High	Medium
Boreal owl	Low	High	Low	Medium	High	Medium
Pygmy shrew	Low	Low	Low	Medium	High	Medium
Hudsonian emerald	Low	Low	Low	Medium	High	Medium
Snowshoe hare	Medium	High	--	Medium	High	Medium
Three-toed woodpecker	Low	High	Low	Medium	High	Medium
Golden-crowned kinglet	Low	High	Low	Medium	Medium	Medium
Brown creeper	Low	High	Low	Medium	High	Medium

Accounting Unit and Wildlife Species	% Habitat in Accounting Unit	% No Treatment Area in Habitat	% Forested with >50% Tree Mortality	Quality of Lynx Analysis Unit after Treatment	% Habitat Outside Wildland-urban Interface	Resulting Habitat Quality and Quantity
Rock Morgan						
Canada lynx	High	Medium	Low	Medium	High	Medium
American marten	High	High	Low	Medium	Medium	Medium
Northern goshawk	High	High	Low	Medium	High	High
Flammulated owl	Low	High	Low	Medium	Medium	Medium
Purple martin	Low	High	Low	Medium	Medium	Medium
Olive-sided flycatcher	Low	High	Low	Medium	Medium	Medium
Bighorn sheep	Low	High	Low	Medium	Medium	Medium
Hoary bat	Low	High	Low	Medium	Medium	Medium
Boreal owl	High	High	Low	Medium	Medium	Medium
Pygmy shrew	Medium	Medium	Low	Medium	High	Medium
Hudsonian emerald	Medium	Medium	Low	Medium	High	Medium
Snowshoe hare	High	Medium	--	Medium	Medium	Medium
Three-toed woodpecker	High	High	Low	Medium	Medium	Medium
Golden-crowned kinglet	Medium	High	Low	Medium	Medium	Medium
Brown creeper	High	High	Low	Medium	Medium	Medium

Accounting Unit and Wildlife Species	% Habitat in Accounting Unit	% No Treatment Area in Habitat	% Forested with >50% Tree Mortality	Quality of Lynx Analysis Unit after Treatment	% Habitat Outside Wildland-urban Interface	Resulting Habitat Quality and Quantity
Sandy Battle						
Canada lynx	NA	NA	Na	NA	NA	NA
American marten	Low	Low	Low	NA	Low	Low
Northern goshawk	Medium	Medium	Low	NA	Medium	Medium
Flammulated owl	High	Medium	Low	NA	High	High
Purple martin	High	Medium	Low	NA	High	High
Olive-sided flycatcher	High	Medium	Low	NA	High	High
Bighorn sheep	Low	Medium	Low	NA	Medium	Medium
Hoary bat	High	Medium	Low	NA	High	High
Boreal owl	Low	Low	Low	NA	Low	Low
Pygmy shrew	None	NA	Low	NA	NA	No Impact
Hudsonian emerald	None	NA	Low	NA	NA	No Impact
Snowshoe hare	Medium	Low	--	NA	Low	Low
Three-toed woodpecker	Low	Medium	Low	NA	Low	Low
Golden-crowned kinglet	Low	Medium	Low	NA	High	Medium
Brown creeper	Low	Low	Low	NA	Low	Low

Accounting Unit and Wildlife Species	% Habitat in Accounting Unit	% No Treatment Area in Habitat	% Forested with >50% Tree Mortality	Quality of Lynx Analysis Unit after Treatment	% Habitat Outside Wildland-urban Interface	Resulting Habitat Quality and Quantity
West French						
Canada lynx	Medium	Medium	Low	Medium	High	Medium
American marten	High	Low	Low	Medium	Medium	Low
Northern goshawk	Medium	Low	Low	Medium	High	Medium
Flammulated owl	Medium	Low	Low	Medium	Medium	Low
Purple martin	Medium	Low	Low	Medium	Medium	Low
Olive-sided flycatcher	Medium	Low	Low	Medium	Medium	Low
Bighorn sheep	Medium	Low	Low	Medium	High	Medium
Hoary bat	Medium	Low	Low	Medium	Medium	Low
Boreal owl	High	Low	Low	Medium	Medium	Low
Pygmy shrew	Low	Low	Low	Medium	Medium	Medium
Hudsonian emerald	Low	Low	Low	Medium	Medium	Medium
Snowshoe hare	Medium	Low	--	Medium	Medium	Low
Three-toed woodpecker	Medium	Low	Low	Medium	Low	Low
Golden-crowned kinglet	Medium	Low	Low	Medium	High	Medium
Brown creeper	High	Low	Low	Medium	Medium	Low

Table 39. Potential effects of the modified proposed action to wildlife species that rely on shrubland habitat

Accounting Unit / Wildlife Species	% Habitat in Accounting Unit	% of Accounting Unit with Potential Treatment outside Habitat	Resulting Habitat Quality and Quantity
Battle Pass			
White-tailed prairie dog	Low	High	Negligible Change
Brewer's sparrow	Low	Medium	Medium
Columbian sharp-tailed grouse	NA	NA	NA
Greater sage-grouse	Low	Medium	High
Western bumblebee	High	Low	High
Big Blackhall			
White-tailed prairie dog	NA	NA	NA
Brewer's sparrow	Low	Medium	Medium
Columbian sharp-tailed grouse	NA	NA	NA
Greater sage-grouse	Low	Medium	High
Western bumblebee	High	Low	High
Bow Kettle			
White-tailed prairie dog	NA	NA	NA
Brewer's sparrow	Low	Medium	Medium
Columbian sharp-tailed grouse	NA	NA	NA
Greater sage-grouse	Low	Medium	High
Western bumblebee	High	Low	High
Cedar Brush			
White-tailed prairie dog	NA	NA	NA
Brewer's sparrow	Low	Medium	Medium
Columbian sharp-tailed grouse	NA	NA	NA
Greater sage-grouse	Low	High	High
Western bumblebee	High	Low	High
Fox Wood			
White-tailed prairie dog	NA	NA	NA
Brewer's sparrow	Low	High	High
Columbian sharp-tailed grouse	NA	NA	NA
Greater sage-grouse	Low	High	High
Western bumblebee	High	Low	High
French Douglas			
White-tailed prairie dog	NA	NA	NA
Brewer's sparrow	NA	NA	NA
Columbian sharp-tailed grouse	NA	NA	NA
Greater sage-grouse	NA	NA	NA
Western bumblebee	High	Low	High
Green Hog			
White-tailed prairie dog	NA	NA	NA
Brewer's sparrow	NA	NA	NA
Columbian sharp-tailed grouse	NA	NA	NA
Greater sage-grouse	NA	NA	NA
Western bumblebee	High	Low	High

Accounting Unit / Wildlife Species	% Habitat in Accounting Unit	% of Accounting Unit with Potential Treatment outside Habitat	Resulting Habitat Quality and Quantity
Jack Savery			
White-tailed prairie dog	NA	NA	NA
Brewer's sparrow	Low	High	High
Columbian sharp-tailed grouse	NA	NA	NA
Greater sage-grouse	Low	High	High
Western bumblebee	High	Low	High
North Corner			
White-tailed prairie dog	NA	NA	NA
Brewer's sparrow	NA	NA	NA
Columbian sharp-tailed grouse	NA	NA	NA
Greater sage-grouse	NA	NA	NA
Western bumblebee	High	Low	High
Owen Sheep			
White-tailed prairie dog	Low	Low	Negligible Change
Brewer's sparrow	NA	NA	NA
Columbian sharp-tailed grouse	NA	NA	NA
Greater sage-grouse	NA	NA	NA
Western bumblebee	High	Low	High
Pelton Platte			
White-tailed prairie dog	Low	Low	Negligible Change
Brewer's sparrow	Low	Low	Low
Columbian sharp-tailed grouse	NA	NA	NA
Greater sage-grouse	Low	Low	High
Western bumblebee	High	Low	High
Rock Morgan			
White-tailed prairie dog	Low	Low	Negligible Change
Brewer's sparrow	Low	Medium	Medium
Columbian sharp-tailed grouse	NA	NA	NA
Greater sage-grouse	Low	Medium	High
Western bumblebee	High	Low	High
Sandy Battle			
White-tailed prairie dog	Low	Low	Negligible Change
Brewer's sparrow	Low	High	High
Columbian sharp-tailed grouse	Low	High	High
Greater sage-grouse	Low	High	High
Western bumblebee	High	Low	High
West French			
White-tailed prairie dog	NA	NA	NA
Brewer's sparrow	NA	NA	NA
Columbian sharp-tailed grouse	NA	NA	NA
Greater sage-grouse	NA	NA	NA
Western bumblebee	High	Low	High

Table 40. Determination of effects of LaVA alternatives to terrestrial wildlife species

Species	Classification	No Action	Modified Proposed Action
Canada lynx	Federally threatened	No effect	May affect, likely to adversely affect
American marten	Rocky Mountain Region sensitive, management indicator species	No impact	MII [1]
Northern goshawk	Rocky Mountain Region sensitive, management indicator species	No impact	MII [1]
Flammulated owl	Rocky Mountain Region sensitive	No impact	MII [1]
Purple martin	Rocky Mountain Region sensitive	No impact	MII [1]
Olive-sided flycatcher	Rocky Mountain Region sensitive	No impact	MII [1]
Rocky Mountain bighorn sheep	Rocky Mountain Region sensitive	No impact	MII [1]
Hoary bat	Rocky Mountain Region sensitive	No impact	MII [1]
Boreal owl	Rocky Mountain Region sensitive	No impact	MII [1]
Pygmy shrew	Rocky Mountain Region sensitive	No impact	MII [1]
Hudsonian emerald	Rocky Mountain Region sensitive	No impact	MII [1]
White-tailed prairie dog	Rocky Mountain Region sensitive	No impact	MII [1]
Brewer's sparrow	Rocky Mountain Region sensitive	No impact	MII [1]
Columbian sharp-tailed grouse	Rocky Mountain Region sensitive	No impact	MII [1]
Greater sage-grouse	Rocky Mountain Region sensitive	No impact	MII [1]
Western bumblebee	Rocky Mountain Region sensitive	No impact	MII [1]
Snowshoe hare	Management indicator species	Suitable habitat would remain across the Medicine Bow	Suitable habitat would remain across the Medicine Bow
American three-toed woodpecker	Management indicator species	Suitable habitat would remain across the Medicine Bow	Suitable habitat would remain across the Medicine Bow
Golden-crowned kinglet	Management indicator species	Suitable habitat would remain across the Medicine Bow	Suitable habitat would remain across the Medicine Bow
Brown creeper	Species of local concern	Suitable habitat would remain across the Medicine Bow	Suitable habitat would remain across the Medicine Bow

[1] (MII) May adversely impact individuals but not likely to result in a loss of viability on the Planning Area, nor cause a trend to Federal listing or a loss of species viability range-wide.

Direct and Indirect Effects on Canada Lynx

Southern Rockies Lynx Amendment Criteria

Vegetation management would utilize exemptions and exceptions to the vegetation management standards in the Southern Rockies Lynx Amendment (USDA 2008). The LaVA project would use 13,214 acres of exemptions (39.7 percent of the remainder), 3,978 acres of the 1 percent precommercial thinning exceptions (32.7 percent of the remainder), and 2,893 acres of the exception for incidental damage to winter snowshoe hare habitat (50 percent of the remainder).

Effects based on the Southern Rocks Lynx Amendment criteria were captured with the following LaVA project indicators for Canada lynx habitat:

- unsuitable habitat (percent treated)
- suitable habitat (percent treated)
- wildland-urban interface treatments (acres)

Table 41 and table 42 show the lynx analysis unit habitat as well as the LaVA treatment acres and percentages that correspond to these lynx habitat indicators.

Table 41. Lynx analysis unit habitat with LaVA treatment (acres) in the Snowy Range.

Lynx Analysis Unit	Total Habitat	Existing Current Unsuitable (%)	Assumed State and Private Habitat Treatment	WUI[1] present in LAU	Suitable Habitat Treatment (no exemption /exception needed)	Suitable Habitat WUI Treatment (3% exemption for 15% in 10 yrs)	Suitable Habitat WUI Treatment (3% exemption for 30% unsuitable)	LaVA Result Unsuitable in 10 yrs. (%)	LaVA Result Unsuitable (%)
Douglas Creek	49,902	5,796 (11.6)	892	5,562	4,580			14.0	11,268 (22.6)
Snowy Range East	32,697	3,631 (11.1)	0	665	4,350			14.3	7,981 (24.4)
Morgan	43,081	4,212 (9.8)	701	2,042	5,300			14.0	10,213 (23.7)
Kettle Ponds	46,891	3,999 (8.5)	2,780	5,950	4,159	1,791		18.8	12,729 (27.1)
Brush Creek	42,877	3,248 (7.6)	1,428	5,320	4,640	1,200		17.8	10,516 (24.5)
French Creek	43,524	7,086 (16.3)	252	2,148	3,850			14.3	11,188 (25.7)

LAU = lynx analysis unit; WUI = wildland-urban interface

Table 42. Lynx analysis unit habitat with LaVA treatment (acres) in the Sierra Madre

Lynx Analysis Unit	Total Habitat	Existing Current Unsuitable (%)	Assumed State and Private Habitat Treatment	WUI[1] present in LAU	Suitable Habitat Treatment (no exemption /exception needed)	Suitable Habitat WUI Treatment (3% exemption for 15% in 10 yrs)	Suitable Habitat WUI Treatment (3% exemption for 30% unsuitable)	LaVA Result Unsuitable in 10 yrs. (%)	LaVA Result Unsuitable (%)
Upper Sierra Madre	40,557	3,290 (8.1)	1,924	7,834	4,052	3,782		24.3	13,048 (32.2)
Battle Creek	35,035	2,156 (6.2)	2,936	8,606	175	4,800		24.6	10,067 (28.7)
Blackhall Mountain[2]	43,532	16,898 (38.8)	725	532	0		532	7.1	18,155 (41.7)
Hog Park[2]	37,396	7,184 (19.2)	1,011	2,131	3,100		1,000	16.3	12,295 (32.9)
Little Snake[2]	46,462	13,949 (30.0)	2	26	0		26	2.2	13,977 (30.1)

Lynx Analysis Unit	Total Habitat	Existing Current Unsuitable (%)	Assumed State and Private Habitat Treatment	WUI[1] present in LAU	Suitable Habitat Treatment (no exemption /exception needed)	Suitable Habitat WUI Treatment (3% exemption for 15% in 10 yrs)	Suitable Habitat WUI Treatment (3% exemption for 30% unsuitable)	LaVA Result Unsuitable in 10 yrs. (%)	LaVA Result Unsuitable (%)
Diamond Park[2]	35,490	12,290 (34.6)	191	0	0		83	3.7	12,564 (35.4)
Red Elephant Mountain[2]	38,508	14,063 (36.5)	0	0	0			0.3	14,063 (36.5)
TOTALS	535,952	97,802	12,842	40,816	34,206	11,573	1641		158,064

LAU = lynx analysis unit; WUI = wildland-urban interface

1 Infrastructure wildland-urban interface includes a 0.5 mile buffer around private lands within lynx analysis units

2 These lynx analysis units also occur in Colorado. Habitat conditions reflect entire lynx analysis unit.

Direct and Indirect Effects on Wildlife Security Areas

No-action Alternative

There would be no impact to wildlife security areas from the no-action alternative.

Modified Proposed Action

LaVA implementation is not likely to meet forest plan wildlife security guidelines in all cases. There are 51,700 acres of security areas in LaVA mechanical or prescribed fire treatment opportunity areas that could be removed temporarily by vegetation management. If vegetation is removed from the security area with stand initiation treatments, then security areas would not exist at the site again until there is sufficient regeneration to hide 90 percent of an adult elk at 200 feet or less (hiding cover) across 250 acres. Hiding cover can be restored within 15 to 25 years. Intermediate treatments might not retain sufficient cover to retain function as security areas.

Additionally, security areas are at least 250 acres in size. LaVA treatments have the potential to remove only a portion of the vegetation in a few security areas but temporarily eliminate the entire polygon as security habitat until cover is restored. There are only eight locations in the project area where removal of a portion of a security area could reduce the area to less than 250 acres. Most security areas are far too large to be removed by small treatment acreages within their boundaries.

Table 43. Security areas and potential treatment by accounting unit (acres)

Accounting Unit	Security Areas	Potential Vegetation Removal in Security Areas
Battle Pass	12,697	2,652
Big Blackhall	13,088	4,696
Bow Kettle	5,533	2,740
Cedar Brush	3,797	1,704
Fox Wood[1]	135	135
French Douglas	9,837	1,475
Green Hog	19,952	7,815
Jack Savery	9,905	7,768
North Corner	4,806	2,946
Owen Sheep	8,705	8,681
Pelton Platte	9,359	571
Rock Morgan	16,024	5821
Sandy Battle	5,711	4,187
West French	3,575	596
Total	123,000	51,700

[1] Security area in Fox Wood is a portion of a large security area across several accounting units

Cumulative Effects

Canada Lynx

No-action Alternative
It is assumed all suitable habitat on private and State lands in lynx analysis units in the project area would be converted to an unsuitable condition. This would total 12,842 acres.

Modified Proposed Action
It is assumed all suitable habitat on private and State lands within lynx analysis units and linkage corridors in the LaVA project area would be converted to unsuitable habitat in the next 15 years. This assumption was subtracted from the total acres available for treatment under Southern Rockies Lynx Amendment vegetation management standards S1 and S2. Therefore, LaVA proposed actions, in combination with the potential conversion of all suitable habitat on private and State lands, will not result in the conversion of more suitable habitat to an unsuitable condition than identified in the biological assessment. Treatments will not exceed 11,714 acres of wildland-urban interface exemptions, for example, based on the total potential unsuitable habitat for any lynx analysis unit.

Region 2 Sensitive Species, Management Indicator Species, and Species of Local Concern

No-action Alternative
There would be no cumulative effects since there are no direct and indirect effects.

Modified Proposed Action
Medicine Bow National Forest personnel are currently preparing two Farm Bill categorical exclusions in the LaVA project area to address insects and disease. These include up to 3,000 acres of timber management in the Fox Creek area and 2,400 acres of timber management in the Ryan park area of the Snowy Range.

The analysis for the North Savery project was recently completed. This project includes 5,816 acres of beetle-killed salvage harvest, 1,018 acres of precommercial thinning, and 358 acres of tree clearing around Medicine Bow National Forest infrastructure.

The LaVA Project, when considered in conjunction with the aforementioned projects, would result in different effects to different wildlife species. Habitat quality would be reduced for some species and improved for others, depending on specific habitat needs and requirements. Detailed cumulative effects discussions specific to individual wildlife species may be found in the wildlife specialist reports.

Aquatic Species

Affected Environment

The LaVA project area includes portions of two major drainage basins: the Green River Basin west of the Continental Divide and the Platte River Basin east of the Divide. The analysis area for aquatic resources is spatially bounded within the two basins and temporally from the early 1900s to five years beyond project completion (approximately 2033). The rationale for this bounding in space and time is that the existing condition has been influenced through human impacts prior to establishment of the National Forest in 1902.

Water diversions, mining, grazing, and timber harvest have impacted the aquatic resources. These activities have reduced stream flows, introduced sediment into stream channels, reduced riparian vegetation, and altered channel morphology.

Nonnative trout have been introduced into Medicine Bow National Forest streams and have become abundant and widely distributed. Although these introductions have established a strong and popular fisheries within, and outside, the project area, they have affected the integrity of native fish, macroinvertebrate, and amphibian communities.

The information below focuses on aquatic species that either occur or have the potential to occur in the LaVA project area. These species include Rocky Mountain Region sensitive species and management indicator species. There are no aquatic species of local concern and no federally listed fish or amphibian species within the analysis area. Additionally, there is no suitable habitat in the project area for threatened, endangered, proposed or candidate fish or amphibian species. The project would also not result in water depletions to the Platte River or Colorado River.

Rocky Mountain Region Sensitive Species

Please refer to the "Wildlife" section for a definition of Rocky Mountain Region sensitive species. The following sensitive aquatic species occur or have the potential to occur in the project area:

Boreal toad: Boreal toads in the Rocky Mountain Region generally occur at elevations between 7,500 and 12,000 feet. Boreal toads occupy three distinct types of habitats during the course of a year: breeding ponds, summer range, and over-winter hibernacula. In the early summer, breeding adult boreal toads are found in or near water. As the season progresses, they may use more terrestrial habitats. Breeding habitats typically include shallow water (less than 20 centimeters) at the edges of ponds, lakes, streams, and wetlands. There are four known breeding sites located in the Snowy Mountains of the Medicine Bow Range within the LaVA project area. The boreal toad will travel over a mile to reach terrestrial hibernacula sites.

Wood frog: An isolated, glacial relict wood frog population occupies a relatively small area of the Medicine Bow National Forest. This population may have declined in the 1970s but presently seems to be increasing; perhaps these population fluctuations are somehow related to the decline of the boreal toad (G. Beauvais, pers. comm.). The Medicine Bow Mountains have robust population densities of wood frogs, and certain areas appear to be especially productive for this species: Stillwater Park, Long Lake, and Fox Park. While available data about wood frog distribution in the Medicine Bow Mountains are good, there are insufficient data to fully describe population dynamics or population persistence.

Northern leopard frog: Northern leopard frogs are present on the Medicine Bow Range but numbers are low and declining. The species has been found in beaver ponds and wetlands in the Sherman Mountains, Foxpark, and Lake Owen. The population in the Laramie Basin has declined since the 1970s. This species appears to be widespread but less common in the Sierra Madre, Medicine Bow Mountains, and Laramie Range. Most sightings of northern leopard frog in the Medicine Bow National Forest (montane habitats) have occurred during surveys for other amphibian or during planning for proposed land management activities. There are insufficient available data to describe population dynamics or to predict species persistence in the Medicine Bow.

Mountain sucker: Mountain sucker occur throughout large portions of the western United States and Canada and are most common in the center of their range in the Intermountain region of the United States. Among the five states in the Rocky Mountain Region, the distribution of mountain sucker is most widespread in Wyoming. It is found on the Medicine Bow west of the Continental Divide in most drainages and is thought to be extirpated from the North Platte River drainage (USDA Forest Service 2003b).

Mountain sucker, primarily, occur in small headwater streams to large rivers (Belica 2006). In Wyoming, the mountain sucker is typically found in low-gradient stream reaches in meadows (Belica 2006). This is the case on the Medicine Bow where mountain suckers have been sampled in the West Fork Battle Creek and lower Big Sandstone Creek; both low-gradient meadow streams. Other streams in the LaVA project area are suspected of supporting mountain suckers.

Colorado River cutthroat trout: The Colorado River cutthroat trout is native only to the Green River Basin. The species was abundant in the basin in the mid-1800s, but by the middle of the last century, the cutthroat was known to be rare and relegated to headwater streams in the Green and Little Snake River drainages (Wyoming Game and Fish Department 2010). The Little Snake River drainage is within the LaVA project area. The Colorado River cutthroat trout currently occupies approximately 30 percent of its historic habitat within the Little Snake River drainage (4^{th}-level hydrologic unit code watershed) (Hirsch et al 2013). Within the LaVA project area, Colorado River cutthroat trout are present in the following 6^{th}-level hydrologic unit code watersheds: Haggerty Creek, North Fork Little Snake River, Roaring Fork of the North Fork Little Snake River, Upper Battle Creek, Big Sandstone Creek, Middle Savery Creek, Dirtyman Fork, and Upper Savery Creek. Within these watersheds, there are conservation populations of Colorado River cutthroat trout (Hirsch et al 2006). Conservation populations are known or suspected to be at least 90 percent genetically pure or determined to be important for conservation of the species (Hirsch et al 2006). Conservation populations may also support core populations. Core populations are at least 99 percent pure based on genetic testing (Hirsch et al 2006).

Management Indicator Species

Please see the definition of management indicator species presented in the "Wildlife" section. The following aquatic management indicator species occur, or have the potential to, occur in the project area:

Brook trout are native to most of eastern Canada from Newfoundland to the west side of Hudson Bay, the Great Lakes, and the Mississippi River Basins into Minnesota and south into the Appalachian Mountains. Brook trout are ubiquitous in most of the Medicine Bow-Routt National Forest, where they occur in 162 of the 196 6^{th}-level watersheds on the Medicine Bow side. Of these, 145 watersheds are classified as having strong brook trout populations (IWWI 2001).

Brown trout are native to most of Europe, North Africa and west Asia. They were introduced to North America in 1883 (New York and Michigan), and are now widely stocked throughout southern Canada and much of the U.S. Brown trout occur in 100 of the 196 6^{th}-level watersheds on the Medicine Bow side of the Medicine Bow-Routt National Forest. Of these watersheds, 54 are considered to have strong populations (IWWI 2001).

Rainbow trout are native to the Pacific Slope from Kuskokwim, Russia, and Alaska to (at least) Rio Santo Domingo in Baja California. They are also in the upper Mackenzie River drainage in the Artic basin

through the endorheic basins of southern Oregon. Rainbow trout have been widely introduced into the cold waters throughout North America and the rest of the world. Of the 196 6th-level watersheds on the Medicine Bow side of the Medicine Bow-Routt National Forest, 111 watersheds have rainbow trout populations. Of these, 51 are considered strong (IWWI 2001).

Environmental Consequences

Species Determinations

Table 44. Determination of effects of LaVA alternatives to aquatic species

Species	Classification	No Action	Proposed Action
Boreal toad	Rocky Mountain Region sensitive	No impact	May result in impacts to individuals, but is not likely to result in a loss of viability in the planning area, nor cause a trend toward Federal listing.
Northern leopard frog	Rocky Mountain Region sensitive	No impact	MII [1]
Wood frog	Rocky Mountain Region sensitive	No impact	MII [1]
Colorado River cutthroat trout	Rocky Mountain Region sensitive	No impact	MII [1]
Mountain sucker	Rocky Mountain Region sensitive	No impact	MII [1]
Common trout	Management indicator species	Low impact	Moderate impact

MII[1]: May result in impacts to individuals but is not likely to result in a loss of viability in the planning area, nor cause a trend toward Federal listing.

Direct and Indirect Effects

No-action Alternative

There would be no direct, indirect or cumulative effects to fish and amphibian species or their habitats with the no action alternative. The existing condition as described in the "Affected Environment" section of this document would be maintained.

Modified Proposed Action

Timber Harvest

Up to 260,000 acres of forested areas could be commercially harvested over the life of the project. Timber harvest along stream channels and riparian areas can directly affect aquatic habitat by reducing large woody debris recruitment, and increase water temperature variations (Cross 2002). Heavy equipment operations around wetlands could destroy amphibian habitat or through direct mortality. Log deck landings that are situated on, or directly adjacent to, perennial or ephemeral ponds could inundate these habitats or pose obstacles to toads traveling among ponds (USDA Forest Service 2003b).

Forest plan standards require vegetative buffers to be established along streams, lakes, and wetlands to maintain or improve long-term stream health and riparian ecosystems. These buffers or water influence zones vary in width from 100 feet to 300 feet or to the top of the inner gorge, depending on the existing

health of stream and riparian ecosystems. Therefore, the risk of harvest activities reducing large woody debris recruitment and modifying stream temperatures would be low.

However, the threat to amphibian habitat and individuals outside the water influence zone would be higher because some amphibian species can travel up to miles between wetlands in search of hibernaculas. During planning and design of individual treatments, biologists would consult with timber staff to develop site-specific design features to protect amphibians and their breeding habitats and associated hibernacula to reduce the risk of direct effects to the species (amphibian and fisheries project design feature #7).

Mastication

Mastication is accomplished with the use of machinery to grind small diameter trees into small chunks which is left on the forest floor as large mulch. Mastication could directly affect amphibians by destroying hibernaculas or through direct mortality. Site-specific design criteria would be developed in areas adjacent to breeding habitats and associated hibernaculas (hydrology and wet area project design feature #3).

This vegetation treatment would not have an effect on aquatic habitats because mastication would not occur within the water influence zones per forest plan standards, unless the long-term health of the riparian area is maintained or improved. Prior to any encroachment into the water influence zones, the area would be reviewed by a fisheries biologist or hydrologist. If it is determined that pre-existing project design features would not be sufficient to protect aquatic species, site-specific design features would be developed to maintain or improve the long-term health of the riparian area.

Prescribed Fire and Hand Thinning

Up to 100,000 acres (mastication, fire, and thinning) could be treated using prescribed fire and hand thinning. Prescribed fire could impact amphibians and their habitats, particularly boreal toads. However, riparian areas and wetlands tend to have enough vegetation, soil moisture, and relative humidity to withstand total destruction in all but the most devastating fires (USDA Forest Service 2003b). Fire ignition will not occur within the water influence zones but would be allowed to back into the buffer.

Thinning may also occur in the water influence zones. Fire and hand thinning activities would disturb potentially occupied amphibian habitat; however, fire and thinning would not be expected to adversely affect fish or amphibian populations. Direct effects from prescribed fire (abrupt changes in temperature, inputs of ash, nutrient spikes, etc.) would not be expected to significantly impact fish or amphibian habitats or populations. Hand thinning would not be expected to have direct effects to aquatic habitat.

Road Construction

The proposed action could construct up to 600 miles of temporary road to access treatment areas. The final assessment of road needs has not yet been determined. The exact location of temporary roads is currently unknown, but there would be potential for direct effects to aquatic habitats and fish and amphibian populations.

Overall, risks of impacts to aquatic, riparian, and wetland ecosystems due to roads tend to increase with new road construction (USDA Forest Service 2003c). Road construction would have the potential to directly affect fish populations and their habitat at stream crossings by increasing sedimentation, reducing large woody debris recruitment, and impeding fish passage. Roads constructed through, or parallel to, wetlands would impact amphibians and their habitats.

Construction of stream crossings would produce short-term sediment pulses. Fish and other aquatic organisms downstream of construction sites could be temporary affected. Reductions in large woody debris could occur if a road parallels a stream or wetland or where the road crosses these habitat types. Fish passage could be impeded at stream crossing if a culvert was installed improperly; or example, the gradient is too steep, the culvert is to small increasing water velocity, or outlet of the culvert is perched.

Road construction impacts could be mitigated through proper road planning, design, and location. In addition, best management practices and forest plan standards would help mitigate the effects of construction.

Cumulative Effects

No-action Alternative

Historic timber harvest, mining, grazing, and stocking of nonnative trout species have had the greatest impact on aquatic resources (USDA Forest Service 2003c). Railroad tie drives down streams straightened and widened stream channels, reduced habitat complexity, and impacted riparian vegetation. Commercial mines contributed heavy metal contamination to area streams, and overgrazing has affected the condition and abundance of riparian and wetland vegetation (willow and aspen). Stocking of nonnative trout has also affected the integrity of native fish, macroinvertebrate and amphibian communities. Finally, water diversions and dams prevent the upstream movement of Colorado River cutthroat trout, which isolates populations.

Presently, timber harvests, road construction, recreational mining and livestock grazing, when combined, incrementally increase the cumulative effects on aquatic, riparian, and wetland ecosystems.

In the future, vegetation management and other multiple use projects would continue to impact aquatic, riparian, and wetland ecosystems. However, watershed restoration activities, such as decommissioning roads and routes and installing aquatic organism passages would offset many of these future cumulative impacts.

Modified Proposed Action

Depending on the extent to which protection measures (impact thresholds and design features) are implemented, fish and amphibian populations and habitats within the project area could be impacted by the following cumulative effects:

- Sedimentation to stream channels could increase as a result of timber harvest and road construction.
- Slight increases in sedimentation could cumulatively increase habitat degradation in a few stream reaches where sedimentation and habitat degradation is already an issue.
- Other factors (mining, grazing, water augmentation, fish introduction, etc.) that have contributed to impaired watershed ratings are not expected to increase or decrease substantially with implementation of the proposed action.

Botany

Affected Environment

There are no federally listed threatened or endangered plant species or suitable habitat found on the Snowy Range or Sierra Madre Range. There are, however, 10 known Rocky Mountain Region sensitive plant species and habitat requirements can met for additional species. These mountain ranges also support over 30 plant species of concern, a forest-level designation of plant species at risk of becoming locally rare or extirpated due to environmental conditions or Medicine Bow National Forest activities.

Populations vary greatly in size and a single population may represent a small handful of plants in a confined area or up to several hundred plants across several acres. Some populations have been well documented, with plant counts, monitoring, and detailed mapping, others have not. The plant species of concern typically are not as well-documented and monitored as the sensitive species.

Habitats and Ecosystems that Support Rare Plants

Wetlands on the Medicine Bow National Forest comprise approximately 4 percent of the landscape but support a disproportionate number of plant species. The term wetlands describes a variety of habitat types including wet meadows, fens, riparian areas, seeps, and springs, many of which have the potential to support rare plant species. In fact, 6 of the 12 sensitive species in the analysis area are found only in wetlands.

The old growth and mature forests of the Medicine Bow National Forest have traditionally supported several rare plant species that thrive on the moist, shaded, and undisturbed forest floor. Rare plants have been found in old growth and mature lodgepole pine and spruce-fir forests in both the Sierra Madre and Snowy Range. Some of these areas are ideal rare plant habitat but also ideal timber harvest areas for the LaVA project.

The sagebrush steppe makes up the lower-elevation foothill regions along the outer perimeter of the Snowy Range and Sierra Madre. This shrubby habitat is typically interspersed with herbaceous-dominated grasslands and sparsely vegetated plant communities as well as treed draws, north-facing slopes, and ridges. The un-treed, lower-elevation vegetation communities are botanical areas of concern for two reasons. These areas support a handful of rare plants, including 2 sensitive species and several regional and local endemic plant species. These areas are highly susceptible to invasion by nonnative plants, most notably cheatgrass.

Environmental Consequences

Sensitive Plant Species

Table 45 lists includes sensitive plant species or their habitats that may occur in the LaVA project area or are located adjacent to, or downstream of, the project and could potentially be affected. A pre-field review was conducted of available information on these species to assemble occurrence records, describe habitat needs and ecological requirements, and determine whether field reconnaissance was needed to complete the analysis. The 2017 Rocky Mountain Region sensitive species list consists of 91 species, of which 12 are known to occur in the LaVA analysis area. Based on the pre-field review, four additional sensitive species (not in previous table) have suitable habitat in the LaVA analysis area and are likely to occur.

Table 45. Rocky Mountain Region sensitive plant species considered and evaluated

Name	Conservation Status (WY)[1]	Habitat Description	Accounting Unit(s)	Potential to Occur
Astragalus leptaleus park milkvetch	G3 G4 S1	Occurs in hummocky willow cars, sedge dominated wetlands. Known from the Snowy Range, suspected in the Sierra Madre. 7,400 to 9,800 feet (Ladyman 2006a).	Big Blackhall	Known
Carex diandra lesser panicled sedge	G5 S2	Occurs in riparian areas, pond edges and fens. Known from wetlands on the Snowy Range; 9,000 to 10,000 feet (Gage and Cooper 2006a).	Rock Morgan, North Corner	Known
Carex livida livid sedge	G5 S3	Occurs on floating mats in bogs and fens. Known from wetlands in the Snowy Range;. 9,000 to 10,000 feet (Gage and Cooper 2006b).		Suitable habitat exists
Drosera rotundifolia roundleaf sundew	G5 SNR	Acid fens, floating mats, bogs. 8,530 to 9,600 feet (Ackerfield 2015; Gage and Cooper 2006c)		Suitable habitat exists
Eleocharis elliptica elliptic spikerush	G5 SNR	Associated thermal seeps and springs, stock ponds, areas of perennial saturation with flowing water from springs. 6,200 to 7,250 feet (Nellessen 2006)	Sandy Battle, Rock Morgan	Known
Eriogonum exilifolium dropleaf buckwheat	G3 S2	Occurs in semi-barren sandy areas with calcareous soils; sparsely vegetated and bunchgrass communities; Known from the Snowy Range, suspected on the Sierra Madre; 6,900 to 8,800 feet. (Anderson 2006a).	Big Blackhall, Bow Kettle	Known
Eriophorum gracile slender cottongrass	G5 S3	Fens and subalpine meadows. 7,000 to 11,140 feet (Decker et al. 2006).	Owen Sheep	Known
Festuca hallii plains rough fescue	G4G5 S2	Open montane and subalpine meadows, mountain parks, forest openings. 8,500 to 12,000 feet (Anderson 2006b).	French Douglas	Known
Ipomopsis aggregata ssp. *weberi* Rabbit Ears gilia	G5 SU	Rocky, gravelly, open sites and with sagebrush, and other shrub species. Openings in coniferous forest slopes. Endemic. 7,200 to 10,000 feet (Ladyman 2004c).	Jack Savery, Sandy Battle	Known
Kobresia simpliciuscula simple bog sedge	G5 S1	Mesic to wet tundra, wet glacial cirques, and rich to extreme rich fens. 8,970 to 12,800 feet (Decker et al 2006b).		Suitable habitat exists
Machaeranthera coloradoensis Colorado tansy aster	G3 S2	Occurs in sparse, gravelly mountain parks, calcareous sandy soils, and on dry alpine tundra. Known from the Snowy Range and Sierra Madre; 8,400 to 12,500 feet.(Beatty et al. 2004).	Battle Pass, Big Blackhall, Owen Sheep	Known

Name	Conservation Status (WY)[1]	Habitat Description	Accounting Unit(s)	Potential to Occur
Rubus arcticus ssp. *acaulis* dwarf raspberry	G5 S2	Occurs under moderately dense canopies of spruce-fir and lodgepole pine, occasionally on the edges of riparian areas and other willow dominated wetlands. Known from the Snowy Range and suspected on the Sierra Madre; 7,000 to 10,000 feet (Ladyman 2006b).	Fox Wood	Known
Salix candida sageleaf willow	G5 S2	Occurs in fens and floating mats in cool, boreal forests, valleys and riparian bottoms. Known from the Snowy Range and Pole Mountain; 6,600 to 10,600 feet (Decker 2006a).	North Corner, Owen Sheep	Known
Salix serissima autumn willow	G5 S1	Fens, some with high pH, in valleys and riparian bottoms. Often on drier edges. Known from the Snowy Range and Pole Mountain 6,800 to 9,720 feet (Decker 2006b)		Suitable habitat exists
Sphagnum angustifolium Sphagnum moss	G5 S1	Acid fens, float mats 7,000 to 12,000 feet (McQueen and Andrus 2007).	Rock Morgan	Known
Utricularia minor lesser bladderwort	G5 S3	Aquatic, in shallow water, montane and subalpine ponds and fens. (Neid 2006). 6,600 to 8,600 feet	Rock Morgan, North Corner	Known

[1] **Conservation Status**: **G1**= Critically imperiled globally because of extreme rarity (five or fewer occurrences or very few remaining individuals) or because of some factor making it especially vulnerable to extinction.

G2= Imperiled globally because of rarity (six to 20 occurrences) or because of factors demonstrably making a species vulnerable to extinction.

G3=Vulnerable throughout its range or found locally in a restricted range (21 to 100 occurrences) or because of other factors making it vulnerable to extinction.

G4= Apparently secure, though it may be quite rare in parts of its range, especially at the periphery.

G5= Demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery.

S1= Critically imperiled in the state because of extreme rarity (five or fewer occurrences or very few remaining individuals) or because of some factor making it especially vulnerable to extinction.

S2 = Imperiled in the state because of rarity (six to 20 occurrences) or because of factors demonstrably making a species vulnerable to extinction.

S3= Vulnerable throughout its statewide range or found locally in a restricted statewide range (21 to 100 occurrences) or because of other factors making it vulnerable to extinction.

S4= Apparently secure, though it may be quite rare in parts of its statewide range, especially at the periphery.

S5= Demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery.

SNR/SU= Not ranked in state/under review

Plant Species of Concern

The 2018 Medicine Bow National Forest species of local concern list consists of 26 species (USDA Forest Service 2003a), of which 18 are known to occur in the LaVA analysis area. In addition, there are verified occurrences of 23 other rare plant species that are tracked as species of concern or potential concern by the Wyoming Natural Diversity Database or have a conservation status of critically imperiled or imperiled in Wyoming. These species have not been classified as a Rocky Mountain Region sensitive species and are not listed in the forest plan as species of local concern, but they are still vulnerable and tracked on the state or Medicine Bow National Forest level.

Collectively these groups of rare plants are referred to as plant species of concern in this document. Impacts to these species are avoided, when possible, to prevent them from becoming rarer, being extirpated from the Medicine Bow National Forest, or getting listed as sensitive species. There is one forest plan species of local concern: brown ladies' slipper (*Cypripedium fasciculatum*). There are over 250 recorded occurrences in the project area, with many additional undocumented occurrences. At this time, this species not considered locally rare on the Medicine Bow National Forest nor considered at risk or imperiled in Wyoming. Consequently, project effects to this species will not be analyzed in this document, but overall abundance of this species will continue to be monitored to assure maintenance of population levels and long-term viability on the Medicine Bow.

Table 46. Botanical species of concern in the LaVA project area.

Scientific Name	Common Name	Conservation Status[1] (WY)	MBNF Species of Local Concern	WYNDD Species of Concern	Accounting Unit
Adoxa moschatellina	muskroot	S2	Yes		Fox Wood
Athyrium distentifolium var. americanum	American alpine ladyfern	S2	Yes		North Corner
Bahia dissecta	Ragleaf bahia	S2	Yes		Fox Wood
Botrychium minganense	Mingan moonwort	S2		Yes	Jack Savery, Rock Morgan
Botrychium pallidum	pale moonwort	S1		Yes	Rock Morgan
Carex buxbaumii	Buxbaum's sedge	S2			Green Hog
Carex hallii	Deer sedge	S2		Yes	Big Blackhall, North Corner, Owen Sheep
Comarum palustre	Purple marshlocks	S1S2			Battle Pass, Rock Morgan, West French
Draba spectabilis var. oxyloba	Showy draba	SH	Yes	Yes	Battle Pass
Gymnocarpium dryopteris	Western oak fern	S2	Yes	Yes	Sandy Battle
Ipomopsis aggregata ssp. tenuituba	Slender tube scarlet gilia	S1		Yes	Sandy Battle, Battle Pass, Rock Morgan
Juncus albescens	Northern white rush	S2	Yes	Yes	Cedar Brush
Juncus filiformis	Thread rush	S2	Yes		Green Hog, Big Blackhall

Scientific Name	Common Name	Conservation Status[1] (WY)	MBNF Species of Local Concern	WYNDD Species of Concern	Accounting Unit
Lesquerella parvula	Narrowleaf bladderpod	S2	Yes		Big Blackhall
Ligularia bigelovii var. halli	Hall's ragwort	S1	Yes		Big Blackhall, North Corner, French Douglas, Fox Wood
Lilium philadelphicum	Wood lily	S2			Fox Wood
Lisgusticum tenufolium	Slender-leaved lovage	S1	Yes	Yes	Green Hog, Big Blackhall
Listera borealis	Northern twayblade	S2			West French
Listera cordata	Heartleaf twayblade	S2			Jack Savery, Battle Pass, Big Blackhall, Rock Morgan, Bow Kettle, Cedar Brush, Fox Wood
Listera convallarioides	Broadlipped twayblade	S1S2	Yes	Yes	Big Blackhall, Bow Kettle, North Corner
Lomatogonium rotatum	Marsh felwort	S2	Yes	Yes	Big Blackhall, North Corner, Fox Wood, Owen Sheep
Lycopodium annotinum	Stiff clubmoss	S2			Fox Wood
Mentzelia rusbyi	Rusby's blazing star	S1		Yes	Sandy Battle, Fox Wood, Owen Sheep
Oreoxis alpine	Alpine oreoxis	S1		Yes	Big Blackhall, North Corner, Owen Sheep
Packera pseudaurea var. flavula	Falsegold groundsel	S1	Yes		Sandy Battle
Penstemon cyathophorus	Sagebrush beardstongue	S2		Yes	Battle Pass, Big Blackhall, Cedar Brush, Pelton Platte
Phacelia alba	White phacelia	S1	Yes	Yes	Fox Wood, Owen Sheep
Phacelia denticulata	Rocky Mountain phacelia	S2	Yes	Yes	Fox Wood, Owen Sheep
Platanthera obtusata	Bluntleaved orchid	S2			Jack Savery, Big Blackhall, Fox Wood
Polypodium saximontanum	Rocky Mountain polypody	S1		Yes	Pelton Platte
Polystichum lonchitis	Northern hollyfern	S2			Battle Pass

Scientific Name	Common Name	Conservation Status[1] (WY)	MBNF Species of Local Concern	WYNDD Species of Concern	Accounting Unit
Pyrola picta	Whiteveined wintergreen	S2			Jack Savery, Battle Pass, Big Blackhall
Pyrrocoma crocea var. crocea	Curlyhead goldenweed	S2	Yes	Yes	Jack Savery, Sandy Battle, Bow Kettle, Cedar Brush, West French
Sisyrinchium pallidum	Pale blue-eyed grass	S3		Yes	Owen Sheep
Sparganium natans	Small bur-reed	S2			Rock Morgan, Bow Kettle, West French
Sphagnum spp.	Sphagnum moss (various species)	varied	Yes	Yes	Big Blackhall, North Corner, West French, French Douglas, Fox Wood
Trichophorum pumilum	Rolland's bulrush	S1		Yes	North Corner
Trillium ovatum ssp. ovatum	Pacific trillium	S2	Yes	Yes	Battle Pass, Green Hog, Big Blackhall
Viburnum edule	Squashberry	S2	Yes		French Douglas, Fox Wood

MBNF = Medicine Bow National Forest. WYNND – Wyoming natural diversity database

Direct and Indirect Effects

No-action Alternative

The no-action alternative represents existing conditions in the LaVA analysis area, including the condition of the forest ecosystem, the current road system, and the ongoing disturbance in the area. The mountain pine beetle epidemic has killed off large portions of the canopy across the Medicine Bow National Forest. These habitats are typically experiencing an increase in light to the forest floor, which can increase soil surface temperatures and evaporation rates. More water, especially snow, is reaching the ground rather than getting caught by tree branches, but it may melt earlier due to sun exposure. Additionally, more water may be available to understory plants because there are now fewer live trees transpiring. These changed conditions may have negative effects on some rare plants in this analysis and a beneficial impact of others, but the extent of the impacts the opened canopy would have on each species or known population is not well understood.

Under this alternative, there would be less habitat disturbance. No new temporary roads, landings, or skid trails would be created, which would lower soil disturbance and soil compaction, decrease direct destruction of native plants, and eliminate erosion associated with these features. The no-action alternative would have a lower impacts on native vegetation from landscape disturbance and habitat destruction. There would also be a lower potential for unintended or indirect impacts to wetlands and noxious weed spread would also be expected to be lower.

Biological Determinations

- Region 2 sensitive species: No impact
- Plant species of concern: No impact

Modified Proposed Action

The direct effects of logging operations to rare plants would be expected to be greatest in forested habitats, as these are the settings in which project activities are most likely to occur. Direct effects would include trampling of individuals by machinery, resulting in breaking, crushing, uprooting of understory plants, or a combination of these things. Individuals could be covered or smothered by slash, chips, or soil and could have trees fall on them. Impacts could occur during the harvest portion or during any post-harvest (especially mechanical), site-preparation activities and could physically damage individuals, populations, and the habitat where they grow. This could reduce growth, development, or seed set; could cause mortality of individuals; or both. Impacts to individual plants could reduce population size, change metapopulation structure, and cumulatively (with other projects, activities, and impacts) could potentially affect viability of the species on the planning unit or rangewide.

Wetlands, riparian areas, and associated vegetation could the most vulnerable rare plant habitats in the analysis area because they are the most uncommon on the landscape and could be easily damaged by canopy removal and operation of heavy machinery. Direct effects could occur in the form of trampling, crushing, and substrate disturbance (uprooting and burial). The standard timber contract provisions typically protect plant species occurring in wetlands from these types of direct effects; however, indirect effects could still occur as a result of winter operations and mechanical treatments directly adjacent to marked wetlands.

Prescribed fire or wildfire could have short-term adverse impacts on plant species in forested habitats and the insect pollinators that rely on native vegetation communities and nesting sites in the area. Long-term impacts could be beneficial, as fire could encourage growth in many native plants species. It could be adverse if invasive plant species move into the area post-fire, or if rare species that are not fire adapted are burned. The foothills and shrub steppe have the potentially to be most affected by prescribed burning. Under ideal situations (no invasive plants, no soil sterilization or widespread destruction of propagules) prescribed fire could be beneficial for these ecosystems. However, in recent years, the post-fire spread of cheatgrass and other invasive plants has damaged soils and disrupted or prevented the regeneration of native plant communities. This large-scale habitat conversion from native vegetation to nonnative invasive vegetation poses a threat to rare plant species.

Biological determinations

- Rocky Mountain Region sensitive plant species: May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing – where effects in the project area are not expected to be significant, and the species and its habitat will remain well distributed.
- Plant species of concern: May affect, not likely to negatively impact long term viability of these species on a forest-wide scale if surveys and design features are consistently implemented.

Cumulative Effects (Modified Proposed Action)

Under the modified proposed action, past, ongoing, and reasonably foreseeable actions in the project area may also have an impact rare plants and suitable habitats. These actions can have many of the

same adverse and beneficial impacts as described above, but species resilient to singular disturbances may be vulnerable when impacted by multiple actions and perturbations. Past, present, and future activities and their effects to plant species are as follows:

- Grazing leads to biomass removal and trampling. It has led to changes in species composition, compaction of soils, changes in fuel loading and the fire regime, down-cutting of riparian areas with subsequent drying of adjacent meadows, and noxious weed invasion. In riparian areas and wet meadows, livestock grazing has led to churning of the soil and pugging which changes soil and water characteristics and often alters native plant communities.
- Timber harvest and thinning has led to a more open canopy with additional light and water reaching the forest floor (which may be beneficial or detrimental depending on the species), soil disturbance and compaction, development of skid roads, and noxious weed invasion. Changes in forest composition, structure and fire frequency have also taken place.
- Insect and disease outbreaks are natural events that occur periodically, although current levels are more wide-spread than other times in the historical record. Such outbreaks lead to tree mortality, creation of forest-gap habitats, opening of meadow habitats, and potentially to stand-replacing fires. It can also lead to a more open canopy and effects to plants related to this change.
- Fire suppression has led to increased fuel loading, canopy closure, and higher intensity wildfire. It has also compacted and disturbed soils and altered native plant communities where fire lines and breaks were created. Vehicles used in fire suppression can also spread noxious weeds.
- Prescribed fire can decrease fuel loading, open the forest canopy and ultimately may sometimes lower the intensity of wildlife. It can also spread noxious weeds and cheatgrass (as can wildfire) which can lead to habitat conversion to nonnative dominated communities that are not suitable for rare plants.
- Motorized and nonmotorized recreational use (including off-highway vehicle use, camping, horseback riding, mountain biking, hiking, hunting, and fishing) has led to the development of non-system roads and trails, development of dispersed campsites, erosion, sedimentation in water bodies, rutting and damage to wetland hydrology and vegetation, and the vectoring of noxious weeds in previously un-infested areas.
- Road construction causes soil disturbance and erosion, destruction of habitat, and noxious weed invasion. It also increases the impacts from recreational activities by allowing new access, improved access, or both for those activities. Road maintenance can reduce erosion by creating and retaining erosion control features and by lowering the instance of road braiding.
- Nonnative plant invasion is often the result of the ground-disturbing activities. These nonnative species displace native plants, mostly through direct competition. Highly competitive nonnative species have been used in revegetation efforts, and these species are potent competitors for light, nutrients, and water.
- Water diversion has historically altered water tables and streamflows on a unit-wide scale.
- Climate change is expected to increase average temperatures across the units as well as changing precipitation patterns and amounts. This may result in more precipitation as rain vs. snow, earlier snowmelt, drier, hotter summers, and other changes. Vegetation communities may change over time as certain species are unable to survive, other changes may be more subtle such as altered phenology that mismatches plant life cycles with important seasonal patterns such as pollinator activity or seasonal rains.

Range and Livestock Grazing

Affected Environment

Allotments

The analysis area includes 45 allotments on the Brush Creek/Hayden and Laramie Ranger Districts on the Medicine Bow National Forest: 8 sheep allotments; 2 sheep allotments, cattle allotments, or both; and 35 cattle allotments. The terrain varies and includes ridges, steep-sided draws and canyons, flat or gently rolling parks and meadows, with the majority of the area being forested land. The elevation span is broad, extending from about 6,900 feet at the Little Snake River in the Sierra Madre range to 12,013 feet at the top of Medicine Bow Peak in the Snowy Range Mountains. Because of the combination of steep terrain and coniferous forest cover with relatively little forage in many parts of the analysis area, only about 24 percent is considered capable rangeland. Capable rangelands are areas that are accessible to livestock and have suitable types and amounts of forage and water available.

Most of the livestock forage is located in upland shrublands, meadows, riparian areas, and aspen stands. Past timber harvest in coniferous forest has provided transitory range for livestock. However, most of the old timber harvest units have regenerated with young trees to such an extent that understory forage has declined markedly. At present, there is relatively little transitory range from timber harvest within the analysis area, but heavy pine mortality from the mountain pine beetle epidemic has created some new transitory range. Once the needles fell from dead pines, the increased sunlight reaching the ground and the reduction in competition for water created new habitat for forage plant species. Now many dead stands of lodgepole pine are beginning to provide forage for livestock. As in timber harvest units, this forage is only temporary and will decline as young trees mature enough to shade the understory plants. Also, as dead trees fall, access to understory forage will be reduced. Clearcut and overstory removal timber harvest usually provide additional livestock forage for 10 to 15 years after the mature trees have been removed, and this temporary forage can help improve livestock distribution and draw livestock away from traditionally favored grazing areas. It is not known how long the transitory range in unharvested dead pine stands will persist or how long it will remain accessible to livestock (Haas 2017). A more detailed description of plant communities that provide forage for livestock is included in the Range Specialist Report.

Of the capable rangeland acres in this analysis area, about 71 percent (144,072 acres) are considered primary range. Primary range includes those parts of the capable range that livestock naturally prefer or will use first under extensive management. It does not include transitory rangeland created by timber harvest or fire because those areas will eventually return to mature forest cover with limited forage in the understory.

Range Improvements

There are numerous miles of allotment boundary and pasture fences and many water developments for livestock use within the analysis area. Most of the Medicine Bow National Forest boundary within the analysis area is fenced, but many of the interior allotment or pasture boundaries are not. Livestock managers rely on natural boundaries such as dense timber stands, steep terrain, or both to limit livestock movement where fences do not exist.

Where natural barriers are not adequate, drift fences have been constructed to help contain livestock in particular pastures or allotments. Drift fences are relatively short, stand-alone fences that block gaps in natural barriers or a potential livestock travel route such as a road or trail. They generally start and end in natural barriers such as dense timber or steep slopes.

Between 2003 and 2011, the mountain pine beetle epidemic killed a substantial number of the mature lodgepole pines within the analysis area. As a consequence, there are many miles of fence which are now receiving accelerated damage due to the high number of dead trees that have begun to fall on them. This is making fence maintenance very difficult and shortens their service life. In addition, permittees who spend a lot of time in these dead stands of timber clearing downed trees to repair the fences are at increased risk of injury from falling trees relative to what would exist in live pine stands. The work of clearing multiple down and lodged trees along fences has become very hazardous and requires advanced sawyer skills not available to many livestock producers. In areas where timber has been cleared on only one side of a fence (on private, State or Bureau of Land Management lands) within the past decade, the problem of blow-down trees has increased because the adjacent unharvested trees now have more wind exposure.

Environmental Consequences

Direct and Indirect Effects

No-action Alternative

The continuation of the existing post-epidemic conditions would contribute to a high rate of damage to fences and spring developments in coniferous forest areas as the large number of dead trees continue to fall. Maintenance of range improvements (fences and watering facilities) and livestock management (moving and gathering livestock) would continue to present increased level of difficulty and danger for permittees.

Before the mountain pine beetle epidemic, most coniferous forest stands provided little or no forage for livestock because the herbaceous understory was sparse or was dominated by plants such as grouse whortleberry, pinegrass or elk sedge which have low palatability and forage value for livestock. However in some areas of high tree mortality there is now more forage for livestock due to more sunlight reaching the forest floor and more water available to herbaceous plants and shrubs. In many forest stands, this relatively new forage source would (or already has) become less available as trees fall, blocking access to forage. In some areas, livestock access to primary (unforested) grazing areas could be hindered where there are surrounding forest stands with heavy tree downfall. Restoration of access would require creation and maintenance of a stock trail through the forest stand blocking livestock access.

In some instances, forest stands that formerly formed natural barriers between pastures or allotments are less effective due to increased forage available in the understory. The forage attracts livestock into and eventually through these forest stands. This effect would decrease as more trees fall in these stands.

Large tracts of coniferous forest with high tree mortality present an increased risk of large-scale wildfire that could endanger permittees engaged in allotment management, cause loss of livestock, and damage or destroy fences or spring developments. In areas where large acreages of shrublands are in predominantly late seral stages, they could be more susceptible to large wildfires, since they often have

dense shrub canopies that carry fire well. Wildfire could degrade rangelands by killing perennial native plants and consuming plant litter and organic matter in the soil. Recovery of forage resources after wildfire could take a decade or more in severely burned locations. A large burn could negatively affect livestock carrying capacity of an allotment or group of allotments until native plant communities recover.

Modified Proposed Action

Large-scale removal of standing dead timber would greatly reduce the risk of injury to livestock managers while maintaining structural improvements and managing cattle on their allotments.

Noise and activity associated with timber harvest could change livestock distribution patterns within pastures or allotments over the short-term and could vary by concentration of vegetation management activities and their locations relative to grazing areas. This could require more rider management of the livestock to maintain satisfactory distribution and to prevent overuse of areas more remote from the logging activity.

Increased log truck and worker traffic could temporarily make it more difficult for permittees to use some roads for trailing livestock and could increase livestock collision hazard, to some degree, during timber harvest and log hauling. Moving livestock around and gathering them within allotments would become easier in clearcut and overstory removal areas after harvest was completed, providing the amount of slash is not too deep to inhibit travel by livestock or livestock managers on horseback.

Removing dead trees through harvest or prescribed fire would prolong the life of some fences and maintain or restore access to some watering facilities and reduce maintenance time and expense.

Harvest in timber stands which presently serve as natural barriers would create breaches in those barriers. This could require more rider time or fence building and maintenance to keep livestock in the appropriate pastures or allotments.

If deferment or rest of prescribed burn areas would be needed, there would be short-term negative impacts to permittees who must either ride the allotment more frequently to move livestock out of burned areas, or employ some type of temporary fencing.

Recovery of forage resources for livestock would be quite rapid after a prescribed burn compared to a wildfire (one or two growing seasons after prescribed fire versus a decade where fire severity is high in wildfires.)

Many aspen stands within the project area, especially on the west side of the Sierra Madre Range, already have a heavy conifer component and therefore produce little or no livestock forage. Treatment of aspen stands would increase acres of earlier successional stages creating more herbaceous livestock forage in the understory. Some short-term adjustments in domestic sheep use of regenerating aspen stands could be needed if livestock are found to be browsing on or trampling young aspen suckers.

Timber harvest would produce transitory livestock forage (forage that will be available for a limited period of time) that could last 15 years or more following harvest. This extra forage would likely improve livestock distribution and could reduce the amount of on-the-ground management needed by the permittees to consistently meet forage utilization standards in primary grazing areas.

Cattle and domestic sheep browsing and trampling effects on young coniferous trees in harvest units is expected to be minor, but will need to be monitored by Forest Service personnel. Adjustments in livestock use of harvest units may be needed if damage to regenerating trees occurs.

Treatment of relatively large areas of coniferous forest around private land inholdings to protect wildland-urban interface areas may encourage more livestock grazing near those private land parcels and could lead to greater permittee and landowner conflicts

Cumulative Effects

No-action Alternative

The negative effects on livestock management described above created by the large-scale tree mortality in recent years would be cumulative to the other global, local, and national factors that make livestock production challenging in Wyoming. A discussion of those factors is included in the Range Specialist Report.

Modified Proposed Action

The negative direct and indirect effects described above for the modified proposed action would be cumulative to the other global, local, and national factors that make livestock production challenging in Wyoming. Negative cumulative effects of the proposed treatments on rangeland management and producers would be primarily short lived and offset by positive effects such as an increase in transitory range, improved and safer access, and reduction of damage to some fences and other range improvements from falling trees.

Multiple timber harvest projects are in late planning or implementation stages on the west and north portions of the Sierra Madre and in the Snowy Range in the Ryan Park area and southeast portion. The positive and negative effects of these timber harvest projects are the same as described for this project and are therefore cumulative.

Effects of past treatments of shrublands through prescribed fire or herbicide application as well as from wildfires would be cumulative to effects from prescribed fire treatments in shrublands proposed in this project. Past treatments include the large-scale spraying of herbicide to kill sagebrush 50 to 60 years ago, as well as various prescribed burns conducted between 1952 and the present.

The coordinated planning among fuels, wildlife, and rangeland management specialists that is included as a design feature of this project should ensure future prescribed burns contribute to appropriate shrubland seral stages and plant species and structural stage composition across forest plan geographic areas.

No meaningful comparison for effects of the modified proposed action on rangeland and livestock grazing can be made among the accounting units since many grazing allotments cross accounting unit boundaries and some permittees use several different allotments that are not confined to a single accounting unit.

Noxious Weeds and Other Invasive Plants

Noxious Weeds

Eleven species of state-listed noxious weeds have been documented within the analysis area: Dalmatian toadflax (*Linaria dalmatica*), yellow toadflax (*Linaria vulgaris*), spotted knapweed (*Centaurea maculosa*), leafy spurge (*Euphorbia esula*), musk thistle (*Cardus nutans*), Canada thistle (*Cirsium arvense*), field bindweed (*Convolvulus arvensis*), oxeye daisy (*Chrysanthemum leucanthemum*), houndstongue (*Cynoglossum officinale*), common tansy (*Tanacetum vulgare*) and hoary cress (whitetop) (*Cardaria draba* and *Cardaria pubescens*). Noxious weed control has been carried out annually in known infestation areas for at least the past 30 years, but program funding and manpower has not kept pace with the rate of weed introduction and spread. Canada thistle is the most abundant species and is so widespread that it is treated mostly where the thistle populations are very dense or where treatment is most cost effective. Species such as yellow toadflax, Dalmation toadflax, spotted knapweed, musk thistle, oxeye daisy, and leafy spurge receive high priority for treatment. Primary control of noxious weeds is with herbicide application, but hand-pulling is feasible on small occurrences. Biological control has been used in the analysis area with the release of the following:

- Toadflax stem boring weevils (*Mecinus* spp.) and toadflax flower-feeding beetle (*Brachypterolus pulicarius*) for yellow toadflax.
- Stem mining weevils (*Hadrolontus litura*), bud weevils (*Larinus planus*), thistle tortoise beetle (*Cassida rubiginosa*), and Canada thistle gall fly (*Urophora cardui*) for Canada thistle.
- Thistle seed head weevil (*Rhinocyllus conicus*) and thistle rosette weevil (*Trichosirocalus horridus*) for musk thistle.
- Flea beetle (*Apthona nigriscutis*) for leafy spurge.

Biological control agents have not had a noticeable effect upon noxious weed infestations on Brush Creek/Hayden and Laramie Districts. We do not know whether this is because insect populations have not yet reached levels where they can effect weed populations or because the insects do not survive well in this combination of elevation and climate.

Musk thistle and Canada thistle are increasing in many lodgepole pine stands that have been killed by the mountain pine beetle, as there is now increased sunshine and available moisture on those sites. This increase of weeds in beetle-kill stands can be expected to increase until young trees in the understory become large enough to shade out understory plants (Haas 2017).

Other Invasive Plant Species

Cheatgrass (*Bromus tectorum*) and field brome (*Bromus arvensis*) are highly invasive annual nonnative grasses which occur within the project area in scattered infestations, usually in big sagebrush or mixed mountain shrub habitat types. Since the year 2000, cheatgrass has been increasing in abundance on some upland shrublands in the project area and surrounding Bureau of Land Management lands, particularly on steep, rocky slopes below 9,000 feet in elevation that have a south, southeast, or southwest aspect. This increase coincided with the severe drought years of 1999 to 2004. Cheatgrass benefits from manmade and natural disturbances that expose mineral soil, remove competing vegetation (particularly sagebrush) and increase available soil nutrients, especially nitrogen. In the project area cheatgrass has increased most aggressively on roadsides and old prescribed burn and wildfire sites that have the slope and aspect characteristics described above (Haas 2017). At present,

there are an estimated 6,100 acres of cheatgrass infested shrublands on the Brush Creek-Hayden District and 4,000 on the Laramie District.

Environmental Consequences

Direct and Indirect Effects

No-action Alternative

Noxious weeds would continue to increase in coniferous forest stands with high tree mortality due to the increased amount of sunlight and water available for understory plants. However, the heavy duff layer in some coniferous stands would reduce weed establishment relative to what would occur in a harvested stand where the duff layer is disturbed. Access to inventory and treat weeds in stands with a lot of dead and downed trees would be difficult and dangerous.

As natural regeneration occurs in stands with high tree mortality, noxious weed infestations would be likely to decrease because most do not grow well in shaded habitats. Cheatgrass and field brome would likely persist in most locations where they presently occur. Over time, some infestations would probably increase in size if not treated.

Modified Proposed Action

Ground disturbance from mechanical vegetation treatments and prescribed burns would increase invasive plant species in the project area. Over time, many invasive species in harvest units would decline as regenerating trees grow tall enough to shade them out. Before that could happen, weed seed would probably have spread beyond the harvest units in some locations.

On shrubland or grassland sites where harvest-related activities would have compacted or disturbed the soil and damaged native plants, there would be a greater risk of long-term weed occupation unless the site was treated because the native vegetation on such sites would not shade out weeds. A design feature included in this project would reduce this risk by requiring most landings and slash piles to be located in formerly forested areas that are expected to return to mature forest stands. On some shrubland sites, particularly those on steep southerly facing slopes, the risk of cheatgrass invasion would be high if they are treated with fire. Design features included in this project would reduce that risk.

Cumulative Effects

No-action Alternative

The increase in invasive plant species that has occurred in coniferous forest stands with high tree mortality would be cumulative to the many other activities and natural events (such as wildfire) that contribute to the spread of invasive plant species.

Modified Proposed Action

The increase in invasive plant species that can be expected from the proposed vegetation treatment would be cumulative to the many other activities and natural events (such as wildfire) that contribute to the spread of invasive plant species. Under the modified proposed action, there would be greater likelihood that new invasive plant species or new infestations would become established in the project area than under the no-action alternative because of the amount of soil disturbance (or native plant community disturbance) and the amount of potential weed seed introduction from humans, vehicles

and heavy equipment implementing the projects. Several design features and standard timber sale provisions included in this project would help reduce the risk of weed seed introduction or spread but would not eliminate the risk. Where disturbed soil from past activities and natural events has allowed invasive species to become established, a ready seed source exists to colonize newly disturbed areas.

Physical Environment

Hydrology

Affected Environment

Annual precipitation on the Medicine Bow National Forest ranges from 14 to over 50 inches and comes predominantly in the form of snow. In contrast, annual precipitation in the surrounding regions in Wyoming is less than 14 inches and is dominated by rainfall. These differences in precipitation result in a higher proportion of streamflow being generated from the Medicine Bow than surrounding areas. Water quality on the Medicine Bow is typical of mountainous regions of the area but contrasts with the water quality of the surrounding lower-elevation areas. Colder water temperatures, limited nutrients, and low salinity are examples of differences in physical, biological, and chemical properties of water on the Medicine Bow National Forest that are reflected in the how the water is put to beneficial use.

The relatively higher quantity and quality of water on the Medicine Bow National Forest is important to ecological sustainability both on and downstream of the Medicine Bow. Water resources provide aquatic habitats, such as providing extensive habitat for coldwater fisheries that is limited in other portions of southeastern Wyoming. Much of the water generated on the Medicine Bow National Forest is critical to sustaining ecological processes in and along the rivers leaving the Medicine Bow.

General Watershed Condition

Forest Service Manual 2521.1 directs national forests to establish watershed condition and assign a designated watershed condition class rating. Medicine Bow National Forest personnel have evaluated watershed conditions based on direction from the Watershed Condition Framework (USDA Forest Service 2011a) and the Watershed Condition Classification Technical Guide (USDA Forest Service 2011b). Twelve core watershed condition indicators comprised of attributes (related to watershed processes) were assessed to classify watershed conditions. For a complete explanation of the condition rating rule set for the attributes, see the Watershed Condition Classification Technical Guide (USDA Forest Service 2011b).

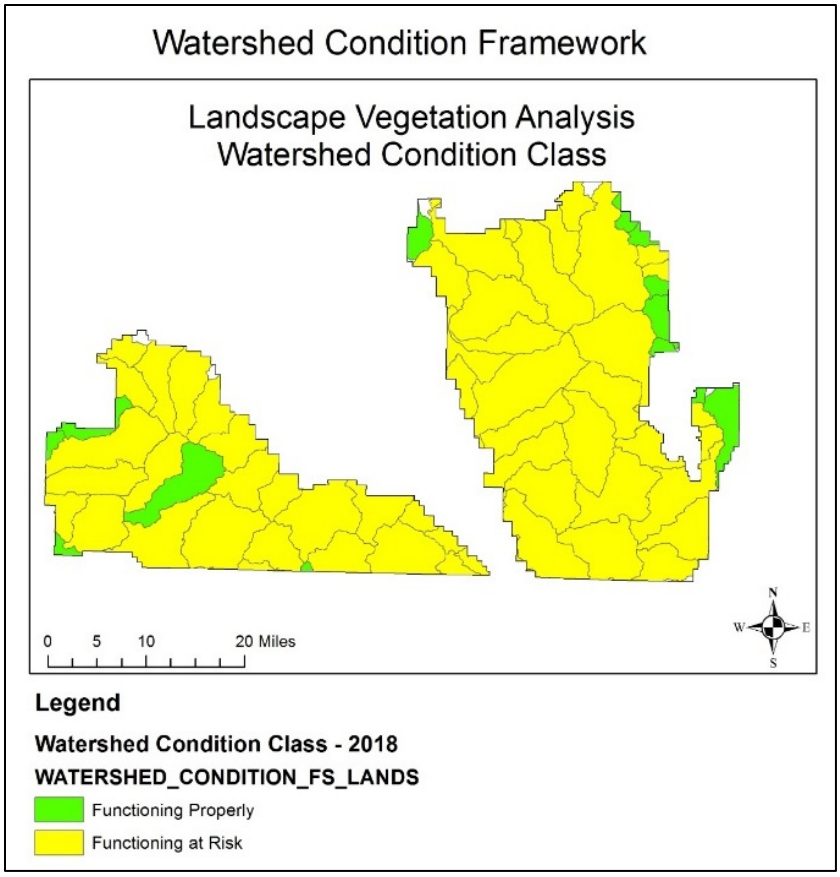

Figure 32. Overall watershed condition

A watershed condition assessment was conducted which showed that 54 subwatersheds within the project area are rated functional at risk and 16 subwatersheds are rated functioning properly. There were no impaired watersheds identified in the assessment. Overall watershed condition for the majority of watersheds in the project area is functioning with certain indicators at risk in being able to support beneficial uses (figure 32).

Water Quality

All waterbodies on the Medicine Bow are designated either Class 1 or 2 by Wyoming Department of Environmental Quality (WDEQ). According to Wyoming's draft 2016/2018 Integrated 305(b) and 303(d) Report (WDEQ 2018), five stream segments in the project area have impaired or threatened water quality due to heavy metals: Roaring Fork Little Snake River (1.8 miles), Haggarty Creek (5.6 miles), West Fork Battle Creek (4.9 miles), Bear Creek (0.7 miles), and Rambler Creek (0.5 miles). Documentation of heavy metal contamination in other streams on the Medicine Bow is sparse and not believed to be a significant problem. The five streams with elevated heavy metals are believed to be outside of the range of natural variability for water quality.

Timber management, road construction, livestock grazing, water development, hard-rock mining, and recreation impacts have affected water quality and the integrity of the fluvial systems. These effects are more localized and less apparent than historic tie-drive effects and dredge mining. There are no known documented cases of stream channel alterations on the Medicine Bow as a result of forest canopy induced changes in water yield. In a study of Medicine Bow National Forest streams with up to 23

percent of the watershed clearcut, Marston and Wick (1993) found channel morphology to be within the range of natural variation. Subtle changes may have occurred but are likely not significant, especially since the water yield changes are believed to be within the range of historic variability.

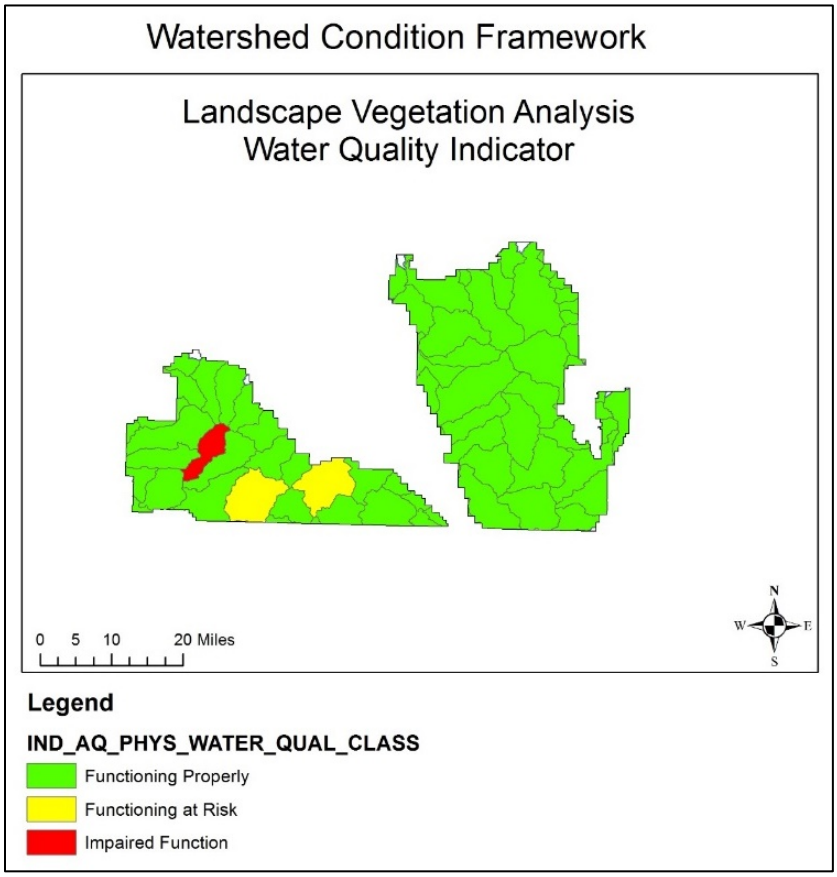

Figure 33. Distribution of water quality indicator ratings

An assessment of water quality from the Watershed Condition Framework is displayed in figure 33. The water quality indicator addresses the expressed alteration of physical, chemical, and biological components of water quality. This assessment showed most watersheds within the project area, with the exception of Haggarty Creek, North Fork Little Snake River, and Encampment River-Billie Creek, are functioning properly with regards to water quality. The Haggarty Creek and the Roaring Fork Little Snake River impairment information has been disclosed above. The Encampment River-Billie Creek subwatershed is functioning at risk and recovering from a ditch overtop that created gullies and introduced sediment into Billie Creek (USDA 2003).

Natural processes, such as fire, and also human disturbances, such as road construction, can affect sediment levels in streams. Roads create a pulse of sediment immediately following construction and then sediment levels decrease. Some level of erosion from roads remains as a constant source of sediment over time. Roads located within 300 feet of streams, in general, have the highest potential to deliver sediment to streams (Ketcheson and Megahan 1996, Burroughs and King 1989).

The existing condition related to the transportation system was established using the Watershed Condition Framework and its roads and trails indicator, which addresses changes to the hydrologic and sediment regimes because of the density, location, distribution, and maintenance of the road and trail network (USDA 2011b).

Within the LaVA project area, 16 subwatersheds have an impaired rating, 46 subwatersheds have a functioning at risk rating, and 4 subwatersheds have a functioning properly rating. Figure 34 displays the distribution of the roads and trails indicator ratings across the LaVA project area. Looking at the rating of specific attributes from the roads and trails indicator, 28 watersheds had an impaired condition for road density and 31 watersheds had an impaired condition for proximity to water.

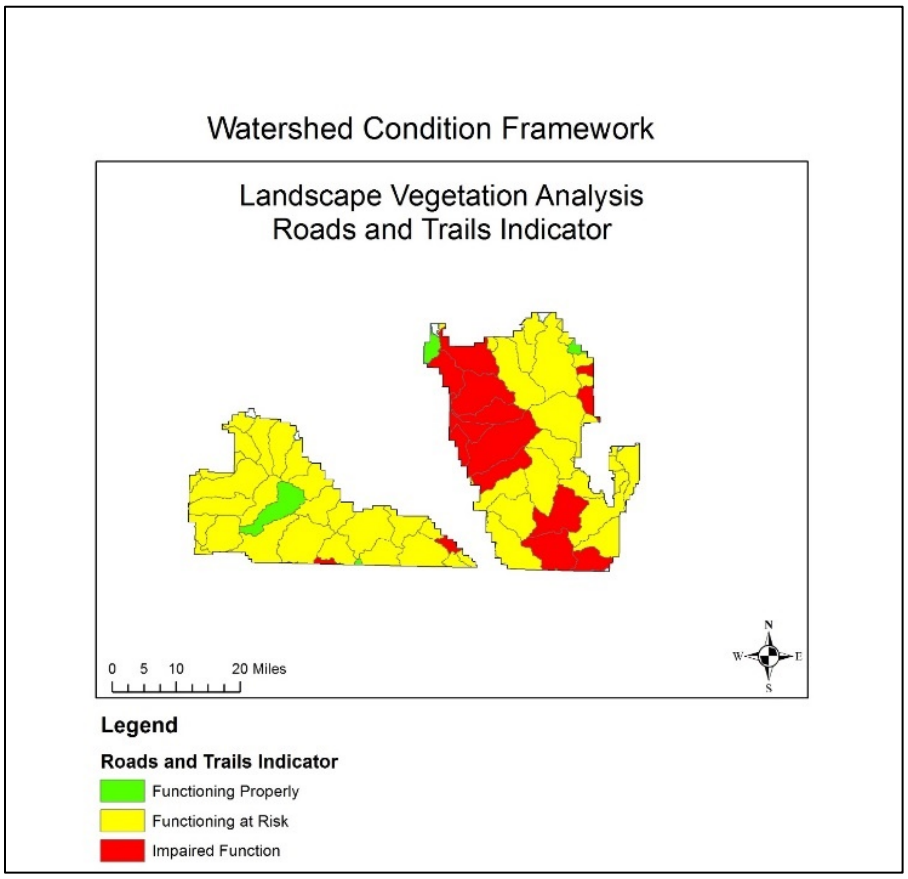

Figure 34. Distribution of roads and trails indicator ratings

Riparian vegetation serves as a filter for sediment, pesticides, certain pathogens and nutrient constituents such as nitrogen and phosphorus. The probability of sediment delivery to streams increases sharply when mechanical disturbance occurs within the water influence zone. The existing condition related to riparian vegetation was established using the WCF and its "Riparian/Wetland Vegetation" indicator, which "addresses the function and condition of riparian vegetation along streams, water bodies, and wetlands" (USDA, 2011b). Within the LaVA project area, 57 subwatersheds have a functioning properly rating for this indicator, and the remaining nine subwatersheds have a functioning at risk rating. No watershed is impaired under the riparian and wetland vegetation indicator (figure 35).

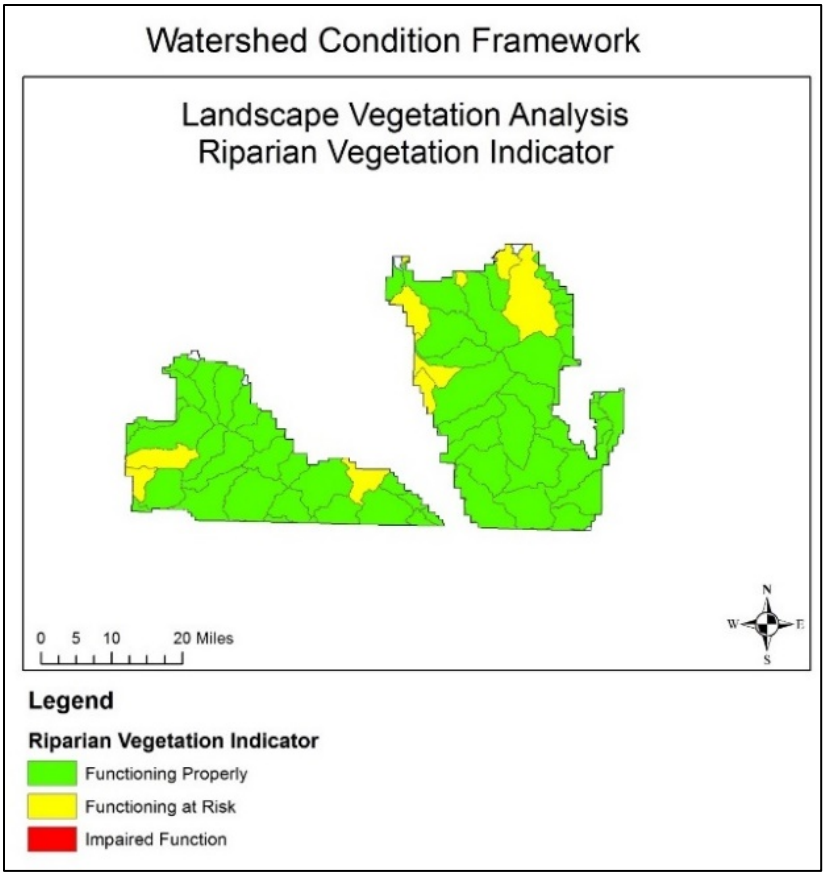

Figure 35. Riparian and wetland vegetation ratings

Water Quantity

Surface water from the project area is used on and off the Medicine Bow National Forest for consumptive and nonconsumptive uses. Major consumptive water users include local water conservation districts and municipalities who use storage water for customers and domestic purposes, respectively. Turpin Reservoir and Sand Lake, along with many smaller reservoirs, provide storage facilities for irrigation water. The towns of Encampment and Laramie utilize water directly off the Medicine Bow National Forest for their municipal water supplies, with intake diversions a few miles downstream of the national forest boundary. The City of Cheyenne also utilizes water as part of its municipal water supply system. The Cheyenne Public Board of Utilities currently maintains three reservoirs in the project area: Rob Roy, Hog Park, and Lake Owen.

The existing condition related to water quantity was established using the Watershed Condition Framework and its water quantity indicator, which addresses changes to the natural flow regime with respect to the magnitude, duration, or timing of the natural streamflow hydrograph (USDA Forest Service 2011b). Within the LaVA project area, 14 subwatersheds have an impaired rating for this indicator, 28 watersheds have a functioning at risk rating, and the remaining 24 are functioning properly (figure 36).

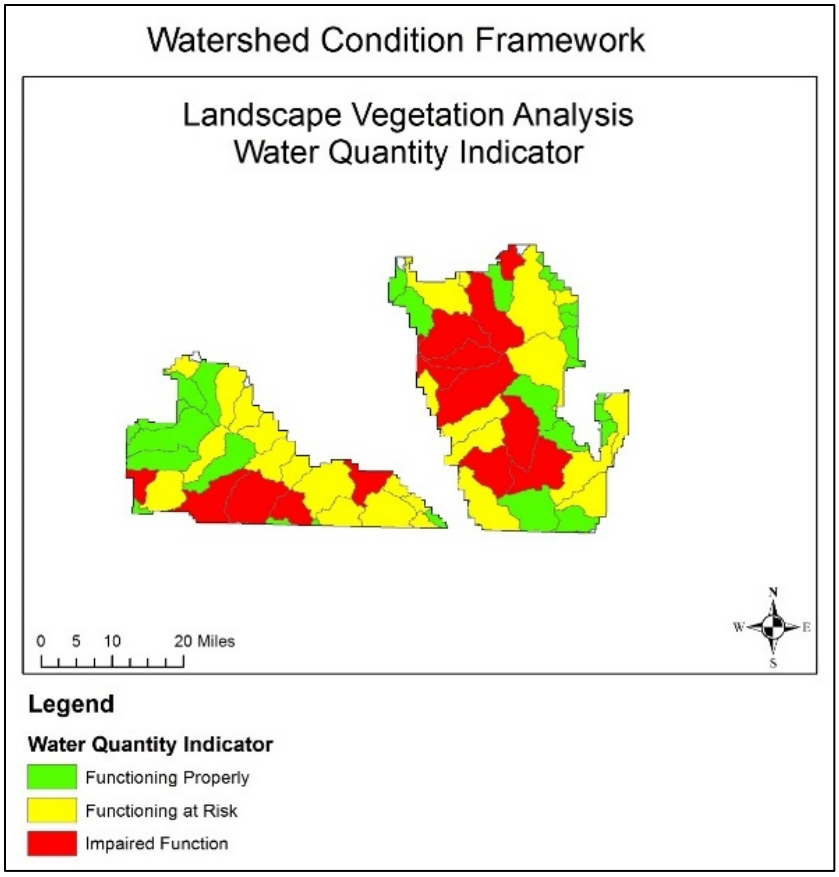

Figure 36. Distribution of water quantity ratings of 6th-level watersheds

Equivalent Clearcut Area - Existing Conditions

The equivalent clearcut area procedure was designed to estimate streamflow responses to forest management in third- to fifth-order streams (King 1989) corresponding to subwatersheds (6th-level hydrologic unit code watershed) of 10,000 to 40,000 acres (Ager and Clifton 2005). Equivalent clearcut area is used to assess the cumulative effects of vegetation treatments and roads by providing a broad indicator of changes in peak streamflows (Ager and Clifton 2005). Depending on the interaction between water yield, sediment yield, and stream channel conditions, such increases, could have impacts on stream channels. Equivalent clearcut area was calculated in the project area for 6th-level subwatersheds.

Streamflow regimes can be indirectly affected by reductions of 15 percent to 25 percent of the vegetation (canopy cover) in a watershed and the resultant reduction in evapotranspiration and interception losses causing a measurable increase in runoff (Troendle et al. 2001; MacDonald and Stednick 2003). Runoff and peak flows can also be indirectly affected by reductions in organic ground cover and compaction of soils from activities such as skid trails, landings, and road construction (Wemple 1994). A LaVA design feature caps equivalent clearcut area levels at 25 percent within the 6th-level hydrologic unit code watersheds. Therefore, watersheds having more than approximately 25 percent of their area in an equivalent clearcut condition are generally considered to have a high potential for changes in runoff quantities and timing. The lower the equivalent clearcut area percentage, the better the watershed condition.

Existing equivalent clearcut area values for the watersheds involved in the proposed project are summarized in appendix B of the hydrology report (Overland 2018). Equivalent clearcut area modeling does not directly address the additional effects of the recent beetle epidemic or reasonably foreseeable future activities such as weather modification, which increased the uncertainty associated this effects analysis. The existing equivalent clearcut area or disturbance levels in project area watersheds are low, as no watersheds are currently above the 25 percent equivalent clearcut area threshold. Based on these results, it is concluded that factors affecting water yield have not impacted the project area subwatersheds.

Environmental Consequences

Project Design Features

Effective implementation of best management practices, outlined in the Watershed Conservation Practices Handbook (Forest Service Handbook 2509.25) (USDA Forest Service 2006), is necessary to ensure compliance with State of Wyoming water quality standards, the Wyoming nonpoint source management plan (WDEQ 2000) and the Clean Water Act. The Watershed Conservation Practices Handbook (Forest Service Handbook 2509.25) provides management measures as well as design criteria and meets the intent of the Wyoming nonpoint source management plan silvicultural best management practices (WDEQ 2004; USDA Forest Service 2016b). Best management practices most relevant to the possible suite of activities in the LaVA Project are provided in appendix C of the hydrology report.

In addition to the best management practices outlined in the Watershed Conservation Practices Handbook, there are a variety of other practices that, if effectively implemented, would reduce the effects to water resources, including:

Project design features have been developed to reduce or prevent potential undesirable effects resulting from management activities and to ensure consistent analysis of project effects:

- proposed treatments are planned for implementation over a 15 to 20 year timeframe
- use of a pre-implementation checklist, a project implementation checklist and guide, and use of the decision-making triggers
- specialist input and recommendations during layout and implementation
- consideration of connected disturbed area when locating roads, landings and skid trails
- consideration of a wetness model when locating harvest units, roads, landings, and skid trails

The Forest Service has a national best management practices program designed to provide a standard set of core best management practices and a consistent means to track and document the use and effectiveness of those best management practices on National Forest System lands (USDA Forest Service 2012). Medicine Bow National Forest personnel have participated in the national best management practices program since 2013 and has conducted 35 best management practices implementation monitoring evaluations, effectiveness monitoring evaluations, or both for a variety of resource categories.

The monitoring protocols most relevant to the type of activities envisioned in the LaVA Project are:

- "Ground-Based Skidding and Harvesting" (Veg A): Stand initiation and intermediate harvest treatments; temporary road construction for vegetation management.
- "Mechanical Site Treatments" (Veg C): Mechanical site treatments include traditional site preparation, timber stand improvements, pile burning, removal of invasive and exotic plants, and other vegetation treatments.
- "Use of Prescribed Fire" (Fire A): Planning and implementation of prescribed fire.

Monitoring

As part of the LaVA adaptive implementation and monitoring framework (appendix A), decision-making triggers have been established to indicate if a resource has the potential to be negatively impacted by treatment proposals, demonstrating the need for more rigorous project design features, change in management approach, or slowing the pace of implementation. Triggers were established for watershed resources and include reviewing disturbance acres prior to treatment design and layout to determine percent equivalent clearcut area. Adaptive action would then be established based on how close the subwatershed is to the 25 percent equivalent clearcut area cap. As identified under the "Analysis Assumptions" section, equivalent clearcut area would be monitored so it would not exceed 25 percent at the 6th-level watershed level.

Implementation and effectiveness of both best management practices and project design features would be monitored annually, and future treatments would be modified to avoid any resource concerns. Lastly miles of temporary roads would be tracked to determine if road construction and percent rehabilitation has occurred in the allotted timeframe. Adaptive actions would be implemented to meet temporary road construction targets, and to ensure that temporary roads are effectively rehabilitated within 3 years of treatment completion.

Direct and Indirect Effects

No-action Alternative

Fire suppression would continue in the project area. Ground fuels from beetle-killed trees would increase across the project area creating a greater risk of adverse effects to watershed condition and water quality from wildfire. If a fire were to occur, direct effects to water quality could result from fire suppression activities, such as the construction of firelines especially in or near stream channels. Indirect effects could occur as a result of changes in vegetation cover, formation of water repellent soils, and increases in runoff.

Modified Proposed Action

Watershed Condition

The LaVA Project has been designed to minimize watershed effects through the adaptive implementation and monitoring framework. While ratings for individual watershed condition indicators such as roads and trails or riparian vegetation may be affected by LaVA treatments, the overall watershed condition class is expected to be maintained or improved.

Water Quality – Harvest Treatments

The projected harvest in wetlands under the modified proposed action would be 1,534 acres (0.59 percent). The amount of harvest in wetlands under the LaVA Project would be 1.4 times the amount of harvest in wetlands that has occurred on the Medicine Bow since the 1930s or about 34 times the amount of harvest that has occurred in wetlands in the last 14 years while implementing the current forest plan.

The projected harvest in the water influence zone under the modified proposed action would be 16,874 acres (6.49 percent). The amount of harvest in the water influence zone is expected to be twice the amount of harvest in the water influence zone that has occurred on the Medicine Bow since the 1930s or about 34 times the amount of harvest that has occurred in the water influence zone in the last 14 years while implementing the current forest plan.

Water Quality – Transportation

Direct effects to water quality are reflected in the following quantitative indicators:

- Number of stream crossings:
  - Perennial streams: 20
  - Intermittent streams: 60
  - Ephemeral streams: 457

The amount of road-stream crossings constructed under the LaVA Project is expected to be one fifth the amount of system road-stream crossings that exist on the Medicine Bow or about 20 times the amount of road-stream crossings that has occurred in the last 14 years while implementing the current forest plan.

- Miles of road construction through wetlands
  - 600 miles of temporary roads

The amount of temporary road construction in wetlands under the LaVA Project is expected to be one twentieth the amount of system road in wetlands that exists on the Medicine Bow National Forest or about 20 times the amount of temporary road construction that has occurred through wetlands in the last 14 years while implementing the current forest plan.

Short-term direct and indirect effects would be expected from temporary roads within wetlands and at stream crossings. These effects could include increased turbidity and suspended sediment values. Sedimentation could impact the immediate footprint of the road and stream crossing location and a short distance of channel downstream of the site, with effects diminishing further downstream. The magnitude and extent of the effects would be lessened by the implementation of best management practices and design features, including limiting activity during wet weather.

Water Quality and Fuels Treatments

Fuels treatments, including burning and mechanical and hand fuels treatments, could increase sedimentation and ash and soot deposition into streams if best management practices and design criteria were not properly implemented.

These effects would come primarily from prescribed burning, mechanical treatments and firelines near streams. Possible effects to water quality, riparian, and wetland areas would depend on the extent and intensity of the treatments particularly those involving ground disturbances. Some riparian areas and wetlands could be lightly burned, but the effects should not be significant. No discernible direct and indirect effects to water quality would be expected if the criteria of no ignition within buffers, low fire severity, and low soil burn severity are maintained and live vegetation is left to act as a sediment filter strip. While short-term degradation could occur, reintroduction of fire into this landscape and movement toward a more natural fire regime would have a long-term benefit for water quality.

Cumulative Effects

Modified Proposed Action

Cumulative effects associated with proposed treatments could include a decrease in tree canopy and an associated increase in water available for streamflow and potential modifications to peak flow timing. The potential increase in water available for stream flow would be due to decreases in interception and transpiration. In wet climates, this could increase annual water yield.

The amount of change in canopy cover necessary to produce a significant effect on water yield is approximately 25 percent. The Hydrology Report shows the maximum allowable disturbance for each sixth-level watershed shown as equivalent clearcut area. No 6th-level watershed would have more than 25 percent equivalent clearcut area.

Table 47. Summary of the road construction effects from the modified proposed action assuming all 260,000 acres of stand initiation and intermediate treatments occur

Resource Element	Resource Indicator	Measure	Forest Plan Period (2004-17)	LaVA Modified Proposed Action (2019-2039)
Water quality	Sedimentation – direct effect	Road-stream crossings (#)	27	534
Water quality and wetland	Sedimentation – direct effect	Road construction in wetland (miles)	0.04	0.8
Water quality	Sedimentation – indirect effect	Road construction in water influence zone (miles)	0.6	12

Table 48. Summary of effects from stand initiation and intermediate harvest treatments under the modified proposed action assuming all 260,000 acres of stand initiation and intermediate treatments occur

Resource Element	Resource Indicator	Measure	Forest Plan Period (2004-17)	LaVA Modified Proposed Action (2019-2039)
Water quality and wetland	Sedimentation – direct effect	Harvest in wetland (acres)	45	1,534
Water quality	Sedimentation – indirect effect	Harvest in water influence zone (acres)	499	16,874
Water quantity	Water yield	Equivalent clearcut area (percent basal area removed)		Maximum of 25 percent or 146,424 acres

Soils

Impacts to the soil resource from the proposed action are a resource concern. Treatments using ground-based mechanical equipment, such as harvest activities, landing construction, temporary road construction, skid trails, and mastication, can compact, rut, and displace soil, and remove surface organic matter. These ground-disturbing activities can reduce infiltration, increase runoff and erosion, and change the amount of organic matter in the soil. Prescribed burning and burning slash piles can heat the soil to the point where there is a loss of physical, biological, and chemical functions and a decrease in organic matter needed for future soil nutrient stores.

Effects to soils were evaluated and disclosed in terms of detrimental disturbance predicted or anticipated from various proposed treatment activities. Examples are compaction, puddling, and erosion and removal of surface vegetation, litter, duff, and large woody debris. Detrimental disturbances can alter or destroy the ability of soils to support native plants.

Affected Environment

Soil wetness is an important factor in the susceptibility of soils to soil compaction and surface disturbance (Block 2002). Most soils in the LaVA project areas are coarse-textured sand and sandy loams and therefore are more resistant to compaction and rutting. Approximately 152,040 acres (table 49) have a wetness index rating of 5 or above which indicates wetter sites. These acres would be at risk for compaction, rutting, and displacement. A total of 455 miles (13.5 percent) of road are located on wet soil types. These roads would be the most susceptible to road drainage issues. Of the 455 miles, 186 are existing closed roads that could be reopened as part of the LaVA Project.

Table 49. Soils characteristics (in acres) in the 14 accounting units in the LaVA project area

Accounting Unit	Wetness Rating of 5 or more	Inherent Wetness Rating of 1 or 2	Erosion Hazard	Mass Wasting	Shallow Soil	Organic Matter 0.5% or Less
Battle Pass	11,770	7,724	2,404	7,643	3,271	31,568
Big Blackhall	24,283	4,958	521	8,230	420	47,954
Bow Kettle	14,545	13,956	1,320	4,952	1,132	58,407
Cedar Brush	4,909	3,951	117	5,556	2,790	48,405
Foxwood	22,372	5,535	0	8,708	5,121	66,566
French Douglas	6.626	4,556	2,743	7,360	8,040	55,084
Green Hog	10,686	2,886	5,536	16,921	6,625	47,112
Jack Savery	9,628	2,829	2,095	16,396	4,266	40,638
North Corner	1,971	2,739	118	3,572	529	37,102
Owen Sheep	13,875	1,587	5,508	1,586	11,461	13,302
Pelton Platte	7,968	1,831	0	3,223	10,537	32,860
Rock Morgan	4,818	2,120	5,722	3,565	78	53,782
Sandy Battle	12,919	3,846	7,764	17,552	1,650	37,621
West French	5,670	4,018	1,219	7,036	3,174	5,106
Totals	152,040	62,526	33,747	112,300	59,094	621,467

Approximately 62,526 acres in the 14 accounting units have a wetness index rating of 1 and 2 which indicates dry sites with south- and southwest-facing aspects and steeper slopes. There are approximately 59,094 acres of shallow soils in the accounting units. These acres would be more vulnerable to effects from prescribed fire.

Approximately 33,747 acres of soils have a severe erosion hazard and approximately 112,300 acres have severe mass wasting potential (table 49). If vegetation is removed from soils with moderate or severe erosion hazard ratings, erosion would likely occur and site productivity would be affected.

There are 621,467 acres within the 14 accounting units with 0.5 percent surface organic matter or less (table 49). In these areas, maintaining organic matter on the site is important for future nutrient cycling and enhancing site productivity. However, the organic matter value does not distinguish between vegetation types with a low growth form, bare areas, or young soils (Entisols) that may not have had time to build organic matter.

Environmental Consequences

Direct and Indirect Effects

No-action Alternative

Under the no-action alternative, no timber harvesting, vegetation treatments, or fuel reduction treatments would be implemented. There would be no new disturbance from project activities; any existing disturbance would continue. No additional compaction would occur, and old disturbance would continue to recover at natural rates. No new adverse effects on soils would occur from this action.

If a high-severity fire occurred in the project area, it would have an increased potential for impacts to soils and soil productivity in severely burned areas, especially since the risk of soil erosion increases proportionally with fire intensity (Megahan 1990). High surface temperatures from high severity wildfire, particularly when soil moisture is low, result in an almost complete loss of soil microbes, woody debris, and the protective duff and litter layer over mineral soil (Hungerford 1991; Neary et al. 2005).

Modified Proposed Action

The modified proposed action has the potential to affect soil functions through erosion (vegetation treatment and prescribed fire activities), compaction (mechanical harvest equipment and temporary road construction), changing soil properties with removal of surface vegetation (prescribed fire treatments and vegetation treatments).

Most soil erosion comes from skid trails, temporary roads, and landings where bare mineral soil is exposed. Existing roads, landings, and skid trails would be reused where feasible. If existing landings were re-used, additional disturbance would not occur or would be minimal. Erosion control measures would be used to avoid soil movement from landing sites during maintenance and construction; therefore, erosion and sedimentation should be minimal. In landings larger than 1 acre, recovery would be long term, greater than 40 to 60 years. Potential soil disturbance would be mitigated by implementing best management practices and soil design features 5 and 6 (see design features appendix).

Approximately 600 miles of temporary road could be created during project implementation. Temporary roads would be decommissioned following treatment activities to preclude future motorized use and to restore ecological function; decommissioning returns a road to a natural state. There are 186 miles of existing closed roads located on wet soils. These roads could be reopened as part of the LaVA Project; however, they would be closed again when treatment activities in the area were completed. Areas with wet soils (wetness rating of 5 or more) should be avoided or have site-specific design features created when a project is developed within the area.

Some degree of soil compaction is expected to occur over 10 to 15 percent of the mechanical vegetation treatment units (Jagow 1994; Fleishman 1996, 2005). Mastication or mowing is also proposed. In the short term, these treatments would have similar impacts as timber harvesting, including compaction, rutting, displacement, and loss of organic matter. Adverse impacts would be mitigated by retaining slash on the soil surface (soil design feature 3). Timber operations would occur under dry soil conditions or when soils are frozen and have adequate snow cover to alleviate soil compaction and rutting (Minard 2003). Soil design features 1, 3, and 7 would be implemented to mitigate soil compaction (see the design features appendix).

In areas where prescribed fire treatment is proposed, there would be a decrease in ground cover and increase in soil erosion in the short term. Generally, negative impacts to the soil resources would be short lived (2 to 7 years) because prescribed burns would occur during favorable weather conditions and in planned burn blocks resulting in favorable fire behavior, and best management practices would be implemented (Neary 2005). Approximately 62,526 acres within the 14 accounting units have a wetness index rating of 1 and 2 which indicates dry sites on south- and southwest-facing aspects with steeper slopes. There are approximately 59,094 acres of shallow soils in the accounting units. These areas would be of concern due to the soil damage that could occur if surface organic material was removed.

Large-scale, detrimental erosion from prescribed fire is not anticipated due to implementation of best management practices (Fire-2 and Fire-4 in the design criteria appendix). Localized minor erosion, which would not impact the overall soil productivity of the area, is expected.

Prescribed fires can also result in a positive benefits by expediting nutrient cycling, decreasing woody canopy cover, improving herbaceous response, and improving ground cover which improves soil stability. Positive impacts to the soil resources would be variable but extend 3 to 10 years.

Cumulative Effects

Past and current activities in the LaVA project area that could be considered detrimental to the soil resource have been accounted for in the existing conditions section of this document.

No-action Alternative

Since no actions would take place, there would be no cumulative effects.

Modified Proposed Action

Timber harvests have occurred in the past within the accounting units. Depending on when and where timber harvests and vegetation treatments were located during LaVA project implementation, there could be cumulative effects to soil productivity if soil recovery has not occurred from previous harvesting activities. Resource protection measures and best management practices would be implemented in order to maintain soil productivity, organic matter, and soil stability on these sites. Coarse woody debris

would be maintained along with ground cover and further treatments would be postponed if soil recovery has not occurred. Previous disturbed areas would be utilized to the extent possible to minimize further soil damage.

The proposed thinning would reduce future potential fire behavior. The benefits of fires with lower intensity and severity would include a reduced potential of excessive soil heating and sterilization as well as the development of hydrophobic conditions that tend to increase sediment movement, flooding, and possible slope instability (de Dios Benavides-Soloria and McDonald 2005; Neary et al. 2005). There would be potential for some cumulative effects to soils if wildfire suppression activities occur in areas where soil disturbance occurred from project implementation. This could slow soil recovery in these areas.

Disturbance from general motorized use and recreational access has been occurring and would continue. Closing skid trails and temporary roads following treatment should prevent this occurrence and should not have additional effects on soils in the project area. Cumulative effects to soils from recreational vehicle use are not expected. See the "Recreation and Areas with Special Designation" report for further discussion.

The proposed treatment units would be subject to cumulative impacts where livestock grazing and mastication treatments or prescribed burning overlap within active allotment boundaries. Impacts include compaction, removal of groundcover, and displacement in areas where livestock trail, access water, or bed down. Cattle may maintain compaction in localized lounging and trailing areas, decreasing the soil recovery on portions of the treated areas. Grazing following prescribed burning could potentially have detrimental soil impacts, but resting prescribed burn units for a time should alleviate cumulative effects from grazing by giving soils and vegetation time to recover.

Existing developed roads have a long-term effect on soil productivity due to compaction and displacement. Maintenance of these roads includes culvert installation, blading, and brushing and typically improves drainage and decreases erosion from water channeling down the road surface in the long run. See the "Hydrology" report for a detailed analysis and information on roads and related issues. Cumulative effects are not expected from road maintenance activities.

Air Quality and Climate Change

Affected Environment

The Medicine Bow National Forest is located in a rural setting, with generally good existing air quality. However, air quality may be impacted by wildland fire or prescribed fire. Emissions from wildland or prescribed fire are carbon dioxide, water, carbon monoxide, particulate matter, hydrocarbons or volatile organic compounds, and nitrogen oxides. The pollutant of concern for the LaVA project area is fine particulate matter.

Fine particulate matter ($PM_{2.5}$)[5] is a component of the smoke produced by wildland and prescribed fire. Smoke is made up of a complex mixture of gases and fine particles produced when wood and other organic materials burn. The biggest health threat from smoke is from fine particles which can penetrate deep into the lungs. The particles can cause a range of health problems, from burning eyes and a runny nose to aggravated chronic heart and lung diseases (EPA 2017).[6] Fine particulate matter is also the leading cause of regional haze or visibility impairment.

Fine particulate matter data is recorded at the State and local air monitoring station in Laramie, WY. Data from the site shows the area is meeting the national ambient air quality standards for fine particulate matter (EPA 2018a).[7]

Environmental Consequences

Direct and Indirect Effects

No-action Alternative

There would be no direct impacts on air quality since no actions would be implemented. Indirectly, this alternative could potentially impact air quality due to resulting buildup of forest fuels, which could cause more smoke over a longer period if wildfires were to burn in untreated areas. Wildfires occurring in areas with increased fuels would produce more smoke, would likely be more difficult to contain, and would burn longer.

Modified Proposed Action

Short-term, direct impacts to the air quality in, and adjacent to, the project area would occur from prescribed burn emissions. The amount of smoke and how it is dispersed depend on the size of the burn, the amount of fuel loading and consumption within the burn unit, and the weather conditions at the time of the burn. In general, smoke from prescribed burning disperses into the atmosphere through the wind where it reacts with other existing pollutants.

The direct effects of smoke include human health and safety issues. Fine particulates, including those found in wildland fire smoke, affect human health through the respiratory system, although eye irritation is also common. Individuals with cardiopulmonary diseases are especially susceptible. Residents near the burn units could have respiratory discomfort from ground-level smoke. It is expected most impacts would be in the form of nuisance smoke, smell, or both.

Fine particulates can also reduce visibility. The visibility impairment caused by the proposed prescribed fires would likely be short term (less than 24 hours), and reductions in visibility (distance, color and texture) would probably decrease as one moved away from the prescribed fire. Visibility on roads could be reduced by ground-level smoke, causing a safety issue. This could cause accidents if vehicle traffic was not closely controlled and guided. Prescribed fires would be managed to disperse and dilute smoke to avoid the negative effects of emissions, especially downwind of the burn.

[5] $PM_{2.5}$ refers to particulate matter 2.5 microns or less in diameter.
[6] AirNow smoke article, https://www.airnow.gov/index.cfm?action=smoke.index
[7] EPA's nonattainment areas for criteria pollutants, https://www.epa.gov/green-book

Cumulative Effects

No-action Alternative

Since no actions would be implemented, there would be no cumulative effects from this alternative.

Modified Proposed Action

No significant cumulative effects would result from implementation of the modified proposed action. The proposed prescribed burning proposed in the LaVA Project combined with prescribed burning in the Divide Peak (USDA Forest Service 2013) and North Savery (USDA Forest Service 2017) decisions or in nearby areas outside the LaVA project area could increase the amount of fine particulate matter in the air. This would not affect meeting national ambient air quality standards because all prescribed burning would be in compliance with Wyoming Department of Environmental Quality air quality standards and regulations, chapter 10, sections 2 through 4 (Wyoming Department of Environmental Quality 2004).

Transportation

Affected Environment

The existing transportation system analyzed for the project area was taken from the road layer contained in the Medicine Bow National Forest geographic information systems database of record. As with any planning area, road conditions vary throughout the area. Maintenance level 1 and 2 roads,[8] which may have not had routine maintenance recently, may not meet maintenance standards. Segments of roads may be located in or cross drainage bottoms, meadows or other wet areas. These road segments may not drain properly and may be contributing to sediment movement. Some road sections that cross drainages may not have a hardened surface or a proper design through the crossing and portions may have steep grades, which will show evidence of road rutting and surface material loss. Numerous roads may have small diameter trees growing within the roadway limits, restricting sight distance and road width.

The following issues and concerns are common throughout the project area:

- the road system may not be adequate to provide access to all areas
- steep terrain may block access and make it difficult for resource management
- portions of roads may be located in or near drainage bottoms, creating drainage problems, soil erosion, soil movement and sediment deposits
- roads that cross streams and drainage bottoms may be contributing sediment because they may not have a hardened surface or proper design through the crossing
- existing roads that may not have adequate drainage may be causing rutting, water ponding, washouts, and aggregate and native surface material loss

[8] Maintenance level 1 roads are physically closed to motor vehicle use. These roads provide for long-term management access, but in the near term, motor vehicle use isn't necessary.
Maintenance level 2 roads are administrative and public use roads maintained for pickup trucks and other high-clearance vehicles. Passenger cars are not prohibited from using these roads, but surface conditions usually discourage prudent passenger car drivers.

- unauthorized routes may not have drainage structures or road templates and may be located in wet areas, meadows, and drainage bottoms
- fire suppression activities may be obstructed or slowed by poor or no road access to areas
- temporary bridges or other designed crossing may be needed to cross drainages
- some existing road closures may be ineffective
- as tree mortality increases and they fall across roads, there is an increased likelihood roads would be inaccessible for periods of time

Environmental Consequences

Direct and Indirect Effects

No-action Alternative

There would be no direct effects to the existing transportation system. Scheduled annual and routine maintenance would continue. Beneficial effects of taking no action would be no additional ground-disturbing activities, no increased dust and noise, and no tree removal.

The adverse indirect effects of taking no action would be foregone opportunities to provide additional maintenance, reconstruction, and road closures associated with, and funded by, various Federal programs. Increased road maintenance needs could be expected due to expected increase in water yield and peak flows. Roads identified for closure with previous decisions could continue to see unauthorized travel until funding becomes available to effectively close the roads. Clearing of hazardous trees along routes would occur.

Modified Proposed Action

Adverse effects from maintenance and reconstruction activities would include short-term vegetation loss, vegetation removal, soil disturbance and compaction, an increase of mixed traffic and traffic delays during project implementation, short-term increases of noise and dust.

Recreational road and trail access could be temporarily affected by transportation needs associated with timber hauling, equipment access, and harvesting activities. Implementation would require closing some roads and trails over the short-term.

Beneficial effects include improvements to existing roads that would comply with best management practices and road design criteria that improve safety. Once road improvements are completed, long term maintenance and deferred maintenance costs would decrease.

As vegetation is reestablished, the effects on soil erosion would be reduced. Revegetation would help stabilize the roadway and the cut-and-fill slopes.

Positive driving experiences would improve from proper road design and repair of the travel way. The road use pattern in the area would change as unauthorized routes being used as temporary roads are closed and closure devices are secured.

Cumulative Effects

Modified Proposed Action

There would be an increase in traffic with implementation of the proposed activities when combined with the activities of other planned projects (for example, North Savery project) occurring in or surrounding the project area during overlapping time periods. Road reconstruction activity for this project and others like it could cause traffic delays. Closures to motorized use on some roads would likely occur during harvest periods for this project and others like it. Improving the road system, specifically road stream crossings, would have a positive cumulative direct and indirect effect on water quality by reducing sediment delivery from roads to water courses at the road stream crossings within the watersheds.

Social Environment

Recreation

Affected Environment

The LaVA project area contains a variety of important recreation areas with a multitude of recreation opportunities: developed recreation campgrounds, picnic areas, day-use areas, recreation rentals, recreation residences, motorized and nonmotorized trail opportunities. There are 23 developed campgrounds, eight picnic areas, eight rentals, two group sites, and 62 trailheads in the proposed LaVA treatment opportunity areas. There are four wilderness areas in the LaVA project area with no treatment proposed. Recreation opportunities include hiking, biking, off-road vehicle use, camping, picnicking, boating, fishing, site seeing, hunting, river floating, snowshoeing, snowmobiling, downhill skiing, and cross-country skiing.

The recreation opportunity spectrum is the framework for integrating recreation values into forest plans, project design, and management decisions. The forest plan provides direction on the allocation of resources to meet expressed local and national public needs. The recreation opportunity spectrum is a planning tool used by land managers to classify areas according to the types of recreation opportunities available in different areas.

Each class is defined in terms of its combination of activity, setting, and experience opportunities. Recreation opportunity spectrum classifications may range from primitive inside a designated wilderness to urban in recreation areas adjacent to metropolitan areas. Five of the seven possible recreation settings are found in the LaVA analysis area: roaded modified (31 percent), roaded natural (22 percent), semi-primitive nonmotorized (20 percent), semi-primitive motorized (23 percent), and rural (3 percent). Of the semi-primitive nonmotorized recreation opportunity spectrum class, 52 percent (79,591 acres) is located in wilderness areas while only 3,000 acres are located in the treatment opportunity areas. All accounting units have semi-primitive nonmotorized, semi-primitive motorized, roaded natural, and roaded modified recreation opportunity spectrum classes with varying percentages. Four accounting units have rural class recreation opportunity spectrum settings in the area which are located along the Wyoming Highway 130 corridor that runs east to west in the center part of the project area and along Wyoming Highway 230 that is located in the southeast part of the area.

Inventoried roadless area characteristics: As mentioned above, 25 percent of the project area is classified as semi-primitive nonmotorized. The LaVA project area encompasses 25 inventoried roadless areas covering 230,215 acres.

Developed recreation: There are 26 developed campgrounds and eight day-use areas in the analysis area offering visitors 455 and 58 sites, respectively, from which to choose. Seven rental cabins and lookouts are available for public use. Most campgrounds have potable water, trash and toilet facilities, with other basic camping amenities.

Dispersed recreation: Dispersed camping, hunting, fishing, and off-highway vehicle use are very popular activities in the project area with many established dispersed sites. While 42,785 acres of the project area are designated and managed for summer motorized uses, there are approximately 2192 miles of National Forest System roads open to motorized travel in the area. This extensive network of roads provides users with a tremendous variety of options to access and view the Medicine Bow National Forest. Other forms of dispersed recreation, including hiking, biking, horseback riding, snowmobiling, snowshoeing, and picnicking, are also popular, though typically not to the extent of these others. The popularity of snowmobiling on the Medicine Bow is worth noting, with the Snowy Range the most heavily used snowmobile area in the project area.

Wilderness: Four wilderness areas are located in the analysis area: Encampment River (10,207 acres), Huston Park (30,917 acres), Platte River (23,273), and Savage Run (15,277).

Trails: There are approximately 431 miles of designated trails in the LaVA analysis area with 74 miles of those being motorized trails. There are also 469 miles of groomed and ungroomed winter motorized trails (snowmobile) that are mainly located on existing roads. Approximately 46 miles of cross-country ski trails are available in the proposed project area. There are 72 trailheads located in the analysis area.

There are 43 miles of the Continental Divide National Scenic Trail which runs the entire length of the Brush Creek/Hayden District from the Colorado and Wyoming state line to the north Medicine Bow National Forest boundary on the west side of the analysis area. When the Continental Divide National Scenic Trail corridor was being established and management direction delineated that, to extent possible, the trail was to be located in more primitive recreation opportunity spectrum classes (primitive and semi-primitive nonmotorized).

Roads are classified as levels 1 through 5. Level 1 is a road closed to motorized travel and a level 5 road is open for public use passible by passenger cars. All open roads in the analysis area are designated for off-road vehicle travel and are enrolled as State designated roads and routes. There are approximately 2,192 miles of open roads in the analysis area. The existing system of open and closed roads, along with proposed new temporary road construction (up to 600 miles), would provide access for vegetation treatments. No new permanent road construction is anticipated, and no temporary or permanent roads would be located in inventoried roadless areas.

All temporary road construction and reconstruction required for access to treatment areas would use minimum ground-disturbing standards. These standards would follow site-specific resource best management practices included in timber sale contract provisions. After project completion, temporary roads would be reclaimed within three years after treatments are completed through a variety of treatments to best repair the resources damaged.

Off-road vehicles include off-highway motorcycles, and four-wheeled, all-terrain vehicles also known as quads. Off-road vehicle use (mainly the single-passenger, four-wheelers) has been overtaken in popularity by the multi-passenger, utility task vehicles, with the majority of off-road vehicle users preferring the experiences associated with backcountry trail travel, as opposed to those gained from road-based recreation (Cordell, et al. 2005; Fisher et al. 2001; Crimmins and Nelson 1990). It is predicted that off-road vehicle recreation days will continue to grow by as much as 54 percent in the Rocky Mountain region by the year 2050 (Silberman and Andereck 2006). The combination of an affluent, aging population and low interest rates may be fueling the growth in off-highway vehicle purchases and use.

The many miles of unauthorized, unmaintained roads and trails and repeated instances of off-road and off-trail resource damage to vegetation, water, and soil resources can be attributed to a combination of the following:

- the increase in off-road vehicle use
- the pre-2000 Medicine Bow National Forest travel management policy permitting cross-country travel
- limited miles of designated motorized trails
- off-road vehicle user preferences for backcountry experiences

The Forest Service recognizes motorized use on national forests as a legitimate form of recreation under certain conditions. However, unmanaged recreation, especially as it pertains to off-highway vehicles, has been determined by the Chief as one of the four major threats facing the National Forest System.

Unauthorized roads and trails: There are many miles of illegal, user-created trails in the project area, and many of them are wide enough to be accessed by off-road vehicles, utility task vehicles, and full-sized vehicles. While it is difficult to determine the origin of the many miles of unauthorized roads and trails, many were likely developed from Medicine Bow National Forest users retrieving game; accessing hunting, fishing, and camping, and gathering wood. Some routes were likely skid trails from past timber sale operations that did not get closed on the ground; others are extensions of authorized roads by off-highway vehicle or old routes left over from roads created when cross-country travel was legal.

The Medicine Bow National Forest had 10.3 percent of all resident off-road vehicle use and 22.3 percent of the nonresident use during the 2012 season (Wyoming Comprehensive Off-road Vehicle Recreation Report 2012).

Recreation user conflicts: Typical conflicts in the project area are dispersed campers overstaying their 16-day camping limit, motorized vehicles accessing areas via an illegal route, access around closures or signs, and retrieving game and firewood past the legal 300-foot distance off a legal route.

Both anecdotal and scientific evidence (Hammit and Schneider 2000) suggests hunters (many of whom are also off-road vehicle users) are increasingly finding their experiences and success rates adversely impacted by the number and behavior of off-road vehicle users. Impacts range from off-road vehicles traveling legally on a road moving game out of an area to illegal cross-country travel of an off-road vehicle into an unroaded area.

Complaints from both sides of the issue are commonplace, with off-road vehicle users often upset at the imbalance between nonmotorized and motorized trail opportunities, and other users (including some motorized enthusiasts) upset at the ongoing examples of off-road-vehicle-caused resource degradation. Far more prevalent is the occurrence of off-road vehicle use disrupting other forms of recreation.

Off-highway-vehicle-caused resource damage: A discernible difference between impacts from motorcycles, single-passenger three-wheelers; single-passenger four-wheelers, and multi-passenger four-wheelers is not well defined in the existing literature. The main difference, depending on terrain and environmental conditions, would be the amount of the vegetation removed and tread width developed from repeated use. Besides the difference in tread width, many impacts would be similar with all off-road vehicles.

A degree of resource damage can occur with all activities managed on the Medicine Bow National Forest under certain conditions. To mitigate resource damage, Medicine Bow National Forest personnel have designated areas for most activities, including motorized and nonmotorized activities. These areas have been designed with resource concerns and potential damage in mind. Trails, roadways, campgrounds, and nearly all Medicine Bow National Forest developments have had some type of environmental effects analysis prior to being created.

Stokowski and LaPointe (2000) summarized multiple research assessments regarding off-road vehicle damage and their findings are listed below:

- Regardless of vehicle type (all-terrain vehicles, off-road vehicles, snowmobiles), research generally shows very similar impacts; differences in impact level are due more to intensity of use or use characteristics, in combination with the level of fragility of the affected environment.
- Studies of air quality impacts are limited and often focus on the emission effects of snowmobile operation. Findings show emissions tend to exceed human health standards. Further research is needed on the effects of all-terrain vehicle emissions on humans, other species, and general air quality.
- Soil and vegetation impacts are widely discussed in the literature. Soil compaction and the shear forces of motorized vehicles create mud holes and gullies that alter hydrologic patterns and intensify erosion. More studies are needed to quantify the amount and extent of soil loss attributable to all-terrain vehicle use.
- Trail erosion and compaction caused by off-road and all-terrain vehicles reduce the quality of recreational trails and require enhanced management action to develop and maintain safe, usable trails.
- Wildlife impacts have been primarily studied in relation to western habitats and have often focused on snowmobile use. Wildlife are negatively impacted by the presence and noise of all-terrain vehicles, off-road vehicles, and snowmobiles; although, some mammals (deer, for example) may become habituated to these vehicles over time. Snow compaction also affects the survival and activities of small mammals.
- All-terrain vehicle use has been found to widen and rut forest road, and to increase the sediment load to streams which may threaten fisheries.
- All-terrain vehicles and off-road vehicles offer access to resource areas that are typically less accessible and more remote.

Direct and Indirect Effects

No-action Alternative

There would be no effect on five of the seven indicators for the recreation opportunity spectrum. In areas with high beetle mortality, access and naturalness indicators for semi-primitive nonmotorized and semi-primitive motorized settings could be negatively impacted by downed and falling trees preventing safe access to many areas.

Continuation of the existing condition of beetle-killed hazard trees would have a negative impact on closed campgrounds and dispersed camping sites. Overhead safety concerns and jackstraw conditions would continue to impede access for recreationists in some areas. Where hazard trees have not been removed, they would continue to block access on many routes affecting travel.

Trail users, including those on the Continental Divide National Scenic Trail, would have to navigate some areas of heavy buildup of downed trees in lodgepole pine stands. There would continue to be both short- and long-term negative impacts for trail system and users as some trails could be closed due to overhead hazards or the lack of maintenance. Annual trail maintenance would continue to treat portions of the trails one time during the season, and tree fall would continue after that clearing. In some years, along many timbered stretches, riders and hikers would have a very difficult time navigating some portions of trails with the continuing downfall accumulation. There would be no effects to unauthorized roads and trails related to off-road vehicle use, recreation user conflicts, or off-highway-vehicle-caused resource damage.

Modified Proposed Action

Semi-primitive nonmotorized recreation opportunity spectrum settings could be negatively affected by mechanical treatments. There could be low to moderate effects on recreation opportunity spectrum indicators from inconsistency with proposed treatments; these effects would not cause a change in the recreation opportunity spectrum class designations within the project area. Prescribed burning could cause inconsistent or normal effects to recreation opportunity spectrum indicators.

There could be short-term effects on visual quality, solitude, and naturalness. Short-term effects on scenery and recreation access from the treatments would occur but lessen over time.

Some dispersed recreation sites (picnic or camping) could be negatively affected in the short term due to loss of site or loss of access during implementation, but new sites would be created and some sites would be improved by hazard tree removal. There would be minimal to no impact on hunter satisfaction.

Removal of beetle-killed trees would have positive effects to trails. Treatments along trails (including portions of the Continental Divide National Scenic Trail) may improve the hiking experience in areas of deadfall and down trees and where dead trees have impacted scenery. Treatments along most trails would reduce overhead safety hazards and the need for annual logging out. One exception is that trail closures or detours (including portions of the Continental Divide National Scenic Trail) during implementation would have short-term negative effects on visitor access.

Effects from the construction of temporary roads could include unauthorized use of those roads or the creation of new unauthorized trails by motorized recreationists which could, in turn, affect the recreation experience for nonmotorized users. These effects could contribute to additional recreation user conflicts.

Off-highway vehicle use could be slightly impacted through the reduction of access and short-term closures.

Cumulative Effects

No-action Alternative

Annual maintenance along the trails would not keep up with the increasing number of trees on the trails in the near future. This maintenance would continue but on fewer miles due to the increasing concentration of fallen trees on the trails across the Medicine Bow National Forest.

Modified Proposed Action

There would be increased access to recreation sites and campgrounds that are currently closed due to hazard trees and these area would be closed in the future. There would be positive effects from reducing the accumulation of fallen trees along and on trails (including the Continental Divide National Scenic Trail). With the construction of temporary roads, negative effects to the recreation experience would occur from incremental increases in unauthorized motorized use of temporary roads when considered with past, present, and reasonably foreseeable motorized use on unauthorized routes within the project area.

Lands and Special Uses

Affected Environment

The LaVA project area contains locations for permitted and potentially permitted temporary recreation activities; outfitter and guide services; recreation residences and lodges; utility facilities such as irrigation ditches and headgates, powerlines and water pipelines; and, and photography and filming (table 50). Forest Service personnel often receive requests for temporary recreation permits for activities in dispersed or developed recreation areas.

Table 50. Permitted activities in the LaVA Project accounting units

Accounting Unit	Permitted Activities
Jack Savery	Temporary recreation events, outfitter and guide services, Bridger Peak radio repeater, irrigation ditches and structures, commercial filming and photography
Sandy Battle	Temporary recreation events, outfitter and guide services, a private resort, irrigation ditches, commercial filming and photography
Battle Pass	Outfitter and guide services and a campsite; irrigation pipeline, ditches, and structures; commercial filming and photography
Green Hog	Commercial and noncommercial permitted activities at 3 developed sites; outfitter and guide services and campsites; irrigation pipeline, ditches, and structures; commercial filming and photography
Big Blackhall	Recreation residence cabin, outfitter and guide services and a campsite, radio repeater site, irrigation ditches and structures, commercial filming and photography
Rock Morgan	Outfitter and guide services, communication site, irrigation ditches and structures

Accounting Unit	Permitted Activities
Bow Kettle	Temporary recreation events, outfitter and guide services and a campsite, irrigation pipeline, ditches and structures
Cedar Brush	Temporary recreation events, a private recreation residence, outfitter and guide services and a campsite, recreational prospecting, Kenneday Peak radio repeater, Carbon Power and Light above-ground powerline, irrigation ditches, stream gage, commercial filming and photography
North Corner	Seventy-one recreation residences, temporary recreation events, outfitter and guide services, above-ground electric line, irrigation ditches and structures, below-ground water pipeline, commercial filming and photography
West French	A resort, temporary recreation events, outfitter and guide services and campsites, 3 recreation residences, cell tower, Carbon Power and Light above-ground powerline, irrigation pipeline and structures, a stream gage, commercial filming and photography
French Douglas	Temporary recreation events, outfitter and guide services, 5 recreation residences, above-ground powerline, irrigation ditches and structures, above- and below-ground water pipeline
Pelton Platte	Outfitter and guide services and a campsite
Foxwood	Twenty-six recreation residences, outfitter and guide services, above-ground powerline, irrigation ditches and structures, recreational prospecting
Owen Sheep	Outfitter and guide services; above-ground electric wire; irrigation ditches, structures, and pipeline; below-ground water pipeline

Environmental Consequences

Direct and Indirect Effects

No-action Alternative

Under the no-action alternative, there would be no measurable direct and indirect effects to special uses authorizations because no actions are proposed.

Modified Proposed Action

Under the modified proposed action, prescribed fire treatments and mechanical treatments could have minimal direct or indirect effects to special use permits and permitted activities but would not significantly alter the permitted use patterns currently observed. Hand treatments would likely have no direct or indirect effects to special use permits or permitted activities.

Cumulative Effects

No-action Alternative

Because there are no direct and indirect effects, there are no cumulative effects.

Modified Proposed Action

Successful treatment, resulting in improved forest health and diversity overall, as well as a reduction in frequency and intensity of wildfires, is likely to gradually increase the number of people that hold permits, easements, or leases in all accounting units. This includes an increase in the number of people who want to engage in recreational prospecting, such as gold panning.

Heritage Resources

Affected Environment

Cultural resources on the Medicine Bow National Forest represent a diversity of cultures and their uses of landscapes and represent at least 12,000 years of human history. Known prehistoric sites include hunting camps, settlements, trails, and resource gathering areas. Historic period sites such as emigrant trails, homesteads, and railroad grades illustrate the westward movement; and conflicts between settlers and the Indians have left evidence in the form of battlegrounds and forts. Mining-related properties, such as shaft houses, ghost towns, and patterned tailings, tell the story of boom-and-bust mining towns and the search for gold and other sought-after minerals. Lodges, summer homes, and campgrounds document the evolution of the outdoor recreation movements of the late 19th and early 20th centuries. Depression-era structures built by the Civilian Conservation Corps, early Forest Service guard stations, and lookout towers illustrate the Federal land management era of the past century.

Prehistoric cultural resources tend to represent cultural and environmental interactions over time and closely reflect responses, in terms of location and site type, to changing environmental and climatic conditions. The natural forest conditions that are currently identified as undisturbed (usually found in the more remote portions of the national forests) are actually the result of the influence of past customs and practices of the previous populations of Native Americans. Historic cultural resources tend to represent cultural and economic needs, facilitated by technology and its advances, to dominate rather than to interface with the environment (Reed 2011).

Sacred sites, as defined in Executive Order 13007, may encompass areas of historic and prehistoric cultural resources. However, sacred sites need not be traditional or historic – sacred sites may be identified by Tribal representatives because the sites are significant in religious observances regardless of age or any empirical evidence of religious activity. When sacred sites are not coincident with historic or prehistoric cultural resources, the sites may be associated with distinctive topographic or geologic features.

As our society grows more urban and complex, people long for unique and authentic opportunities to experience the natural and cultural heritage of special places. Thus, cultural resources on public lands enrich people's experiences by creating opportunities to discover their past. People are fascinated with the past, whether it is their own family history, the history of their town or regional past, or the lifeways of ancient peoples. There is a mystery and nostalgia associated with the past that captivates the imagination as well as the intellect – the desire to understand how we arrived at where we are today. Because of the intrigue of archaeology and the past, heritage has a ready and willing public constituency. Cultural resources enhance local communities and build bridges of understanding between the Medicine Bow National Forest personnel and its neighbors.

The existing condition of cultural resource sites and their eligibility for listing to the National Register of Historic Places within each accounting unit is provided in the below table.

Table 51. Type of cultural resource sites by accounting unit

Site Type	JS	SB	BP	GH	BB	RM	BK	CB	NC	WF	FD	PP	FW	OS
Unknown	69	55	16	34	49	9	5	22	10	31	26	2	29	4
Prehistoric	45	23	5	7	72	2	6	15	0	6	20	23	24	8
Historic	133	130	94	105	154	69	50	89	130	198	241	40	175	11
Multicomponent	18	7	0	2	11	5	0	2	1	2	4	3	9	1

Accounting Units: JS = Jack Savery, SB = Sandy Battle, BP = Battle Pass, GH = Green Hog, BB = Big Blackhall, RM = Rock Morgan, BK = Bow Kettle, CB = Cedar Brush, NC = North Corner, WF = West French, FD = French Douglas, PP = Pelton Platte, FW = Fox Wood, OS = Owen Sheep

Table 52. Cultural resource site eligibility information by accounting unit

Site Type	JS	SB	BP	GH	BB	RM	BK	CB	NC	WF	FD	PP	FW	OS
Eligible	54	48	32	68	62	22	15	29	50	68	105	13	38	4
Not Eligible	131	106	60	44	160	42	27	68	46	131	127	52	133	7
Listed	3	1	0	0	0	0	0	2	3	1	1	0	1	0
Unevaluated	69	60	22	36	64	17	14	29	42	42	59	3	65	13

Accounting Units: JS = Jack Savery, SB = Sandy Battle, BP = Battle Pass, GH = Green Hog, BB = Big Blackhall, RM = Rock Morgan, BK = Bow Kettle, CB = Cedar Brush, NC = North Corner, WF = West French, FD = French Douglas, PP = Pelton Platte, FW = Fox Wood, OS = Owen Sheep. Eligible = eligible for listing to the National Register of Historic Places; Not Eligible = Not Eligible for listing to the National Register of Historic Places; Listed = Listed on the National Register of Historic Places; Unevaluated = unevaluated for listing to the National Register of Historic Places

Environmental Consequences

Direct and Indirect Effects

No-action Alternative

Without fuels treatments, impacts to significant cultural resources would continue, and likely increase. Tree mortality would continue to result in direct impacts to the surface features of cultural sites. Dead and dying trees could fall and impact standing historic structures and accumulate on the surface of sites. This would resulting in the heavy fuel loading which, when exposed to wildfire, could alter the condition of stone tools, organic materials, and historic artifacts. Effects of potential high-intensity wildfire would include rendering many dating methods inaccurate, visually altering sites and the physically destroying materials. Rain and snow after a fire could cause severe erosion on heritage properties.

Modified Proposed Action

There would be a reduction in adverse direct effects to significant cultural resources due to the requirement of meeting legal obligations under section 106 of the National Historic Preservation Act, the 2008 programmatic agreement, and design feature #3 for heritage resources (see attachment 3 in appendix A).

Indirect effects could result from changed visitor use patterns and improved access that brings more visitors, resulting in the deterioration or loss of the site. These types of activities (such as unauthorized off-road vehicle use or human ignition of wildfires) would have the greatest potential to adversely affect cultural resources, as these activities do not lend themselves to identification, anticipation, or mitigation.

Cumulative Effects

No-action Alternative

Actions considered in the cumulative effects analysis are the cumulative loss of archaeological resources in the past and in the future without protection measures. Over time the cumulative effect would be fewer archaeological resources available for study and interpretation.

Modified Proposed Action

Application of the appropriate mitigation measures is not expected to result in adverse effects to significant cultural resources. Therefore, no adverse cumulative effects to cultural resources would be expected from with implementation of any of the activities proposed in this project.

Scenic Resources

Affected Environment

For this project, a large portion of the treatments would occur on lands already adversely affected by insects compared to the landscape character normally observed. Normal landscape character would have evidence of insects and disease or other disturbance factors, such as fire or wind, and generally those areas would be relatively small. In this case, the insect epidemic has vastly exceeded the typical scale of disturbance. While it is true large scale disturbances occur in this landscape, those disturbances are not typically apparent on the landscape for the long return intervals between disturbance events.

Existing scenic integrity typically looks at purposeful human-induced change to the landscape. It is not well suited to describing landscapes that have had large-scale disturbance events. The insect epidemics in the conifers and the diseases in aspen have created a heavily impacted landscape, in nearly the entire area, in terms of vegetation condition, and thus, scenic attractiveness. Areas of previous management are sometimes the only places with remaining green trees. For purposes of these discussions, disturbed landscapes do not currently meet scenic integrity objectives, in the eyes of most observers.

There is incomplete information about timber treatments prior to 1960. Timber has been harvested from the area since the late 1800s, primarily larger trees, for railroad ties and telegraph poles. Since 1960, about 113,000 acres have had some type of timber management treatment. Just under half of this has been using clearcutting. There are numerous roads through the area to support timber harvest or other resource management activities. The result is the appearance of a fairly heavily managed landscape in places and much less so in other places.

The project area and planned treatments have been organized into 3 categories which reflect degrees of impact from insect damage or disturbance:

- areas where more than half the trees have died
- areas where about one-third to one half the trees have died
- areas with less than one-third mortality for trees

Areas where more than half the trees have died appear grey. Trees may be falling over or may be standing for a while longer. The appearance is that of an unhealthy forest to most observers.

Areas where one-third to one-half the trees have died retain some green appearance but have noticeable amounts of dead trees; the forest does not appear healthy. Trees may be falling over or may be standing for a while longer. Removal of dead overstory may be followed with treatment of the residual stand.

Areas where less than one-third of the trees have died are likely to be younger stands or have a variety of species present. These stands generally appear largely intact if there have not been treatments or there will be noticeable areas where previous timber operations have created younger stands. Older stands in this category may be treated to regenerate a new stand. Stands that are middle aged or younger may be treated to improve growing conditions.

Advanced regeneration of trees has been found in a variety of microclimates in the project area after the mountain pine beetle infestation (Kayes and Tinker 2010). This suggests there may be opportunities to utilize advance regeneration to screen or to populate areas being treated to remove dead trees. The desirability of retaining advanced regeneration for scenery will need to be balanced against the composition and the health of that regeneration.

Each category of disturbance has a different appearance which affects how the areas will appear in the future, without or with treatment. Different species have variations in appearance within each of those categories. The species will respond somewhat differently with or without treatment.

Aspen stands usually have understory vegetation of grasses, forbs, and shrubs. Sometimes there will be an understory of young aspen or individuals and clumps of conifers of various ages. Areas of higher mortality will usually retain a vegetated appearance, although there may not be a strong presence of trees. Areas with less mortality will typically have more living trees.

Lodgepole pine stands have a variation of stand characteristics. Stand may be a single story of pure lodgepole with little understory vegetation or there may be varying amounts of understory vegetation. Stands may have mixed ages of lodgepole or may contain different species in varied combinations. The level of mortality affects the appearance of these stands very differently.

Spruce-fir stands are typically multi storied, but they may have single-story characteristics in places. Frequently there is advance regeneration in these stands. Due to the moister climate, other growth types may be in the understory. With insect disturbance, a range of appearance exists. In some places, all ages of trees may be affected. In others, the impact may be on older and larger trees alone. The amount of remaining live vegetation will vary.

A large acreage of the tree types described above have been treated previously. Some stands are young to almost middle-aged regeneration, especially in lodgepole pine. Others are in the process of being regenerated or have had some types of more selective treatment. So, in addition to insects or other disturbances, evidence of management is apparent. Some areas of older management activity have straight-line edges at the treated area. Those edges and the size of treatments in respect to the surrounding area may not meet the current scenic integrity objectives for the area.

There is considerable mortality along the Continental Divide National Scenic Trail, and there are locations with residual live trees. The insect disturbance has changed the scenic character of the experience of hiking along the trail. There has also been previous active management of trees in places along the trail.

Environmental Consequences

Direct and Indirect Effects

No-action Alternative

In the absence of treatment, most standing dead and dying trees would fall and therefore remain a hazard to forest users and travelers until removed or blown down. Strong winds could blow down dead and dying tree across trails, roads, campsites, trailhead parking areas and administrative sites. Trees falling across roads or trails would be cut to open access but would not be removed. Evidence of cut-ends of logs would have a small effect on scenic quality.

Visitors could impact the immediate foreground of scenic resources by creating new paths around roads or trails blocked by naturally fallen trees that have not been removed. Impacts could include eroded or bare soils; trampled or removed ground-level vegetation along created paths; and damage to young healthy trees.

The effects of no action would mostly be indirect. Natural processes would continue and the scenery would change based on those processes. The Medicine Bow National Forest would continue to recover at a natural pace. The presence of standing dead trees and fallen trees would detract from the natural appearance of the landscape for most observers. Recovery in conifer stands would continue slowly. Large fires could result due to fuel loadings which would affect scenic quality for mid to long term.

In certain areas, visitors would notice high numbers of downed trees in or near travel corridors and recreation areas, which would negatively impact scenic quality.

Activities to regenerate new stands or manage existing stands (young or approaching maturity) would not occur. There would not be visual impacts from activities. Indirectly, the opportunity to improve the appearance of those stands, especially stands which do not meet the desired scenic integrity, would be foregone.

Scenic byways and the Continental Divide National Scenic Trail are key features in the project area. Without treatment, these areas would have lower scenic quality.

Modified Proposed Action

For much of the area, the existing scenic quality has been diminished due to insects and disease. In other places, previous management occurred prior to adoption of the forest plan and the current scenic integrity objectives. The existing scenic condition may not meet current scenic integrity objectives. There may be a temporary reduction of existing scenic integrity with some treatments. In the long term, the treatments are designed to meet scenic integrity objectives.

Medicine Bow National Forest visitors would notice the removal of mature trees that once dominated the landscape. The immediate visual impact from treatments could be negative if the observer valued more dense stands of trees. Openings resulting from removal of live and diseased trees of various sizes and shapes would be noticed by visitors traveling along road and trail corridors and from viewing points. The immediate visual impact from treatments in areas of mortality could be positive if an observer considered the removal of dead and dying trees an improvement on existing situation. Fewer large stands of dead trees would be visible from travelways, potentially improving scenic quality.

In the short term, mechanical treatments would be more apparent to visitors traveling through active work areas. Felled trees and slash would remain on the ground to protect sensitive plants, soils, and wildlife habitat at some sites. Some sections of trail corridors would have large amounts of felled trees visible by trail users, which could negatively impact scenery. Some trees would remain to provide present and future shade and screening. Some recreation and administrative sites would become more visible due to removal of screening trees.

Removing dead and diseased trees in affected spruce-fir stands would allow existing advanced regeneration to grow faster with less competition for light and moisture, which would improve scenic quality over the long term.

Debris from treatment activities, typically root wads from temporary road construction and slash from harvesting or thinning, would have a negative effect on scenery. Clean-up in the immediate foreground would reduce the intensity and duration of that impact. Actions would be taken to rehabilitate areas previously cut in linear geometric shapes. To the extent possible, the edges would be blended to reduce the adverse visual impact and improve the scenic quality.

Scenic byways and the Continental Divide National Scenic Trail are key features in the project area. The proposed treatments should help achieve higher scenic quality in these areas. The removal of dead trees would enhance views for most observers. Treatments would be designed to intrude as little as possible in the foreground. Debris cleanup would minimize the distracting elements in the landscape. For most viewers, improvement of the foreground and middleground scenery would provide a better experience. The proposed actions would not substantially interfere with the nature of the Continental Divide National Scenic Trail over the long term nor would they interfere with uses on, and purposes of, the trail. The appearance of the trail corridor has been altered by the insect epidemic. Efforts to restore vegetation would impact scenic quality and the experience on the trail while activities were occurring and while vegetation recovers.

Over time, the effects of the proposed action would improve scenery as the results of treatment approached more natural conditions. For scenic byways and the Continental Divide National Scenic Trail, current degraded conditions would reach the higher desired scenic integrity objectives more rapidly.

Cumulative Effects

No-action Alternative

Scenic quality would remain degraded for many years as accumulations of fallen dead trees increase causing the landscape to appear unhealthy. Stands would gradually begin to regenerate, which would improve scenic quality over a long period. The character of stands could change with changes in species. It is possible that aspen would continue to decline and become absent from the landscape, which would reduce a visual element most people find pleasing, especially in contrast to conifer stands.

Past management actions created younger stands for the most part. As a result, those stands were not as affected by mountain pine beetle or other insects. Because of that, a small portion of the landscape remains green and vibrant. The cumulative effects of no further action would be the slow recovery of stands and continued aging of existing stands. Growing conditions might not be optimal, so stagnation could occur and eventually another event—insects or fire—would occur and portions of the area would begin anew.

Scenic quality would change with time. The expectation is that the impacted landscapes would remain for the long term such that scenic quality would be diminished compared to the recent past.

Modified Proposed Action

A large part of the project area would be treated over time and a majority of the area will not receive treatment. This would result in a variety of scenic quality across the landscape. The untreated areas would regain the typical landscape character over the long term. The project treatments would provide better scenic quality by removing some of the large amounts of dead material currently present that is less desired for scenic observers. The enhanced regeneration of the forests would provide better scenic experiences more rapidly. Treatments of the existing regeneration would create better growing conditions and a healthier and more pleasing forest appearance. With the design features that are employed, the Medicine Bow National Forest would meet the desired scenic conditions expressed in the forest plan over time.

Application of forest plan standards and guidelines to meet scenic integrity objectives would meet the requirements of law, regulation, and policy. There would be effects to scenery, which are discussed below, but these effects would be within the range contemplated in the forest plan. To meet scenic integrity objectives, the size, shape, pattern, visibility, and clean-up of debris from activities would need to be considered, along with other resource management concerns.

It is important to realize that for much of the area, the existing scenic quality has been diminished due to insects and disease. In other places, previous management has occurred, which altered scenic conditions prior to adoption of the forest plan and the current scenic integrity objectives. Thus, the existing scenic condition may not meet current scenic integrity objectives. There could be a temporary reduction of existing scenic integrity with some treatments. In the long term, the treatments are designed to meet scenic integrity objectives.

Inventoried Roadless Areas

Affected Environment

The 2001 Roadless Rule established prohibitions on road construction, reconstruction, and timber harvest in inventoried roadless areas on National Forest System lands, with few exceptions (36 CFR 294.13). The LaVA Project contains 25 inventoried roadless areas that require protection and conservation but which were proposed for exception to allow implementation of specific vegetation management activities. Exceptions for certain activities are allowed provided they are used infrequently and their use is approved by a responsible official (36 CFR 294.13(b)(1)-(4)).

Inventoried roadless areas are undeveloped lands, typically larger than 5,000 acres that meet the minimum requirement for wilderness and are managed to maintain the nine roadless area characteristics (36 CFR Part 294: Special Areas; Roadless Area Conservation). The forest plan includes goals, objectives, and desired conditions to maintain the nine roadless characteristics on 95 percent of roadless areas on the Medicine Bow National Forest.

The modified proposed action includes approximately 124,290 acres of potential vegetation treatments (for example, timber harvest and prescribed fire) across 25 inventoried roadless areas (table 53). Detailed treatment proposal information is located in the LaVA project file. Detailed descriptions of all IRAs within the Medicine Bow National Forest administrative boundary may be found in appendix C of the forest plan final environmental impact statement (USDA Forest Service 2003b).

The modified proposed action was approved as an exception to the Roadless Rule by the Rocky Mountain Regional Office in June 2017 to treat wildland-urban interface areas and to maintain or restore the characteristics of ecosystem composition and structure, such as to reduce the risk of uncharacteristic wildfire effects, within the range of variability that would be expected to occur under natural disturbance regimes of the current climatic period (36 CFR 294.13(b)(ii)). The proposed treatments would impact 54 percent of the inventoried roadless areas in the project area.

Table 53. Inventoried roadless areas and treatment acres

Roadless Name	IRA Acres	No Treatment (acres)	Full Suite TOA (acres)	Limited Suite TOA (acres)	Ditch / Fence (acres)	Total Proposal (acres)	% of IRA
Battle Creek	5,894	3,587	2,200	28	5 / 75	2,307	39
Bear Mountain	9,426	3,669	5,530	--	28 / 199	5,757	61
Big Sandstone	7,170	2350	4770	0	-- / 50	4,821	67
Bridger Peak	6,694	--	3,864	2,765	65 / --	6,694	100
Campbell Lake	7,085	5,559	1,180	283	23 / --	1,526	22
Deep Creek	6,411	3,254	2,812	345	-- / --	3,157	49
East Fork Encampment	7,443	6,685	74	11	-- / --	758	10
Encampment River Addition	4,982	3,821	273	845	24 / 20	1,161	23
French Creek	5,925	5,640	--	285	-- / --	285	5
Huston Park Addition	8,400	1,255	2,631	4,491	12 / 11	7,145	85
Illinois Creek	6,708	4,733	1,819	145	-- / 11	1,975	29
Libby Flats	11,082	7,465	52	3,565	-- / 1	3,617	33
Little Sandstone	5,481	77	910	4,291	-- / 202	5,404	99
Little Snake	9,920	3,549	3,579	2,672	48 / 73	6,371	64
Middle Fork	13,232	6,425	3,141	3,525	19 / 128	6,807	51
Mowry Peak	6,241	1,092	3,445	1,704	-- / --	5,149	83
Pennock Mountain	9,592	--	9,394	--	4 / 198	9,592	100
Platte River Addition	7,948	4,500	1,848	1,518	-- / 82	3,448	43
Rock Creek	18,860	11,976	1,165	5,594	12 / 114	6,884	37
Savage Run Addition	2,370	1,996	217	153	-- / 4	374	16
Sheep Mountain	17,615	--	17,573	--	42 / --	17,615	100
Singer Peak	10,491	3,140	5,853	1,458	1 / 39	7,351	70
Snowy Range	29,637	23,674	287	5,625	22 / 30	5,963	20
Solomon Creek	5,757	1,280	4,413	--	37 / 26	4,476	78
Strawberry Creek	5,876	201	2,293	3,255	35 / 93	5,675	97
Total	230,239	105,968	79,997	42,559	376 / 1,355	124,287	54

IRA = inventoried roadless areas. TOA = treatment opportunity area.

Existing Condition and Environmental Consequences

The existing condition and environmental consequences discussions are combined into one section for inventoried roadless areas. Keeping the two sections together is intended to make the discussion of the following 9 roadless area characteristics easier to track:

- High quality or undisturbed soil and air
- Sources of public drinking water
- Diversity of plant and animal communities
- Habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land
- Primitive, semi-primitive nonmotorized, and semi-primitive motorized classes of dispersed recreation
- Reference landscapes
- Natural appearing landscapes with high scenic quality
- Traditional cultural properties and sacred sites
- Other locally identified unique characteristics

High Quality or Undisturbed Soil and Air

Existing Condition

There are mostly undisturbed soils in the inventoried roadless areas, partly due to the lack of extensive logging. Water quality is classified as functioning properly and air quality is good.

No-action Alternative

There would be no changes to existing conditions under the no-action alternative. There would be a greater risk of a large, high-severity wildfire than with the modified proposed action. This could adversely affect soil productivity by volatilizing nutrients, creating hydrophobic soils, increasing erosion, and burning ground cover and vegetation off large areas. Increased erosion could lead to increased sediment delivery to streams, with effects to water quality depending on the location and severity of the fire. A wildfire could cause short-term air pollution which would dissipate after several days, depending on the size and severity of the fire.

Modified Proposed Action

Mechanical treatments, prescribed fire treatments, or both are proposed in all 25 inventoried roadless areas. Where ground-disturbing activities are planned compacted and displaced soil would occur. These areas would be fairly localized at landings, skid trails, and new temporary road construction. If non-ground-disturbing equipment is used (chainsaws, cross saws), there would be no increase in compacted or displaced soils. Erosion would increase where vegetation is removed down to mineral soil and on steeper slopes.

Where prescribed fire treatments occur, soil physical and chemical properties could be affected. These areas should be localized in extent; for example, burn piles and areas where the fire burns long enough to create high burn severity in concentrated areas of heavy fuel buildup. Erosion would increase in areas where vegetation is removed down to mineral soil, especially on steeper slopes. Effects would be localized and mitigated using design criteria and best management practices (see soils analysis). Generally, negative impacts to the soil resources would be short lived (2 to 7 years) because prescriptions would occur during favorable burn periods (for example, favorable weather conditions and planned burn blocks resulting in favorable fire behavior) and best management practices would be implemented. Positive impacts to the soil resources would be variable but would extend to 3 to 10 years. The actual degree of accelerated soil loss impacts would be variable and depend on the different soil characteristics and ecotypes.

Based on previous best management practices monitoring, approximately 22 percent of total timber harvest acres and 12 percent of total prescribed fire acres would result in effects to water quality. Best management practices and design criteria for water resources are required to maintain high quality water and reduced effects

Prescribed fire emissions from the modified proposed action would have a direct, short-term effect on air quality in inventoried roadless areas. See the "Air Quality and Climate Change" section of this chapter for a more detailed description of effects of smoke on air quality.

Sources of Public Drinking Water

Existing Condition

Major consumptive water users include local water conservation districts and municipalities who use storage water for customers and domestic purposes, respectively. The towns of Encampment and Laramie utilize water directly off the Medicine Bow National Forest (North Fork Encampment River) for their municipal water supplies, with intake diversions a few miles downstream of the national forest boundary. The City of Cheyenne also utilizes water from the Medicine Bow as part of its municipal water supply system. The Cheyenne Public Board of Utilities currently maintains two three reservoirs on the Forest, Rob Roy, Hog Park, and Lake Owen.

No-action Alternative

There would be no potential for increased sedimentation, turbidity, fuel spills, or other changes to water quality that would affect public water supplies.

Modified Proposed Action

There would be short-term increased sedimentation and turbidity from proposed activities. These would impact the immediate footprint and a short distance of channel downstream of the site, with effects diminishing further downstream. The proposed activities do increase the potential for contamination of water supplies due to petroleum spills. Best management practices are recommended to minimize effects. Detailed effects to water quality are discussed in the hydrology section of this chapter and the specialist report located in the project file.

Diversity of Plant and Animal Communities

Existing Condition

The vegetation in inventoried roadless areas has not been adequately inventoried to date. We lack data on vegetation communities, diversity, and rare plants for most inventoried roadless areas. Few ground-disturbing activities occur in roadless areas, so vegetation surveys rarely occur. However, we do have good quality information on the plant species in Sheep Mountain and Snowy Range Inventoried Roadless Areas, and parts of Middle Fork, Libby Flats, Bear Mountain, and French Creek Inventoried Roadless Areas from research and monitoring. These areas support a disproportionate number of rare plant species and uncommon vegetation communities in comparison to the adjacent roaded areas, and the plethora of rare plants and vegetation types increases the biodiversity of these inventoried roadless areas.

No-action Alternative

The no-action alternative will not affect the diversity of native vegetation in the inventoried roadless areas.

Modified Proposed Action

The project could adversely affect the diversity of native plants in these units and other (unsurveyed) roadless areas in a number of ways. The proposed activities could bury, crush, or otherwise physically destroy rare plants and native vegetation.

Logging would also reduce or eliminate the forest canopy which could make forest floor conditions unsuitable for species that typically grow in shaded, moist environments and cannot tolerate increased light and heat. These habitats would likely lose diversity once logged and convert to species that can tolerate open, hotter and drier conditions. Some species could be nonnative.

The proposed activities could introduce noxious weeds and other nonnative plants which could outcompete or replace native species, both rare and common. Logging activities commonly spread noxious weeds, such as toadflax and thistles, via equipment and haul routes. These species would add an undesirable element to vegetation communities and could dominate wet meadows or other habitats.

Prescribed burning could also spread thistles and toadflax to new areas, but more problematic would be the habitat conversion that could happen after a wildfire. Wildfire could multiply and spread cheatgrass exponentially across the landscape. This wildfire-proliferating species has been especially problematic in areas such as Sheep Mountain and the Platte River valley (Platte River Addition Inventoried Roadless Area). Sheep Mountain burned in the Squirrel Creek Fire and areas of the Platte River valley burned in a prescribed fire. Both areas converted to cheatgrass-dominated systems where cheatgrass composed 50 to more than 90 percent of the vegetation cover. Both burned areas saw a large decrease in native plant diversity. Sheep Mountain, having been shown to be particularly vulnerable to this type of disturbance, is of particular concern because it contains several plant species found nowhere else on the forest.

Activities in these areas could open the landscape and clear routes for unauthorized recreational use (all-terrain vehicles, utility task vehicles, and other vehicles) to enter the inventoried roadless areas. These vehicles could be vectors for noxious weed transfer. These types of vehicles could destroy vegetation, especially wetlands, through destructive off-roading and mudding.

Habitat for Threatened, Endangered, Proposed, Candidate, and Sensitive Species and for Those Species Dependent on Large, Undisturbed Areas of Land

Existing Condition

The inventoried roadless areas do not contain any habitat for threatened, endangered, proposed, or candidate plant species listed under the Endangered Species Act. They do contain habitat for populations of multiple Rocky Mountain Region sensitive plant species. The alpine tundra and fellfield of the Snowy Range Inventoried Roadless Area supports many alpine sensitive species and the headwater wetlands of Hecht Creek and Fence Creek in Sheep Mountain Inventoried Roadless Area contain several sensitive willows and one sensitive carnivorous aquatic plant. In addition, the lower elevational extents of several inventoried roadless areas, such as Bear Mountain and Middle Fork, support rare plants that prefer sparsely vegetated, rocky, and calcareous foothills habitat.

No-action Alternative

The no-action alternative will not affect sensitive plant species or habitats in the inventoried roadless areas.

Modified Proposed Action

The project could adversely impact sensitive plant species and habitat in the parts of the inventoried roadless areas proposed for treatment. The alpine tundra and fellfield in the Snowy Range Inventoried Roadless Area and other areas have not been identified as treatment opportunity areas; sensitive species in those habitats would not be affected.

Other habitats could be impacted by logging activities and subsequent ground disturbance, the transfer and spread of noxious weeds and cheatgrass by vehicles and fire, and the opening of access for unauthorized recreational activities. The lack of land management activities and the unroaded nature and difficult access in these areas has helped support sensitive plant species and habitat. Introducing more human-caused disturbance in these areas could diminish or eliminate some sensitive plant populations.

Primitive, Semi-Primitive Nonmotorized, and Semi-Primitive Motorized Classes of Dispersed Recreation

Existing Condition

Roadless areas often provide outstanding dispersed recreation opportunities such as hiking, camping, picnicking, wildlife viewing, hunting, fishing, cross-country skiing, and canoeing. Inventoried roadless areas exist adjacent to or near wilderness areas and serve as a transition between wilderness and developed or road-based activities.

Unlike wilderness, use of mountain bikes and other mechanized means of travel is often allowed. These areas can also take pressure off heavily used wilderness areas by providing solitude and quiet and dispersed recreation opportunities. While hunting and fishing can occur in areas managed for the more developed end of the recreation opportunity spectrum, roadless areas typically provide a semi-primitive setting, which is important to many hunters and fisherman.

The majority of the 25 inventoried roadless areas within the project area are in the same geographical setting as the semi-primitive motorized recreation opportunity spectrum setting. The semi-primitive nonmotorized areas that are not located in wilderness or roadless areas are associated with crucial big game winter range, special interest areas, infrastructure, special habitat areas, or management areas where minimal vegetation treatments are allowed.

No-action Alternative

In areas with high beetle mortality, access and naturalness indicators for semi-primitive nonmotorized and semi-primitive motorized settings could be negatively impacted by downed and falling trees preventing safe access to many areas. See the "Recreation" section for a more detailed analysis of effects.

Modified Proposed Action

Approximately, 46 percent of the semi-primitive nonmotorized setting is located in wilderness areas and no vegetation treatments are proposed in wilderness areas so no negative impacts are anticipated to the primitive area characteristics.

If prescribed fire is used upwind of wilderness areas, individuals could be negatively affected by smoke. The negative effects would be short duration, and the direct impact would be displacement of recreationist out of the area during the treatments.

Mechanical, prescribed fire, and hand treatments are proposed in roadless areas close to wilderness areas where the opportunity for solitude (primitive characteristic) may be negatively affected for some recreationist.

Because most of the inventoried roadless areas are small and surrounded by roads, the potential negative effect from proposed treatments would be similar to the negative effects from existing human activities near roadless areas. Effects of the project on access and remoteness indicators would be similar to human activities (wood cutting and off-road vehicle use along adjacent roads) that already occur adjacent to roadless areas.

Approximately, 40 percent of the semi-primitive nonmotorized setting is also located in inventoried roadless areas where no permanent or temporary roads would be constructed. Access for vegetation treatments would be limited to operations along the boundaries of inventoried roadless areas or off existing roads. Minor shifts in recreation use could occur because of the vegetation treatments, but availability of roadless areas for Medicine Bow National Forest visitors seeking primitive, semi-primitive nonmotorized, and semi-primitive motorized recreation opportunities would not be significantly impacted by the proposed project.

Semi-primitive motorized areas also have mechanical, prescribed fire, or hand treatments prescribed throughout the project area. Treatments in this setting would be less likely to cause negative impacts to access, naturalness, and remoteness indicators because motorized use in adjacent areas is evident and ongoing. Impacts to semi-primitive motorized areas would fall in the normal and inconsistent condition range with inconsistent indicators meeting management area objectives and direction.

Access would be limited by terrain for mechanical treatments and would likely keep impacts within 1,000 feet of boundaries as that would be the maximum treatable distance with no temporary road access. In these areas, mechanical treatments would negatively affect some of the primitive and semi-primitive nonmotorized characteristics as mechanical treatments could negatively impact the access, naturalness, or remoteness indicators for some Medicine Bow National Forest visitors. Impacts would be limited in extent and intensity and would be short duration so they would not diminish semi-primitive characteristics.

Projected vegetation treatments over the next 10 years could change the natural appearance of some areas until the area regenerates. The treatments would also disperse recreationist to other areas of the forest that are not being treated. Dispersed recreation opportunities would not change as a result of the proposed vegetation treatments, but the location available for some opportunities would and the feeling of remoteness and solitude could change.

Based on the small percentage of inventoried roadless areas that would be affected over 10 years and the overall availability of inventoried roadless areas, dispersed recreationists would be able to enjoy primitive, and semi-primitive characteristics with one or two indicator conditions being slightly diminished but not enough to effect the roadless area experience.

Reference Landscapes

Existing Condition

Reference landscapes can provide areas for comparison and evaluation, and monitoring of effects of vegetation management activities over large undisturbed landscapes. These landscapes provide a natural setting that allows comparison to evaluate the effects of more intensely managed areas. Reference landscapes need to be larger than the predicted size of natural disturbances (fire, insects, and diseases) to evaluate the scale and effect of natural disturbances. In Wyoming, the largest undisturbed reference landscape for the LaVA project area includes the Greater Yellowstone Area which encompasses approximately 20 million acres with similar cover types such as lodgepole pine (Schullery 2006).

The Medicine Bow National Forest contains 319,738 acres designated as inventoried roadless areas under the Roadless Area Conservation Rule. When broken down into the contiguous landscapes in the Snowy Range and Sierra Madre mountain ranges, the size of landscape is considered to be too small to provide a reference landscape for the extent of the natural disturbances (that is, the bark beetle epidemic).

No-action Alternative

Fire suppression and post-epidemic conditions would continue under the no-action alternative resulting in continued fuel buildup and risk of a high severity wildfire. The area could continue to serve as a reference landscape due to the minimal level of management activity.

Modified Proposed Action

Twenty-five inventoried roadless areas (230,215 acres) are located within the LaVA project area. Under the modified proposed action, 125,200 acres of inventoried roadless areas have been identified as potential treatment opportunity areas. Treatment opportunity areas which overlap with inventoried roadless areas are proposed for mechanical, prescribed fire, hand treatment, and treatments for ditches and fences.

Prescribed fire would not change the character of forest stands but would reduce the density of the understory. Thinning treatments would not change the forested character of the stands within the inventoried roadless areas. The forested character of the stands would be changed through commercial tree harvest. The sites in the inventoried roadless areas where trees are cut and removed might no longer serve as a reference landscape over the short term—1 to 7 years. As the forested vegetation regenerates over the mid-term (7 to 30 years) and long term (30 to 150 years) within the inventoried roadless areas, their value as reference landscapes would increase.

Natural Appearing Landscapes with High Scenic Quality

Existing Condition

The LaVA project area contains a landscape that is characterized by rocky, steep mountains, dense forests, open meadows and riparian areas. The forested vegetation primarily consists of lodgepole pine, followed by spruce-fir, forbs and grasses, aspen, willow, and other less abundant cover types. Scenic features on the landscape include granite and quartzite cliffs and boulders, deep canyons, snowfields, waterfalls, lakes, and swift rivers and creeks.

No-action Alternative

There would be no human-caused change to the scenery or the existing scenic condition of the 25 inventoried roadless areas other than effects of continued fire suppression. With continued fire suppression, vegetative succession would slowly change the scenic qualities of the area over time.

Increased tree mortality due to post-epidemic conditions would appear natural but lower the visual quality of the landscape until green trees return within dead stands. As untreated fuels continue to build, an uncharacteristic, high-severity wildfire could dramatically change the scenic qualities.

Modified Proposed Action

Implementation of the modified proposed action would change the landscape character by altering vegetation patterns and creating more edges associated with landings and temporary roads. Within 3 to 5 years of vegetation treatment, scenic quality would recover with regeneration of young trees, shrubs, and grasses and continue to improve over the mid to long term. Temporary roads would be reclaimed to a natural appearing landscape after treatments are implemented. If beetle-killed trees were removed or if they fall and are replaced by stands of green trees, scenic quality would improve over the mid (7 to 30 years) and long term (30 to 150 years) in stands resilient to future epidemics.

Additional discussion regarding effects on scenic quality including scenic integrity objectives are discussed in the "Scenery" section.

Traditional Cultural Properties and Sacred Sites

Existing Condition

There are no identified traditional cultural properties or sacred sites within the project area.

A traditional cultural property is a property that is eligible for inclusion in the National Register of Historic Places based on its associations with the cultural practices, traditions, beliefs, lifeways, or social institutions of a living community (36 CFR 60.4). A traditional cultural property must be a physical property or place; for example, a district, site, building, structure, or object. Sacred sites, as defined in Executive Order 13007, may encompass areas of historic and prehistoric cultural resources. They may be identified by Tribal representatives because the sites are significant in religious observances regardless of age or any empirical evidence of religious activity. In almost all cases, traditional cultural properties and sacred sites are assisted in designation by the traditional group that holds those properties or resources as significant. Many times, the resources are identified only when their location can be kept in confidence due to the sensitive nature of those properties.

No-action Alternative and Modified Proposed Action

There are no identified traditional cultural properties or sacred sites within the project area. If any traditional cultural properties or sacred sites were found during project implementation, they would be protected as directed by the forest archaeologist. Effects on cultural resources, including traditional cultural properties and sacred sites, are included in the "Heritage Resource" section with a discussion of compliance with Wyoming State Historical Preservation laws.

Other Locally Identified Unique Characteristics

Existing Condition

This discussion focuses on characteristics related to rare plants, uncommon ecosystems, and native vegetation and fungi. A prominent features in the inventoried roadless areas is the giant quartzite outcrop that makes up the iconic Snowy Range (and Snowy Range Inventoried Roadless Area). A popular recreation area, this inventoried roadless area also supports a large number of unique wetland complexes with rich vegetation communities including tarns, fens, spring mounds, kettle ponds, and snowmelt-fed wetlands. It also sustains the high-elevation krummholz spruce-fir forests that grow in parallel lines, likely caused by wind and snow loading. These forests are colloquially referred to as ribbon forests. Figure 37 shows ponds, wetlands, and the ribbon forests of the Snowy Range Inventoried Roadless Area.

Figure 37. Krummholz spruce-fir forests (ribbon forests) and wetlands in the Snowy Range Inventoried Roadless Area

The Libby Flats Inventoried Roadless Area has old-growth spruce-fir clusters of trees that grow in the subalpine. These have been referred to as sky-island forests. They have a grouped or clustered pattern similar to the ribbon forests, likely also caused by wind and snow loading. The sky islands are different from the ribbon forests in that they are at a lower elevation and the trees are much larger (not krummholz) and had a higher mortality from the spruce beetle. The Libby Flats Inventoried Roadless Area also has some rich and interesting wetland complexes, as do most of the inventoried roadless areas.

No-action Alternative

The no-action alternative would not affect characteristic, interesting, and unique habitats and ecosystems in the inventoried roadless areas, and it would have little to no effect on the availability and abundance of botanical forest products. In the absence of prescribed fire, there could be fewer morel mushrooms, but greater quantities of other products that do not increase in population size after fire, such as osha. Wildfire could affect the availability of botanical forest products, but wildfire is a possible scenario under the no-action alternative and the modified proposed action.

Modified Proposed Action

The modified proposed action could decrease the quantity or quality of botanical forest products in the roadless areas. Timber treatments could change forest floor conditions and collectable species such as fiddlehead ferns and osha that depend on shaded, moist conditions could decrease in abundance as light and heat to the forest floor increases.

Many mushrooms are mycorrhizal, meaning they have a symbiotic relationship with trees, shrubs, or other plants. Often mycorrhizal relationships are species-specific. The widespread death of trees caused by the mountain pine beetle has decreased the number of trees available to form symbiotic relationships with fungus species and (anecdotally) has decreased the availability of matsutakes and other mushrooms. Harvest of the remaining live trees in parts of roadless areas could decrease the abundance of these mushrooms even further.

Fire, including prescribed fires and wildfires, can increase the abundance of other botanical forest products, such as morels. Prescribed fires in parts of roadless areas could increase the opportunities for collection of morels.

Socioeconomics

Affected Environment

Key Socioeconomic Characteristics

Multiple indicators were analyzed to get a comprehensive view of the economy affected by the LaVA Project. Key demographic and economic indicators from the LaVA analysis area—Albany and Carbon Counties—were compared to the benchmark area – the State of Wyoming. See the "Social and Economic" report in the project file for a complete discussion.

When compared to the Wyoming state average, the two-county project area experienced lower growth in population, employment, personal income, and per capita income from 2000 to 2015; but higher growth in average earnings per job. The area also has a lower unemployment rate and a higher percentage of workers in the government sector.

Economic Resilience

One measure of economic well-being is the resilience of the local economy during periods of national recession. It is a positive sign if local employment continues to grow (or does not decline) during a recession. As shown in table 54, local employment continued to grow during the 1980 and 2001 recessions; while during the other three recessions, local employment declined minimally (from 0.2 to 0.3 percent).

Another sign of economic well-being is how well the local economy recovers from a recession. As shown in table 55, local employment increased minimally during periods of recovery. The negligible changes in employment suggest the local economy is fairly insulated or isolated from the national economy, rather than indicating economic diversity.

Table 54. Employment change during national recessions (1976 to 2015) for the two-county LaVA project area

Type of Employment Change	Jan 1980 to July 1980	July 1981 to Nov 1982	July 1990 to Mar 1991	Mar 2001 to Nov 2001	Dec 2007 to June 2009
Net Jobs	1,798	-1,309	-346	101	-950
Monthly percent change	1.2%	-0.3%	-0.2%	0.0%	-0.2%

Data Sources: U.S. Department of Labor. 2017. Bureau of Labor Statistics, Local Area Unemployment Statistics, Washington, D.C.; National Bureau of Economic Research. 2009. U.S. Business Cycle Expansions and Contractions, Cambridge, MA

Table 55. Employment change during national recovery (1976 to 2015) for the two-county LaVA project area

Type of Employment Change	Aug 1980 to June 1981	Dec 1982 to June 1990	Apr 1991 to Feb 2001	Dec 2001 to Nov 2007	Jul 2009 to Dec 2015
Net Jobs	253	1,938	1,371	1,341	4,003
Monthly percent change	0.1%	0.1%	0.0%	0.1%	0.2%

Data Sources: U.S. Department of Labor. 2017. Bureau of Labor Statistics, Local Area Unemployment Statistics, Washington, D.C.; National Bureau of Economic Research. 2009. U.S. Business Cycle Expansions and Contractions, Cambridge, MA

Employment and Wages in the Area Timber Industry

To understand the potential impact of the proposed action associated with this project, it is important to grasp the relative size of the timber industry and its components, how these have changed over time, and how local trends compare to trends in other geographies.

Table 56 displays the number of jobs (full and part-time) in the timber industry, broken out by three major categories: growing and harvesting, sawmills and paper mills, and wood products manufacturing.

Data from figure 38 and table 57 suggest the local economy is growing independent of trends in the timber industry. This indicates management actions that potentially affect the timber industry may have limited impacts on the local economy.

In 2015, 3.48 percent of Carbon County's employment was in the timber industry, while the State of Wyoming had 0.29 percent as a whole. In the two-county LaVA analysis area, from 1998 to 2015, non-timber employment grew by 8.9 percent. During the same period, timber employment decreased by 60.4 percent. Overall, timber represented 3.43 percent of total employment in 1998; by 2015, timber represented 1.27 percent of total employment (figure 38).

Table 56. Employment in timber, 2015

Employment Categories	Carbon County, WY	Albany County, WY	LaVA Project Area	State Total
Total Private Employment	4,397	9,892	14,289	219,881
Timber	153	29	182	630
Growing and Harvesting	7	14	21	71
Forestry and logging	7	13	20	64
Support activities for forestry	0	1	1	7
Sawmills and **Paper Mills**	146	15	161	416
Sawmills and wood preservation	146	1	147	255
Pulp, paper, and paperboard mills	0	0	0	0
Veneer, plywood, and engineered wood	0	14	14	161
Wood Products Manufacturing	0	0	0	143
Other wood product manufacturing	0	0	0	141
Converted paper product manufacturing	0	0	0	2
Non-Timber	4,244	9,863	14,107	219,251

Data Sources: U.S. Department of Commerce. 2017. Census Bureau, County Business Patterns, Washington, D.C.

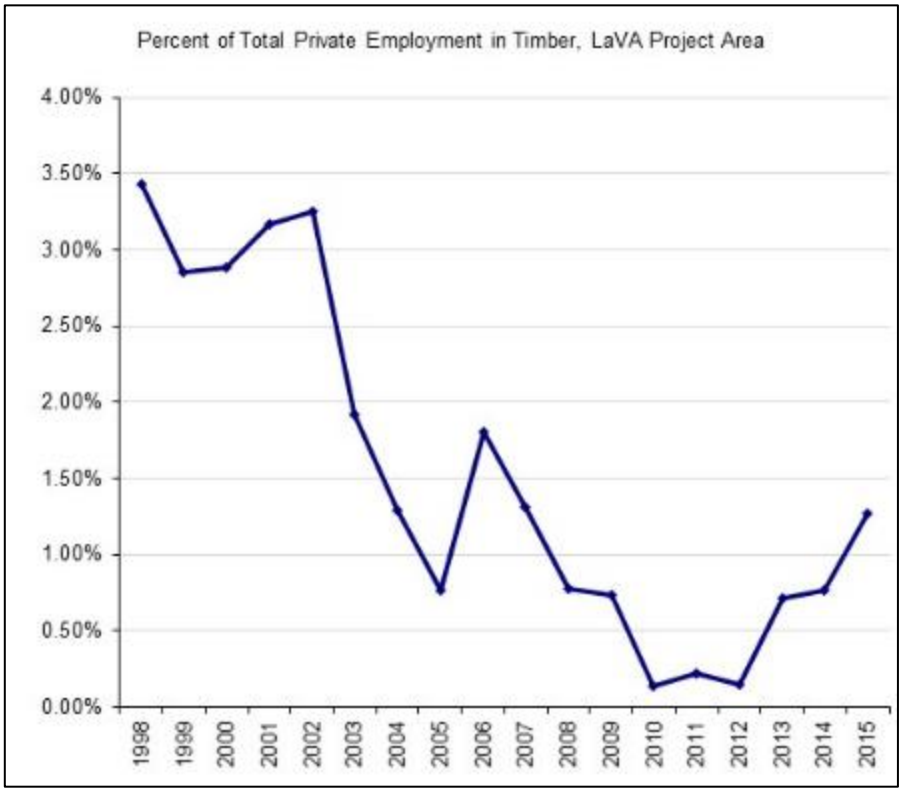

Figure 38. Long-term trends in timber employment as a percent of all jobs in the LaVA project area (U.S. Department of Commerce 2017)

The timber industry has the potential to provide high-wage jobs, but this may differ by timber subsector and by geography. Table 57 shows wages (in real terms) from employment in the timber industry, including subsectors, compared to wages from employment in all non-timber sectors combined.

Table 57. Wages (in real terms, 2016) from employment in the timber industry, including subsectors, compared to wages from employment in all non-timber sectors combined

Employment Sectors	Carbon County, WY	Albany County, WY	LaVA Project Area	State Average
All Sectors	$46,799	$39,110	$41,511	$44,974
Private	$46,798	$32,104	$37,236	$43,814
Timber	$29,869	$28,864	$29,178	$41,127
Forestry and logging	$29,869	NA	$29,869	NA
Wood products manufacturing	NA	$28,864	$28,864	$41,127
Non-timber	$38,062	$31,138	$33,397	$43,639
Government	$46,802	$58,944	$47,755	$48,536

U.S. Department of Labor. 2017. Bureau of Labor Statistics, Quarterly Census of Employment and Wages, Washington, D.C. This table uses employment data from the Bureau of Labor Statistics, which does not report data for proprietors or the value of benefits and uses slightly different industry categories than those shown on previous pages of this report.

In 2016, timber sector average wages in forestry and logging were $29,869; while the average wages in the wood products manufacturing sector was $28,864. Some important issues to consider are how timber industry wages compare to wages in other sectors, whether some components of the timber industry pay higher wages than others, and if there are significant wage differences between geographies. The above data show average wages in the private sector (including timber industry wages) tend to be lower in Albany County; while Carbon County's non-timber private sector wages exceeded the State average.

Wildland-urban Interface

The wildland-urban interface is the area where urban development contacts natural or undeveloped land. The wildland-urban interface is especially vulnerable to wildland fire. Approximately two percent of homes in the LaVA project area are in the wildland-urban interface. In contrast, seven percent of homes West-wide are in the wildland-urban interface (Headwaters Economics 2018, Gude et al. 2008). This indicates the project area is less likely to have private property at risk of wildland fire than other areas in the western United States.

While the number of homes in the wildland-urban interface is low in the project area compared to the rest of the western United States, Albany and Carbon counties have some of the highest wildfire risk to development in Wyoming. Albany and Carbon counties are both rank in the top half of counties vulnerable to wildland fire. In addition, both counties have among the highest risk (both existing and potential) in the state of Wyoming.

Table 58 displays the existing risk of wildfire for lands already developed in the wildland-urban interface and the potential risk of wildfire should homes be built on undeveloped land in the wildland-urban interface. This risk is measured using the 11 western-most states and their counties. There are 414 counties, therefore a rank of 1 in 414 indicates the most at-risk county for wildland fire, whereas a rank of 414 would indicate very low risk.

Table 58. Wildfire risk to development, west-wide and state-wide county rankings, 2010

Ranking of Wildfire Risk	Carbon County, WY	Albany County, WY
West-wide rank by existing risk	205 of 414	183 of 414
West-wide rank by potential risk	128 of 414	159 of 414
State-wide rank by existing risk	6 of 23	4 of 23
State-wide rank by potential risk	2 of 23	5 of 23

Source: Headwaters Economics 2018

Environmental Justice

Executive Order 12898 directs Federal agencies to consider the human health and environmental conditions in minority and low-income communities. The goal of environmental justice is for Federal agency decision makers to identify impacts that are disproportionately high and adverse with respect to minority and low-income populations and identify alternatives that will avoid or mitigate those impacts.

Overall, the project area has a somewhat higher share of minority residents than Wyoming as a whole. In particular, Carbon County has a large share (22 percent) of Hispanic or Latino residents relative to the state (16 percent). The poverty rate in Albany County is greater (26 percent) than the poverty rate statewide (12 percent), with more than double the share of people living in poverty. The poverty rate in Carbon County (14 percent) is comparable to the statewide poverty rate (Headwaters Economics 2018). These data indicate variation across the project area but overall suggest the presence of environmental justice communities. The environmental consequences analysis considered the potential for Forest Service management actions to disproportionately and adversely affect low-income and minority populations.

Ecosystem Services

Water resources from the project area contribute to municipal water supplies and wells, irrigation, recreation, stock water facilities, wildlife habitat, etc. The project area provides timber and other forest products. As noted above, the project area has a relatively high share of employment in timber-related sectors compared to the state. However, the share of timber employment declined considerably between 1998 and 2015.

The project area supports a variety of developed and primitive recreation opportunities, as described in the "Recreation" section. Tree mortality in the project area due to insects and disease create both safety and access problems for recreational users.

Environmental Consequences

Direct and Indirect Effects

No-action Alternative

There would be no immediate or direct financial costs or revenue from an Agency perspective from the no-action alternative. There would be no additional economic contributions to the local economy because no treatments would take place.

Ongoing forest management activities and planned harvests would continue to occur, including timber currently scheduled for sale, and those that have been sold but not yet cut. Expected economic contributions stemming from planned timber harvests on the Medicine Bow National Forest in the next decade were estimated. If future harvest levels were to drop, the associated economic contributions would decrease accordingly. Estimates are expressed in terms of annual averages; therefore, year-to-year results could vary.

Estimated annual employment from existing and future timber sales is 194 to 247 jobs. This includes total full- and part-time wage, salaried, and self-employed jobs. Estimated labor income is 7.7 to 9.8 million dollars. Labor income includes the wages, salaries and benefits of workers who are paid by employers and income paid to proprietors. Estimated contribution to the gross domestic product (in 2017 dollars) is 10 to 12.8 million dollars.

The no-action alternative would not contribute to forest restoration in the project area. Wildfire and other disturbances could affect a number of ecosystem services and infrastructure. The risk of wildfire, insect infestations, and disease would continue in the project area. Water supplies to Cheyenne, Laramie, and other communities could be adversely affected. Smoke emissions, damage to infrastructure, and the risk of falling trees due to fire, insects, and disease could displace users.

Continued development in the wildland-urban interface would increase the number of people exposed to health and safety risks. Fire would continue to threaten homes, businesses, and infrastructure in these areas. The risk to public health and safety from fire, smoke emissions, and falling trees would continue.

The project area has a relatively high share of minority and low income residents. The no-action alternative would not reduce the potential for wildland fire to threaten human safety and property in the project area. However, this would not be expected to affect low-income residents. Since most homes in the wildland-urban interface portion of the project area are second homes, the individuals with the highest exposure to wildfire risk are expected to be relatively affluent (Headwaters Economics 2018). The no-action alternative would not affect employment or labor income in the project area; therefore no disproportionate or adverse effects from changes in economic opportunities would occur as a result of this alternative.

Modified Proposed Action

The expected economic contributions stemming from planned timber harvests with the implementation of the modified proposed action over the next decade are 220 to 250 jobs, 8.7 to 9.8 million dollars in total labor income, and 11.4 to 12.7 million dollars in gross domestic product contribution for the local economy on an annual average basis. If future harvest levels were to drop, the associated economic contributions would decrease accordingly.

The estimated jobs and income may not be new but rather existing jobs and income in the regional economy that are supported or sustained by national forest timber management. The economic contributions cannot be viewed or described as *economic benefits*. Economic contributions are expressed in terms of employment, income, and gross domestic product. These are the distributional effects associated with timber production or other economic activities in the area economy and must not be conflated with economic benefits which are obtained through financial efficiency analysis. For more information about the modeling and how the data should be interpreted, see the "Social and Economic" report in the project file.

The modified proposed action would enhance and protect a number of ecosystem services and infrastructure on the Medicine Bow National Forest. Water supplies to Cheyenne, Laramie, and other communities would be less likely to experience negative effects to water quality or quantity than under the no-action alternative. Displacement of recreationists, livestock operations, and other forest users would be less likely because there would be less smoke emissions, less damage to infrastructure, and reduced risk of falling trees.

The modified proposed action would reduce threats to property and human safety by prioritizing restoration treatments in the wildland-urban interface. This would reduce wildfire risk in the wildland-urban interface compared to the no-action alternative. The proposed restoration activities to reduce the extent and intensity of wildfire are unlikely to affect low-income residents. Since most homes in the wildland-urban interface in the project area are second homes, the individuals with the highest exposure to wildfire risk are expected to be relatively affluent (Headwaters Economics 2018). Low income individuals may benefit from new economic opportunities under the modified proposed action. However, the estimated economic impact is minor in the context of the local economy, and it is unknown whether those jobs would provide opportunities to currently unemployed or underemployed individuals.

Cumulative Effects

No-action Alternative

Past and ongoing activities, including fuels treatment, hazard tree removal, road and trail system management, and timber harvest activities affect social and economic conditions in the project area. The employment and labor income associated with current and planned timber harvest activities were described in the "Direct and Indirect Effects" section.

Reasonably foreseeable activities (table 59) may reduce the risk of falling trees and wildfire relative to current conditions, but these activities are insufficient to move toward desired conditions (per fire and fuels specialist report). The no-action alternative would not contribute to achieving desired conditions. Wildfire, smoke emissions, and falling trees would continue to pose safety risks and potentially displace recreation visitors, nearby residents, and other forest users.

Modified Proposed Action

Past and ongoing activities, including fuels treatment, hazard tree removal, road and trail system management, and timber harvest activities affect social and economic conditions in the project area. The employment and labor income associated with current and planned timber harvest activities and the modified proposed action were described in the "Direct and Indirect Effects" section.

Reasonably foreseeable activities (table 59) may reduce the risk of falling trees and wildfire relative to current conditions. The cumulative effect of the modified proposed action and reasonably foreseeable activities would reduce the safety risks and potential displacement of forest users associated with falling trees. Fuel reduction activities could reduce the potential for smoke emissions to displace or adversely affect forest users and nearby residents and reduce the risk of damage to infrastructure and important ecosystem services

Table 59. Reasonably foreseeable projects considered in the cumulative effects analysis

Project	Description
Battle Mountain Prescribed Burn Project	Prescribed burn
North Savery Project	Hazard tree clearing, precommercial thinning and salvage harvest, road proposals
Ryan Park Vegetation and Fuels Project	Hazardous fuels treatment
West Side Snowy Range Travel Management Project	Modify road and trail system
Fox Creek Vegetation Management Project	Treat mountain-pine-beetle-infested stands
Owen Timber Sale additional treatment in Cheyenne Board of Public Utilities catchments	Hazardous fuels treatment

Short–term Uses and Long-term Productivity

The National Environmental Policy Act requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16).

Tradeoffs between short-term impacts and long-term, sustainable resource management are pivotal considerations for the LaVA Project. The project is intended to have significant, beneficial, long-term effects on forest vegetation, fuels profiles, and the transportation system. These changes would have short-and long-term effects, some possibly significant, on the condition of watershed and wildlife resources, as well as sensitive plant species in inventoried roadless areas. However, the selection of the no-action alternative would also have short-term or lasting adverse impacts on recreation, wilderness, and roadless characteristics. Individual resource analyses highlight the relationship between short-term impacts and long-term attainment of desired conditions.

Unavoidable Adverse Effects

Cumulative adverse effects are associated with the impact of extensive past and proposed timber harvest and changed forest conditions due in part to the pattern of fire suppression and forest management in the project area. Some watershed effects are adverse, and some will be unavoidable. However, the interdisciplinary team believes the project design features developed to

mitigate these effects are sufficient to prevent adverse effects from creating permanent damage and at such a level as to be irreversible.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

Resource impacts with potential to constitute irreversible or irretrievable commitments of resources are disclosed in this draft environmental impact statement. There is risk for potential for loss of timber production (irretrievable in this planning cycle) and watershed stability (irretrievable or irreversible depending on degree of impact). See the "Silviculture and Timber" (page 82) and "Hydrology" (page 153) sections for additional information.

Forest Plan Conformance

No-action Alternative

This alternative would not conform to the following forest plan standards for Management Areas 5.13 and 5.15:

- Management Area 5.13: Vegetation Standard 1 (USDA Forest Service 2003a)
    - Use a full range of biologically appropriate silvicultural practices to produce sawtimber and other forest products. Timber harvest is scheduled and does contribute to the allowable sale quantity…
- Management Area 5.15: Vegetation Standard 1 and Guidelines 1-3 (USDA Forest Service 2003a)
    - Manage vegetation to maintain or restore healthy ecological conditions through a variety of management activities. Timber harvest is scheduled and does contribute to the allowable sale quantity.

The no-action alternative is not in conformance with the following desired conditions for Management Areas 5.13 and 5.15 (USDA Forest Service 2003a) as follows:

Management Area 5.13:

- Vegetation composition and structure will be managed for a mosaic of tree groups with different ages and heights while providing for a sustained yield of forest products.
- Forest insects and diseases may be present but not at epidemic levels.
    - ♦ Accordingly, vegetation patterns will be developed primarily through the use of silvicultural practices, in conjunction with physical site characteristics
- Timber harvesting and thinning activities will be noticeable.

Management Area 5.15

- Management activities produce a wide variety of forest products...
- Vegetation composition, structure and pattern will exist in a range of successional stages to move toward and eventually meet the natural range of ecological conditions and provide for wildlife, range, and timber objectives.
- Harvested areas provide early successional habitats in a pattern with older forest that provides connectivity of the older forest.
- Forest vegetation is managed to eventually develop a range of successional stages from seedlings to late successional stands.
    - ♦ Management gives priority to harvesting successional stages that are more common than the typical historical range of variation, especially in the 80- to 120-year age classes.
        - ▪ Use of the full array of silvicultural practices and systems may be appropriate to achieve this objective.
- Vegetation patterns will be developed through both natural processes and the use of silvicultural practices, in conjunction with physical site characteristics.

Modified Proposed Action

All activities associated with the modified proposed action would be in conformance with forest plan standards. However, certain activities are likely to deviate from forest plan guidelines for wildlife security areas, as identified on page 132.

There may be apparent changes to scenery in some areas along the Continental Divide National Scenic Trail (temporary road crossings). However, the overall effects of the modified proposed action on scenery would remain within the forest plan standard of a moderate scenic integrity objective in the foreground of the trail. Design features 4, 7, 8, and 9 would minimize impacts to scenery along the trail to ensure this standard is met.

Other Required Disclosures

The National Environmental Policy Act at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with … other environmental review laws and executive orders." Other laws, policy, and executive orders which are integrated into this project are listed in the last column in table 7. Specific laws pertaining to particular resource areas are outlined in chapter 3 under the respective resource areas.

Chapter 4. Administrative Material

Preparers and Contributors

Table 60. Current interdisciplinary team members

Name	Title
Russell Bacon	Forest supervisor
Frank Romero	District ranger, Laramie Ranger District
Jason Armbruster	District ranger, Brush Creek/Hayden Ranger District
Melissa Martin	Planning and information program manager
Kelle Reynolds	Renewable resources director
Joshua Peck	Timber management assistant, Brush Creek/Hayden Ranger District
Tim Douville	Silviculture, Laramie Ranger District
Daron Reynolds	Assistant fire management officer
Jerod Delay	Supervisory forest technician-fire
Steve Loose	Wildlife Biologist, Brush Creek/Hayden Ranger District
Sean Harkins	Wildlife Biologist, Laramie Ranger District
Steve Kozlowski	Wildlife program manager
William Baer	North Zone fisheries biologist
Katherine Haynes	Botanist
Wendy Haas	Rangeland management specialist, Brush Creek/Hayden Ranger District
Jacquilyn Roaque	Rangeland management specialist, Laramie Ranger District
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Geri Proctor	Rangeland management program manager
Camilo Arias	Hydrologist
Dave Gloss	Hydrologist
Stacey Weems	Soil scientist
Melanie Pitrolo	Air quality and climate change specialist
Suzanne Layne	Civil engineering technician
Jacob Brown	North Zone engineer
Ryan Nupen	Civil engineer
Brian Waugh	Recreation
Amber Horne	Realty specialist, Brush Creek/Hayden Ranger District
Kolleen Kralick	Forest heritage program manager
Delilah Jaworski	Regional social scientist
Kawa Ng	Regional economist
James Cuthbertson	Recreation, wilderness, trails program manager, Grand Mesa, Uncompahgre and Gunnison National Forests
Aaron Voos	Public affairs
Christopher D. Jones	Forest planner, Bighorn National Forest

Table 61. Other Forest Service contributors.

Name	Title
Dennis Jaeger	Forest supervisor (retired)
Melanie Fullman	District ranger, Brush Creek/Hayden Ranger District (moved)
Paula Guenther	Central Zone NEPA coordinator (moved)
Michael Salazar	Timber management assistant, Laramie Ranger District (moved)
Bill Overland	Soil scientist

Collaborators and Stakeholders

In 2016, the Forest Service, the Office of the Governor, the State of Wyoming, and the Intermountain and Rocky Mountain Regions of the U.S. Forest Service entered into a memorandum of understanding related to National Environmental Policy Act analyses to improve communication and information sharing (USDA Forest Service 2016c). Release of this draft environmental impact statement continues to act on the memorandum of understanding by distributing the document to the suite of State agencies who have expressed interest in receiving environmental documents related to the project. The full list of engaged agencies is listed under "Distribution" (below).

The LaVA cooperating agencies (see chapter 2) and Medicine Bow National Forest personnel have been closely engaged with the public during the development of the LaVA project. The LaVA cooperators provided detailed review and suggested improvements to the draft environmental impact statement. County commissioners and other staff have been involved in two-way exchange of information about development of the LaVA Project. Medicine Bow personnel participated in the collaborative development of the 2016 update of community wildfire protection plans for counties within and surrounding the LaVA project area, including identifying communities at risk.

Consultation with U.S. Fish and Wildlife Service personnel on potential effects to Canada lynx is complete.

Considerable interest in the site-specific implementation of proposed activities and ongoing public feedback of these activities gave rise to the LaVA implementation and monitoring framework. As part of this framework, resource indicators were developed to determine environmental impact thresholds and suitable, site-specific management activities (see appendix A)

Potentially interested Tribes were invited to participate in this project during scoping, including participation in the collaborative process. The Tribes have been invited to participate in the review of the draft environmental impact statement. Scoping information was made available to 18 Tribal entities (see list under "Distribution" below). However, only the Cheyenne and Arapaho Tribes Tribal historic preservation officers commented during the scoping period.

Comments Received During Scoping (July 21, 2017 to August 21, 2017)

Comments were received from the following individuals or organizations:

- Jean Public (anonymous)
- Office of the Governor
- Joy Keown
- Duane Keown
- Wyoming Game and Fish
- Dr. John Johnson
- Dave Gloss
- Joyce Hecht
- Laramie Rivers CD
- Saratoga Encampment Rawlins CD
- Dick Artley
- Randy Tepler
- Saratoga Investments, LLC
- Benjy Duke
- Wyoming State Forestry
- Arthur Smith
- Larry and Nancy Jander
- Robert and Dianna Seabeck
- Alexander Wilson
- Madison Baugh
- Lauren Pepe
- Justin Stone
- Albert Kitchens
- Stephanie Pidcock
- Mary Pyron
- Dana Leavitt
- Colleen Fitzpatrick
- Megan Maher
- John Birnbaum
- Elizabeth Dixon O'Donnell
- Gina Campo
- Robert Howe
- Suzanne O'Donnell
- Mary Webb Banning
- Katherine Boucher
- Joshua-John Owens
- Lauren Farrington
- Lissa Howe
- Elizabeth Erker
- EPA, Region 8
- Joseph Bisceglia
- WildEarth Guardians
- Justin Howe
- Sarah Pavilack
- Greg Warren
- Spencer Hirst
- Hampton Williams
- Robbie Gfeller
- Anna Cameron
- Dowling Anon
- John Mowery
- Rachel Rydberg
- Beatrice Wagnon
- Leah Koehn
- Dabney Robinson
- Jeff Minnich
- Cheyenne and Arapaho Tribes THPO
- WY Department of Agriculture

Distribution of the Draft Environmental Impact Statement

This draft environmental impact statement is the means to disclose to the public what the considerations, impacts, and tradeoffs associated with implementing an action or no action alternative would be. It is distributed to inform the public, agencies, other governments, organizations, and tribal concerns about the modified proposed action. Individuals and organizations that meet the criteria for standing may participate in pre-decisional review and objection of the project decision.

Whenever possible, the document has been distributed electronically to expedite delivery and reduce waste. Digital files have been used to deliver the documents when possible, and interested parties have been encouraged to access the project information webpage: LaVA Project, https://www.fs.usda.gov/project/?project=51255.

Copies of the draft environmental impact statement are available at these Forest Service offices:

- Brush Creek/Hayden Ranger District, 2171 South Highway 130, Saratoga, WY
- Medicine Bow-Routt National Forests Headquarters, 2468 Jackson Street, Laramie, WY

Notice of the availability of the draft environmental impact statement has been distributed to individuals who specifically requested notification, submitted comments during the scoping comment period, or otherwise contributed to the project.

In accord with the memorandum of understanding between the Office of the Governor, State of Wyoming, and the Rocky Mountain Region of the U.S. Forest Service (USDA Forest Service 2016c), notice of this draft environmental impact statement has been sent to the following contacts in the Governor's office and State agencies:

- Office of Governor Matt Mead
- Wyoming Department of Agriculture
- Wyoming Department of Environmental Quality - Administration
- Wyoming Department of Environmental Quality - Air Quality
- Wyoming Department of Environmental Quality - Land Quality
- Wyoming Department of Environmental Quality - Water Quality
- Wyoming Department of Revenue
- Wyoming Department of Transportation
- Wyoming Game and Fish Department
- Wyoming Livestock Board
- Wyoming Office of State Lands and Investments
- Wyoming Office of Tourism
- Wyoming State Engineer's Office
- Wyoming State Forestry Division
- Wyoming State Historic Preservation Office
- Wyoming State Parks, Historic Sites and Trails
- Wyoming Water Development Commission

A notice of availability of the draft environmental impact statement has also been distributed to the following Federal agencies, federally recognized Tribes, local governments, and organizations representing a wide range of views:

- U.S. Fish and Wildlife Service
- Environmental Protection Agency
- Bureau of Land Management, Rawlins Field Office
- Cheyenne River Sioux Tribe Chippewa
- Cheyenne and Arapaho Tribes
- Cree At Rocky Boys Crow Creek Sioux Tribe
- Eastern Shoshone Tribe
- Crow Nation
- Fort Peck Assiniboine and Sioux tribe
- Lower Brule Sioux Tribe
- Northern Arapaho Tribe
- Northern Cheyenne Tribe
- Northern Ute Tribe
- Oglala Lakota Nation
- Rosebud Lakota Tribe
- Sisseton-Wahpeton Oyate Tribes
- Southern Ute Tribal council
- Standing Rock River Sioux
- Ute Mountain Ute Tribe
- Santee Sioux Nation
- Yankton Sioux
- Albany County commissioners
- Carbon County commissioners
- Albany County fire warden
- Carbon County fire warden
- Carbon County Planning Commission
- Medicine Bow Conservation District
- Saratoga-Encampment-Rawlins Conservation District
- Little Snake River Conservation District
- Laramie Rivers Conservation District
- Laramie County Conservation District
- Cheyenne Board of Public Utilities
- Town of Baggs
- Town of Encampment
- Town of Rawlins
- Town of Riverside
- Town of Saratoga

A list of individuals or organizations who were contacted during scoping but did not comment on the project is included in the project record; this list is also available online at LaVA Project, https://www.fs.usda.gov/project/?project=51255. These individuals and organizations will be notified when the draft environmental impact statement is available.

Appendix A. Adaptive Implementation and Monitoring Framework

A Process for Participating in Adaptive Implementation and Monitoring of the Medicine Bow Landscape Vegetation Analysis (LaVA) Final Environmental Impact Statement and Record of Decision

Medicine Bow-Routt National Forests and Thunder Basin National Grassland
USDA Forest Service

In cooperation with multiple Wyoming State, County, and
local governments and Federal agencies

Introduction

This adaptive implementation and monitoring framework (framework) establishes the direction for implementing the Medicine Bow Landscape Vegetation Analysis (LaVA) Project, as authorized by the LaVA record of decision (*** 2018). The framework was developed in conjunction with LaVA cooperating agencies and outlines a cyclic planning process for identifying, refining, implementing, and monitoring individual vegetative treatments on the Snowy and Sierra Madre Mountain Ranges over the next 10 to 15 years. The framework also describes the importance of continued collaboration, thus outlining a commitment to promote and encourage cooperation and coordination between the Forest Service, cooperating agencies, and the public throughout the life of LaVA implementation and monitoring.

This framework will help Forest Service personnel:

- conduct a transparent, adaptive implementation process that encourages cooperating agency and public participation in identifying, designing, and monitoring treatments throughout the life of the LaVA Project;
- focus on shared priorities and works collaboratively to accomplish project goals and objectives during the life of the LaVA Project;
- Authorize treatments that achieve multiple resource benefits and are responsive to current, on-the-ground conditions, new scientific information, and cooperating agency expertise; and
- conduct monitoring activities, interpret and share results, and adapt implementation practices to improve results and better meet LaVA Project objectives.

The adaptive implementation and monitoring framework is a dynamic document. It will be reviewed on a periodic basis and updated, if necessary, to ensure LaVA implementation is occurring collaboratively and within the sideboards of the LaVA final environmental impact statement and record of decision. All updates to the framework will be made public.

Cooperating Agencies

Forest Service personnel have worked cooperatively with multiple State, County, local, and Federal agencies in developing the LaVA Project since March of 2017. Cooperating agencies were instrumental in the development of the LaVA draft and final environmental impact statements and record of decision and their continued involvement during project implementation is necessary for successful, collaborative project implementation. The framework outlines the process for continued involvement in the LaVA project implementation and for submitting treatment proposals that advance their respective agency mission as well as meet the goals and objectives of the LaVA Project.

Cooperating agencies include, but are not limited to, Wyoming State Forestry Division; Wyoming Game and Fish Department; Wyoming Department of Environmental Quality; Wyoming State Historic Preservation Office; Wyoming Department of Agriculture; City of Cheyenne Board of Public Utilities; Carbon County; Albany County; Little Snake River Conservation District; Laramie Rivers Conservation District; Laramie County Conservation District; Medicine Bow Conservation District, Saratoga-Encampment-Rawlins Conservation District; Bureau of Land Management; and U.S. Fish and Wildlife Service.

Cooperating agency roles during adaptive implementation of the LaVA Project include, but are not limited to:

- participating in identification, prioritization, and design of treatment areas
- helping to identify appropriate project design features to protect area resources
- identifying opportunities for cross-jurisdictional treatments areas
- identifying partners and opportunities for treatment funding, in-kind matches, or both
- providing special expertise
- participating in monitoring activities, including interpreting and sharing results
- where necessary, assisting with adapting implementation practices to improve results and better meet project objective
- participating in public engagement efforts

Public Engagement

The public was also instrumental in the development of the LaVA environmental impact statement and record of decision and continued public engagement is essential to successful project implementation. Target audiences include, but are not limited to:

- public and citizens
- user groups
- industry groups
- state and local government officials
- residents of surrounding communities
- non-profit organizations
- elected officials

Although public feedback will be accepted during any phase of LaVA implementation, there are specific times when it will be most useful. While feedback will be considered and incorporated, where appropriate, it will be considered informal because there are no regulatory comment or objection periods (36 CFR 218) associated with LaVA project implementation. Forest Service personnel are committed to a transparent process that keeps the public informed of, and involved in, LaVA implementation and monitoring; therefore, consideration and incorporation of public feedback will be documented in an annual LaVA implementation and monitoring report (see page 227).

When providing feedback, please consider the following suggestions:

- Become familiar with the parameters of the final environmental impact statement and record of decision to understand project limits and constraints so you can participate effectively in implementation and monitoring efforts.
- Provide feedback online using website links provided by Forest Service personnel or by submitting written feedback to addresses provided by the Forest Service personnel.
- Be as specific as possible when providing feedback.
- Be timely with your feedback so it may be considered at relevant times.

Communication Tools

Forest Service personnel will use a suite of communication tools, as appropriate, to solicit feedback on individual treatments and to provide LaVA updates and information. The following list is not all inclusive. Communication tools will change as technologies change over the life of the LaVA Project.

- media coverage, including news releases and use of social media
- both external and internal media sources should be utilized
- project website and landing page with photos and videos of projects
- story map website
- partner and cooperator resources (meetings, events, websites, social media platforms, etc.)
- public forums (open houses, presentations, field tours)

Adaptive Implementation and Monitoring Framework

Adaptive management is defined as:

> "A system of management practices based on clearly identified outcomes and monitoring to determine if management actions are meeting desired outcomes, and if not, to facilitate management changes that will best ensure that outcomes are met or reevaluated. Adaptive management stems from the recognition that knowledge about natural resource systems is sometimes uncertain" (36 CFR 219.16; Forest Service Manual 1905; Forest Service Manual 2020.5).

Desired outcomes for the LaVA Project are 1) enhancing forest and rangeland resiliency to future insect and disease infestations; 2) providing for recovery of forest products; 3) providing for human safety; 4) protecting infrastructure and municipal water supplies and restoring wildlife habitat; 5) mitigating hazardous fuel loading; and 6) providing recreation access.

The Medicine Bow National Forest personnel have adopted this adaptive implementation and monitoring framework as part of the LaVA record of decision to ensure desired outcomes are realized on National Forest System lands. This framework includes defining treatment locations and treatment design; completing surveys and field validation; establishing monitoring protocols; reviewing and evaluating the effects of treatments; and adjusting management actions to improve results and better meet objectives of future treatments. Participation by cooperating agencies, the public, and the Forest Service personnel is necessary in all phases of the implementation and monitoring framework to

optimize effectiveness of ongoing and future treatments. The adaptive implementation and monitoring framework will be utilized over the 15- to 20-year lifetime of the project. Monitoring will continue until reclamation of individual treatment areas is complete.

Framework Overview

The following diagrams depict the adaptive implementation and monitoring framework that will be used to identify vegetation treatments and their locations over the life of the LaVA Project. The diagrams start out broad, conveying the overarching implementation and monitoring concept, and become increasingly more detailed to convey how individual treatments would move from ideas, to packaged projects for implementation, to discussion topics in a monitoring report.

Diagram 1 depicts LaVA adaptive implementation and monitoring over the project's 15- to 20-year lifespan. This is a visualization of the LaVA Project several years into implementation; for example, year 4 of implementation. The group of different-sized circles demonstrates how multiple projects may be implemented simultaneously across the LaVA landscape and will be in various stages of completion. For example, some projects will be in the monitoring phase, while others are being implemented and additional projects are just beginning. Finally, the large yellow circle interconnecting the example projects is meant to illustrate the coordination and collaboration that will occur with the public and cooperating agencies throughout LaVA implementation. It is also meant to illustrate the adaptive management principles that will be incorporated to continually improve on project design and implementation. The callout circle shows how an individual project's life cycle, as depicted in diagram 2, connects to the longer LaVA implementation cycle.

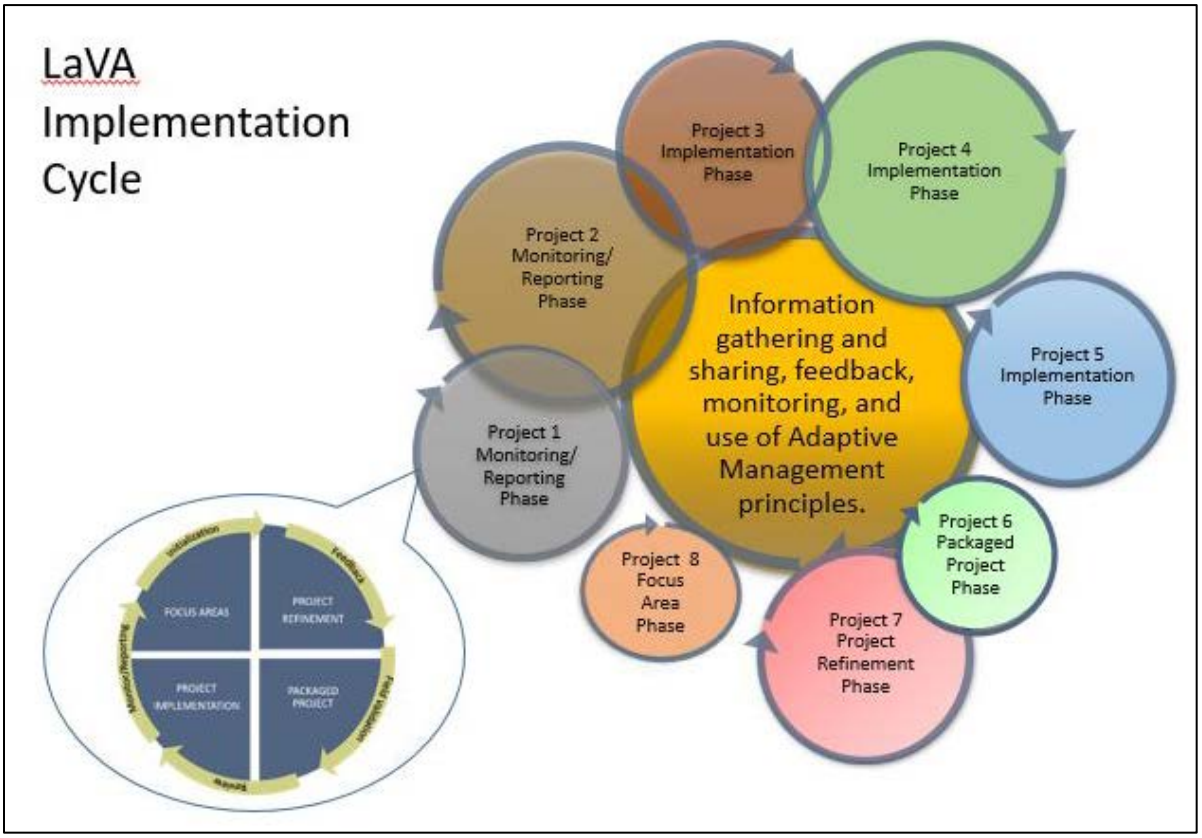


Diagram 1. LaVA adaptive implementation and monitoring framework – LaVA implementation cycle

Diagram 2 depicts the life cycle for a project. It shows how one of the projects shown in diagram 1 would be formulated and implemented. The outer circle with arrows depicts the five action phases that will be utilized as projects are developed. The actions will involve internal Forest Service personnel, cooperating agencies, and the public.

The inner blue quadrants represent products or results that would be realized at the end of each action phase. For example, focus areas would be identified at the end of the initialization phase; projects would be refined at the end of the feedback phase; and so on. Additional information on each of the action phases and products is in the "Framework Details" section.

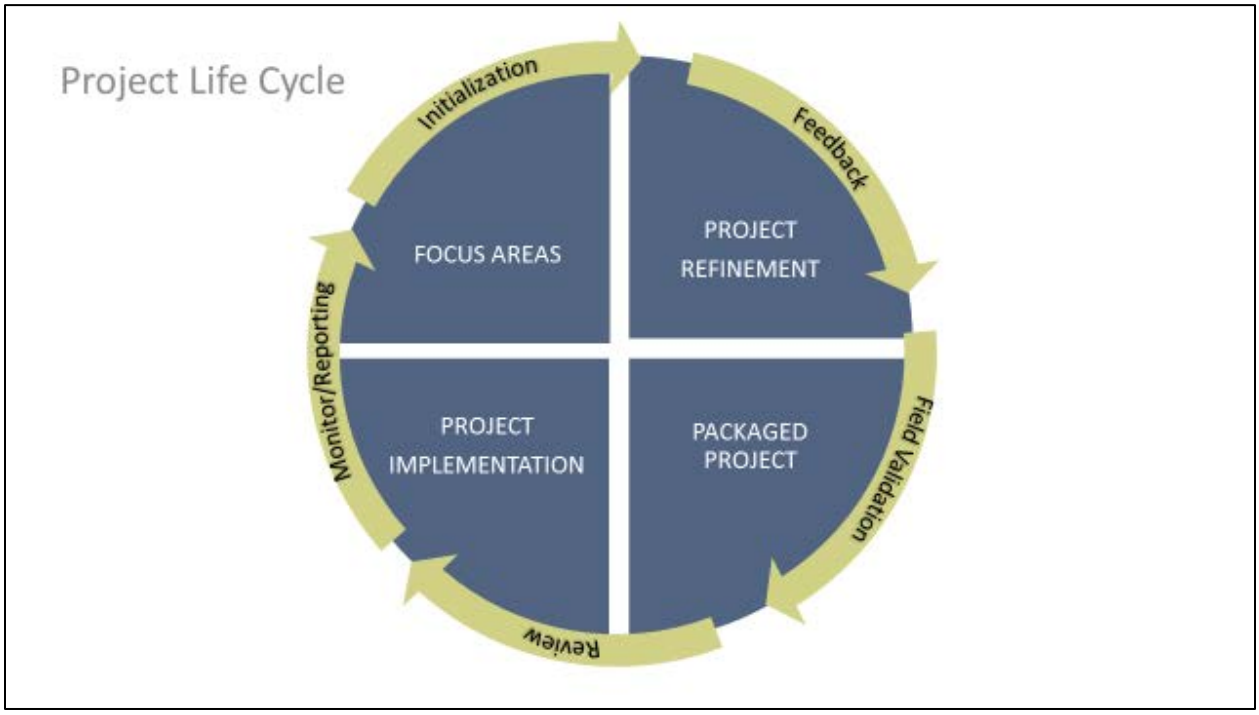


Diagram 2. LaVA adaptive implementation and monitoring framework – project life cycle

Diagrams 3 and 4 show the process for identifying and implementing a project within the LaVA area. The diagrams further explain and depict the project life cycle shown in diagram 2.

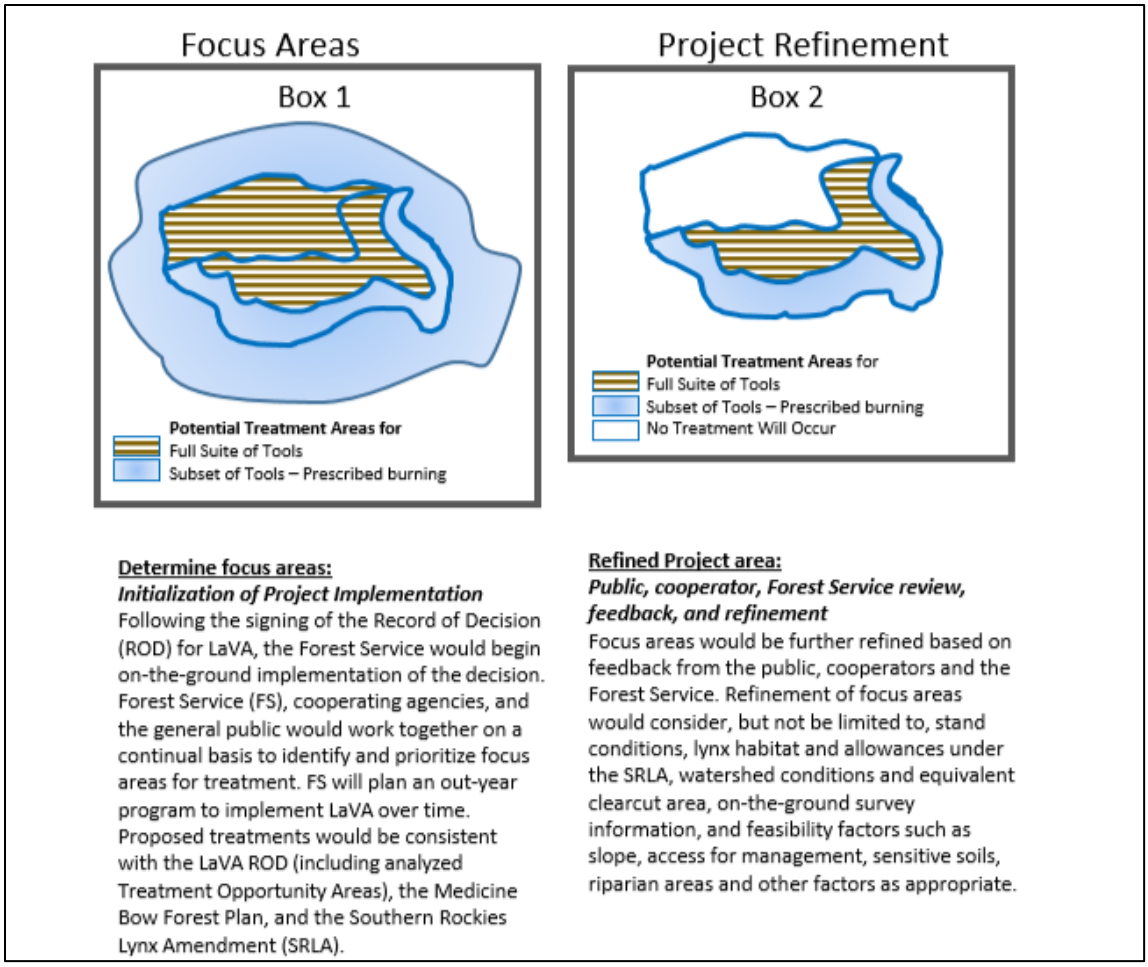


Diagram 3. Example project implementation for the Medicine Bow Landscape Vegetation analysis

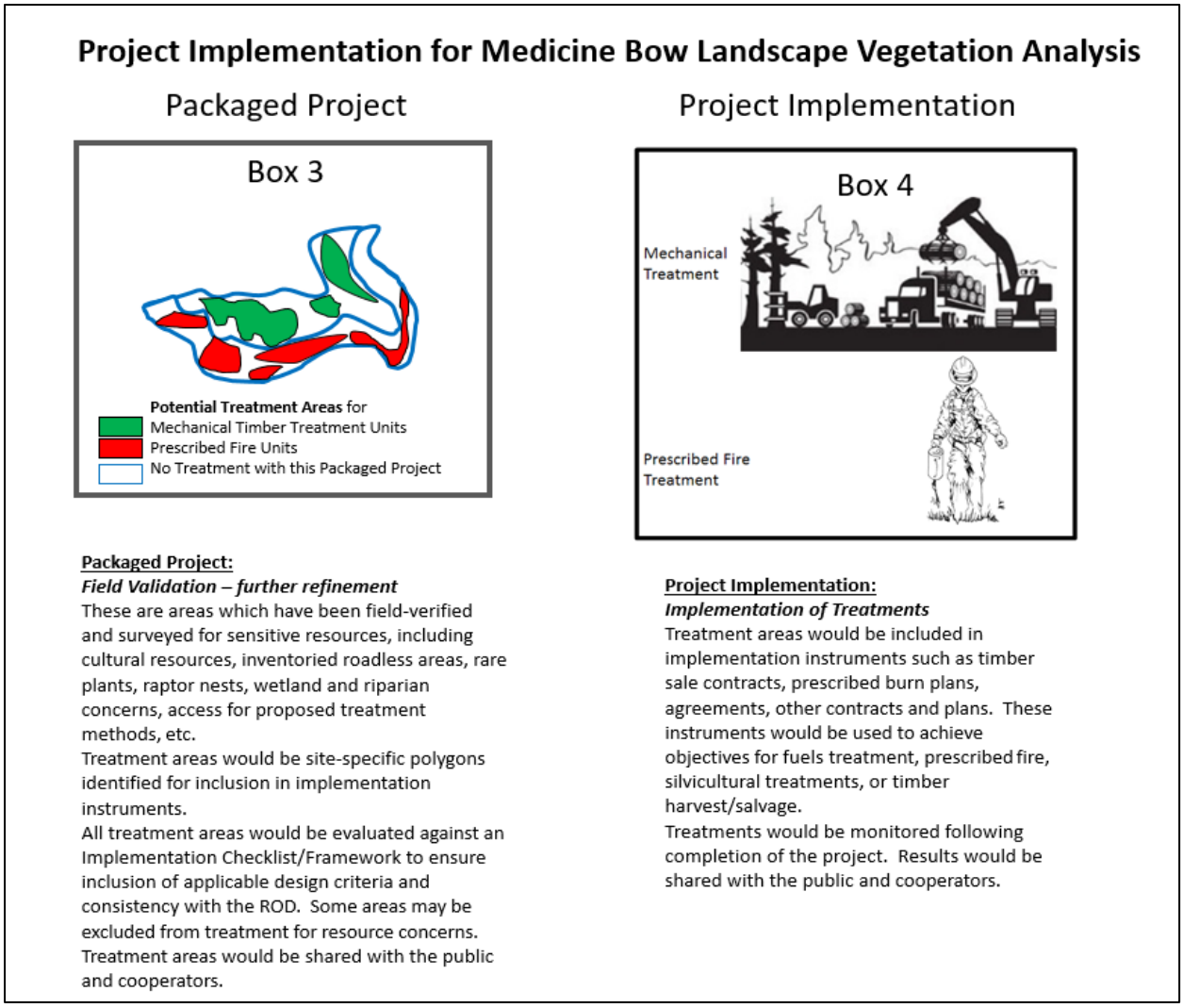


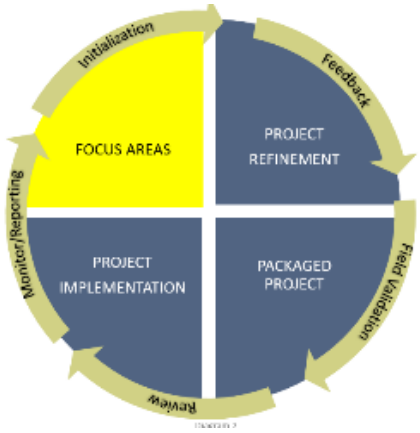
Diagram 4. Project implementation for the Medicine Bow landscape vegetation analysis

Framework Details

The adaptive implementation and monitoring framework consists of a cyclic, 5-phase process for identifying treatment areas, soliciting feedback, completing field validation, reviewing treatment packages, and implementing and monitoring treatments over the 15- to 20-year life of the LaVA Project. Given the cyclic nature of the framework, several projects may pass through different phases of project design, implementation, and monitoring at any given time and be implemented simultaneously. Cooperating agencies and the public are encouraged to participate in all phases, as appropriate for their individual interest.

The introductory information associated with each phase describes the overall intent of the phase as well as the intended outcome. The bulleted information outlines Forest Service and cooperating agency roles associated with the particular phase as well as opportunities for public engagement.

Initialization Phase (2 to 3 months)



Intent: Identify focus areas, such as a watersheds or communities at risk, where preliminary projects would be identified for implementation. This phase requires working with cooperating agencies to focus limited resources where multiple resource benefits can be realized through vegetation manipulation (for example, prescribed fire, timber harvest, and precommercial thinning). This phase is depicted in box 1 of diagram 3 and quadrant 1 of diagram 2.

Outcome: Identification of a focus area or focus areas that would be advanced to the feedback phase.

Forest Service:

- Consult 5-year action plans[9] for all program areas to help prioritize vegetative treatments and establish boundaries for focus areas;
- Review the LaVA treatment opportunity area map to determine the land base wherein treatments may occur and the types of treatments that may be implemented;
- Organize and host an annual meeting with cooperating agencies to review and finalize focus area boundaries; prioritize focus areas across the LaVA landscape based on a multiple priority factors, identify potential treatment types that advance both Forest Service and cooperating agency missions; and review and discuss monitoring results and potential adaptive management options for future treatment proposals;
- Review focus area information to validate consistency with law, regulation, and policy and the LaVA record of decision; and
- Upload focus area information, including maps, to a data-sharing website for public review and feedback.

[9] Five-year action plans are developed as the normal agency program of work to guide resource management.

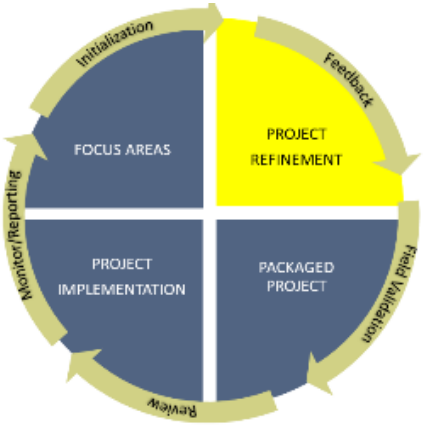
Cooperating Agencies:

- Participate in annual coordination meetings with the Forest Service;
- Help Forest Service personnel prioritize focus areas;
- Provide proposals to the Forest Service personnel for consideration in out-year project planning;
- Review, assist, or both with the consistency review of LaVA record of decision; and
- Identify potential partners, opportunities to work across boundaries, and potential funding sources.

Public:

- Work with the Forest Service and cooperating agency personnel to identify potential treatment opportunities and treatment priorities;
- Keep informed of LaVA activities by reviewing the LaVA implementation website; and
- Engage in public engagement opportunities as they are advertised.

Feedback Phase (2 to 3 months)



Intent: Annually, provide an opportunity for the public and cooperating agencies to give detailed, site-specific feedback on focus area project proposals identified at the initialization phase. This phase is depicted in box 2 of diagram 3 and quadrant 2 of diagram 2.

Outcome: Refined focus area boundaries and project proposal information and maps, based on internal Forest Service, public, and cooperating agency feedback.

Forest Service:

The following items are the first portion of the feedback phase and will be completed prior to asking for feedback from the public and cooperating agencies.

- Delineate preliminary project areas within the focus area and treatment opportunity area boundaries on maps;
- Complete a pre-implementation checklist (attachment 1) and associated worksheets to identify potential management constraints and treatment sideboards. The checklist and worksheets require preliminary analysis of specific resources, including inventoried roadless areas; lynx analysis units; watershed disturbance thresholds; temporary road construction; and wildlife security areas;
- Review the decision-making triggers table to determine if project proposals are approaching yellow-light or red-light triggers; incorporate adaptive action options as appropriate (attachment 2);
- Assess project feasibility factors, such as slope and sensitive soils; and
- Validate applicable design features and identify any additional potential project design features (attachment 3) to protect area resources.

The following items are the second portion of the feedback phase for solicitation and feedback:

- Organize and conduct public engagement efforts;
- Gather and synthesize feedback;
- Share feedback with cooperating agencies;
- Incorporate feedback into project design, as appropriate;
- Refine datasets and project area maps; and
- Include all written feedback as a part of the LaVA project record.

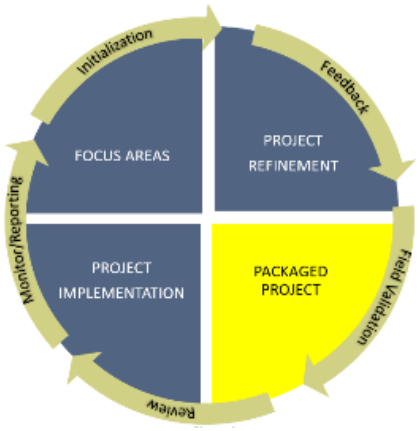
Cooperating Agencies:

- Participate with Forest Service personnel in public engagement efforts;
- Provide detailed project information to Forest Service personnel, as applicable;
- Review, assist, or both with pre-implementation checklist and worksheets. Consider and address feedback specific to cooperating agency-advanced projects; and
- Refine datasets and maps specific to cooperating agency-advanced projects.

Public:

- Keep informed of LaVA activities by periodically visiting the LaVA implementation website;
- Engage in public engagement opportunities; and
- Provide written feedback to project solicitations during established timeframes.

Field Validation Phase (2 to 3 months)



Intent: The field validation phase is intended to take the refined project and prepare the treatment areas on the ground. It considers information provided during the previous phases and incorporates timely, on-site resource protection needs during the preparation of the treatment areas. This phase is depicted in box 3 of diagram 3 and quadrant 3 of diagram 2.

Outcome: A packaged project ready for review by a district ranger.

Forest Service:

- Utilize refined project information to prepare on-the-ground projects, coordinating with cooperating agencies, where appropriate;
- Conduct field surveys for resource needs to help delineate treatment locations and to confirm treatments can be designed and implemented in conformance with the final environmental impact statement and record of decision parameters;
- Review vegetation treatment option tables to identify appropriate vegetative prescriptions (attachment 4);
- Validate project design features identified in the feedback phase. Determine if additional site-specific design features to protect area resources are warranted (based on field surveys);
- Review and complete the project implementation checklist (attachment 5), coordinating with cooperating agencies, as appropriate;
- Prepare final packaged project for district ranger review; and
- Upload updated project and scheduling information to the LaVA implementation website.

Cooperating Agencies:

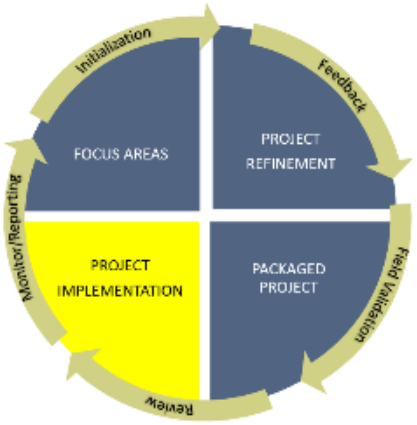
- Work with the Forest Service personnel to flag on-the-ground treatment unit boundaries, as appropriate;
- Assist Forest Service personnel with surveying treatment units, as appropriate;
- Recommend project design features to meet resource needs;
- Participate in review and preparation of the project implementation checklist, as appropriate; and

- Provide updated project and scheduling information on cooperating agency webpage, as appropriate.

Public:

- Keep informed of LaVA activities by periodically visiting the LaVA implementation website.

Review (1 month)



Intent: The project review phase is the final review of the package project (for example, timber sale contract, prescribed burn plan, stewardship contract) before it is implemented. This is the final opportunity for cooperating agency and the Forest Service personnel to make sure consistency with the LaVA final environmental impact statement and record of decision and all resource concerns have been addressed before the project is implemented. At this point, the plan is locked in and will be implemented barring unforeseen events. The district ranger will approve the final packaged project before it is implemented. This phase is depicted in quadrant 4 of diagram 2.

Outcome: Approved project ready for implementation.

Forest Service:

- Finalize product packaging and appropriate sourcing for implementing project;
- Finalize and sign project implementation checklist (resource specialists and district ranger);
- Share final treatment plan, implementation plan and other pertinent information with public and cooperating agencies;
- Prepare project monitoring plan, incorporating 'post-treatment' items from the decision triggers table; and
- Provide information on final treatment units and treatment schedule to public and cooperators using a selection of the communication tools.

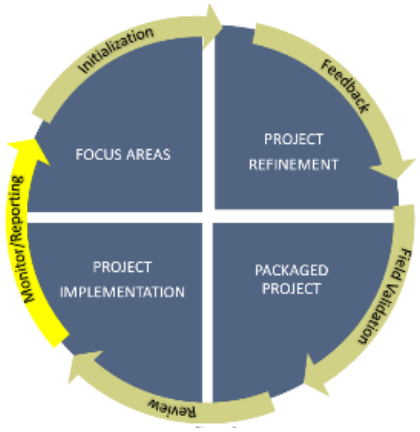
Cooperating Agencies:

- Review final project implementation checklist for consistency with resource needs and final environmental impact statement and record of decision
- Provide feedback or help prepare project monitoring plans; and
- Help share information with public about projects.

Public:

- Remain engaged with the LaVA by keeping up on the new information posted to the LaVA website regarding implementation updates and feedback and input opportunities.

Monitor and Report (2 to 3 months)



Intent: Learn from previous projects and adapt for future LaVA projects. The primary intent of this phase is to answer the questions:

- Did we do what we said we were going to do?
- Did we get the expected outcomes?
- Do we need to adjust future treatments?

Monitoring will help ensure consistency with the LaVA record of decision and provide Forest Service and cooperating agency personnel with more information to design better projects in the future.

Outcome: Monitoring report and increased knowledge when planning future projects.

Forest Service:

- Complete the field reviews for the project and any required project monitoring;
- Share information gathered with cooperating agencies and general public via the LaVA website;
- Publish a summary the adaptive implementation and monitoring framework on the LaVA website;
- Review the decision-making triggers table and summarize the results post treatment;
- Publish facts – acres, vegetation treatments used, percent of LaVA total, etc. through an annual LaVA progress report;

- Track and validate acres treated (for example, equivalent clearcut area, lynx analysis units) and miles of temporary roads for the individual project and LaVA as a whole. Revise initial acreage and mileage estimates as appropriate;
- Provide opportunities for public, groups, or both to be involved in monitoring programs using a selection of the communication tools listed on page 217;
- Request public feedback and input for consideration for future year projects; and
- Upload any modifications to the framework for public and cooperating agency review.

Cooperating Agencies:

- Participate in LaVA implementation field reviews;
- Provide evaluation and feedback on whether treatment implementation met expectations and was responsive to overall treatment objectives and final environmental impact statement and record of decision requirements;
- Provide evaluation and feedback about how well pre-treatment public input was incorporated into treatment design and implementation;
- Identify implementation or monitoring concerns with the Forest Service implementation team and develop recommendations for improvement;
- Provide summary information to Forest Service personnel regarding projects advanced by cooperating agencies; and
- Review and provide feedback to a draft report prior to public distribution.

Public:

- Review the annual report and monitoring information;
- Provide feedback and input on whether treatment implementation met expectations and was responsive to overall treatment objectives and final environmental impact statement and record of decision requirements;
- Plan future participation in implementation and monitoring as the LaVA moves forward, repeating the phases of the adaptive implementation framework; and
- Coordinate project monitoring, implement project monitoring, or both with Forest Service.

Attachment 1. Pre-implementation Checklist

Project:				**District:**	
NEPA Document:				**Sign Date:**	
Responsible Official:				**Title:**	
Partnership Project:		**Primary Partner(s):**			
Project Objective(s):					
Accounting Unit:		**Accounting Unit:**			
Project Description and Location					
Data File Location(s):					

For all "yes" answers below attach supplemental project worksheets, documentation or approval information. District Ranger signature confirms all appropriate documentation for necessary pre-implementation items is attached and the project can proceed.

YES	NO	
☐	☐	The project or portions of the project are occurring within an inventoried roadless area or areas.
☐	☐	The project or portions of the project are occurring within a lynx analysis unit or linkage corridor.
☐	☐	The project or portions of the project are occurring within a 6th-level watershed approaching the 25 percent disturbance threshold.
☐	☐	This project will utilize temporary roads to access treatment areas.
☐	☐	All or part of this project has potential to alter wildlife security areas as part of overall project priorities.
☐	☐	Design features applicable to this project have been verified and attached.
☐	☐	Project has potential to treat greater sage-grouse habitat.
☐	☐	Feedback was received from the public, cooperators, or both and feedback was used to refine project.
☐	☐	Project was brought forward or is primarily funded through a partnership source.

Approved By: _____ _____

District Ranger **Date**

Attachment 2: Decision-making Triggers for the LaVA Project

The decision-making triggers outlined below correspond to the issues tables discussed in chapter 1 within the "Issue Development and Resolution" section. Yellow-light triggers indicate that a resource has the potential to be negatively impacted by treatment proposals, demonstrating the need for more rigorous project design features, a change in management approach, or slowing the pace of implementation. Red-light triggers correspond with a legal standard or project standard that cannot be exceeded and demonstrate a need to either discontinue treatment proposals or to consider other treatment options.

Note: This table prints at 11 x 17.

Table 62. Decision-making triggers for adaptive implementation of the LaVA Project.

Desired Condition	Indicator(s)	Unit of Measure	Methods	Scale	Frequency	Yellow-light Trigger	Adaptive Action Options	Red-light Trigger	Adaptive Action Options	Regulatory Requirement
Watershed Condition and Trends										
Disturbance from vegetative treatments and temporary road construction is maintained at 25 percent or less of 6th level watersheds. Other natural events (wildfire) could also affect watershed conditions.	Weighted acres[10] of management actions, or other anthropogenic or natural disturbances within the watershed, considering watershed improvement projects and time since disturbance.	Equivalent clearcut area	Track acres of management actions and/or natural disturbances reported in FACTS or INFRA (Forest Service databases) or other appropriate databases.	6th level Watershed	Pre-treatment: Review disturbance acreages prior to treatment design and layout; pre-treatment checklist item Post-treatment: Annual reporting	Cumulative management and natural event acres are approaching 25 percent equivalent clearcut area	Maintain treatment(s) as planned, validating modeling results (for example, recovery actions such as road rehabilitation; confirm prior vegetation management actions; confirm recovery timeframes for affected vegetation types; assess watershed sensitivity; and asses on-the-ground conditions) to ensure 25 percent equivalent clearcut area threshold is not exceeded; Reduce acres of treatment or modify intensity of treatment; or develop more rigorous project design features to ensure 25 percent equivalent clearcut area threshold is not exceeded (for example, wider buffers along water influence zones).	Cumulative management and natural event acres will exceed 25 percent equivalent clearcut area after model validation.	Same as yellow; or discontinue treatment proposal(s) until sufficient watershed recovery has occurred.	Forest plan; Watershed Conservation Practices Handbook
Applicable best management practices are implemented and effective.	Project implementation complies with best management practices and is achieving desired outcomes.	Select mechanical vegetation management best management practices	Field visits with LaVA interdisciplinary team and cooperating agencies	Treatment unit	Post-treatment: Monitor a minimum of one treatment unit annually. Contribute to annual reporting.	Selected best management practices implementation – rating of marginally implemented. Selected best management practices effectiveness – rating of marginally effective	Modify future treatments so as to avoid identified resource concerns.	Resource impacts continue despite treatment modifications.	Reduce footprint of future treatment proposals, consider other treatment options, or both	National best management practice monitoring protocols

[10] See vegetation treatment options tables for explanation of weighting process.

Desired Condition	Indicator(s)	Unit of Measure	Methods	Scale	Frequency	Yellow-light Trigger	Adaptive Action Options	Red-light Trigger	Adaptive Action Options	Regulatory Requirement
Project design features are implemented and effective.	Project implementation complies with Forest Service design specifications and is achieving desired outcomes.	Select project design features	Field visits with LaVA interdisciplinary team and cooperating agencies	Treatment unit	Post-treatment: Monitor a minimum of one treatment unit annually. Contribute to annual reporting.	Selected project design features implementation – rating of marginally implemented Selected project design features effectiveness – rating of marginally effective	Modify future treatments so as to avoid identified resource concerns, develop more rigorous project design features, or both.	Resource impacts continue despite treatment modifications.	Develop more rigorous project design features, reduce footprint of future treatment proposals, consider less intensive treatment options, or a combination of these things.	Forest plan; LaVA record of decision
Impacts to Wildlife Habitat, including Threatened, Endangered, and Sensitive Species Habitat										
Specific treatments are designed to maintain or improve wildlife habitat.	Targeted aspen regeneration in old stands. Targeted conifer removal from mature aspen stands. Regeneration of conifer stands with more than 60% overstory mortality and sparse understory. Promotion of ponderosa pine and Douglas-fir by removal of surrounding trees. Thinning of mature Rocky Mountain juniper where density exceeds natural levels. Shrubland regeneration in a fine scale mosaic pattern within large expanses (at least 25 acres) of shrubs with high mortality (more than 50%), or live shrub canopy cover at least 35%, or a sparse understory.	Acres	Track acres of management actions or natural disturbances. Reported in FACTS or WIT. Conduct field surveys	Treatment unit and accounting unit	Post-treatment: Monitor a minimum of one treatment unit annually. Contribute to annual reporting.	A 300-acre or larger LaVA wildlife habitat improvement project not implemented in each 3-year period.	Adjust Medicine Bow National Forest resources to accomplish at least one 300-acre or larger LaVA wildlife habitat improvement in each fourth year.	A 300-acre or larger LaVA wildlife habitat improvement project not implemented in each 5-year period.	Adjust Medicine Bow National Forest resources to accomplish at least two 300-acre or larger LaVA wildlife habitat improvements in each fifth year.	Forest plan; LaVA record of decision
Treatments are designed to maintain or improve wildlife security areas.	Forest plan wildlife guideline 1 (p. 1-40).	Mapped and inventoried wildlife security polygons	Track acres of management actions, natural disturbances, or both reported in FACTS; Conduct field surveys.	Treatment unit	Pre-treatment: Prior to treatment design and layout; pre-treatment checklist item Post-treatment: Monitor a minimum of one treatment unit annually, if applicable. Contribute to annual reporting.	At least 20% of the security areas in the treatment opportunity areas in an analysis unit are removed with project implementation.	Modify future treatments to maintain security areas Continue treatment plans; consider reducing treatments that remove security areas; or implement treatments that do not remove security areas.	A least 30% of the security areas in the treatment opportunity areas in an analysis unit are removed with project implementation.	Eliminate treatments that remove security areas; or implement treatments that do not remove security areas.	Forest plan

Desired Condition	Indicator(s)	Unit of Measure	Methods	Scale	Frequency	Yellow-light Trigger	Adaptive Action Options	Red-light Trigger	Adaptive Action Options	Regulatory Requirement
Implementation will not result in the conversion of more suitable habitat to an unsuitable condition in lynx analysis units than the amount identified in the biological assessment for Canada lynx. Southern Rockies Lynx Amendment standard VEG S1 and wildland-urban interface exemption	Vegetative management, temporary road construction, skid trails, landings, or other anthropogenic or natural disturbances within lynx habitat.	Acres per lynx analysis unit	Track acres of management actions and natural disturbances. Reported in FACTS.	Lynx analysis unit	Pre-treatment: Prior to treatment design and layout; pre-treatment checklist item. Post-treatment: annual reporting.	80 percent of the conversion of suitable habitat to an unsuitable condition as identified by the biological assessment has been completed for a lynx analysis unit.	Continue treatment plans, consider reducing treatments that convert suitable habitat to an unsuitable condition, or implement treatments that do not convert suitable habitat to an unsuitable condition.	100 percent of the conversion of suitable habitat to an unsuitable condition as identified by the biological assessment has been completed for a lynx analysis unit.	Eliminate treatments that convert suitable habitat to an unsuitable condition, or implement treatments that do not convert suitable lynx habitat to an unsuitable condition	Southern Rockies Lynx Amendment; Endangered Species Act
Implementation will convert no more suitable lynx habitat to an unsuitable condition in lynx analysis units over a 10-year period than the amount identified in the biological assessment. Southern Rockies Lynx Amendment Standard VEG S2 and wildland-urban interface exemption	Vegetative management, temporary road construction, skid trails, landings, or other anthropogenic disturbances within lynx habitat	Acres treated over a 10 year period in the lynx analysis unit	Track acres of management actions. Reported in FACTS.	Lynx analysis unit	Pre-treatment: Prior to treatment design and layout; pre-treatment checklist item. Post-treatment: annual reporting.	80 percent of the conversion of suitable habitat to an unsuitable condition in 10 years as identified by the biological assessment has been completed for a lynx analysis unit.	Continue treatment plans, consider reducing treatments that convert suitable habitat to an unsuitable condition, or implement treatments that do not convert suitable habitat to an unsuitable condition.	Vegetation management has regenerated 15 percent of lynx habitat in the lynx analysis unit. Fuel treatments are exempt from the trigger.	Eliminate treatments that convert suitable habitat to an unsuitable condition or implement treatments that do not convert suitable lynx habitat to an unsuitable condition	Southern Rockies Lynx Amendment; Endangered Species Act
Implementation will not result in more precommercial thinning in each lynx analysis unit than the sum of the 1% proportion per lynx analysis unit identified in the biological assessment and the wildland-urban interface exemption and exceptions. Southern Rockies Lynx Amendment Standard VEG S4, wildland-urban interface exemption, and exceptions	Amount of precommercial thinning	Acres per lynx analysis unit and across LaVA project area	Track acres of management actions. Reported in FACTS.	Lynx analysis unit	Pre-treatment: Prior to treatment design and layout; pre-treatment checklist item. Post-treatment: annual reporting.	80 percent of the precommercial thinning as identified by the biological assessment has been completed for a lynx analysis unit.	Continue treatment plans, reduce the amount of precommercial thinning, or implement alternate treatment method.	100 percent of the precommercial thinning as identified by the biological assessment has been completed for a lynx analysis unit.	Eliminate any more precommercial thinning or implement alternate treatment method.	Southern Rockies Lynx Amendment; Endangered Species Act
Implementation will not result in the use of more than 13,214 acres for wildland-urban interface exemptions as identified in the biological assessment. Southern Rockies Lynx Amendment exemption to standards VEG S1, S2, S5, and S6	Amount of wildland-urban interface treatment acres	Acres per lynx analysis unit and across LaVA project area	Track acres of management actions. Reported in FACTS.	Lynx analysis unit	Pre-treatment: Prior to treatment design and layout; pre-treatment checklist item. Post-treatment: annual reporting.	80 percent of the wildland-urban interface exemptions identified by the biological assessment have been used for a lynx analysis unit or the project area.	Continue treatment plans, reduce the amount of amount of wildland-urban interface exemption use or; implement alternate treatment method.	100 percent of the wildland-urban interface exemptions identified by the biological assessment have been used for a lynx analysis unit or the project area.	Eliminate any more wildland-urban interface exemption use or implement alternate treatment method.	Southern Rockies Lynx Amendment; Endangered Species Act

Desired Condition	Indicator(s)	Unit of Measure	Methods	Scale	Frequency	Yellow-light Trigger	Adaptive Action Options	Red-light Trigger	Adaptive Action Options	Regulatory Requirement
Implementation will not result in the use of more than 2,893 acres for incidental damage exceptions as identified in the biological assessment. Southern Rockies Lynx Amendment exceptions to standards VEG S5 and S6	Amount of incidental damage treatment acres	Acres across LaVA project area	Track acres of management actions. Reported in FACTS.	Lynx analysis unit	Pre-treatment: Prior to treatment design and layout; pre-treatment checklist item. Post-treatment: annual reporting.	80 percent of the incidental damage exceptions identified by the biological assessment have been used for the project area.	Continue treatment plans, reduce the amount of amount of incidental damage, or implement alternate treatment method.	100 percent of the incidental damage exceptions identified by the biological assessment have been used for the project area.	Eliminate any more incidental damage or implement alternate treatment method.	Southern Rockies Lynx Amendment; Endangered Species Act
Changes to Major Vegetation Types										
Vegetation treatments are accelerating forest and rangeland restoration and resiliency and moving these ecosystems toward forest plan desired conditions.	Cover types, ecological site conditions, age classes, size classes, and vegetation structural stages (including shrubland, grassland, and forested vegetation)	As appropriate for indicator	GIS mapping; ecological site descriptions; activities and changes recorded in FACTS; insect and disease infestation mapping from Forest Health Monitoring Program	Project area (Snowy Range and Sierra Madre Mountain Ranges)	Post-treatment: annual reporting.	Amount of habitat structural stages 4A, 4B, and 4C is less than 20 percent.	Retain pockets of live habitat structural stages 4A, 4B, and 4C to the greatest extent practicable; and/or Design treatments to ensure minimum old forest classifications are maintained.	Amount of habitat structural stages 4A, 4B, and 4C is less than 5 percent.	Same as yellow	Forest plan
Temporary Road Miles										
Temporary road miles constructed annually and cumulatively, their on-the-ground location, and temporary road miles rehabilitated annually and cumulatively are within the constraints of the record of decision.	Temporary road construction and rehabilitation; Wetness index modelling	Miles, wetness index modelling outputs	Track miles of temporary road construction and rehabilitation reported in pre-treatment checklists; Use wetness index modelling outputs to assist in temporary road locations	Project area (Snowy Range and Sierra Madre Mountain Ranges)	Pre-treatment: Prior to treatment design and layout; pre-treatment checklist item. Post-treatment: annual reporting.	Construction: 500 of the 600 miles of temporary roads have been constructed by 2029 (5 years of project implementation remaining. Rehabilitation: 90 percent of temporary roads are effectively rehabilitated within 3 years of treatment completion.	Construction: Review treatments to determine if resource objectives can be met via means other than constructing roads. Adjust treatments accordingly. Rehabilitation: Increase project administration to ensure temporary roads are effectively rehabilitated in the allotted timeframe.	Construction: 600 of the 600 miles of temporary roads have been constructed by 2033 (1 year of project implementation remaining) Rehabilitation: 80 percent of temporary roads are effectively rehabilitated within 3 years of treatment completion.	Construction: Eliminate treatment proposal; or identify other means of achieving resource objectives that do not require temporary road construction. Rehabilitation: Do not allow new temporary road construction until field reviews indicate that temporary roads have been effectively rehabilitated within 3 years of treatment completion.	LaVA record of decision
Inventoried Roadless Area Characteristics										
Treatments do not negatively alter the nine characteristics that define inventoried roadless areas.	Inventoried roadless area characteristics	Acres	Treatments affecting inventoried roadless areas only: Prepare mandatory inventoried roadless area review forms for regional office approval prior to treatment authorization.	Inventoried roadless area boundary	Pre-treatment: Prior to treatment design and layout; pre-treatment checklist item. Post-treatment: annual reporting.	Treatments are anticipated to negatively impact one or more characteristic.	Eliminate inventoried roadless area portion of treatment proposal or identify other means of achieving resource objectives that do not result in adverse impacts to inventoried roadless area characteristics.	Same as yellow.	Same as yellow.	Roadless Area Conservation Rule

Desired Condition	Indicator(s)	Unit of Measure	Methods	Scale	Frequency	Yellow-light Trigger	Adaptive Action Options	Red-light Trigger	Adaptive Action Options	Regulatory Requirement
Recreation and Visitor Satisfaction										
Hunting experiences and access are improving as a result of project implementation.	Hunter satisfaction; hazard tree removal along National Forest System roads	Surveys; acres	Wyoming Game and Fish Department hunter surveys Track acres of hazard tree removal actions reported in FACTS	Project area (Snowy Range and Sierra Madre Mountain Ranges)	Post-treatment: annual reporting.	Negative public comments relative to access and tree mortality.	Review treatments to determine if hazard tree clearing along National Forest System roads can be incorporated into treatment design. Adjust treatments accordingly.	Same as yellow.	Same as yellow.	LaVA record of decision
Dispersed recreation opportunities are enhanced and public safety is improved as a result of project implementation.	Trail safety; trail condition	Miles	Track miles of trail clearing and hazard tree removal reported in pre-treatment checklists	Project area (Snowy Range and Sierra Madre Mountain Ranges)	Post-treatment: annual reporting.	Negative public comments relative to access and tree mortality.	Review treatments to determine if hazard tree clearing along National Forest System trails can be incorporated into treatment design. Adjust treatments accordingly.	Same as yellow.	Same as yellow.	LaVA record of decision

Attachment 3: LaVA Project Design Features

Project design features were developed to conserve and protect area resources during implementation of the LaVA Project. The majority of the design features were derived and adapted from forest plan standards and guidelines, the Region 2 Watershed Conservation Practices Handbook, national core best management practices for water quality management on National Forest System lands, and best management practices developed by the state of Wyoming.

The project design features listed below are expected to provide adequate resource protection under most treatment scenarios associated with LaVA implementation. However, there may be instances where additional or more stringent design features are needed to address locally unique conditions. These situations are addressed in specific project design features, such as amphibian and fisheries project design feature #7 and soils project design feature #2. The additional, or more stringent, project design features would be developed by Forest Service resource specialists and approved by the responsible official prior to project implementation.

Recreation

Objective: Maintain or improve the condition of recreation resources while enhancing recreation opportunities by improving public safety and accessibility around recreation features.

Design Feature Number	Description
#1	Remove operational slash and merchantable materials from developed recreation sites that are the direct result of logging the site.
#2	Do not implement treatments in developed campgrounds between November 15 and April 30. If this is not feasible, coordinate treatment timing to minimize conflicts with recreation use.
#3	Temporary road crossings, skid trail crossings, or both across designated trails would be kept to a minimum. Any crossings would be perpendicular to designated forest trails.
#4	Minimize overlaying skid trails/haul roads on nonmotorized system trails. If trails are used as skid trails and haul roads, they will be returned to pre-existing conditions. Trail widths will not be increased.
#5	When timber harvest activities preclude use of a nearby trail, a) notify the public; b) consider identifying timeframes for safe travel on the trail; c) if harvest is expected to preclude use for more than one season and a detour is feasible, provide a detour; and d) place warning signs on all trail access points and along the trail where treatment activities are occurring.
#6	Unauthorized user-created routes that fall within treatment boundaries may be decommissioned to discourage continued, illegal motorized use and to offset impacts to area resources.
#7	To the maximum extent possible, alternate route(s) or detours will be used during project implementation to allow continued use of the Continental Divide National Scenic Trail (CDNST) and to mitigate scenery management impacts during vegetation management operations.
#8	No skidding is allowed on the Continental Divide National Scenic Trail.
#9	Coordinate with recreation staff on off-highway vehicle trails if vegetative treatments are planned on or adjacent to off-highway vehicle trails. Off-highway vehicle trails will be returned to pre-existing conditions.
#10	Coordinate with recreation staff if winter operations are planned on snowmobile trails.

Design Feature Number	Description
#11	Design and implementation of vegetative treatments or associated activities (for example, access routes, staging, etc.) within Management Area 8.22 Ski Based Resorts- Existing and Potential must be coordinated with the Forest Service ski area permit administrator to ensure compatibility with current and potential recreational opportunities.

Amphibians and Fisheries

Objective: Conserve populations of amphibian and fisheries species and maintain or improve habitats.

Design Feature Number	Description
#1	Keep heavy equipment out of streams during fish spawning, (March 15 to May 31 for cutthroat and rainbow trout, October 15 to November 30 for brook trout and brown trout), incubation, and emergence periods.
#2	Install stream crossings as perpendicular to flow as practicable.
#3	In consultation with fisheries and timber staff, Forest Service resource specialists will locate, design and designate any temporary road crossings of perennial streams.
#4	Avoid direct ignition in riparian and wetland areas; allow fire to back into these areas.
#5	Use spill containment equipment if it is necessary to locate staging and refueling areas within water influence zones.
#6	Felled material or other associated debris with potential to block stream culverts or bridges will be removed from the high water mark.
#7	In consultation with fisheries staff, develop site-specific design criteria to ensure protection of boreal toad, wood frog, and northern leopard frog habitat and populations.

Public Safety

Objective: To provide safe conditions for the administrative operations and the public uses.

Design Feature Number	Description
#1	Forest Service personnel will provide advanced notice to the public if roads are temporarily closed during vegetation management activities. Available alternate access routes may be identified. Forest Service personnel will work cooperatively with the applicable Federal, State, County and local governments to post road closure information. The traffic control will comply with the Manual for Uniform Traffic Control Devices.

Hydrology and Wet Areas

Objective: Maintain long-term ground cover, soil structure, water budgets, and flow patterns of wetlands to sustain their ecological functions.

Design Feature Number	Description
#1	Fens: Treatment will not occur in fens. In addition, fens will be protected by a 300-foot limited-action buffer in which heavy equipment use will be prohibited.
#1a	Wet meadows: No operation of heavy equipment, prescribed fire control line, or tree removal will occur in seasonally wet, herbaceous- or shrub-dominated wetlands, commonly referred to as wet meadows. Wet meadows may also contain trees but do not include aspen woodlands or riparian gallery forests.

Design Feature Number	Description
#2	Wetlands, riparian areas, and aquatic ecosystems: When treating within non-excluded wetlands (see numbers 1 and 1a above), riparian areas, and aquatic ecosystems: • Restrict temporary roads, landings, or main skid trails as recommended by project resource specialists and approved by the line office. • Hand fall and leave in place or • Treat with mechanized equipment over a combined surface of 12 inches of frozen ground and snow.
#3	Water influence zone: A buffer with a minimum horizontal width of 100 feet from the top of each stream bank or edge of wetlands will be applied to perennial and intermittent streams, lakes, reservoirs, riparian areas, and wetlands. However, buffers may vary depending on the type of wet area and site conditions, as agreed upon by project resource specialists. When treating buffers, including the water influence zone: • equipment use is permitted; • if winter logging occurs, the over-snow logging desired condition will apply; and • where feasible, avoid temporary roads, landings, main skid trails, or slash piles in the buffer (water influence zone). If the aforementioned are necessary in the water influence zone, consult with Medicine Bow National Forest resource specialists. Prior to working within water influence zone buffers, resource specialists would conduct an assessment to determine site-specific design criteria for the retention of coarse woody debris.
#4	Winching of trees across streams is prohibited.

Rare Plant Species and Sensitive Ecosystems

Objective: Maintain ecological integrity and functioning of uncommon, sensitive, or otherwise vulnerable ecosystems. Protect populations of threatened, endangered, and sensitive plant and pollinator species and maintain viability of all plant species in the project area. The follow design criteria were developed to comply with the standards and guidelines in the forest plan, meet the requirements of the National Forest Management Act and 2012 Final Planning Rule, and conform to the policy described in Supplement 2600-2017-1 to the Forest Service Manual 2600 – Wildlife, Fish, and Sensitive Plant Habitat Management, Chapter 2670 – Threatened, Endangered, and Sensitive Plants and Animals.

Design Feature Number	Description
#1	Rare plants: Threatened, endangered, Rocky Mountain Region sensitive and local concern plant species will be subject to a limited action buffer (typically 30 to 100 feet), in which heavy equipment will be prohibited and other treatment activities may be limited, unless otherwise agreed upon by the botanist and district ranger. Specific buffer distances will depend and plant and habitat characteristics and will be determined at time of discovery.
#2	Meadows: Use of heavy equipment is prohibited in meadows and grasslands unless no other option is available. If heavy equipment use cannot be located outside these areas, Forest Service resource specialists would be contacted prior to implementation to determine whether additional surveys are needed or special requirements are warranted to protect site integrity.
#3	Pollinators: In consultation with Medicine Bow National Forest resource specialists, conduct vegetation management activities in a manner that protects or enhances pollinator habitat. The pollinator-friendly best management practices for Federal lands (draft, May 2015 or finalized version) will be used as a guide.

Invasive Weeds

Objective: Maintain ecological integrity by preventing the introduction and reducing the spread of noxious weeds and invasive plant species in the project area. The following decision criteria were developed to comply with the direction in the forest plan, Executive Order 13751 – Safeguarding the Nation from the Impacts of Invasive Species, and the USDA Forest Service guide to noxious weed prevention practices.

Design Feature Number	Description
#1	Cleaning of equipment: Require heavy equipment to be cleaned of mud and plant debris and inspected before vehicles are moved into the project area to prevent introduction or spread of noxious or invasive weed species.
#2	Vegetation treatments: Manage vegetation treatments to promote native species and to hinder weed species germination. Prior to implementation, field conditions will be assessed to locate areas with existing infestations of weeds. Areas may be excluded from prescribed burning where there are infestations of fire-proliferating species (cheatgrass and musk thistle). Weed-infested areas included in burns, with the exception of annual grasses, will be treated with appropriate herbicides or other control methods, as needed, to minimize the spread of weed species pre-treatment, post-treatment, or both.
#3	Seeding: On sites where the probability of erosion or weed infestation is high, disturbed areas will be seeded with an appropriate mix of native plant species per the Guidelines for Revegetation for the Medicine Bow-Routt National Forests and Thunder Basin National Grasslands (signed 2007, as updated). Areas where duff or slash cover the ground, or where natural revegetation is expected to occur quickly, may not need to be seeded. The intent is to intervene only if necessary to establish effective ground cover to control erosion, prevent weeds, and meet scenic objectives.
#4	Imported materials: All materials imported from off-forest (erosion control materials, soil, mulch, etc.) will be certified weed free or from a weed-free source or area. Forest-level source material (gravel pits and borrow areas) used for individual treatments will be inspected prior to use to inventory noxious weed presence and treated with herbicide as needed. If inspections cannot occur before treatment implementation, identify where the source came from and monitor for noxious weed presence.

Soils

Objective: Minimize disturbances to soil properties (physical, chemical, and biological) to ensure inherent ecological capacity and hydrologic functions of the soil resources are maintained.

Design Feature Number	Description
#1	When logging occurs over snow or frozen ground: • Harvest when frozen soil is more than 4 inches deep or snow or a combination of compactable snow and frozen soil is more than 12 inches thick. Snow quality should be such that it will compact and form a running surface for equipment by being moist and non-granular. • Additional site-specific implementation measures may be developed to minimize resource concerns, if necessary.
#2	Prohibit soil-disturbing activities on slopes greater than 60 percent and on soils susceptible to high erosion and geologic hazard. Site-specific measures will be developed if these features cannot be avoided.
#3	For mechanical treatment, maintain, at a minimum, 60 percent effective ground cover throughout project implementation to provide long-term levels of organic matter and nutrients and erosion control.

Design Feature Number	Description
#4	Site-specific project design criteria will be developed if treatment activities include operation of heavy equipment on slopes greater than 40 percent.
#5	Designated skid trails would be used, when applicable, during timber harvests. Designated skid trails are recommended if more than 3 passes over the same ground is necessary or when not on flat ground. Designated trails are not necessary when harvesting over frozen ground, snow, or both.
#6	Where feasible, skid trails and landings from past harvests are to be utilized to minimize new soil disturbances.
#7	Equipment operation shall not occur when ground conditions are such that extensive damage will result. If ruts develop that are 6 inches deep and 30 feet long, activities should stop.

Wildlife

Objective: Conserve populations of threatened, endangered, and sensitive species and maintain or improve wildlife habitats.

General

Design Feature Number	Description
#1	Vegetation management and ground-disturbing actions within ¼ mile of suitable goshawk nesting habitat will be surveyed using accepted protocol (Joy et al. 1994) between June 19 and August 4 of the year prior to actions or the year actions are expected to occur. Where active nests or territories are identified, these forest plan standards will apply (USDA 2003a).

Migratory Birds

Design Feature Number	Description
#1	Outside the wildland-urban interface, vegetation management actions will be designed to retain or promote unique features for overstory and understory diversity if feasible. These features can include items such as snags, uncommon trees, or woody debris.

Columbian Sharp-tailed Grouse

Design criteria for shrubland treatments within 2 kilometers (1.24 miles) of Columbian sharp-tailed grouse leks (based on Hoffman and Thomas 2007, Hoffman et al. 2015).

Design Feature Number	Description
#1	Prioritize treatment in Columbian sharp-tailed grouse habitat to manage conifer invasion in shrublands and manage over-mature (more than 40 percent canopy cover) mountain shrublands, especially Gambel oak. Prioritize treatment on ridges, mesas, and other flat topography.
#2	Treatment prescriptions can treat up to 20 percent of over-mature sagebrush shrublands. Individual treatment areas can vary up to 2 to 10 hectares. Prioritize treatment in over-mature stands (more than 40 percent canopy cover). Retain some over-mature stands within 400 meters of leks.
#3	Treatment prescriptions can treat up to 30 percent of over-mature mountain shrublands, focusing on Gambel oak. Individual treatment areas can vary up to 20- to 100-hectare patches. Future treatments can occur at 5 to 10 year intervals in remaining stands. Where mountain shrublands comprise less than 15 percent of the area, treatment prescriptions can treat up to 10 percent of the over-mature mountain shrublands with subsequent treatments at 10- to 15-year intervals. Treatment areas can vary up to 2- to 10-hectare patches.

Design Feature Number	Description
#4	Prescribed fire can occur before April 15, during September if there will be substantial early fall snow to cover treated areas, or after September.
#5	Treated areas should be rested from livestock grazing for 1 to 2 growing seasons unless mountain shrubs have re-sprouted sufficiently and grass and forb cover is adequate for long-term habitat productivity. If mountain shrub and grass and forb response is not adequate, additional measures such as adaptive livestock management or temporary fencing can be adopted until recovery occurs.

Preble's Meadow Jumping Mouse

Design Feature Number	Description
#1	No treatment will occur in suitable habitat for the Preble's meadow jumping mouse. Suitable habitat (614 acres) occurs along the Laramie River at 7,800 feet elevation and lower in Township 13 North, Range 77 West, section 33 and Township 12 North, Range 77 West, section 04.

Temporary Road Construction, Landings, and Skid Trails

Objective: To decompact compacted soil in the temporary road surfaces, restore natural drainage, and prevent unauthorized motorized use after vegetation management.

Erosion Control

Design Feature Number	Description
#1	Recontour temporary road template to the original contour to permit normal maximum flow of water.
#2	Remove culverts, install water bars, and restore stream channels to near natural dimensions.
#3	For the entire length of the temporary road, provide 35 percent to 65 percent ground cover by scattering debris on the route footprint. Ground cover range is provided to account for different harvest methods and project objectives.

Compaction

Design Feature Number	Description
#1	Rip, or otherwise roughen, the length of the temporary road prism to eliminate compaction, ensuring an average depth of 6 inches to 12 inches, as needed, to remove compaction. Avoid continuous furrow lines as they act as conduits for water transport and do not eliminate compaction within the entire prism.

Visuals and Motor Vehicle Access

Design Feature Number	Description
#1	Temporary road obliteration methods will be designed to effectively prevent motorized vehicle use by utilizing berms, boulders, slash, mulch, dead trees, or a combination of these things. The obliteration method(s) selected will cover the temporary road for the sight distance from the origin of the temporary road. For the entire length of the temporary road, provide 35 percent to 65 percent ground cover by scattering debris on the route footprint.

Timing

Design Feature Number	Description
#1	Complete obliteration of temporary roads will occur within 3 years after the unit has been accepted and operations completed.
#2	Skid trails and landings will be rehabilitated as needed to minimize soil and hydrologic effects. Site-specific measures will be developed at time of implementation.

Inventoried Roadless Areas

Objective: To protect and enhance inventoried roadless area characteristics

Design Feature Number	Description
#1	Projects in inventoried roadless areas will be reviewed according to regional roadless review processes and standards.

Old Growth

Objective: To maintain or enhance old forest across the landscape.

Design Feature Number	Description
#1	If treatment in old growth is planned, replacement acres will be identified prior to implementation, per forest plan biological diversity standard 1. Vegetation management can be conducted within these stands as long as treatments maintain or promote characteristics of old growth stands, new stands are identified that meet the requirements of old growth and are incorporated into the Medicine Bow National Forest old growth strategy.

Scenic Resources

Objective: To provide high-quality scenery while allowing multiple-use management to occur

Design Feature Number	Description
#1	In all treatment areas, follow general direction and associated standards and guidelines in the "Visual Resource Management" section of the forest plan (USDA Forest Service 2003a, pages 2-52 to 2-53).
#2	Along scenic byways, burned slash piles will be rehabilitated, if needed, within four years of the activity to eliminate the appearance of uncharacteristic disturbance.

Infrastructure

Objective: To protect improvements and investments

Design Feature Number	Description
#1	All Forest Service authorized improvements (for example, fences, water improvements, survey monuments) would be protected during management activities.
#2	Slash piles should be removed as soon as practicable. If possible, locate all machine piles at least 100 feet from infrastructure. If possible, locate hand piles at least 50 feet from infrastructure. If not possible to meet the aforementioned distances, consult the zone fire staff or forest fuels specialist.

Rangeland Resources

Objective: Maintain grazing opportunities on suitable rangelands to achieve desired conditions. Desired condition includes emphasis on healthy native plant communities, minimizing noxious weeds and other non-native species

Design Feature Number	Description
#1	Treatment opportunities must be coordinated with Forest Service rangeland management specialists to provide adequate time to plan changes in grazing management and to limit impacts to allotment management and permittee operations.

Heritage Resources

Objective: Protect cultural sites that need protection; fulfill National Historic Preservation Act requirements; and avoid, minimize, or mitigate unexpected adverse impacts to heritage resources.

Design Feature Number	Description
#1	National Historic Preservation Act compliance will be completed for each treatment area prior to treatment implementation. This may include literature reviews, field surveys (if deemed necessary by the heritage specialist) and completion of State Historic Preservation Office and Tribal consultation. Surveys, reporting, and consultation may be conducted in accordance with a programmatic agreement. State Historic Preservation Office and Tribal consultation may result in additional cultural resource avoidance or protection measures.
#2	In the event that cultural materials or human remains are discovered, all activities in the immediate area will stop, the area secured and the forest archaeologist and district ranger will be notified immediately. Work will not resume in that area until the forest archaeologist has evaluated the material and has notified the district ranger that the applicable requirements of 36 CFR 800 and the Native American Graves Protection and Repatriation Act have been completed.
#3	Site-specific implementation measures to protect or enhance heritage resources will be determined at the time of project implementation.

Attachment 4: Vegetation Treatment Options

Table 63. Vegetation treatment options for stand initiation or even-aged treatments (up to 95,000 acres)

Adaptive Management: Vegetation Treatment Options	Regeneration Objective	% Overstory Removal	Current[1] Mortality	Current Insect and Disease level	Site Prep	Slash treatment
Clearcut: This treatment can remove all the trees from the stand, producing a fully exposed microclimate for the development of a new age class.	Yes (even-aged)	Up to 100%	50 to 100%	Moderate to high	Yes	Varies
Coppice: This treatment removes all of the trees (aspen) from the stand and the majority of the regeneration that occurs is from sprouts or root suckering.	Yes (even-aged)	Up to 100%	50 to 100%	Moderate to high	Yes	Varies
Stand-replacing prescribed fire: This treatment kills all or most of the living canopy (trees). It produces a fully exposed microclimate and initiates succession or regrowth.	Yes (even-aged)	Up to 100%	50 to 100%	Moderate to high	Yes	Varies
Final shelterwood removal cut: This treatment releases established regeneration from the competition with the overstory after there is no longer a need for shelter under the shelterwood regeneration method.	Yes (even-aged)	Up to 100%	50 to 100%	Moderate to high	Yes	Varies
Seed tree cut (preparatory): This treatment removes trees to enhance conditions for seed production, develop wind firmness for a future seed-tree seed cut, or both.	Yes (even-aged)	Up to 100%	50 to 100%	Moderate to high	Yes	Varies
Overstory removal: This treatment removes trees constituting an upper canopy layer to release understory trees. The primary source of regeneration is advanced reproduction.	Yes (even-aged)	Up to 100%	50 to 100%	Moderate to high	Yes	Varies
Two-aged clearcut: This two–aged regeneration harvest removes sufficient trees to produce an exposed microclimate for the development of a new age class.	Yes (even-aged)	Up to 90%	50 to 100%	Moderate to high	Yes	Varies

Adaptive Management: Vegetation Treatment Options	Regeneration Objective	% Overstory Removal	Current[1] Mortality	Current Insect and Disease level	Site Prep	Slash treatment
Two-aged coppice cut: This treatment for aspen stands removes the majority of trees from a stand, leaving at least 10 percent. The majority of the regeneration that occurs is from sprouting or root suckering.	Yes (even-aged)	Up to 90%	50 to 100%	Moderate to high	Yes	Varies

[1] Calculations of the percentage of current mortality could include fire, blowdown, insect and disease, and other natural disturbance events.

Table 64. Vegetation treatment options for uneven-aged or intermediate treatments (up to 165,000 acres)

Adaptive Management: Vegetation Treatment Options	Regeneration Objective	% Overstory Removal	Current[1] Mortality	Current Insect and Disease level	Site Prep	Slash treatment
Shelterwood preparatory cut: This treatment removes some overstory trees except those needed for shelter or seed production. It prepares the seed bed and creates a new age class in a moderated microenvironment.	Yes (even-aged)	Up to 40%	30 to 49%	Low to moderate	Yes	Lop and scatter
Shelterwood establishment cut: This treatment removes some overstory trees except those needed for shelter or seed production. It prepares the seed bed and creates a new age class in a moderate microenvironment.	Yes (even-aged)	Up to 80%	30 to 49%	Low to moderate	Yes	Lop and scatter
Thinning: The objectives vary depending on the objectives for the stand. Objectives may include promoting a healthier stand, reducing forest fuels associated with high-severity wildfires, producing future sawtimber, or creating conditions suitable to meet future wildlife habitat, such as old growth forest	No	varies	30 to 49%	Low to moderate	Not usually	Lop and scatter
Sanitation: The objective is to remove trees infected with undesirable insects or diseases to reduce the likelihood of insects or diseases spreading to other trees in the stand. After treatment, a fully stocked stand with a reduced amount of insects and diseases remains.	Not usually but may occur	varies	30 to 49%	Low to moderate	Not usually	Varies
Improvement cut: The objective is to harvest less desirable trees of any species in a stand of poles or larger trees, primarily to improve the composition and quality of the remaining trees.	No	Less than 30%	30 to 49%	Low to moderate	Not usually	Varies

Adaptive Management: Vegetation Treatment Options	Regeneration Objective	% Overstory Removal	Current[1] Mortality	Current Insect and Disease level	Site Prep	Slash treatment
Liberation cut: The objective is to remove older overtopping trees that are competing with desired sapling trees.	No	Up to 100%	30 to 49%	Low to moderate	Not usually	Varies
Release and weed: The objective is to remove undesirable competing vegetation from stands of young desirable trees.	No	Less than 30%	30 to 49%	Low to moderate	Not usually	Varies
Non-stand-replacing prescribed fire (broadcast burning, jackpot burning): In this prescribed burning activity, fire is applied to most or all of an area (broadcast burning) or concentrations of fuels (jackpot burning) within well-defined boundaries for reduction of fuel hazard, as a resource management treatment, or both.	Possible	Less than 30%	30 to 49%	Low to moderate	Not usually	Does not apply
Uneven-aged group selection: The objective is to cut small groups within stands to establish new age classes.	Yes (uneven-aged)	100% in groups	30 to 49%	Low to moderate	Varies	Varies
Uneven-aged, single-tree selection: The objective is to uniformly remove individual trees of all size classes throughout a stand, creating or maintain a multi-age structure to promote the growth of remaining trees and to provide space for regeneration.	Yes (uneven-aged)	Less than 30%	30 to 49%	Low to moderate	Not usually	Lop and scatter

[1] Calculations of the percentage of current mortality could include fire, blowdown, insect and disease, and other natural disturbance events.

Table 65. Vegetation treatment options for green tree, shrub, and grassland treatments (up to 100,000 acres)

Adaptive Management: Vegetation Treatment Options	Regeneration Objective	% Overstory Removal	Current[1] Mortality	Current Insect and Disease level	Site Prep	Slash treatment
Conifer removal from aspen, shrub, or meadows: The objective is to remove conifers from aspen, shrub, or meadow areas where large numbers of conifers have not historically occurred; to enhance aspen stands, shrubs, or meadows; or both.	No	Varies	Does not apply	Does not apply	No	Varies
Mountain shrub and sage brush treatment: The objective is to reduce shrub cover in stands of dense or decadent shrubs using prescribed fire or mechanical methods. Treatment will increase age class diversity of shrubs, create a greater mosaic of openings in the shrub canopy, and promote increased cover and production of grasses and forbs.	Varies	Does not apply	Does not apply	Does not apply	Possible	Varies
Grass and forb treatment: The objective is to remove decadent areas of grass and forbs and increase grass and forb production.	Yes	n/a	Does not apply	Does not apply	Possible	Does not apply
Coppice cut: This treatment removes all the aspen trees from the stand. The majority of the regeneration that occurs is from sprouts or root suckering.	Yes (even-aged)	Up to 100%	Less than 30%	Does not apply	Varies	Varies
Two-age coppice cut: This treatment removes the majority of aspen trees from a stand, leaving at least 10 percent. The majority of the regeneration that occurs is from sprouting or root suckering	Yes (even-aged)	Up to 90%	Less than 30%	Does not apply	Varies	Varies
Shelterwood preparatory cut: This treatment removes some overstory trees except those needed for shelter or seed production. It prepares the seed bed and creates a new age class in a moderated microenvironment.	Yes (even-aged)	Up to 40%	Less than 30%	Low to moderate	Yes	Lop and scatter
Shelterwood establishment cut: This treatment removes some overstory trees except those needed for shelter or seed production. It prepares the seed bed and creates a new age class in a moderated microenvironment.	Yes (even-aged)	Up to 80%	Less than 30%	Low to moderate	Yes	Lop and scatter

Adaptive Management: Vegetation Treatment Options	Regeneration Objective	% Overstory Removal	Current[1] Mortality	Current Insect and Disease level	Site Prep	Slash treatment
Thinning: The objectives vary depending on the objectives for the stand. Objectives may include promoting a healthier stand, reducing forest fuels associated with high-severity wildfires, producing future sawtimber, or creating conditions suitable to meet future wildlife habitat, such as old growth forest	No	Varies	Less than 30%	Low to moderate	Not usually	Lop and scatter
Sanitation: The objective is to remove trees infected with undesirable insects or diseases to reduce the likelihood of insects or diseases spreading to other trees in the stand. After treatment, a fully stocked stand with a reduced amount of insects and diseases remains.	Not usually but may occur	Varies	Less than 30%	Low to moderate	Not usually	Varies
Salvage: The objective is to harvest trees that have experienced mortality or damage from a fire, flood, wind event, insects and diseases, or other natural disaster.	Not usually but may occur	Varies	Less than 30%	Low to moderate	Not usually	Varies
Improvement cut: The objective is to harvest less desirable trees of any species in a stand of poles or larger trees, primarily to improve the composition and quality of the remaining trees.	No	Less than 30%	Less than 30%	Low to moderate	Not usually	Varies
Liberation cut: The objective is to remove older overtopping trees that are competing with desired sapling trees.	No	Up to 100%	Less than 30%	Low to moderate	Not usually	Varies
Release and weed: The objective is to remove undesirable competing vegetation from stands of young desirable trees.	No	Less than 30%	Less than 30%	Low to moderate	Not usually	Varies
Non-stand-replacing prescribed fire (broadcast burning, jackpot burning): This treatment is a prescribed burning activity where fire is applied to most or all of an area (broadcast burning) or concentrations of fuels (jackpot burning) within well-defined boundaries for reduction of fuel hazard, as a resource management treatment, or both.	Possible	Less than 30%	Less than 30%	Low to moderate	Not usually	Does not apply
Uneven-aged group selection: The objective is to cut small groups within stands to establish new age classes.	Yes (uneven-aged)	100% in groups	Less than 30%	Low to moderate	Varies	Varies

Adaptive Management: Vegetation Treatment Options	Regeneration Objective	% Overstory Removal	Current[1] Mortality	Current Insect and Disease level	Site Prep	Slash treatment
Uneven-aged, single-tree selection: The objective is to uniformly remove individual trees of all size classes throughout a stand creating or maintain a multi-age structure to promote the growth of remaining trees and to provide space for regeneration.	Yes (uneven-aged)	Less than 30%	Less than 30%	Low to moderate	Not usually	Lop and scatter

[1]Calculations of the percentage of current mortality could include fire, blowdown, insect and disease, and other natural disturbance events.

Attachment 5. Project Implementation Checklist

Project:				**District:**	
NEPA Document:				**Sign Date:**	
Responsible Official:				**Title:**	
Partnership Project:		**Primary Partner(s):**			
Project Objective(s):					
Accounting Unit:			**Accounting Unit:**		
Project Description and Location					
Data File Location(s):					

Available Treatment Acres from Proposed Action					
Stand Initiation:		**Intermediate:**		**Other Treatment(s):**	
Project Treatment Acres					
Stand Initiation:		**Intermediate:**		**Other Treatment(s):**	
Treatment Type	**Treatment Acres**	**Treatment Type**	**Treatment Acres**	**Treatment Type**	**Treatment Acres**

Management Area Acreage			
Management Area	**Treatment Acres**	**Management Area**	**Treatment Acres**

Specified Road Work (Type)	**Miles**

Temporary Road Mileage Available	**Project Temporary Road Mileage**	**Balance of Temp Roads**

All temporary road mileage is estimated. Actual road miles would be tracked and recorded during administration of sales/projects.

Resource	No Design Features are required to meet resource needs.	Design Features were implemented as designed in Decision.	Site specific or alternative design features are recommended (See attached documentation)	Signature / Date
Botany	☐	☐	☐	
Engineering	☐	☐	☐	
Fire and Fuels	☐	☐	☐	
Fisheries	☐	☐	☐	
Heritage	☐	☐	☐	
Hydrology	☐	☐	☐	
Lands and Special Uses	☐	☐	☐	
Noxious Weeds and Invasives	☐	☐	☐	
Range	☐	☐	☐	
Recreation	☐	☐	☐	
Scenery	☐	☐	☐	
Soils	☐	☐	☐	
Boundary Survey	☐	☐	☐	
Timber and Silviculture	☐	☐	☐	
Wildlife	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	

Your signature acknowledges participation in the review, implementation, or both of this project.

Proposed By: _____ _____

Project Manager **Date**

Reviewed By: _____ _____

NEPA Coordinator **Date**

☐ **Approve proceeding with project. All resource concerns have been mitigated as recommended and project is within the effects analyzed.**

☐ **Approve proceeding with project. Resource concerns could not be mitigated fully but project is still within effects analyzed under decision. Justification for proceeding is included in supplemental information.**

☐ **Do not proceed with project. Conditions since initialization of the project have changed substantially and need to be reassessed. Justification is attached.**

Approved By: _____ _____

District Ranger **Date**

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