CHAPTER 2 – ISSUES & ALTERNATIVES

LANDSCAPE RESTORATION & STEWARDSHIP PLAN (*DRAFT NOVEMBER 2012*)

In their procedures for implementing NEPA the Council for Environmental Quality (CEQ) directs agencies to "*…study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources*…" and refers to the alternatives section as "*the heart of the Environmental Impact Statement*." Considering reasonable alternatives to a proposed action is certainly at the heart of the type of critical thinking that embodies good decision-making.

> "Even in high school, a rule that permits only one point of view to be expressed is less likely to produce correct answers than the open discussion of countervailing views."
>
> - John Paul Stevens, Senior Associate Justice of the U.S. Supreme Court
> MORSE V. FREDERICK (2007)

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2.1 INTRODUCTION

This chapter includes:

- Issues – A list and description of the issues and concerns associated with the proposed action. Issues provide the basis for the development of mitigating measures and alternative actions, and help to focus the analysis.
- Performance Requirements – The laws, policies, procedures, and mitigating measures that guide or constrain management activities.
- Alternatives – Including:
  - Alternatives Eliminated from Detailed Analysis – Alternatives that we have eliminated from further consideration and a brief explanation for their elimination.
  - The "No Action" Alternative – required by NEPA, this alternative establishes a basis for comparing the costs and outcomes of taking no action with those of any action alternative.
  - Action Alternatives – A detailed description of the action alternatives.
- Adaptive Management – Goals, objectives and monitored outcomes that we plan to use to evaluate our progress, measure the effects and effectiveness of our actions, and indicate any needed adjustments.
- Alternatives presented in a comparative form – This administrative draft is being made available for an early public review. At this time, this section only includes actions and costs. The outcomes from the environmental analysis will be included here in the Draft EIS.

2.2 ISSUES & KEY ISSUES

Issues are the possible conflicts that may arise between the proposed use and allocation of resources or potential (adverse) environmental impacts that are likely to result from the proposed action.

Identifying issues is the basis for developing performance requirements that guide or constrain management practices to avoid potential adverse impacts. Issues that cannot be adequately addressed by performance requirements are considered *key* issues. Identifying key issues is the basis for developing alternatives to the proposed action and helps us to focus the analysis. Issues are also an important element for developing monitoring plans and thresholds for adjusting future actions (adaptive management).

Identifying issues early on helps us to focus the analysis on the subject matter most relevant to the decision(s) to be made. Issues related to the proposed Stewardship Plan were identified through

interdisciplinary analysis and public involvement. Table 2.1 belowpresents the issues, including key issues, and indicates whether the issue is addressed through the proposed action, performance requirements, alternative development, a focus of the environmental analysis, or through adaptive management.

Issues

Table 2.1- Issues

Issues (* Indicates Key Issue)	Issue Statement	Response
Composition & Structure		
Mortality from prescribed fire	In some areas fire adapted species composition (ponderosa pine, Douglas-fir) transitioned to fire intolerant composition (white fir, blue spruce). In these stands, the proposed use of wildland fire may cause uncharacteristic levels of mortality.	- Proposed action - Performance requirements
*Successful aspen regeneration	Aspen may regenerate successfully following treatments, but browsing by elk may limit its recruitment into the overstory.	- Alternative action - Performance requirements - Adaptive management
White pine blister rust	White pine blister rust, an exotic rust fungus, has been found near the preserve.	- Performance requirements
Introduction of noxious weeds	Activities and equipment used in restoration can introduce or spread noxious weeds/invasive plants.	- Proposed action - Performance requirements
Spread of noxious weeds	Treatments adjacent to current populations of weeds could create opportunities for weeds to spread into forest and grasslands.	- Performance requirements
Effects from herbicides	Proposed use of herbicides have the potential to directly and indirectly affect composition	- Performance requirements - Environmental analysis
Climate Change		
Effects to climate	Wildland fire and vegetation management can create greenhouse gases (GHG) and affect the movement and sequestration of carbon.	- Proposed action - Performance requirements - Environmental analysis - Adaptive management
Response to climate change	Restoration activities can affect how an ecosystem responds to climate change – both trends and events.	- Proposed action - Performance requirements - Environmental analysis - Adaptive management
Habitats & Biodiversity		
*Jemez Mountain Salamander habitat	Snags and downed logs provide essential habitat for the Jemez Mountains Salamander (candidate species for listing under the ESA) and many other animals. Restoration treatments provide opportunities protect these features and to increase overall habitat heterogeneity and biodiversity.	- Performance requirements - Adaptive management

	However; these features are conversely susceptible to destruction from restoration treatments, especially fire.	
Northern goshawk	Prescription guidelines thought to protect or optimize forest structure for the Northern goshawk are complex and difficult to communicate to contractors.	- Performance requirements - Adaptive management
Direct effects to neotropic migratory birds, northern goshawk, Mexican spotted owl	Forest thinning or prescribed fire activities, aimed at improving and protecting habitat for the species, may pose short-term, negative impacts to individual birds when implemented in the spring.	- Performance requirements - Environmental analysis
Herbicide use	Herbicides may negatively affect non-target species and aquatic habitats.	- Performance requirements - Environmental analysis
Soils		
Ground disturbance	Treatment or removal of biomass can impact soils leading to erosion or changes in productivity.	- Performance requirements
Fire effects	Fire can affect soils directly and indirectly.	- Performance requirements - Environmental analysis
Cultural Resources		
Ground disturbance	Restoration activities proposed include direct and indirect actions that may potentially affect cultural resources including the use of fire and ground disturbing activities.	- Performance requirements - Adaptive management
Fire effects	Burning could damage fire-sensitive cultural resources such as field houses, shrines, and wooden structures and corrals, or alter culturally meaningful forest configurations or other traditional cultural properties.	- Performance requirements - Adaptive management
Hydrology		
Increased sediment	The proposed action could have short-term impacts to stream condition and water quality, even when long-term benefits are ultimately achieved.	- Performance requirements - Adaptive management - Environmental analysis
Biomass Disposal		
Markets	Market conditions fluctuate creating uncertainty regarding utilization.	- Proposed action - Adaptive management
Mastication	Long-term impacts of mastication are not well understood.	- Performance requirements - Adaptive management
Cost Benefit Ratio		
*Prescribed fire vs. mechanical treatments	Costs and benefits vary between treatments	- Alternatives
Biomass Disposal	Costs and benefits (monetary and non-monetary) vary between biomass disposal options.	- Performance requirements - Environmental analysis

Wildland Fire Management		
Smoke	Smoke from prescribed burning has the potentially to affect individuals and communities.	- Performance requirements
Firefighter and public safety	Fire and smoke can present a hazard to the public and fire fighters.	- Performance requirements
Risk management	Any use of fire includes the risk of escape and wildfire.	- Performance requirements
Management actions	Actions used to control fire including construction of control lines and use of hand tools are sometimes unplanned and are ground disturbing.	- Performance requirements
Aerial retardant	Aerial retardant used as an emergency control method (unplanned) can impact fish and wildlife, cultural, features, scientific instruments, facilities and infrastructure	- Performance requirements
Preserve Operations		
Livestock grazing	Livestock grazing either before or following treatments may negatively affect the success of restoration efforts.	- Performance requirements
Public access	Public access and use may negatively affect restoration or monitoring activities.	- Performance requirements
Public access	Permanent and temporary monitoring equipment and instrumentation may be vulnerable to theft and vandalism.	- Performance requirements
Sensory Resources	Restoration activities may affect the sights and sounds of the preserve.	- Performance requirements - Environmental analysis
Sensory Resources	Monitoring activities including exclosures and instrumentation may have long-term negative visual effects.	- Performance requirements - Environmental analysis

Key Issues

As indicated (*) in Table 2.1- Issues, we have identified three key issues:

SUCCESSFUL ASPEN REGENERATION

There is uncertainty regarding aspen management including whether aspen is declining in the southern Rockies, the precise combination of factors for successful regeneration, and the scale of treatment necessary to overcome browsing by elk.

Under the proposed action, the priority for treatments would be ecosystems adapted to frequent, low intensity fire and forests with the greatest fire behavior potential. While some forests likely to regenerate with aspen would be treated, treatment for the purpose of regenerating aspen would not be prioritized. An alternative restoration strategy is also being considered where the priority for treatments would be ecosystems adapted to frequent, low intensity fire and forests most likely to respond with aspen regeneration. While some forested areas with higher fire behavior potential would be treated, fire behavior potential would not drive prioritization.

The environmental analysis will take a hard look at the tradeoffs between these two approaches to prioritizing treatments on a landscape.

CRITICAL HABITAT CHARACTERISTICS

Snags and downed logs provide essential habitat for many animals, but these features are susceptible to destruction from restoration treatments, especially fire. However, restoration treatments would protect these features from wildfires and provide opportunities to increase habitat heterogeneity and biodiversity.

While mitigation measures are being proposed to reduce the loss of these critical habitat features, some loss of individual features is nearly certain. In a typical national forest setting, one would expect moderate degrees of loss to be replaced by future recruitment. However; on the preserve large and old live trees are nearly as rare as large down logs and snags. Without hazard reduction and restoration actions, recruitment of large and old trees is unlikely and the potential for complete loss of these characteristics to occur in localized context from wildfire continues.

The environmental analysis will predict the potential loss associated with each alternative and monitoring and evaluation actions will be used to validate these critical predictions.

COST/BENEFIT

Costs versus benefits received vary between treatments. The environmental impact analysis will provide a prediction of costs and outcomes that will be evaluated through adaptive management.

2.3 PERFORMANCE REQUIREMENTS

Performance requirements include laws, policies, procedures, and mitigation measures that guide or constrain our actions. Mitigation measures are best management practices intended to eliminate or reduce the context or intensity of potential adverse impacts on resources or values. Performance requirements apply to all action alternatives.

Laws

- Omnibus Public Lands Management Act of 2009
- Valles Caldera Preservation Act of 2000 as amended
- Endangered Species Act of 1973
- Clean Water Act of 1972 as amended
- Clean Air Act of 1970 as amended
- National Environmental Policy Act of 1969 as amended
- National Historic Preservation Act of 1966 as amended
- The Migratory Bird Treaty Act, signed in 1918, amended in 1936, 1974 and 1989

Policies

- Federal Wildland Fire Management Policy and Implementation Guidelines Interagency (Revised 2009)
- Prescribed Fire Planning and Implementation Guide (Revised 2009)
- NWCG 310-1Wildland Fire Qualifications System Guide (Revised 2009)
- VCT Wildland Fire Management Policy

Procedures

- The National Environmental Policy Act Procedures for the Valles Caldera Trust, Federal Register, July 2003
- VCT Cultural Resource Clearance Process (VCT internal protocol, unpublished)
- VCT Interdisciplinary Clearance Process (VCT internal protocol, unpublished)

Mitigations

The following mitigating measures are designed to reduce the context and intensity of potential adverse impacts or, to optimize potential benefits. The measures are organized by area of impact.

VEGETATION COMPOSITION AND STRUCTURE

- Silvicultural prescriptions and contract specifications for thinning shall include selection (leave tree or cut tree) based on tree form, species, size, and forest structure.
- Sample mechanically treated areas, photos, or sample marked areas can be used to communicate structural objectives regarding “groups” and “clumps”. Other techniques may be incorporated.

- Prescriptions shall emphasize the retention of large[1] and old trees (characteristic bark and crown). Large trees can only be cut if their presence would negatively impact future health and vigor due to genetics or host status (poorly formed, fire intolerant, diseased, mistletoe infected, insects); or the location presents a threat to facilities or public safety (hazard trees).
    - Large trees may be designated for cutting in prescriptions but all such trees must be marked with paint or other impervious method for removal.
- Prescriptions shall emphasize the retention of large snags and down logs. A large snag can only be cut if it presents a threat to facilities, or to public or worker safety (hazard trees), or would contribute to control problems during prescribed fire activities. If a large snag is cut for the above reasons, it shall be retained as large down log.
- Mechanical and prescribed fire treatments can be implemented in two entries in significantly departed forests based on soils to reduce the intensity of impacts.
- Healthy white pine shall be favored as leave trees. This will ensure the greatest degree of genetic diversity is retained within the white pine species and offer protection from white pine blister rust.
- Mid- to long-term, small, or large elk exclosures can be erected to allow aspen to mature or facilitate monitoring following treatments.

VEGETATION MANAGEMENT FOLLOWING UNPLANNED EVENTS (INSECTS, WIND THROW, WILDLAND FIRE, DISEASE)

- All performance requirements shall apply to areas treated in response to an unplanned event.
- The following, additional requirements will also apply:
    - On slopes less than or equal to 30 percent where mastication or removal of killed trees is occurring, five large (or largest available) logs per acre shall be left for wildlife.

NOXIOUS WEED PREVENTION AND CONTROL

- For all projects resulting in ground disturbance, the ICP document, contract, or agreement must identify noxious weed control measures that must be undertaken during project implementation.
- Measures taken to avoid the spread of noxious weeds through operations would include but may not be limited to:

[1] "Large" is a measure of tree diameter. This EIS defines a large tree (standing live or dead) as having a diameter greater than 16 in. when measured 4.5 feet above the ground on the uphill side (diameter at breast height or dbh); a large log is defined as having a diameter greater than or equal to 12 in. measured at the large end.

- When the risk of spread is moderate or high (Appendix B), noxious weed treatment would be required prior to project implementation.
- The occurrence of noxious weeds either within or in close proximity to a project area shall be identified during operational planning.
- All ground disturbing activities in areas known to have, recently had, or are adjacent to, non-native thistles shall take place before flower buds appear on the plants so seeds are not spread by the wind.
- Establish plant cover and increase recovery on all heavily disturbed areas as needed such as decommissioned roads, landings, and main skid trails by the following methods: (1) Seed with native grass seed and non-persistent/non-allopathic cereal grains, (2) place fine and coarse slash material as mulch, and/or (3) increase soil porosity by ripping.

- To prevent the spread of noxious weed species, construction equipment shall be cleaned of dirt and mud that could contain weed seeds, roots, rhizomes, or other plant propagative parts. The tracks, feet, tires, and undercarriage shall be carefully washed, and special attention shall be paid to axles, frame, cross members, motor mounts, underneath steps, running boards, and front bumper/brush guard assemblies.
- Prior to entering the preserve, equipment shall be inspected to ensure they are free of any dirt or mud that could contain weed seeds, and any plant propagative parts.
- Other construction vehicles (e.g. pick-up trucks) that shall be frequently entering and exiting the site shall be inspected and washed on an as-needed basis.
- Equipment cleaning shall be included in contracts, agreements, and other operational plans in order to reduce introduction of weeds to and transport from the project area by removing dirt, plant parts, and material that may carry weed seeds.
- Vehicles and equipment used in known weed infested areas shall be washed before leaving the work area.
  - Cleaning stations would use either high-pressure water or air to remove dirt and mud from equipment and vehicles.
  - Use certified weed free sources of seeds and other plant material for revegetation and erosion control. Use local seed when possible.
  - Gravel used for road maintenance (if needed) shall be weed free. Use local gravel sources when possible.
  - Certify all mulching agents such as hay or straw as weed free. Create mulch from on-site material when possible.
  - Use weed free sources of feed for preserve horses.
  - Livestock that shall graze on the VCNP should be held in a single pasture for at least three days so that any weed seeds within their digestive systems may pass in a contained area before livestock are turned out to pasture (Rounds 1998).
- Livestock to be housed and grazed on the preserve shall be fed feed that is certified as weed free for at least three days prior to entry.

- Only certified noxious weed free feed shall be used on the VCNP.
- Certified noxious weed free hay must be identified by one of the following:
  - State certification tag attached to the bale string;
    - Forage Tag Minimum Requirements:
    - The words “North American Weed Free Forage Certification Program".
    - A number system (for tracking purposes).
    - Province/state of issue.
    - Province/state telephone number (responsible official).
    - A statement that the product is "Certified to the North American Standards".
  - At least one strand of purple and yellow (intertwined) bale twine encircling the bale; blue and orange (intertwined) bale twine encircling the bale; or other colored twine encircling the bale that is used to designate certified forage.
  - Certified noxious-weed-free compressed forage bales are identified by yellow binding (strapping) material with the statement "ISDA NWFFS" and the manufacturer's name printed in purple.
  - Certified noxious-weed-free forage in bags is identified by a stamp, sticker, or printing on the bag identifying it as certified forage.

HERBICIDE USE

- Herbicides shall be applied consistent with label guidance.
- Herbicide applications shall target only classified noxious weeds.
- Target plants are to be sprayed by wetting exposed surfaces and avoiding non-target plants.
- Only licensed personnel may apply herbicides.
- Contract and Federal workers are required to meet Federal Worker Protection Standards (40 CFR Part 170) and existing State of New Mexico Regulations, including the use of protective clothing. Safety procedures and Material Safety Data Sheets must be reviewed by personnel prior to herbicide applications.
- Procedures for spill cleanup and emergencies must be established by the project leader and conveyed to each applicator prior to fieldwork.
- When no aquatic label is available, an herbicide shall not be applied in a wet or riparian area or where it could be washed into a wet or riparian area.
- All storage, mixing, or backpack refilling of herbicides must be located away from open water in a central location.
- Individual spray containers must be filled from a single source and may be transported to the weed infestation sites by motor vehicle if secured in transport.

- The area must be posted during application, restricting human access to the treatment area until the spray solution has completely dried.

HABITATS AND BIODIVERSITY

- Best Management Practices for the protection of Jemez Mountains Salamander (JMS) are being collaboratively developed. Once finalized, these practices shall be incorporated as performance requirements.
- Suitable habitat for JMS shall be considered occupied for the purpose of implementing performance requirements.
- Thinning contracts and specifications shall include the protection of large snags and logs as well as stumps.
- Use of heavy equipment/ground disturbing activities shall be curtailed in suitable JMS habitat during the summer monsoonal season.
- Prescribed burn plans shall include the following to protect large down woody debris including stumps and snags"
  - Prescription parameters that minimize consumption of large down woody debris.
  - Lighting techniques that reduce the ignition of large down woody debris and snags.
  - Pre-burn treatments such as removing concentrations of fuel surrounding large woody debris and snags.
  - Pile burning shall be curtailed when salamanders could be directly impacted i.e. piles are on likely salamander locations, within suitable habitat, conditions are saturated and salamanders could be active (spring, summer, or early fall).
- A 300-foot aerial retardant avoidance buffer shall be applied to waterways, wet meadows and wetlands. The only exception to the application of aerial retardant within the mapped avoidance area is for the protection of firefighter or public safety.(USDA-Forest Service 2012)
- Proposed management activities planned within suitable nesting/breeding habitat for Mexican spotted owls and northern goshawk should occur October 1 through February 28 to avoid disturbance during breeding season. If surveys (goshawk, Mexican spotted owl), according to protocol, are done in May/June and were negative for response, and no nests are discovered, then management activities can proceed with no seasonal restrictions.
- Appropriate seasonal restrictions for wildlife (Jemez Mountains Salamanders, Mexican spotted owls, neotropic migratory birds, northern goshawk) shall be considered and documented within the interdisciplinary clearance process for project activities.
- Plans to capture birds, reptiles, rodents, fish, and mammals for research, inventory, or monitoring shall identify mitigation measures to ensure actions are humane.

SOIL AND EROSION

- Action alternatives identify activities appropriate on various soil types and slopes based on mapping. Any finer scale assessment that would permit a treatment on an area mapped otherwise unsuitable must be documented in the ICP.
- Hazard reduction or other less intensive thinning prescriptions shall be used in lieu of restoration prescriptions on steeper slopes and sensitive soils.
- Effects resulting from on site mastication are not well known – may be adverse and/or beneficial.
  - Where practical, remove a portion of the biomass prior to mastication.
  - Thinning intensity may be limited to reduce the amount of biomass created.
  - Where practical, masticate only a portion of the biomass (i.e. only tops and branches or only material under 6 in. diameter.)
  - Mulching or masticating equipment should be set to operate no closer than 3”to the ground surface.
  - Where practical, move biomass to roadbed or other currently unproductive site for mastication.
  - Incorporate new mitigating measures, as new information is available.
- Only tops and branches or material less than or equal to 6 in. diameter at the large end should be burned in piles.
- No heavy equipment is to be operated on slopes greater than 30 percent.
- Requests for proposals and contract award criterion shall favor awards to practices and equipment that reduce impacts to soils where practicable.
- Biomass removal performance requirements:
  - Skidding or dragging logs and slash should be minimized; thinned material should be elevated off the ground where practicable.
  - Contracts shall provide for the designation of trails and roads and other mitigations to limit the context and intensity of equipment impacts.
  - Contracts shall include parameters for curtailing equipment use based on moisture and soils including limiting operations to dry or frozen ground when appropriate.
- Prescribed fire burn plans shall include prescription parameters to reduce impacts to soils
  - Prescriptions to limit consumption of duff
  - Prescription parameters to limit hydrophobicity
  - Removing or rearranging (lopping and scattering) fuels prior to prescribed burning
  - Ignition patterns to reduce fire intensity and consumption
- Road management activities shall include BMP’s (best management practices) to limit short term impacts to soils including:
  - Erosion control plan
  - Timing of construction activities
  - Road slope stabilization

- Control of road drainage
- Maintenance of roads
- Control of sidecast material
- Traffic control during wet periods
- Timely erosion control measures on incomplete roads and water crossings
- Road Surface Treatment to prevent loss of materials
- Construction of stable embankments (fills)
- Restoration of borrow pits and quarries

CULTURAL RESOURCES

- The VCT Cultural Resources Compliance Process (CRCP) shall be completed prior to on-the-ground implementation of any ground disturbing activity (any scale).
  - Identify and implement Tribal consultation requirements
  - Identify and implement inventory requirements.
  - Identify and implement site-specific protection measures in addition to performance requirements.
- The following general recommendation shall be applied to all mechanical treatment unless otherwise stated in the CRCP:
  - Significant sites shall be avoided by: ground based equipment (hand thinning would be permitted), piling or stockpiling logs or slash, skid trail identification, mechanized removal of forest products, parking or driving vehicles, staging equipment.
  - Trees shall be directionally felled away from sites features.
  - Thinned material shall be carried off of the site.
  - Site boundaries shall be clearly marked with while tape, white flagging, or t-posts.
  - All activities shall be restricted to the areas surveyed and cleared. Changes to a project boundary must be surveyed and cleared prior to implementation.
- The following general recommendations shall be applied to all planned ignitions of wildland fire unless otherwise stated in the CRCP:
  - Surveys shall identify fire sensitive cultural resources
  - CRCP completed for planned ignitions shall address connected activities (parking, staging of vehicles and equipment, construction of control lines or fuelbreaks etc.)
  - Briefings shall include necessary maps and information to ensure personnel can avoid activities in or on sites.
  - Prescriptions shall be developed to limit consumption of duff where subsurface artifacts are likely.
  - Removing or rearranging fuels within cultural resource sites prior to burning to reduce fire severity.
  - Ignition patterns to reduce fire severity.

- Known cultural resources likely to be damaged by the aerial delivery of retardant have been included on the mapped avoidance areas (Appendix XX) as points where the direct delivery of retardant should be avoided.

WATER QUALITY AND RIPARIAN HABITATS

- Use hand tools including chainsaws in lieu of heavy equipment in riparian areas.
- Where heavy equipment is being used to restore stream channels, create water-crossings, decommission roads, create exclosures, or other beneficial restoration work; project plans shall specify access, rehabilitation, and short-term actions to minimize erosion.
- When closing, maintaining, or decommissioning roads on hill slopes or former wet meadows the roadbed should be out sloped to allow water to drain evenly across the road.
- Bar ditching and use of culverts to drain the uphill sides of roads should be avoided and replaced by outsloping, and using rolling dips to improve drainage.
- Road management activities shall include best management practices to limit short term impacts to soils including:
  - Erosion control plan
  - Timing of construction activities
  - Road slope stabilization
  - Control of road drainage
  - Maintenance of roads
  - Control of sidecast material
  - Traffic control during wet periods
  - Timely erosion control measures on incomplete roads and water crossings
  - Road Surface Treatment to prevent loss of materials
  - Construction of stable embankments (fills)
  - Restoration of borrow pits and quarries
- Where streamside vegetation is likely to burn in a prescribed fire, the prescribed burn plan shall include mitigating measures such as:
  - Prescription parameters for live fuel moisture content or “greenness” of riparian vegetation.
  - Ignition patterns to limit spread of fire in riparian areas.
  - Buffers to keep fire outside of riparian areas.
- The application of aerial retardant in or within 300 feet of waterways, wet meadows, or wetlands will only be permitted when human life or safety is threatened and the application of aerial retardant is reasonably likely to alleviate that threat.

AIR QUALITY

- Planned ignitions of wildland fire shall include prescription parameters designed to reduce the consumption of large woody debris and duff.

- Biomass piled for burning shall limit the size of piled material to a maximum of 6 in. diameter at the large end.

SOCIOECONOMIC BENEFITS TO LOCAL BUSINESSES AND COMMUNITIES

- Requests for proposals and contract bids shall incorporate methods to value benefits to local businesses and communities as practical, lawful, and consistent with over all competitiveness and efficiencies.
- Mechanical treatments should consider suitability for removal in selecting treatment areas.
- Consider opportunities for public firewood use and Christmas tree removal prior to prescribed burning.
- Collaboration with the SWJML and other governmental and non-governmental entities should continue in order to expand outreach regarding potential utilization opportunities.

CLIMATE CHANGE

- Environmental consequences and comparisons are based on current information and assumptions and reasonable predictions. The ICP shall be used to affirm that new information does not significantly alter the assumptions of this analysis.
- Prescription parameters addressing structure, composition, prescribed fire season, and environmental parameters shall consider changing climate and incorporate new information.

WILDLAND FIRE MANAGEMENT

- Prescribed fire shall be planned and implemented in compliance with the Interagency Prescribed Fire Planning and Implementation Guide (USDA/USDOI 2008).
- Prescribed burn plans shall include the following elements:
  - Description of the prescribed fire area and maps
  - Environmental prescription and parameters
  - Burn objectives and fire behavior prescription and parameters
  - Complexity analysis
  - Personnel organization, qualifications, and assignments
  - Communications plan
  - Ignition plan
  - Monitoring plan
  - Holding Plan
  - Contingency Plan and Assignments
  - Safety and Medical Plan
  - Wildfire Conversion
  - If aerial ignition devices shall be used, include an aerial ignition plan

MANAGING PRESERVE ACTIVITIES

- Livestock grazing may be restricted in time and place to promote the success of restoration and monitoring activities.
- Public access may be restricted in time or place to promote the success of restoration and monitoring activities or to protect equipment and instruments.
- Public access may be restricted in time or place to provide for public safety.
- The public shall be informed about ongoing restoration activities that may affect the quality of their recreation experience.
- Restoration activities may be restricted on holidays, weekends, or special events when they would adversely affect the quality of visitors' experience or impact public safety.
- The ICP shall include a review by recreation staff prior to implementation.

SENSORY RESOURCES

- Mitigate visual impacts of prescribed fire in major views:
  - Limit patches of mortality by using mechanical treatments in combination with prescribed fire or adjusting ignition patterns.
  - Burn in the fall when second order fire effects are less likely to lead to mortality in mature trees (USDA Forest Service 2000).
  - Provide information to the public to explain the intensity and expected duration of visual effects from prescribed fire.
- Avoid straight lines for mechanical treatment boundaries.
- Thinning treatments shall include biomass disposal.
- Stump height will not exceed 6" measured from the ground on the uphill side or 4" above natural obstacles. This height should be reduced along trails or scenic routes. The cut side of a stump should be angled away from roads or trails.
- Locate monitoring exclosures and instrumentation to minimize impacts to views.
- Concentrate instrumentation and exclosures of monitoring in a single footprint where possible.
- Provide information to the public regarding the purpose of exclosures and instrumentation.
- Off-road vehicle access shall occur only under dry or frozen conditions.
- Minimize any off-road vehicle access to monitoring sites to what is necessary to transport supplies and equipment.
- Utilize ramps or bridges for any necessary water crossings by vehicles or equipment.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

A wide range of actions were considered but then eliminated from detailed analysis based on technical or economic feasibility and whether or not they met the purpose and need for action. A brief description of these alternatives and the rationale for eliminating them from detailed analysis is provided below.

Wildland Fire Management Only

We considered wildland fire management as the only tool for restoration and management of the forest, grassland, and woodland ecosystems. Based on detailed assessments of the current condition, we determined that this alternative was not technically feasible and would not meet the purpose and need for action.

In the current condition, there would be such a narrow set of environmental parameters where it would be safe and effective to ignite prescribed fire or manage natural fire that it would be unlikely that the use of fire alone would measurably move the current condition towards the reference condition in a ten-year period. Further, while managing fire-adapted forests with prescribed fire is often the least expensive option to reduce hazardous fuels[2] when utilization opportunities are limited, there are many areas and times where prescribed fire cannot be used. High fuel loadings, air quality restrictions, short windows of appropriate weather, and risk of escaped fire are some of the factors that limit application of prescribed fire (USDA-Forest Service 2005).

Less Mechanical Treatment

We considered limiting mechanical treatments just to the degree necessary to improve the safety of wildland fire management. This alternative may be less costly (USDA-Forest Service 2005) and would address concerns from the public such as, "*Mechanical thinning sounds like logging companies being allowed to come in under the guise of "thinning" the trees*" (Martinez 2010).

We determined that this alternative would not meet the purpose and need for action in forest types adapted to frequent fire regimes (ponderosa pine and dry-mesic mixed conifer). Fire alone can improve the resilience of these forests and reduce hazardous fuels but would not move the structure towards the reference condition. Further, less intensive thinning can reduce the intensity of fire behavior but is not effective at reducing crownfire potential at the landscape scale ((Placeholder n.d.) .

More Intensive Use of Mechanical Treatment

[2] Hazardous fuels are live and dead vegetation that could be difficult to control if ignited.

We considered emphasizing mechanical treatments in all forest types, slopes, and elevations to more precisely restore forest structure. This alternative was not considered to be economically feasible at a cost of $50,000,000[3] over 10 years depending on slope, access and forest condition) relative to the benefits received.

Salvage Logging Following Fire, Insects, and Disease Events

There is a very short window following high severity fires where the dead and dying trees can be valuable as wood products. Following the Las Conchas Fire we looked at the potential to salvage the potential economic value in the burned area as well as establishing guidelines for salvaging timber in the future. The purpose of salvage logging is to capture potential economic value; the purpose of the proposed LRMP is to restore ecosystem structure and function and to reduce current and future threats. Mechanical treatment in a burned area for the purpose of restoration is included in the proposed action. Burned area restoration would not cut and remove large trees except where needed for the protection of people and infrastructure. Removing hazard trees near roads, trails, or facilities are examples of where larger trees may be cut.

Any salvage logging in the Las Conchas or any future burned area for the purpose of recovering any potential economic value, would be considered as a separate action and require additional analysis under NEPA.

Capping the Diameter of Cut-trees

Because forest inventories found few large and old trees it was reasonable to consider a diameter cap on trees to be cut to ensure that any remaining large and old trees are protected. However, a diameter cap could limit our ability to achieve both hazard reduction and forest health[4] objectives.

While removal of sub merchantable seedlings and saplings is important to reduce ladder fuels, thinning only small material does little to reduce crown fire spread (Ohara 2009, USDA-Forest Service 2005, Fiedler, et al. 2001, Keyes and O'Hara 2002). Fiedler and others (2001), found that a comprehensive selection treatment, removing some trees from all diameter classes, had a more significant effect on reducing measures of fire risk than removing only small trees.

We determined that large and old trees could be protected by the application of mitigating measures. Also, the all proposed treatments are aimed at protecting large and old trees and increasing their abundance on the landscape over time.

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[3] Assuming treatment costs of $600-$1200 per acre

[4] For the purpose of this EIS, "forest health" is used to indicate a forested area where trees are growing vigorously and for the most part are well formed and not excessively impacted by insects, disease or competition.

Eradication of Non-native Plants Other than Classified Noxious Weeds

Approximately 10 percent of all herbaceous species found on the preserve are non-native European pasture grasses, which affect the overall resiliency of the grasslands (Valles Caldera Trust 2009). While we considered eliminating non-native grasses, this alternative is not technically feasible. Any measures to eradicate these species would likely be equally detrimental to native species. All action alternatives manage for the benefit of native species and include native species cover and diversity as monitored outcomes.

Using Only Non-chemical Methods to Eradicate Noxious Weeds

Biological, mechanical, and chemical methods are all commonly used to eradicate noxious weeds. Public comments indicated a concern regarding the application of herbicides in wildland environments. In the development of the proposed action, we considered mechanical and biological methods along with chemical treatments.

Eliminating chemical methods would not meet the purpose and need for action. Some weeds such as Canada thistle and other rhizomes actually spread when treated mechanically (hoeing, grubbing, herbivory, etc.). The use of biological controls, such as insects and or pathogens, has not proven to be an effective method of controlling or eradicating Canada, musk, or bull thistle (Valles Caldera Trust 2003, Reviewed 2008, 2010).

Two insects are available to control Canada thistle, *Ceutorhyncus litura* and *Urophora cardui* and are available from the Colorado Department of Agriculture. These insects may be quite effective in croplands where they could be combined with cultural practices such as planting alfalfa or other highly competitive crops (practices that are limited on native rangelands). They are generally not effective when used as a sole control (Duncan and Brown 2001).

The rosette weevil is can be effective on bull thistle but requires 10-12 years to reach a population level that can be considered effective (Beck 2011).

While grazing or mowing in the early spring or late fall can effectively reduce cheatgrass, the location of cheatgrass on the preserve is primarily limited to road cuts. Concentrating cattle along these isolated areas is not feasible. Further, livestock grazing on the preserve begins later in the season than is recommended for effective reduction of cheatgrass.

Action alternatives emphasize the use of non-chemical treatments where they can be effective and include performance requirements to eliminate or mitigate any adverse effects from herbicides.

Wildlife Management Actions

Several fisheries and wildlife species have been extirpated from their range in the preserve and/or Jemez Mountains or had their range significantly reduced over the last century. These species include (but are not limited to) New Mexico meadow jumping mouse *Zapus hudsonius luteus*, Mexican gray wolf (*Canis lupus baileyi)*, Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*), northern leopard frog (*Rana pipiens)*, and American beaver (*Castor canadensis)*. Further, the current population of elk, a result of reintroduction, is thought to be significantly higher than any historic population and is affecting both vegetation and riparian (Valles Caldera Trust 2009). While the IDT considered actions to directly manage wildlife populations, recreating historic (reference) faunal assemblages is outside the scope of this action, which focuses on restoring and managing the terrestrial and aquatic habitats for all species. However, it is likely and desirable that extirpated species such as beaver would naturally return to the preserve as habitats are created and sustained. While such reintroduction is outside the scope of this analysis, the reintroduction of any species could be considered on a case-by-case basis following the appropriate level of environmental analysis and public involvement.

Figure 2. 1 - Wildlife species extirpated from the preserve shown clockwise from top, left: New Mexico meadow jumping mouse, Mexican grey wolf, northern leopard frog, American beaver, Rio Grande cut throat trout

2.5 NO ACTION ALTERNATIVE

The NEPA requires that the "no action" alternative be analyzed in detail. It serves as a baseline for measuring the environmental consequences, costs, and benefits of the action alternatives and ensures that federal actions, and the associated investments, are warranted.

Under Alternative 1 – *No Action* there would be no decisions regarding landscape restoration or management of the preserve's natural resources. Actions covered under existing Stewardship Registers (http://www.vallescaldera.gov/stewardship/vctdevmain.aspx) would continue including:

- Ongoing thinning and follow-up prescribed burning prescribed fire.
- Annual inventory and eradication of Canada, musk and bull thistle; and oxeye daisy.
- Riparian and wetland restoration in San Valles Antonio and Sulphur watersheds and repair of earthen tanks and other historic range infrastructure.
- Routine road maintenance and repair and road management currently proposed in San Antonio and Sulphur watersheds.

2.6 ACTION ALTERNATIVES

Besides *Alternative 1 – No Action*, two action alternatives are being considered and compared in the detailed impact analysis. *Alternative 2 – Collaborative Forest Restoration* – selects forest stands for treatment based on the degree of ecological departure and current fire behavior potential. *Alternative 3 – Aspen Restoration* – selects forest stands for treatment based on the degree of ecological departure and the potential for treatments to stimulate aspen regeneration.

Restoration Activities Common to All Action Alternatives

Both alternatives propose a similar suite of restoration activities including forest thinning, wildland fire management, riparian and wetland restoration, post wildfire rehabilitation, road closure, decommissioning, and maintenance and erosion control; noxious weed eradication, and research, inventory, and monitoring. Descriptions of the proposed restoration activities that comprise the action alternatives are presented in Table 2.2 below; narrative descriptions follow.

Table 2.2 – Restoration Activities

Activity	Description
Mechanical Treatment - MECH	Selectively cutting or pruning trees using chainsaws or heavy equipment
Biomass Disposal - BD	Cutting or pruning trees requires a connected biomass disposal activity.

❖ Biomass Disposal Utilization – BDUT	Biomass created by forest thinning may be removed for a variety of uses including firewood, latillas, posts and poles, or small dimensional lumber. The biomass can also be chipped for use in landscaping or to fuel burners for heat or energy. The material may be removed by: *yarding* (using cables to pull partially or fully suspended logs or trees) or *skidding* (using heavy equipment to drag or carry logs or trees) biomass to a road or landing point.
❖ Biomass Disposal Mastication – BDMA	Biomass created through thinning may be masticated or chipped and left on site; some equipment is capable of thinning and masticating trees simultaneously.
❖ Biomass Disposal Hand Piling– BDHP	Biomass may be piled for burning under low risk conditions
❖ Biomass Disposal Lop and Scatter – BDLS	Biomass may be lopped and scattered to reduce the height and increase the compaction of the fuel bed and to break up concentrations of fuel and later burned.
❖ Biomass Disposal Prescribed Fire - BDPF	Wildland fire may be used alone or in combination with any other BD method.
Wildland Fire Management - WF	Includes the management of both planned and unplanned ignitions to achieve resource management objectives as well as resource protection objectives
❖ Wildland Fire - Prescribed Fire - WFPF	Planned ignition of wildland fire under prescribed environmental conditions (prescribed fire) may be used to achieve resource benefits including biomass disposal. Planned ignitions may be used alone or in combination with mechanical treatments (see BDWF above).
❖ Wildland Fire – Wildfire - WFWF	Unplanned ignitions can be suppressed to meet protection objectives or managed for resource objectives or some combination thereof. Only lighting caused fires can be managed for resource objectives and only if environmental and other conditions are appropriate. Unplanned human caused fires are managed with safety and protection[5] as the primary objectives.
Road Management - RM	Includes the administrative and physical closure and decommissioning as well as the repair and maintenance of roads.
❖ Roads Closures - Administrative - RMCA	Prohibiting motorized use of a road to encourage natural revegetation. This action may include the placement of barriers.

[5] Protection strategies are based on current and predicted conditions, values at risk, cost effectiveness and other considerations. Public and fire fighter safety is always the first consideration when selecting the appropriate response to any unplanned ignition or the management of any planned ignition.

	Non-motorized (pedestrian, equestrian, or bicycle) use may be permitted.
❖ Road Closure and Decommissioning -RMCD	Physical road rehabilitation to promote natural revegetation. Activities may include the placement of biomass or may require creating drainage or installing culverts.
❖ Road Maintenance - RMMT	Maintenance and deferred maintenance on open roads. Includes road grading, reconstruction of the road prism, and construction of drainage features such as lead out ditches and the placement (or replacement) of culverts. May include realignment to improve safety or protect resources.
Watershed Restoration - WR	Activities (other than road management) to protect or restore riparian and wetland areas or watershed function. Commonly employed activities are planting, placing sod, erecting fences or barriers, placing structures to reduce the energy of flow, heavy equipment may be used to remove man made impoundments, to restore previously diverted stream courses, or address localized erosion in riparian or upland environments.
❖ Riparian Restoration - WRRR	"Low tech" actions that support natural rehabilitation as well as manipulative actions that directly restore habitats and riparian function.
❖ Wetland Restoration - WRWR	Restoring wetlands generally requires restoring a source of watering and involve low tech as well as manipulative actions.
Erosion Control - ERCO	Activities other than road maintenance to prevent, control, or halt erosion.
Noxious Weed Control– NWER	Eradicating noxious weeds using mechanical or biological methods or herbicides.
Research, Inventory, Monitoring and Evaluation– RIME	Measuring structure, composition, and function of various ecosystems at various scales including collecting samples using non-destructive[6] and destructive methods, establishing temporary and permanent instrumentation and/or exclosures, and providing temporary and/ or limited administrative access.

[6] Non destructive sampling: measuring an element such as vegetation, in situ and leaving it intact. Capturing animals and taking measures, attaching collars or transmitters and releasing the animals is non-destructive.

Destructive sampling: Generally refers to any action where the element is removed or destroyed and cannot be re-measured. Cutting down snags, capturing and killing or removing animals, removing plants are all destructive methods of sampling.

MECHANICAL TREATMENT

Mechanical treatments include cutting or masticating of standing trees and the removal, mastication, burning, or other method of biomass disposal.

MECHANICAL TREATMENT - DIRECT, INDIRECT AND CONNECTED ACTIVITIES

The focus of landscape restoration is forest thinning, or physically cutting trees. This EIS is considering not only the impacts of the proposed change in the forest structure but also the impact of physically carrying out forest thinning operations. Forest thinning is primarily a mechanical endeavor involving heavy equipment as well as chainsaws. There are also may additional activities connected to forest thinning in order to access the project area and to dispose of the biomass created by forest thinning. The activities that can be associated with mechanical treatment include:

- Cutting trees using a chainsaw operated by hand or mounted on specialized equipment
- Cutting trees using heavy equipment.
- Yarding or skidding trees from the forest to a landing site for removal (as chips, logs, firewood, etc.)
- Masticating standing trees or pushing over and masticating trees on the ground
  - leaving the material on site
  - removing the chipped material
- Lopping off and piling or spreading tops and branches of trees
- Removal as firewood by individuals with pickups
- Stockpiling logs or slash for removal or disposal (burning or chipping)
- Constructing fenced exclosures to protect restored areas from impacts by elk or livestock.
- Camping by crews or contractors
- Improving or maintaining roads for temporary access
- Construction of up to 1320’ of new temporary roads
- Closing and rehabilitating temporary roads and/or skid trails

MECHANICAL TREATMENT – PRESCRIPTION GUIDELINES

Mechanical treatments can be used at various prescriptions (intensity and design) to achieve the desired outcome. Proposed prescriptions have been developed based on fire regime, vegetation type, current

fire behavior potential[7], current structure and composition, slope, soils, and climate and/or the desired outcome following treatment. Prescriptions and guidelines for mechanical treatment are presented below in Table 2.3.

Table 2.3 - Prescriptions and guidelines for mechanical treatments

Activity Code	Prescription	Guidelines
MECH	Restoration - REST	Reduce canopy closure to 30-60 percent over a landscape area with a target Basal Area (BA) of 40-75 ft^2. Leave groups and clumps representing all age classes. Select trees based on size, species, and vigor.
MECH	Aspen Regeneration - ASRE	Target conifer species growing in and adjacent to aspen trees. Removal of individual trees and group selection with a target BA of 40-60 ft^2.
MECH	Forest Health[4] - FOHE	Reduce tree densities, remove suppressed, damaged, or diseased trees; and reduce hazardous fuels (remove ladder fuels, break up surface and canopy fuel continuity, raise canopy base height) with a target BA of 50 -75 ft^2. Less intensive degree of thinning than "restoration".
MECH	Hazardous Fuels Reduction - HFRE	Remove ladder fuels[8], disrupt the continuity of canopy and surface fuels, and raise canopy base height with a target BA of 60-95 ft^2.
MECH	Wildland Fire Control - WFCO	Reduce canopy closure to 30 to 50 percent in a localized area; size of treatment area based on slope and fuels and may vary in intensity. Strategically located to provide an anchor for wildland fire management.

MECHANICAL TREATMENT – PRESCRIPTIONS BY ECOTYPE

Prescription is the term used to refer to the descriptive parameters for selecting trees to be cut versus those to be left. The trust is proposing a series of basic prescriptions based on fire regime and ecotype. These prescriptions may be adjusted based on site-specific considerations including access, slope, and soils as these factors may limit our ability to remove or otherwise dispose of biomass. Where our ability to remove biomass is limited, a less intensive prescription and/or multiple entries may be used.

[7] Each forest stand is attributed with a fire potential rating based on a scale of 1-6. See *Chapter 4 – Affected Environment.*

[8] Ladder fuels are small trees, brush or slash that provide a "ladder" for fire to move from the ground to the forest canopy.

FIRE REGIME I - PONDEROSA PINE WOODLAND AND SAVANNA, DRY MIXED CONIFER

This prescription leaves the largest and healthiest trees in groups with 10-20 feet between tree canopies and 25-50 feet between groups of trees (see Figure 2.2). The largest and most vigorous ponderosa pine and Douglas-fir as well as inclusions of aspen would be favored for retention. Based on field-sampled data, white fir and ponderosa pine would be targeted for removal; the majority of the white fir trees are under 7 in. diameter.

Figure 2.2 – A closed mid-aged ponderosa pine forest thinned using a restoration prescription. Residual stand is an open mid-aged forest.

FIRE REGIME I - MONTANE GRASSLANDS

A restoration prescription would be assigned where ponderosa pine ponderosa pine trees are encroaching into the grasslands. Prescriptions would call for retaining small well-spaced groups (60-100 feet between groups) of the healthiest trees (see Figure 2.3 below). Where blue spruce trees are encroaching, trees average from 7-9 in. diameter. The blue spruce would be lightly thinned in an irregular pattern to reduce the susceptibility to wind throw and protect soils, while enhancing watershed function.

Figure 2.3 – Before (left) and after (right) grassland restoration

FIRE REGIME III - ASPEN AND MESIC MIXED CONIFER

Forest health, aspen regeneration, and hazardous fuels reduction prescriptions would be assigned to these forests emphasizing the removal of ladder fuels[9], trees impacted by insects, trees with visible signs of damage or disease, and fire intolerant species (white fir, blue spruce, Engelmann spruce).

Figure 2.4 - Aspen-mixed conifer forest

Based on measures taken in the field, conifers, especially white fir and spruce, less than 9 in. diameter would be targeted for removal. Some stands contain over 1000 aspen trees per acre, most under 5 in. diameter. In these stands, the emphasis would be to remove overstory conifers that shade the aspen. The largest, most vigorous aspen, Douglas-fir, and ponderosa pine, would be favored for retention. Limber pine would also be retained[10].

FIRE REGIME IV - MESIC AND DRY SPRUCE-FIR

Hazardous fuels reduction prescriptions would be used to reduce the potential intensity and severity of wildland fire across the landscape. Planned prescription parameters would select small, disease or damaged trees for removal. The largest, healthiest trees of all species would be favored for retention. Fuelbreak prescriptions would be used strategically to improve the safety and effectiveness of wildland fire management.

Figure 2.5 – Dense young spruce-fir forest and heavy slash

Based on measures taken in the field, trees targeted for removal would be white and subalpine fir less than 5 in. diameter and Engelmann spruce less than 7 in. diameter. Healthy Engelmann spruce, Douglas-fir, and aspen would be favored for retention.

Typical conditions (dense small trees and heavy slash from historic logging) are shown right in Figure 2.5. The figure shows slash laid out as a track for pulling out the large tree from the center.

[9] "Ladder fuels" refer to trees small to medium sized trees arranged to create a "ladder" of fuel that would allow fire to move from the surface into the crowns of the larger trees.

[10] White pine blister rust is present regionally indicating that white should be retained to ensure the greatest degree of genetic heterogeneity is present.

FIRE REGIME III MIXED MONTANE WOODLANDS

Wildlife habitat improvement prescriptions would be used to create patches and corridors of various size classes emphasizing the retention of mature shrubs and trees.

Conifers less than 9 in. diameter would be targeted for removal; healthy large conifers and oak trees and shrubs would be retained.

A mixed montane woodland where the thinning of small conifers could improve wildlife habitat is shown right in Figure 2.6.

Figure 2.6 - Mixed montane woodland

ALL FIRE REGIMES/ECOTYPES - HAZARDOUS FUELS REDUCTION ON STEEP SLOPES

On steep slopes with a very high fire behavior potential, mechanical treatments may be implemented employing a hazardous fuels reduction prescription. This prescription focuses on removing ladder fuels (small trees, brush and slash) and breaking up the continuity of the fuels. Biomass is generally hand piled (as shown in Figure 2.7) or lopped and scattered for later burning.

Small tree yarding systems, which fully or partially suspend trees could also be used.

Figure 2.7 – Hazardous fuels reduction and handpiling on slope

ALL FIRE REGIMES/ECOTYPES - WILDLAND FIRE MANAGEMENT CONTROL

Localized thinning or fuelbreak construction may be used in association with control lines or to protect cultural or natural features from fire.

ALL FIRE REGIMES/ECOTYPES - RESPONDING TO NATURAL EVENTS

Under the proposed Stewardship Plan we would use mechanical treatments to restore and rehabilitate burned areas or areas impacted by insects and disease as follows:

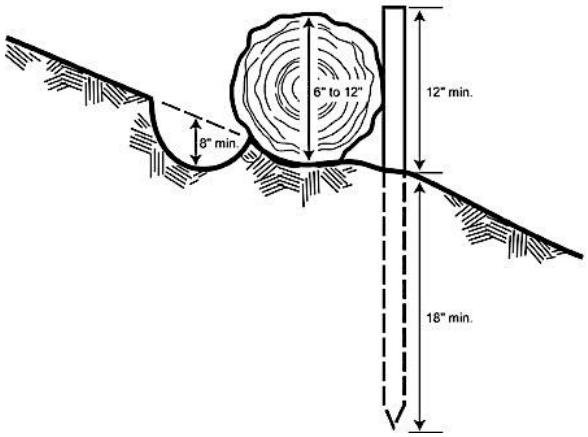


Figure 2.8 – Contour felling diagram source: (Montana - NRCS n.d.)

- To reduce secondary risks created by dead and dying trees we would implement any of the prescription options for mechanical treatment – all performance requirements would apply.
- To stabilize areas following a loss of vegetation from wildfire we would cut trees, and either lop and scatter or masticate biomass to provide surface cover. On steep slopes, the boles of trees could be anchored horizontally along the slope to capture soil and reduce erosion as illustrated in Figure 2.8, right.
- To reduce the spread of insects or disease infected trees may be removed or isolated if it is determined that such treatment can be timely and effective – all performance requirements shall apply.

WILDLAND FIRE MANAGEMENT

We are proposing to manage wildland fire, both planned ignitions (*prescribed fire)* and unplanned ignitions, as a restoration and management tool in forests, montane grasslands, and woodlands. We are proposing to use prescribed fire alone and in combination with mechanical treatments.

Figure 2.9 – Valle Toledo Prescribed Fire, November 2005

Wildland fire management would be consistent with, but not necessarily imitative of, the fire regimes that have influenced the structure, composition, and function of the preserve's ecosystems prior to European settlement.

Any unplanned human caused ignitions would be managed for protection and we would select the safest, most cost effective means to extinguish such fires. However, under any action alternative we would consider managing any lightning caused wildland fires to enhance our management objectives. The management of these fires would be limited initially due to the current fire behavior potential but could be expanded over time as more of the forests were treated and the fire behavior potential was reduced.

Consistent with the *Guidance for the Implementation of the Federal Wildland Fire Management Policy*, reviewed and updated in 2009 (NWCG 2009) and the *Interagency Prescribed Fire Planning and Implementation Guide*, reviewed and revised in 2008 (USDA/USDOI 2008), any use of wildland fire would consider current climate trends, expected weather, potential fire behavior, the impacts of wildland fire on other activities on the preserve, and the amount and duration of smoke impacts in surrounding communities. The primary objective for managing any planned or unplanned wildland fire is safety; the safety of our firefighters, the public, as well as employees, volunteers, contractors, or others.

WILDLAND FIRE - DIRECT, INDIRECT AND CONNECTED ACTIVITIES

Wildland fire management activities include direct and indirect actions to prepare, ignite, control, or otherwise manage wildland fire:

- Construction of control lines (clearing all vegetation and debris to expose only bare dirt or rock) using hand tools or mechanized equipment.
- Igniting fire by hand using a gasoline-diesel fuel mix.
- Mixing and dispensing of the fuel mixture.
- Use of aerial ignition devices.
- Management of aircraft (helicopters) including staging and refueling.
- Use of approved foaming agents or water to retard the spread of fire or to protect sensitive features.
- Use of approved foaming agents or water in combination with digging and scraping to extinguish fire.
- Reducing concentrations of fuel adjacent to control lines or surrounding sensitive features by hand or using equipment.
- Using areas to store or stage water tanks and vehicles
- Staging, parking, and turning vehicles and equipment
- Establishing camps for short term staging of vehicles and personnel and project management
- Forest thinning as previously described.

ROAD CLOSURES, REHABILITATION AND MAINTENANCE

We are proposing to move the current road density from an average of 9 mi/mi^2 to 1.5 mi/mi^2. Meeting this objective would require closing and/or decommissioning about 1000 miles of road over 10 years. Based on soils and hydrology, road closure and decommissioning would primarily be achieved through administrative closure and natural rehabilitation Figure 2.10.

Figure 2.10 - Old logging road, administratively closed naturally revegetating

Approximately 100 - 150 miles of road have been identified as needing physical decommissioning and rehabilitation. Most of this would occur at localized points, less than 500 linear feet, where active erosion is occurring.

Approximately 52 miles of the 200 miles of roads to be maintained for ongoing use are in need of deferred maintenance to restore hydrology or halt ongoing erosion. Deferred maintenance activities include:

- Reshaping and resizing the existing road prism.
- Realignment to alter grades or reduce erosion.
- Constructing lead-outs, or installing or replacing culverts to improve drainage.
- Replacing fill
- Extracting and hauling aggregate material (gravel, rock, dirt, etc.).
- Staging equipment.

Currently differed maintenance activities are ongoing on open roads in the VCNP and this would continue. Existing roads were developed to support of past logging, hunting, ranching and geothermal development. Other infrastructure features associated with the roads include well pads, log landing or livestock gathering areas. Rehabilitation of these localized features would generally include erosion control (placement of logs, rocks, or man-made features to halt erosion), construction of contours or placement of culverts to provide drainage, or soil scarification to promote the establishment of native grasses.

The priority for physically decommissioning and rehabilitating roads would be site-specific areas rather than landscape areas. Road alignments which are directly affecting water quality, diverting wetlands, increasing overland flow, or impacting cultural resources (Figure 2.11 left) would be the first priority, as opposed to more stable areas of localized erosion (Figure 2.11 right). The priority for completing deferred maintenance would be based on current condition, level of use and current resource impacts.

Figure 2.11 - Road causing active resource damage on right compared with relatively stable roads on left

Figure 2.12 - Road VC05, post Las Conchas fire

Maintenance and repair to VC05 (see location in Figure 2.13) is the first priority for beginning new maintenance activities. VC05 is characterized by ongoing severe erosion (Figure 2.12), currently impacting cultural resources and watershed condition, and is valued as a key administrative and interpretive route. Ongoing erosion has since been significantly exacerbated by post fire run-off following the Las Conchas wildfire.

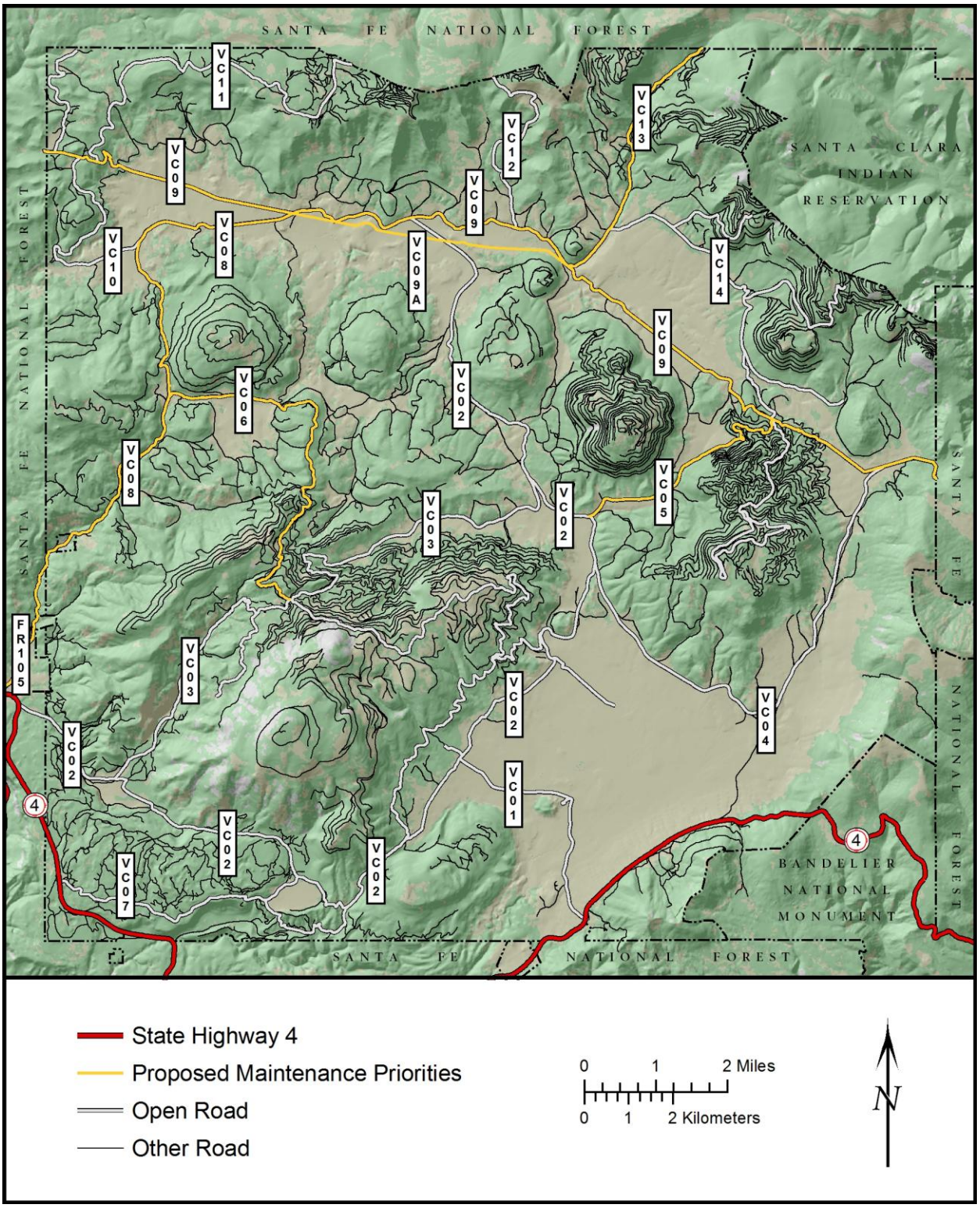


Figure 2.13 - VCNP Road Network

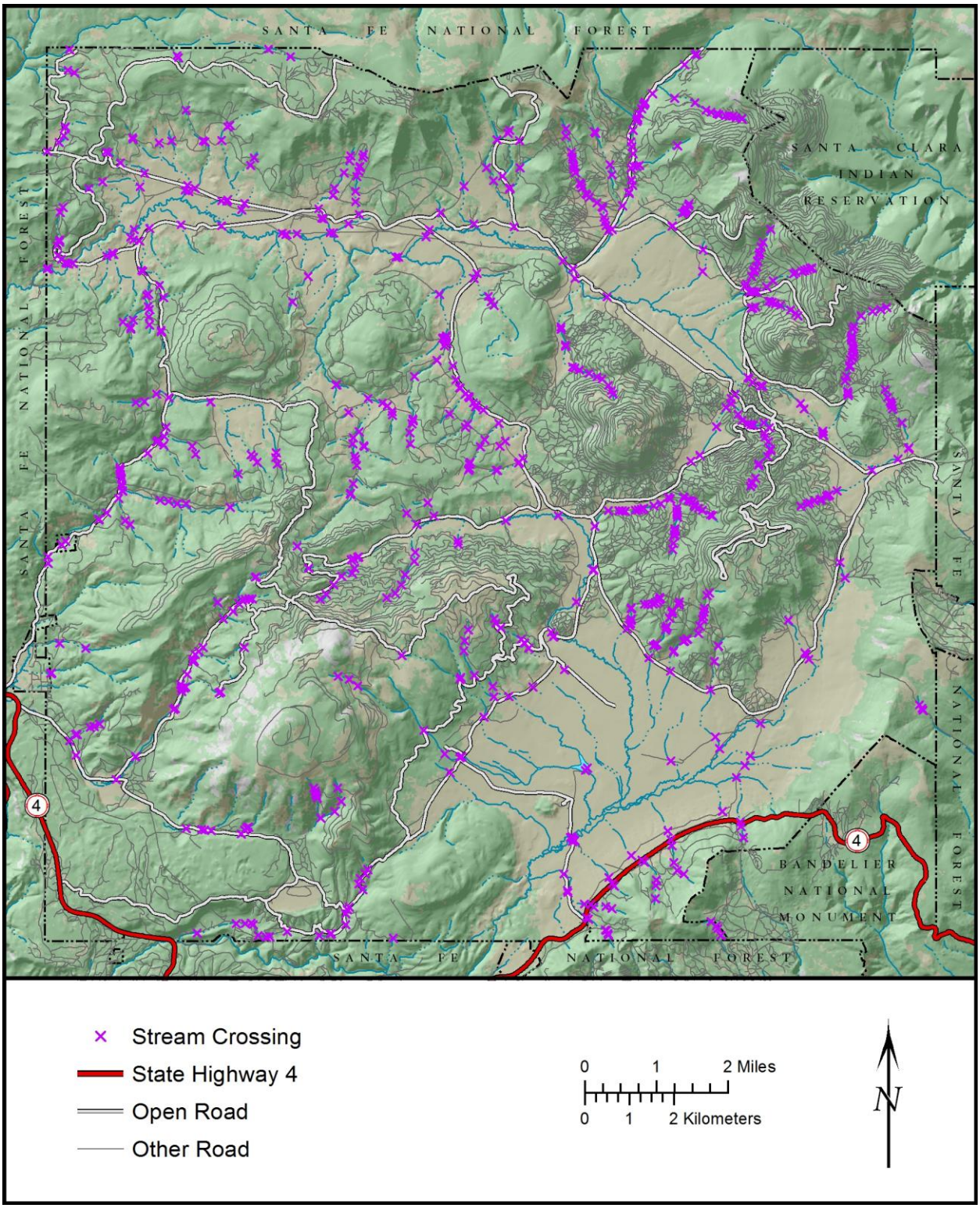


Figure 2.14 – Points where intermittent or perennial flows intersect roads often require point source erosion control activities whether the road is maintained for continued motorized or non-motorized use or closed and naturally recovering.

RIPARIAN AND WETLAND RESTORATION

In combination with road management actions as described above, we are also proposing to restore wetland and riparian areas throughout the preserve. The objectives of this restoration work are to optimize interflow, minimize overland flow, increase base flow, reduce sediments, dissolved oxygen and other water quality impairments; and reduce stream temperatures. The wetland and wet meadow systems containing the preserve's riparian areas and streams comprise just over 6,800 acres, mostly within the open valle systems. Restoration activities would include:

- Streambank and channel restoration to address site-specific erosion.
- Planting trees and shrubs (Figure 2.15 top left).
- Placement of rock or log and fabric dams, or Zuni bowl techniques to protect and restore wetlands and mitigate ongoing erosion (Figure 2.15 top center and right).
- Removal of road and water control features to restore wetlands.
- Repairing or decommissioning earthen tanks and dams.
- Installing weirs or channel modifications to slow the development or reduce the consequences of meander cutoffs (Figure 2.15 bottom left, center, and right).

Many water quality and stream condition issues are addressed through the treatment of forests, grasslands, and road management actions. The priority for riparian restoration is to continue ongoing restoration in San Antonio, Sulphur, and Redondo Creeks within the San Antonio and Sulphur 6th code watersheds (see Figure 2.16) especially post Las Conchas Fire rehabilitation in Indios and San Antonio creeks. As additional funding is available, the trust would begin restoration actions in the Jaramillo and the East Fork of the Jemez River

Figure 2.15 –Clockwise from top, left: tree planting, rock dam, zuni bowl, meander cut-off mitigation (before, during, and after)

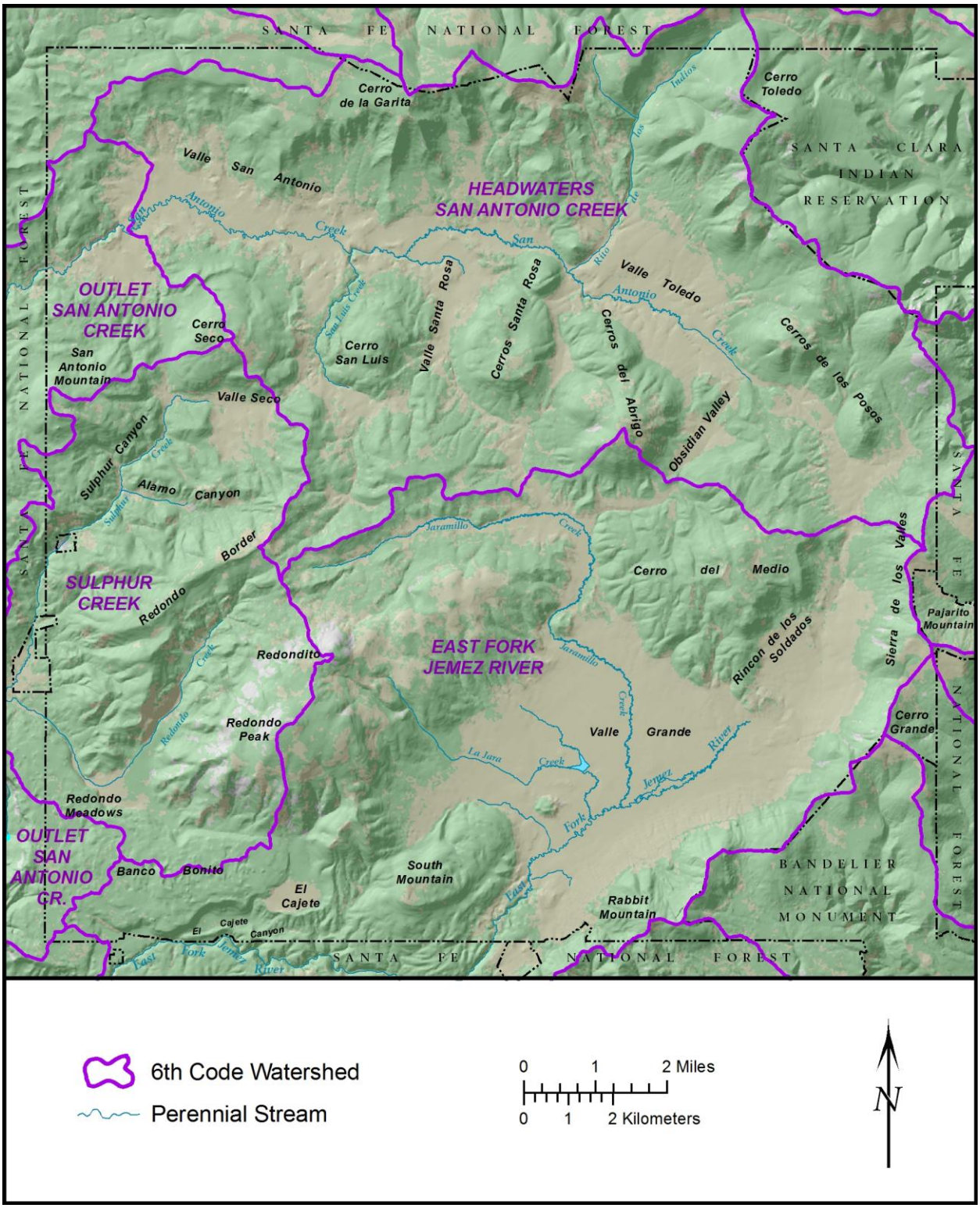


Figure 2.16 - Hydrological features on the VCNP

PREVENTION, CONTROL AND ERADICATION OF NOXIOUS WEEDS

Noxious weeds are legally defined as any plant designated by a federal, state, or county government to be injurious to public health, agriculture, recreation, wildlife, or any public or private property (Sheley and Petroff 1999). All ecosystems (rangelands, forests, grasslands, riparian areas, wetlands, lakes, and streams) are vulnerable to invasion by non-native weed species. The State of New Mexico maintains a list of species considered noxious in the state. The list places a weed designated as noxious into one of three categories for treatment:

- Class A species are currently not present in New Mexico, or have limited distribution. Preventing infestations of these species and eradicating existing infestations is the highest priority.
- Class B species are currently limited to portions of the state. In areas with severe infestations, management should be designed to contain the infestation and stop any further spread.
- Class C species are widespread in the state. Management decisions for these species should be determined at the local level, based on feasibility of control and level of infestation.

Currently we are actively eradicating weeds occurring on the preserve deemed noxious in the state of New Mexico including:

- Canada thistle (*Cirsium arvense*) (Figure 2.17, left) a Class A noxious weed,
- Bull thistle (*Cirsium vulgare*) a Class C noxious weed,
- Musk thistle (*Carduus Nutans*) (Figure 2.17, center) a class B noxious weed,
- Oxeye daisy *(Leucanthemum vulgare)* (Figure 2.17, right), a Class A noxious weed.

Canada and bull thistle as well as oxeye daisy are being treated annually with an herbicide, Clopyralid, (Transline™). Musk thistle is primarily treated by digging up the plant and removing the seed heads.

We are proposing to continue current efforts to eradicate these weeds as well as implementing a long-term strategy to prevent, control, and eradicate noxious weeds. Under this long-term strategy we would continue current eradication efforts and would begin immediate and aggressive control and eradication of known populations of Cheatgrass *(Bromus tectorum),* shown left in Figure 2.18, using Glyphosate (Roundup™), Imazipic (Plateau™), or the combination of both (Journey™) to control cheatgrass.

We are also proposing to implement a strategy of *early detection, rapid response (EDRR)* to prevent, control, and/or eradicate any weeds found on the preserve in the future. The EDRR strategy would allow treatment of invasive plant infestations located outside of currently identified treatment areas. Infestations outside of existing treatment areas may include sites and species that currently exist on the preserve but have not been located during previous inventories, or new sites and species that arise in the future. For example, Dalmatian toadflax (*Linaria dalmatica*) and Yellow toadflax (*Linaria vulgaris*)

(Figure 2.18 center and right) are known threats from surrounding areas that would be treated under these rules if they were discovered on the preserve.

Figure 2.17 - Canada thistle (left), musk thistle (center), oxeye daisy (right) (Photo ©Al Schneider, www.swcoloradowildflowers.com)

Figure 2.18 - Cheatgrass (left), Dalmatian toadflax (center), yellow toadflax (right) (Photo ©Al Schneider, www.swcoloradowildflowers.com)

The intent of EDRR is to allow timely control, so that new infestations can be treated when they are small in order to control their spread, minimize treatment costs, and reduce adverse effects of treatment. EDRR would improve our ability to eradicate new invasive plant species and keep areas currently without infestations noxious weed-free. Newly discovered sites considered for treatment under EDRR must meet certain requirements. They would be reviewed prior to treatment to determine if environmental impacts and treatments would be consistent with those analyzed and disclosed in the

LRMP EIS. All of the following requirements must be met in order for new sites to be treated through EDRR:

- The species at the site must be a plant meeting the definition of "noxious weed" and be on the list of species identified as noxious in the state of New Mexico. We are *not* proposing to eradicate all non-native plants, only those classified as "noxious weeds". An exception is regarding goatheads (*Tribulus terrestris)* which have been sighted on the preserve. Goatheads are an exotic, invasive, and generally miserable plant although not classified as noxious by the state of New Mexico. Goatheads would be aggressively eradicated by digging or pulling in combination with the application of Glyphosphate.
- The control is consistent with this plan.

Annually, or as needed, we would identify new sites outside of the known treatment areas for potential treatment under an EDRR strategy. Sites considered for treatment under EDRR would be assigned a priority, objective, treatment method, and restoration strategy consistent with the methodologies described below. Sites would be reviewed by an interdisciplinary team of resource specialists using the ICP to determine appropriateness of treatment under EDRR. Applicable Performance Requirements would then be implemented at each new site.

The review team would screen the new site(s) and complete the ICP demonstrating how treatment would be within the scope of the original NEPA decision. In general, if the anticipated environmental impacts do not exceed those presented in this EIS, treatment would proceed through the normal process. If impacts would exceed those analyzed in the EIS, treatment methods would need to be adjusted, or additional review in compliance with NEPA would be necessary. The completed ICP would be reviewed by the Responsible Official prior to treatment. Proposed treatments under EDRR would be included and disclosed in the stewardship register.

PROPOSED TREATMENT METHODS FOR INVASIVE SPECIES

Once prioritized and assigned treatment objectives, noxious weed populations would be treated i.e. either eradicated, confined or controlled. Selected treatment methods would be based on the experience of staff, invasive plant control experts from local agencies, and herbicide labels, (Bossard, Randall and Hoshovsky 2000, Sheley and Petroff 1999). No single management technique is perfect for all invasive plant control situations therefore more than one option is listed for each species where available. Treatments may be used in combination, or change over time as sites become smaller and less dense. We would follow the decision-making process outlined in the appendices which focuses on site specific factors and on incorporating an integrated weed management approach in order to achieve effective and practical treatment at each site.

Physical control methods include manual hand-pulling, the use of hand tools, power tools, prescribed fire, mulching, mowing, and solarization. Biological control, within the context of this analysis, involves the use of animals or vegetation to consume or out-compete undesirable plant species. Grazing can be

used to selectively control or suppress weed growth, but may also spread certain invaders. The use of desirable or innocuous plants, especially natives, to out-compete alien species is an important consideration in any weed treatment effort and may be used to enhance other types of control measures.

Chemical control is conducted with herbicides that kill or inhibit plant growth and would be used to eliminate the target species. Different herbicides would be selected based on the site specific factors including:

- Stages of plant growth;
- Preventing herbicide resistance;
- Sensitive plants, riparian areas, open water, or human uses that may be present or occur at a site-specific area.

As previously described the continued use of Clopyralid (Transline), authorized under the 2003 decision, is proposed in this analysis. Three additional herbicides are also proposed for use as noxious weed treatments on the preserve. They are: Glyphosate (Roundup), Imazapic (Plateau), and Imazapic+Glyphosate (Journey).

Increased inventories have located noxious weed occurrences that were previously unknown. The weed populations occur as individual plants or several plants. In 2012 we treated about 40 individual locations. However, comprehensive mapping efforts have not been conducted and the true extent of invasive species has not been quantified. If existing occurrence size turns out to have been underestimated, if treatment needs increase in response to vegetation treatments, or if emergencies arise in the future (such as response to post- fire invasion) it could be necessary to be able to treat significant areas of the preserve.

Combined herbicide treatments from within existing sites and as a result of EDRR would not exceed 1139 acres per year (~1.28% of the preserve's area) during the life of the plan (We currently treat 40 point locations of individual plants and groups of plants.). This upper limit is a "cap" derived from considering acres treated in recent years, potential increases in treatment acres resulting from recently discovered weed populations, and potential "worst case" needs based on a comprehensive inventory of high risk locations (such as roadsides and gravel pits).

Realistically, it is expected that actual treatment would be much less than 1139 acres per year. Herbicides would not be used in every instance of treatment, existing weed populations likely cover far less than 1139 acres, and performance requirements are expected to prevent noxious weeds from achieving this extent. In general relatively small spot treatments similar to historic herbicide application on the preserve are expected. Nonetheless, it is prudent to plan for unforeseen circumstances so that we can be adaptive in our management of the preserve. If this cap proves to be inadequate in the future, additional environmental analysis would be required to implement a decision to treat additional areas.

SITE RESTORATION

Commonly used control methods, such as manual or herbicide treatments may eliminate or suppress invasive species in the short term, but the resulting gaps in vegetation and bare soil create open niches that are susceptible to further invasion by the same or other undesirable plant species. Site restoration or revegetation is an important part of any strategy to reduce invasive plants. The first step is to determine the need for active restoration/revegetation versus passive restoration.

Passive restoration depends on re-colonization from the existing native plant seedbank and from seed dispersed from surrounding sources, as well as growth and reproduction of native species already within the treatment site. Passive restoration is appropriate on sites where relatively little bare ground exists after treatment. Active restoration requires activities such as seeding, raking (by hand or with a harrow pulled by an ATV), mulching, and/or planting native plants. Active restoration would likely be limited to large sites with dense infestations, where considerable bare soil and little native vegetation are present after treatment. None of these areas presently exist.

Passive restoration would be the preferred option at known noxious weed locations within the preserve due to their relatively small size and the fact that they are within or adjacent to native plant communities capable of providing seeds for recolonization. Many of the sites have low-density infestations, and growth and reproduction of existing native plants should be sufficient to revegetate the sites. Sites where continual disturbance prevents long-term establishment of vegetation (such as parking areas, and gravel pits) would not be actively restored. Foreseeable active management opportunities would include recently disturbed landings and skid trails where restoration would be used as a preventative measure to reduce bare soil, or on roadsides where restoration seeding could be used to vegetate recently treated areas. Active restoration opportunities such as planting or seeding of native species would be implemented on a site specific (project by project/treatment by treatment) basis as they are identified in the future, and according to the principles of adaptive management.

Prevention would be accomplished through the implementation of mitigating measures listed under Noxious Weed Prevention and Control, Mitigations.

The long-term strategy for prevention and control focuses on reducing the establishment of new noxious weeds or spread of existing weeds. Initially we would focus on known occurrences and features such as roads, aggregate sources, mechanical treatment sites, grazing infrastructure and open roads. Additional inventories may correlate other locations or activities as high risk.

NOXIOUS WEED TREATMENT PRIORITIES

Invasive species sites would be prioritized for treatment based on factors such as the current abundance and distribution of the species, the potential for spread, and the type and values of the site affected Table 2.4 shows criteria for determining high, medium, and low priority for treatment. Other management considerations may also affect treatment priority, and these factors may change over

time. For example, sites located in areas proposed for ground-disturbing management activities may be treated prior to project implementation in order to prevent spread. Priority may be given to treatment and restoration of sites where considerable time and money has already been spent. Opportunities for special funding or cooperative projects with other landowners, agencies, and organizations may also be considered.

After invasive plant species locations are prioritized for treatment, each site within the preserve would be assigned a treatment objective; defined as follows:

- **Eradicate**: Attempt to eliminate an invasive plant species from a site.
- **Control**: Reduce the infestation over time; some level of infestation may be acceptable.
- **Contain**: Prevent the spread of the invasive plant beyond the perimeter of patches or infestation areas mapped from current inventories.
- **Tolerate**: Accept the continued presence of established infestations and the probable spread to ecological limits for certain species. Try to exclude new infestations through prevention practices.

Objectives vary depending on the potential negative impacts of a given invasive species, the potential for spread, the value or sensitivity of the treatment site, and the feasibility and costs of treating a site. Different sites of the same species may have different objectives. For example, the objective for a large population of musk thistle in a young forest site may be control or contain, while the objective for a small population of musk thistle in an active gravel pit may be eradicate. Objectives may also change over time based on adaptive management factors (experience, new research, new technology, etc.). Additionally the class of weed (A-C) often provides guidance based on state level objectives.

All known populations of noxious weeds on the preserve near high traffic areas are a high priority for treatment. Eradication is the objective of choice for noxious weeds that currently exist on the preserve because all known noxious weed populations are relatively small at this time and/or restricted to roadsides where they can be easily accessed and treated. Roadside populations are a special concern due to their observed tendency to spread rapidly and over great distances in a short period of time (Iskra 2009). The ability of these weeds to be spread by day-to-day operational traffic on the preserve highlights the importance of early and proactive management. It is important that these populations be treated before or concurrent with any ground disturbing activity that is conducted in adjacent areas (Noxious Weed Prevention and Control Mitigating Measures) to avoid spreading them into mechanically treated or burned locations. Additional precautions (per the proposed performance requirements) may also need to be implemented concurrent with or prior to proposed project implementation.

Table 2.4 - Criteria for determining the treatment priorities for noxious weeds

Priority	Description
High	❖ Sites of species new or uncommon on the preserve. ❖ In active pits and quarries.

	❖ In areas of high traffic (e.g., roads, high use recreation sites, trailheads, horse camps, fire camps, parking lots, etc.). ❖ Sites in recent fire areas where potential for infestation and spread is high. ❖ Sites that could impact Threatened, Endangered, or Sensitive plant and animal habitat. ❖ Sites in or near unique plant habitats, or areas of high diversity (e.g., meadows, stream sides, wetlands, fens). ❖ Sites with potential to spread across ownership boundaries onto lands that are currently not infested. ❖ Instances where weed treatment partnerships or funding opportunities are available ❖ Areas of high/concentrated livestock or wildlife use
Medium	❖ Control/Containment of existing large infestations of priority species with a focus on the boundaries of the infestation. ❖ Roads that have less traffic, but still promote seed dispersal.
Low	❖ Sites of species already widespread on the preserve. ❖ Large infestations, where eradication, control, or containment would be costly and difficult to achieve in 10 to 15 years. ❖ Sites with low risk of spread that are expected to decline with natural plant community succession.

RESEARCH, INVENTORY, MONITORING, AND EVALUATION

Research, inventory, and monitoring activities include on-the ground actions that may have environmental consequences:

- Routine inventory of floral and faunal habitats using non-destructive as well as destructive[11] methods.
- Inventory of wildlife using observation as well as capture and measurement.
- Measure of ecosystem processes including succession, water capture, storage and yield and carbon sequestration using temporary and permanent exclosures and instrumentation.
- Measures of climate and/or weather using permanent instrumentation (Figure 2.19)
- Pre and post activity monitoring
- Long term monitoring of various ecosystems and various scales using temporary and permanent plots and instruments.

[11] Destructive monitoring includes cutting trees or down logs; digging pits, capturing specimens, or other features to take precise measurements.

Figure 2.19 - Existing meteorological monitoring station, Valle Grande

RESEARCH, INVENTORY, MONITORING AND EVALUATION PRIORITIES

Priorities would be to:

- Install permanent water quality and climate instrumentation, and permanent sites and exclosures for long-term monitoring;
- Collect baseline information for LRMP activities.
- Evaluate and compile the results of LRMP activities.
- Maintenance of existing monitoring instrumentation and exclosures.
- Landscape scale baseline data on wildlife including, New Mexico meadow jumping mouse and large predators.

Extramural research and inventory (not directly associated with ongoing management activities or long-term monitoring; generally in support to an external project) would be second priority.

Alternative 2 - Collaborative Forest Landscape Restoration

Alternative 2 proposes integrated restoration and management actions including forest thinning, wildland fire management, watershed, riparian, and wetland restoration and management, road closure, decommissioning and maintenance; and noxious weed eradication and control. Stands being proposed for treatments were selected based on the criteria from the restoration strategy submitted for funding under the collaborative forest restoration program(Valles Caldera Trust, Santa Fe National Forest 2010) – ecological departure and fire behavior potential.

ALTERNATIVE 2 - MECHANICAL TREATMENT AREAS AND ACRES

To develop a proposed strategy over the next 10 years that would move the forests of the VCNP towards the reference condition at the landscape scale, the IDT evaluated several forest attributes at the stand level: fire regime, vegetation type, structure, composition, fire behavior potential, slope, and soils. Based on these attributes the IDT identified forests stands where mechanical treatments would be the most suitable and effective and assigned the following prescriptions. 27,312 acres were considered suitable and in need of mechanical treatment. Based our current capacity including staffing and expected levels of funding, we are proposing to treat nearly 80 percent of these forests or approximately 21,500 acres. Table 2.5 below displays the total acres within the ecotypes, the acres suitable for mechanical treatment (footprint for treatment), and the acres we expect to treat over the 10-year planning period.

Table 2.5 - Alternative 2: Proposed mechanical treatment acres

Fire Regime & Ecotype	Treatment Criteria	Potential Treatment Acres	Prescriptions	10-Year Treatment	Potential Utilization
FR I – Ponderosa Pine; Xeric Mixed Conifer	Average Slope[12] ≤ to 25%	7,860	REST	7,860	Yes
FR I – Montane Grasslands	Encroachment by conifer	3,236	REST	3,236	Yes
FR III – Mesic Mixed Conifer; Aspen/Mixed Conifer	Average Slope ≤ 25%, Fire Intensity Class[13] = IV or V	8,527	ASRE, FOHE	7,500	Yes
FR III – Mesic Mixed Conifer; Aspen-Mixed Conifer	Slope >25%, Fire Intensity Class = V, erosive soils.	3,840	HFRE	1,500	No
FR IV – Xeric Spruce-fir; Mesic Spruce-fir	Slope ≤ 25%, Fire Intensity Class = IV or V	2,620	HFRE	1,200	Yes
FRIII – Mixed Montane Woodlands	Gambel oak dominate species	1,229	HFRE	200	No
Totals		**27,312**		**21,496**	

All fire regimes, forest types	2364	Not otherwise selected	[14]	WFCO	<2000	Yes
All fire regimes, forest types	30,100	Burned in the Las Conchas Fire		HFRE		No
All fire regimes, forest types	N/A	Affected by unplanned events		HFRE		Yes

[12] Each forest stand is attributed with an average slope. This attribute was used to identify stands on "generally" operable ground. Performance requirements limit the use of heavy equipment to slopes less than 30 percent. Actual slopes will be used to identify operable ground.

[13] Fire Behavior Potential is indicated by a Fire Intensity Class attribute of 1-VI, with one being the least potential and VI being the greatest.

[14] Mechanical treatments in support of prescribed fire preparation to reduce the intensity of prescribed fire or to create or improve control lines.

ALTERNATIVE 2 – MECHANICAL TREATMENT PRIORITIES

The proposed activities are planned over a 10-year period. The plan is based on expected levels of funding, typical costs for treatments, current market conditions, and an assumption that environmental conditions will be favorable. These assumptions and expectations can vary substantially over the planning period therefore, it is important to identify priority treatment activities at the project level to ensure that goals and objectives can be met at the landscape scale.

The IDT considered watershed management units (WMU), which are sub-units of 6th level HUCs. There are 24 WMUs in the VCNP which have been organized into five priorities based on degree of ecological departure, fire risk[15], fire behavior potential, and values at risk (and vulnerable) to damage or loss from fire. Forest stands where treatments are proposed and priority areas are displayed below in Figure 2.20

PRIORITY 1

The southwestern corner was considered the first priority due to the proximity and alignment to a historically high concentration of human caused fires as well as the current degree of ecological departure.

PRIORITY 2

WMUs within the Valle Grande are the second priority due to ecological departure, fire behavior potential and values at risk (historic wooden cabins and iconic views; both extremely vulnerable to loss or damage from fire).

PRIORITY 3

Sulphur Creek and the middle San Antonio where the forests are ecologically departed and fire behavior potential is high. Post fire impacts (debris flows and flooding) could damage or destroy homes and infrastructure in downstream communities (Sulphur Springs, La Cueva)

PRIORITY 4

The forests aligned with the northern boundary of the VCNP are the fourth priority. Reducing the fire behavior potential in this area would enhance the objectives on the surrounding NFS land.

PRIORITY 5

This area includes the Valle Jaramillo, and the Upper San Antonio WMUs.

PRIORITY 6

[15] Fire risk considered fire behavior potential as well as proximity and alignment to historic fire occurrence.

South Mountain and East Fork Jemez River WMUs are the sixth priority

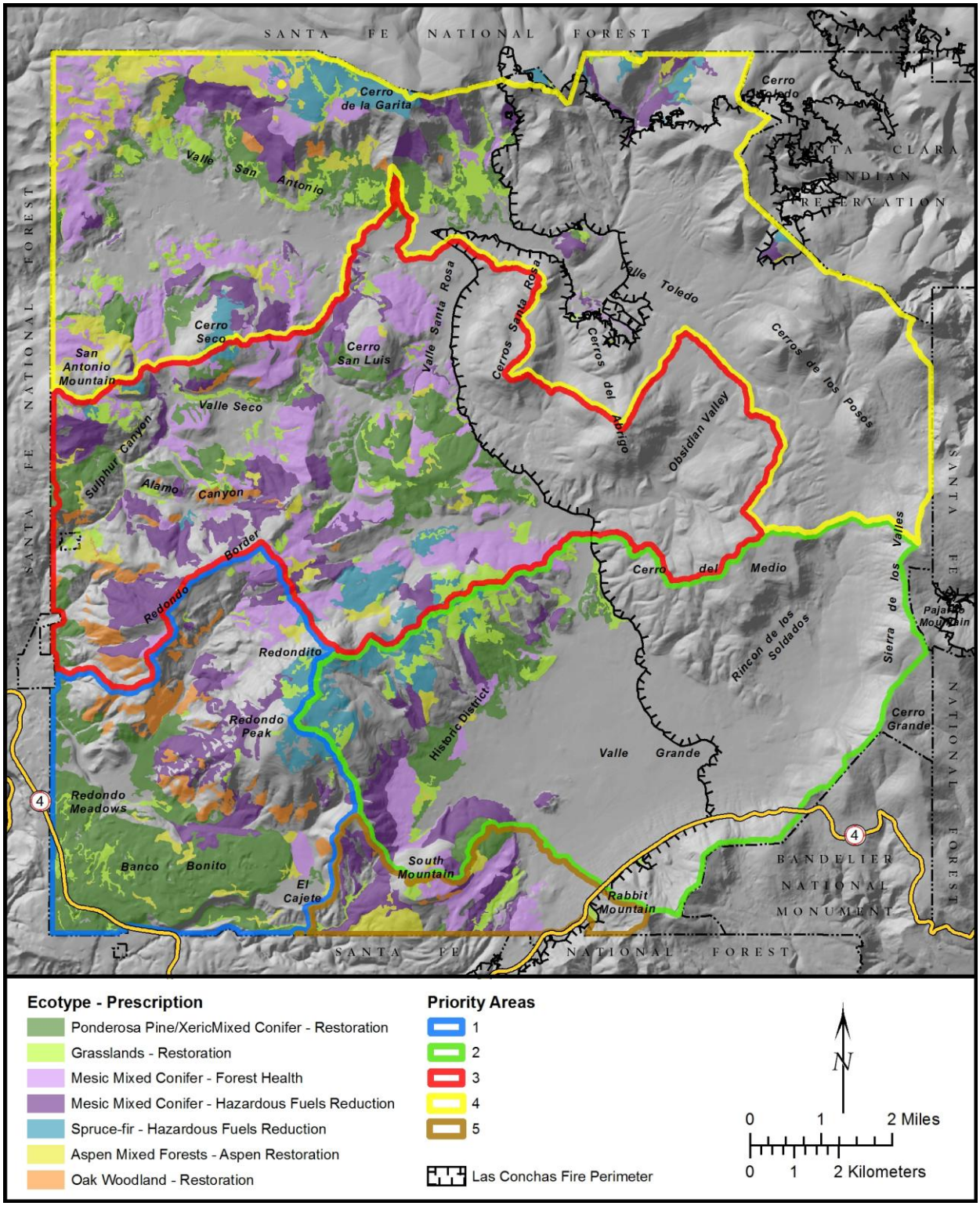


Figure 2.20 - Alternative 2: Mechanical treatment areas

WILDLAND FIRE – AREAS AND PRESCRIPTIONS

Fire has been an essential process in the landscapes in and around the preserve for the past 10,000 years (Allen 1989) and in general wildland fire could potentially be applied beneficially to most ecotypes on the preserve. However, funds and environmental conditions limit the amount of acres proposed for treatment during the planning period. Due to the current fire behavior potential most burning within forest types would follow mechanical treatment. Table 2.6 presents proposed prescribed burning over the 10-year planning period. The table is followed by a narrative description of proposed burning.

Table 2.6 - Alternative 2: Proposed prescribed burning

Fire Regime	WFPF Only[16]	WFPF in combination with MECH (Table 2.5)	Prescriptions	Total WFPF
FRI	17,415	11,095	LOWS	28,510
FRIII &IV	10,915	10,400	MIXS	21,315
Totals	**28,330**	**21,495**		**49,825**

PONDEROSA PINE WOODLAND AND SAVANNA, DRY MIXED CONIFER, AND MONTANE GRASSLANDS

Prescribed fire would be used in these forest types alone or following appropriate mechanical treatments. Prescriptions parameters would emphasize low severity and intensity fire (Figure 2.9) burning continuously (>50 percent) across the landscape to reduce hazardous fuels, restore composition and structure, or dispose of biomass resulting from mechanical treatment.

ASPEN AND MESIC MIXED CONIFER FORESTS

Wildland fire would be used in these forest types alone or following appropriate mechanical treatments. Prescriptions would promote low to mixed severity and intensity fire with patchy (<50 percent) continuity to reduce hazardous fuels, restore structure and composition, and dispose of biomass resulting from mechanical treatments.

GAMBEL OAK-MIXED MONTANE WOODLANDS

Wildland fire would be used to enhance structural diversity and wildlife habitat improvements initiated by mechanical treatments. Prescriptions would promote low severity and intensity, patchy and

[16] MECH areas would also be treated with prescribed fire following BD activities

discontinuous burning (<50 percent) across the landscape to restore structure and composition and dispose of biomass resulting from mechanical treatment.

DRY AND MESIC SPRUCE-FIR FORESTS

Wildland fire would be used in these forest types alone or following mechanical treatments. Prescriptions would promote low to mixed severity and intensity fire with patchy (<50 percent) continuity to reduce hazardous fuels restore structure and composition and dispose of biomass resulting from mechanical treatment.

WILDLAND FIRE PLANNED IGNITION PRIORITIES

Biomass disposal and hazardous fuels reductions would be the highest priority for planned ignitions. Opportunities to implement planned ignitions can be limited by environmental conditions and lack of resources. As mechanical treatments were completed opportunities to manage wildland fire would increase. Planned ignition projects should be used to treat larger landscapes whenever possible and consistent with desired outcomes.

Alternative 3 – Aspen Regeneration

This alternative varies from the alternative 2 in the intensity and location of mechanical treatments and associated wildland fire management actions. Other proposed restoration activities would remain the same.

ALTERNATIVE 3 MECHANICAL TREATMENT

This alternative proposes more thinning prescriptions within the mesic mixed conifer, aspen-mixed conifer, and dry spruce-fir type forests, where disturbance is likely to stimulate aspen reproduction. This alternative addresses two issues regarding aspen forests. First, the preserve's resident elk herd is reducing the survival of regenerating aspen to what could be an unsustainable level; field transects measured 95 percent browsing of aspen seedlings. Second, a variety of factors including elk, climate, fire exclusion, forest pests, and diseases are combining to affect aspen at the regional scale and warrant the consideration of more intensive protection and management of aspen. This alternative could also increase the capture, storage and yield of water to a greater degree than the alternative 2.

Table 2.7 below summarizes the proposed mechanical treatments under alternative 3 organized by fire regime and ecotype and includes a summary of the criteria used to identify the proposed treatment areas as well as the intensity of treatment proposed over the next 10 years. Figure 2.21 displays the areas suitable for mechanical treatment and priority treatment areas for alternative 3.

Table 2.7 - Alternative 3: Proposed mechanical treatment acres

Fire Regime & Ecotype	Treatment Criteria	Potential Treatment Acres	Prescriptions	10-Year Treatment Acres	Potential Utilization
FR I – Ponderosa Pine Woodland & Savanna; Dry Mixed Conifer	Average Slope[17] ≤ to 25%	7,860	REST	7,860	Yes
FR I – Montane Grasslands	Encroachment by conifer	3,236	REST	3,236	Yes
FR – III & IV Aspen Composition	Slope ≤ 30%, aspen in composition	9,677	ASRE	9,677	Yes
FR III – Mesic Mixed Conifer; Aspen-Mixed Conifer	Slope >30%, FIC V, erosive soils (not included above)	322	HFRE	322	No
FRIII – Mixed Montane Woodlands	Gambel oak dominate species	1,235	HFRE	200	No
Totals		**22,330**		**21,295**	

All fire regimes, forest types	2,368	Not otherwise selected	[18]	WFCO	<2000	
All fire regimes, forest types	30,100	Burned in the Las Conchas fire				
All fire regimes, forest types		Impacted by future disturbance	[19]			

[17] Each forest stand is attributed with an average slope. This attribute was used to identify stands on "generally" operable ground. Performance requirements limit the use of heavy equipment to slopes less than 30 percent. Actual slopes will be used to identify operable ground.

[18] Mechanical treatments in support of prescribed fire preparation to reduce the intensity of prescribed fire or to create or improve control lines.

[19] A unplanned event such as wildfire, insect infestation, or storm may create a short term need for localized mechanical treatment

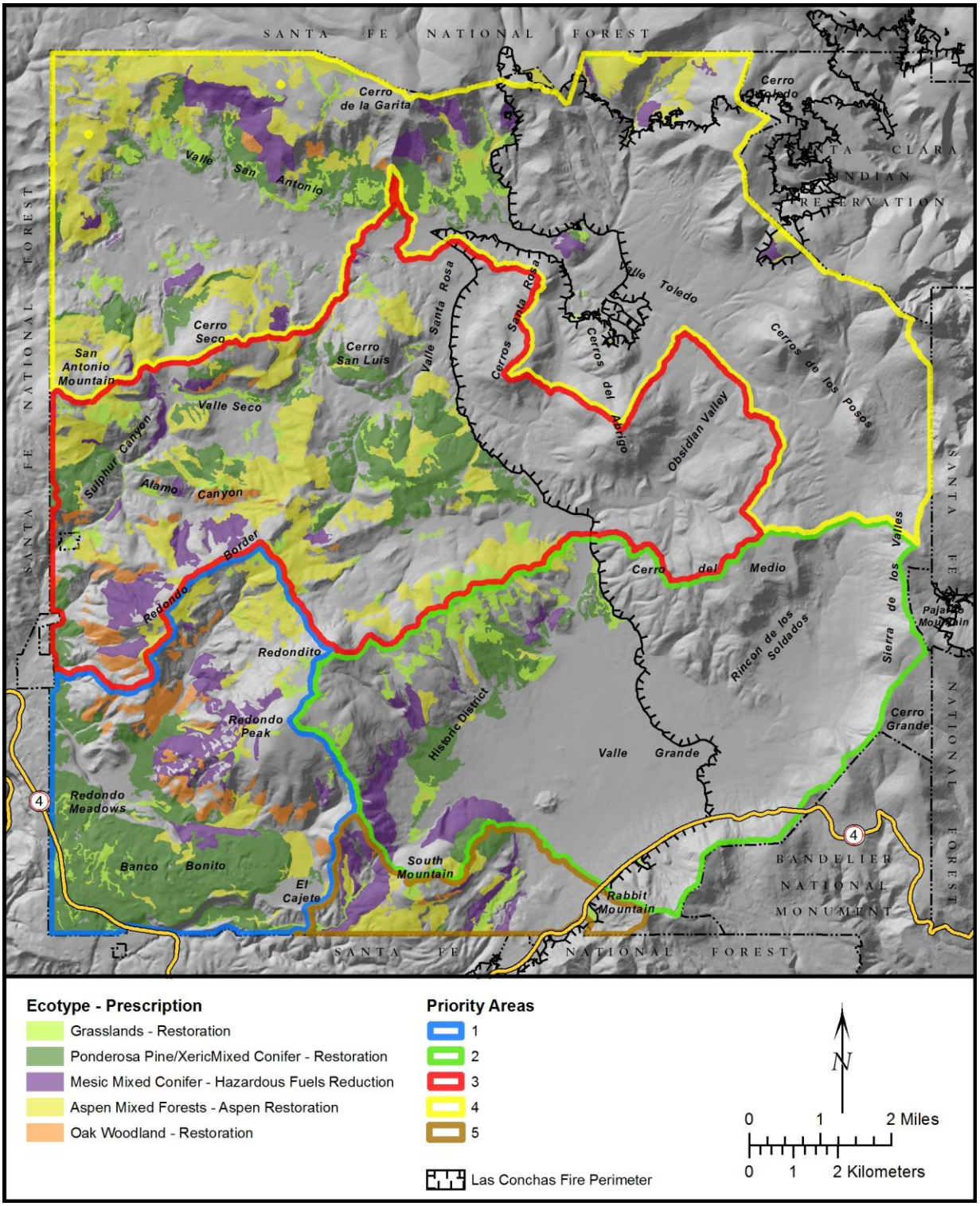


Figure 2.21 - Alternative 3: Forest stands meeting treatment criteria and priority areas for treatment

ALTERNATIVE 3 – WILDLAND FIRE

Table 2.8 displays proposed planned ignitions of wildland fire management under alternative 3.

Table 2.8 - Alternative 3: Proposed planned ignitions of wildland fire

Fire Regime	WFPF Only[20]	10-Year Treatment Acres (Table 2.7)	Prescriptions	Total WFPF
FRI	17,415	11,096	LOWS	28,511
FR III & IV	10,915	10,199	MIXS	21,114
Totals	**28,330**	**21,295**		**49,625**

2.7 ALTERNATIVE COMPARISON

The action alternatives (2 and 3) vary in the acres of mechanical treatment and prescriptions, and the ecotypes treated mechanically (with follow up prescribed burning); other restoration actions would be the same.

Table 2.9 – Comparing 10-year proposed mechanical treatment acres presented by ecotype (differences between alternatives are in bold)

Ecotype	Alt. 2 10-Year MECH Acres	Alt. 3 10-Year MECH Acres
FR I Montane Grassland	3236	3236
Ponderosa Pine Savanna	1032	1032
Ponderosa Pine Forest	3817	3817
Xeric Mixed Conifer	2957	2957
Blue Spruce Fringe	53	53
Mesic Mixed Conifer	**5471**	**5756**
Mesic Mixed Conifer (HFRE)[21]	**1205**	**322**
Aspen/Mixed Conifer	**2020**	**3493**
Aspen/Mixed Conifer (HFRE) [21]	**295**	**0**
Xeric Spruce-fir	**764**	**429**
Mesic Spruce-fir	**445**	**0**

20 MECH areas would also be treated with prescribed fire following BD activities

21 Hazardous fuels reduction on steep slopes

Mixed Montane Shrublands	200	200
Totals	**21495**	**21295**

Table 2.10 below compares the intensity and costs of the action alternatives. Alternative 3 is anticipated to cost nearly $3.5 million more over the 10-year planning period due to more intensive mechanical treatment. Dollars are estimates based on direct and indirect (12.5 percent) costs, reflecting current costs and dollars. It does not reflect potential market value, which today are not significant but we believe could increase as the supply of small diameter material become more reliable. Table 2.10 only presents the intensity of costs for activities that vary between the action alternatives. The complete costs and benefits for all alternatives are detailed in Chapter 4 – Environmental Consequences.

Table 2.10 – Comparing the intensity and cost of mechanical treatments (action alternatives only)

MECH Prescription	**Acres**		**Cost/Acre ($)**	**Total Cost ($)**	
	Alt. 2	**Alt. 3**		**Alt. 2**	**Alt. 3**
REST – Restoration	11095	11095	800	8,876,000	8,876,000
ASRE – Aspen Restoration	2020	9,677	950	1,919,000	9,193,150
FOHE – Forest Health	5480	0	700	3,836,000	0
HFRE - Hazardous Fuels	2900	522	600	1,740,000	313,200
Total	**21,495**	**21,295**		**16,371,000**	**18,383,150**
Prescribed Fire Type	**Acres**		**Cost/Acre ($)**	**Total Cost ($)**	
	Alt. 2	Alt. 3		Alt. 2	Alt. 3
WFBD	21,495	23,498	150	3,224,250	3,524,700
WFPF - Grasslands	12,340	12,340	75	925,500	925,500
WFPF – Forest/Woodland	15,990	15,990	200	3,198,000	3,198,000
Total	**49,825**	**51,828**		**7,347,750**	**7,648,200**
Grand Total				**23,718,750**	**26,031,350**

2.8 ADAPTIVE MANAGEMENT

The implementation of any action alternative would incorporate a system for adaptive management. The NEPA procedures of the VCT define adaptive management as "…*adjusting stewardship actions or strategic guidance based on knowledge gained from new information, experience, experimentation, and monitoring results, and is the preferred method for managing complex natural systems*." (Federal Register 2003). We implement adaptive management by adopting goals and identifying objectives and monitored outcomes in order to measure goal attainment (Figure 2.22 below).

> "What is important is to keep learning, to enjoy challenge, and to tolerate ambiguity. In the end there are no certain answers."
>
> *-Martina Horner, President Radcliff College*

Based on a review of monitored outcomes, mid-course adjustments can be made. Adjustments can be made without further review under the National Environmental Policy act (NEPA) provided the adjustments include actions and potential environmental consequences identified in this EIS. A summary of all actions, monitored outcomes and adjustments will be presented every five years in the State of the Preserve.

Perhaps adaptive management can be better understood as a set of principles:

- Define explicit and measurable management objectives
- Recognize uncertainty and develop and test hypothesis
- Seek input of interested members of the public and stakeholders
- Monitor and learn through experience
- Adapt management and stewardship actions and decisions based on learning

Adaptive management is a process of viewing management actions as experiments rather than solutions. It is a formal and systematic approach to learning from the outcomes of our stewardship actions, accommodating change, and improving management.

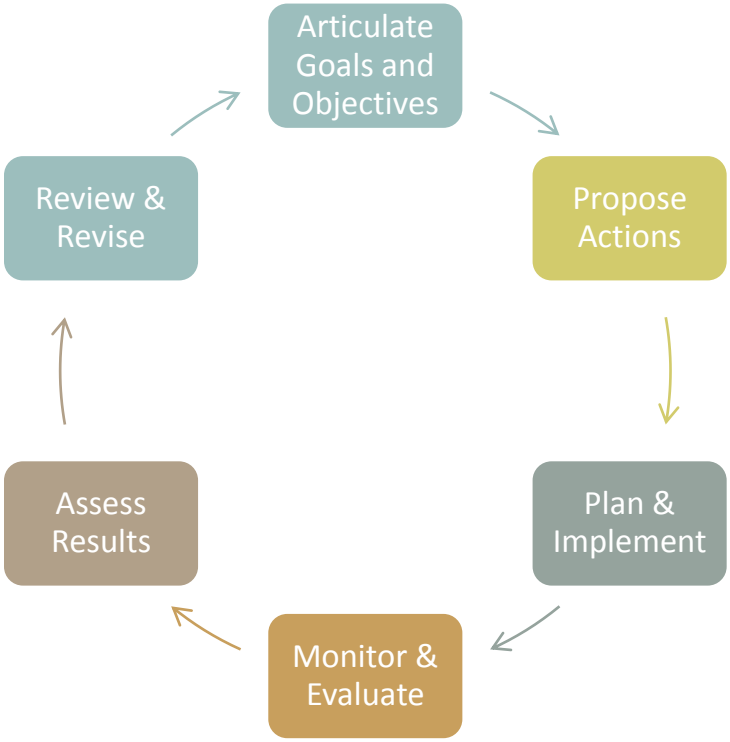


Figure 2.22 - Process diagram illustrating adaptive management

Goals

Our procedures for implementing NEPA define a goal as "*… a desirable condition as sought by the Trust*" (Federal Register 2003). The procedures include that a goal can be adopted based on a review of a current *State of the Preserve.*

A goal is both qualitative and quantifiable, but is not quantified. Goals stretch and challenge us, but they are realistic and achievable as well as flexible enough to persist over time.

Based on a review of the 2007 *State of the Preserve,* and in pursuit of the central goal for management put forward in the 2004 *Framework and Strategic Guidance for the Comprehensive Management of the Valles Caldera National Preserve*, we adopted the following goal for the ecological condition of the preserve:

"The ecological condition of the preserve would be moving toward the composition of landscape vegetation and disturbance attributes that, to the best of our collective expert knowledge, can sustain current native ecological systems and reduce future risk to native diversity" (Valles Caldera Trust 2009).

This goal is synonymous with the collaboratively developed goal for the Southwestern Jemez Mountains Landscape: "*Improve the resilience of ecosystems to recover from wildfires and other natural disturbance events in order to sustain healthy forests and watersheds for future generations"* (Valles Caldera Trust, Santa Fe National Forest 2010).

Objectives

Our NEPA procedures define an objectives as "*… the desired outcome that can be meaningfully evaluated by location and timing within the Preserve*." Measurable objectives are used to evaluate progress towards goal attainment. The objectives proposed for assessing goal attainment for the Stewardship Plan are listed in Table 2.11.

Table 2.11 - Proposed objectives, desired outcomes and targets

Objective	Desired Outcome	Target
Improve Forest Structure	Move the structure and composition of the preserve's ecosystems towards the reference condition. Improve the resilience of the ecosystem.	35% of closed forests move to open classes
Improve Forest Function	Improve water capture, storage and yield, carbon sequestration, and succession.	35% of closed forests move to open classes
Reduce Uncharacteristic	To reduce the likelihood of	55% reduction in acres classified FIC

Wildfire Potential	disturbances (especially fire, but also including insects and disease) occurring with uncharacteristic intensity, severity, frequency and/or at an uncharacteristic scale.	IV or V.
Reduce Crown Fire Potential	Reduce the likelihood and extent of crown fire potential.	30% reduction in crown fire potential.
Reintroduce Wildland Fire	Restore fire as a critical process in fire adapted ecosystems.	35,000 acres treated with planned or unplanned ignition in 10 years.
Reduce Road Density	Reduce road densities and associated erosion and water quality impacts.	1000 miles of roads decommissioned
Improve Water Quality	Move the water quality of the preserve towards meeting all designated uses as identified by the New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB).	No exceedance of any TMDL
Restore Stream Function	Move all stream conditions to a fully functioning condition.	Streams rated as "Proper Functioning Condition"
Restore Wetlands	Restore historic wetlands extent	20% increase in acres identified as wetlands[22]
Protect Native Species	Eradicate noxious weeds; maintain and increase native species and diversity.	Eradication of Canada, bull and musk thistle, 70 % reduction in oxeye daisy, 50% decrease in cheatgrass, no new species established.
Improve Wildlife and Terrestrial Habitats	Improve and maintain the quality and diversity of wildlife.	Maintain 70% of large down logs; 35% of closed forest moves to open forest
Improve Fisheries and Aquatic Habitats	Restore the quality, function and disturbance pattern of aquatic habitats	Return of beaver, New Mexico meadow jumping mouse, and northern leopard frog
Protection and preservation of cultural	Protect cultural resources from direct or indirect damage from	No damage or loss resulting from treatments.

[22] Currently wetlands have been identified through the 2006 vegetation map prepared by New Mexico Natural Heritage Museum(Muldavin, et al. 2005).

resources	restoration activities	
Benefit local economy	Create opportunities for local employment	10,000 days of work [23]

Monitored Outcomes

Our procedures for implementing NEPA define monitored outcomes as "*…the result or consequence of a stewardship action that can be meaningfully evaluated by location and time of occurrence*" (Federal Register 2003). Meaningful evaluation of outcomes ensures that progress is being made towards achieving plan goals and objectives. Such evaluations are used as the basis for adjusting management actions in a timely manner to ensure continued progress. Table 2.12 identifies outcomes selected for monitoring and evaluation and indicates the proposed frequency for measure.

> "An experiment is a question which science poses to Nature, and a measurement is the recording of Nature's answer."
>
> — Max Planck
>
> *Scientific Autobiography* (1949).

Measures may be taken either at the project location or representative long-term monitoring sites.

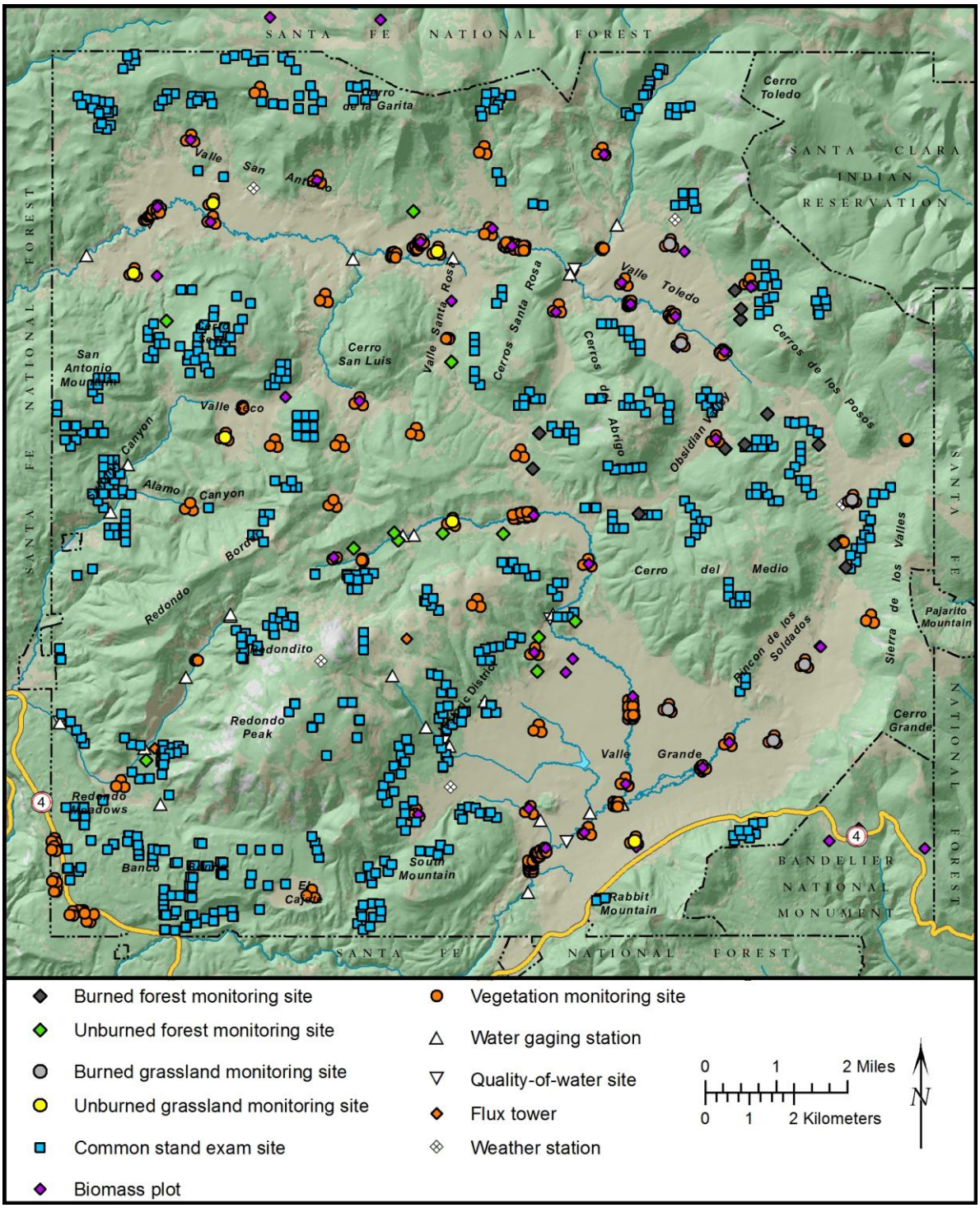
Table 2.12 Objectives, monitored outcomes and frequency of measure

Objective	Monitored Outcomes	Frequency
Improve forest structure - stand level	Tree size, species, and canopy density	1-5 years following treatment
Improve forest structure - landscape level	Distribution of successional classes	Summarized every 5-years
Restore forest function	Carbon flux, water capture storage and yield	Continuously, summarized every 5 years
Reduce uncharacteristic fire potential	Crown base height, crown bulk density or canopy closure, surface fuel model	1-5 years following treatment
Reduce road density	Miles of road, closed, rehabilitated, and maintained	Every 5 years
Improve water quality	Temperature, turbidity, dissolved oxygen, pollutants	Continuously during frostfree seasons; summarized every 5

[23] (100/days/year for 10 individuals within the impact area for 10 years)

		years.
Restore stream condition	Depth to width ratio, vegetative cover	1-3 years following treatments
Restore wetlands	Acres of wetland	3-5 years following treatment
Protect native species	Vegetative cover/diversity, cover /diversity of native species, presence of noxious weeds	1-3 years following treatments, summarized every five years.
Improve wildlife and fisheries habitats	Key characteristics related to forest structure, water quality, and stream condition	1-3 years following treatments, summarized every five years.
Improve wildlife and fisheries habitats	Population health and characteristics	Varies by species
Protect and preserve cultural resources	Damage or loss of features	During implementation or 1-3 years following treatment
Benefit local economy	Utilization of wood products, Days of work	Jobs and Labor Income; reported annually.

Figure 2.23 – Monitoring predator population health and characteristics as it relates to habitat



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