Valles Caldera National Preserve

Sandoval County

New Mexico

Stewardship Register

Valle Toledo Prescribed Fire

Stewardship Action:	Valle Toledo Prescribed Fire
File Number:	Designated upon Implementing Decision
Target Start Date:	Fall 2005
Actual Start Date:	Fall 2005
Target Completion Date:	Fall 2005
Actual Completion Date:	Fall 2005
Location (approximate project center):	Latitude/Longitude: 35.9625°N, 106.4625°W Legal description: New Mexico, New Mexico Meridian T20N, R4E, Section13 UTM: zone 13 (X,Y) 368122 , 3980778

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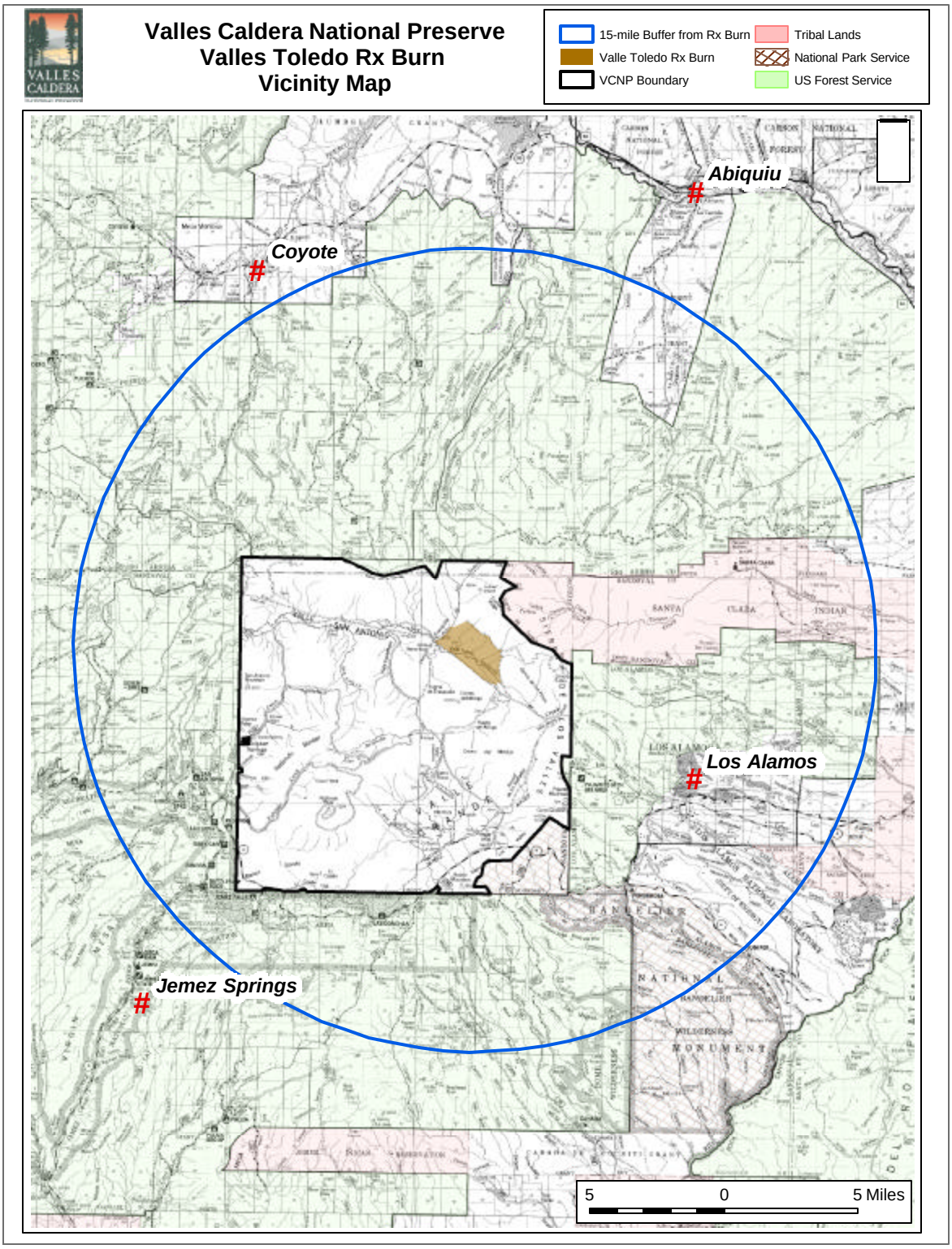
Please address your comments to the attention of Marie Rodriguez, Natural Resource Coordinator.

Map 1.1 Vicinity Map



Environmental Assessment

Chapter 1 Proposed Action - Purpose and Need

1.1 Proposed Stewardship Action

The Valles Caldera Trust is proposing to treat approximately 1800 acres of the nearly 3800-acre Valle Toledo with prescribed fire in the fall of 2005 or 2006 (depending on the environmental conditions). The prescribed fire would be implemented over a period of 2-5 days using both aerial and hand ignition devices.

Open roads and a fire hose-lay system would be used for control lines and to provide contingency positions.

Approximately 40 people would be onsite for operations and support. Staging would occur in a nearby recreational staging area and personnel would access the site from the VC09, VC13, and VC14 Roads. Personnel would travel daily from their home duty stations or accommodations would be provided (no camp facilities would be established).

Twelve integrated (non-ground disturbing) monitoring tasks would occur in association with the proposed stewardship action.

Task 1: Plant responses to fire and ungulate grazing would be measured in representative habitat types within the proposed fire perimeter. A system of exclosures would be paired with unenclosed areas. Within these study plots, population demographics and nutritional composition would be determined for the five most common grasses and forbs, individual plants would be marked for continual measurement. Mortality and growth response in ponderosa pine would be measured. Study plots within the treatment area would be paired with control plots which will remain untreated.

Task 2*:* Soil cores would be analyzed for field water content, soil organic matter, water-holding capacity, field available nitrate and ammonium, potentially mineralizable nitrogen and the identification of the nitrogen mineralization pattern.

Task 3*:* Rates and sequences of litter decomposition would be measured in the absence of fire. Litter samples would be collected from the five most common species three times per year following the fire from burned and unburned plants. The samples would be analyzed for litter production as well as nutrient and ion content.

Task 4*:* Rates of erosion would be measured for three years following the fire. Measurements would be taken using erosion pins inside and outside the burn area.

Task 5*:* The use of the treated versus untreated areas by ungulates would be documented using two programmable video cameras. The cameras would capture information every 30 minutes for 5 seconds from dawn to dusk.

Task 6*:* Changes in terrestrial arthropod populations, particularly grasshoppers, would be measured using pitfall traps and visual observations.

***Task 7**:* Effects to stream water quality would be measured by placing Sonde stations in the Upper San Antonio (treated with fire using Best Management Practices (BMPs) and Rito de los Indios (control, unburned) streams. These stations would continuously record water temperature, dissolved oxygen, pH, conductivity and turbidity. Samples for ions, minerals and chemicals would be collected and analyzed weekly and opportunistically following monsoonal flow events.

***Task 8**:* The composition, distribution and abundance of the resident macro invertebrate population would be sampled seasonally prior to and following the prescribed fire.

***Task 9**:* Biomass and abundance of fish populations would be determined prior to and following the prescribed fire.

***Task 10**:* The effect of prescribed fire on artifact visibility and condition would be determined by three actions. 1) a sample survey conducted prior to the burn, 2) an assessment of fire effects within systematically placed sites using thermisters and chemically assessing compositional changes in lithic materials, and 3) 100 % survey following the burn. The reduction in surface vegetation and litter would provide the first opportunity to assess artifacts in a continuous valle landscape.

***Task 11**:* Meteorological measurements would be taken using an on-site Campbell weather station.

***Task 12**:* Landscape scale vegetative change would be detected using imagery collected from low elevation (1:4000) digital photography.

Task Synthesis: The tasks would be conceptually integrated then statistically integrated and synthesized using single and multiple correlation analysis.

1.2 Purpose and Need for Action

This stewardship action is being proposed to measure the effectiveness of using prescribed fire as a management tool to improve the health and vigor of grassland communities and improve the distribution of ungulate grazing within a valle at a landscape scale.

The Board of Trustees has authorized the Trust to consider a comprehensive plan for the use of fire to protect and enhance the forest and rangeland ecosystems on the Preserve (Valles Caldera Trust 2004 Annual Operating Plan).

Sufficient information is available to predict the range and intensity of outcomes resulting from the use of fire[1]. A carefully monitored prescribed burn in representative montane grassland on the Preserve would help to quantify predicted outcomes at a landscape scale and validate/refine performance requirements and Best Management Practices (BMP's) proposed to protect natural and cultural resources.

[1] The Ecological Restoration Institute at Northern Arizona University, First Order Fire Effects Model – USDA USFS Rocky Mountain Research Station, Fire Effects Information System USDA USFS Rocky Mountain Research Station, The Rainbow Series USDA USFS Rocky Mountain Research Station, are examples of efforts which focus on making the best available science consistently available to land managers.

Implementing a small, intensely monitored action in order to measure the effectiveness of using fire is in keeping with the goals of the Trust to:

- "…take action incrementally and make adjustments based on outcomes."
- "…base decisions on the best available science"
- "…strive to integrate opportunities for research, reflection and learning in the programs of the Preserve.

1.3 Description

The Valle Toledo is located on the northeast corner of the Valles Caldera National Preserve at an elevation of 8500 to 8900 feet. The planning area is within the 3800 acre Valle Toledo and contains a variety of habitat types and plant associations including upper, and lower montane grasslands, riparian areas, wet meadows and ponderosa pine woodlands. Wet and dry mesic spruce, aspen, and fir communities surround it. The Rito de los Indios flows south along the western boundary of the planning area and the Upper San Antonio Creek flowing west, intersects the southern portion of the planning area.

There has been no site-specific sampling of tree rings in or around the Valle Toledo, however, it is generally accepted from fire scar samples taken at 42 sites around the Jemez mountains that frequent, low intensity surface fires naturally characterized these forests (Allen, Touchan, Swetnam 1996). Limited tree ring samples taken elsewhere on the Preserve indicate a fire return interval of about 9-11 years in the Valles and adjacent pine forests (Allen, C.D. unpublished data)

The diversity of associations within and around the planning area, as well as the abundant water, create habitat for a variety of wildlife. While no threatened or endangered species reside within the planning area, bald eagles, listed as threatened, roost near the planning area and forage along the San Antonio Creek during the late fall, early winter and early spring.

The abundant resources of the planning area also offer opportunities for human activities such as fishing, hunting and livestock use. The seasonal fishing and hunting programs on the Preserve are controlled with only two to eight anglers allowed in the valle on any given fishing day and even fewer hunters.

Although cattle use has been prevalent in the past, grazing has been minimal since federal acquisition. From 2000 -2003, livestock did not graze the Valle Toledo. In 2004, 460 heifers were in the Valle Toledo for roughly 10 days in late summer. In 2005, the use will be about the same as in 2004 although use will occur earlier in the season.

PNM maintains a gas pipeline adjacent to and within the planning area. Other improvements include the open road system that surrounds the planning area.

There is evidence that the project area has been attractive to humans for thousands of years. Sample cultural resources surveys indicate a dense concentration of obsidian artifacts spread across the valle providing information about the pre-

historic occupation of the area. There are no standing structures or wooden features within the planning area.

1.4 Monitored Outcomes

1.4.1 Goals

- Science and Adaptive Management
- Learning and Inspiration

1.4.2 Objectives

- Reduction in litter accumulations within upper and lower montane grassland communities by 50% with a 20% tolerable deviation.
- Reduction in conifer seedlings (less than or equal to 2" diameter at breast height or less than 4 ½ feet tall) by 50% with a 20% tolerable deviation.

1.4.3 Monitored Outcomes

- Plant responses to prescribed fire and utilization by ungulates and insects.
- Elk and cattle response to changes in vegetation.
- Subsequent nitrogen mineralization rates in soils.
- Rates and sequences of nutrient cycling.
- Effects to stream water quality.
- Changes in abundance and distribution of macro invertebrates and fish.
- Soil erosion rates.

1.5 Performance Requirements

Performance requirements are the limitations placed on the implementation of a stewardship action necessary for compliance with applicable laws, regulations, standards, mitigating measures, or generally accepted practices.

1.5.1 Applicable Laws

- The Valles Caldera Preservation Act of 2000 - Authorizes the acquisition and management of the Valles Caldera National Preserve.
- The National Environmental Policy Act of 1969 as amended – NEPA, established a national policy for the environment.

- The Endangered Species Act of 1973 - Provides for the protection and conservation of threatened and endangered animal and plant species.
- The National Historic Preservation Act - Establishes a requirement for the consideration of potential impacts to historic properties.
- The Migratory Bird Treaty Act - Implements various treaties and conventions between the U.S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under the Act, taking, killing or possessing migratory birds is unlawful.
- Executive Order 13186 -- Responsibilities of Federal Agencies To Protect Migratory Birds , January 10, 2001
- The Clean Air Act of 1990 - Defines the National Ambient Air Quality Standards (NAAQS).
- Clean Water Act of 1977 - Establishes the basic structure for regulating discharges of pollutants into the waters of the United States.

1.5.2 Regulations and Procedures

- The NEPA Procedures of the Trust, Federal Register, July 17 2003 – Established to guide comprehensive management of the Preserve and achieve the purposes of NEPA.
- NMAC 20.2.65 Smoke Management. The objective of this part (65) is to manage the air quality impacts of smoke from all sources of fire in the State of New Mexico.
- The Valles Caldera Trust Cultural Resource Compliance Process – Established to implement the National Historic Preservation Act on the Preserve.
- Valles Caldera National Preserve Wildland Fire Management Policy
- Valles Caldera National Preserve Fire Management Plan

1.5.3 Performance Requirements Specific to the Stewardship Action

Threatened or Endangered Species

- The stewardship action is proposed prior to the expected return of the bald eagles. If eagles are present during burning operations:
  - Minimize traffic in proximity to eagle foraging areas.
  - Limit the stopping and exiting of vehicles within the sensitive area to activities necessary for control or contingency.

Water Quality/Soil Resources

- Implement the following Best Management Practices (BMP):
  - Manage ignitions (timing and pattern of the ignition) to reduce the area treated within the riparian zone to less than 30%.
  - Manage ignitions to reduce the consumption of duff and plant roots.

- Do not deploy ignition devices in water or wet areas.

Cultural Resources

- Complete the Valles Caldera Trusts Cultural Resource Compliance Process prior to implementation of the proposed stewardship action
- Survey and mark cultural sites along proposed control lines.
- Stage and brief personnel and equipment at the VC12 recreation staging area to avoid affecting cultural resources outside the burn area.

Plant Utilization

- Utilization of plants by elk will be monitored.
- Utilization by cattle will be monitored and managed (controlling timing and duration) to prevent over utilization.

Fire Fighter and Public Safety, Fire Risk Management

- Implement the Prescribed Fire under the direction of a qualified (meeting the standards identified by the National Wildland Fire Coordination Group Wildland and Prescribed Fire Qualifications Systems Guide PMS 310-1) prescribed fire organization.
- Complete Job Hazard Analysis for all activities associated with prescribed burning.
- Ensure an inspection of the pipeline by PNM is completed prior to ignition.

Air Quality

- Conduct the burn in accordance with NMAC 20.2.65 Smoke Management. The objective of this part (65) is to manage the air quality impacts of smoke from all sources of fire in the State of New Mexico.

Recreation

- Implement the prescribed fire either between hunts or between fishing days or assign hunters and anglers to areas not affected by prescribed fire operations.

Chapter 2 Alternatives

The Valles Caldera Trust considered public comment and environmental analysis to identify issues and consider alternatives to meeting the purpose and need for action. Several issues were identified:

- Risks associated with the use of prescribed fire including threats to firefighter and public safety and the risk of an escaped fire.
- The potential to disturb roosting and foraging bald eagles.
- The potential to affect Archaeological resources.
- The potential to affect water quality, air quality and other natural resources.
- Plant response to prescribed fire may lead to over utilization by elk and/or livestock.
- The potential to impact visitor's recreational activities especially hunting.

The proposed action was revised to include performance requirements to address these issues (see 1.5.3). No alternatives were developed to specifically address these issues. Several alternatives were considered but eliminated from a detailed analysis (see 2.1). The proposed action and the alternative of taking no action were considered in detail and presented in a comparative form in Chapter 3.

2.1 Alternatives Eliminated from Detailed Analysis:

2.1.1 Alternative Location

Alternative sites were considered but eliminated from a detailed analysis. Site selection was based on a unique combination of features present in the Valle Toledo:

RISK: The open roads and favorable topography of the Valle are suitable for establishing control lines and contingency plans necessary for using prescribed fire safely.

LOGISTICS: These same features greatly reduce the logistics associated with accessing the project area to implement and monitor the complex array of data locations over a multiple year period.

CONTROL FEATURES: The presence of paired[2] perennial streams and riparian features will allow the Trust to measure the effectiveness of using the timing and

[2] Upper San Antonio Creek and Rito de los Indios are not identical streams. Comparisons will not be made between the streams but rather in the changes to the streams following the prescribed burn. Both streams will be subjected to similar mico climates and isolated precipitation events.

pattern of ignition to reduce negative impacts to water quality as a result of prescribed burning.

CURRENT CONDITION: It has been at least 11 years since the Valle Toledo was treated with prescribed fire (personal communication with Randy McKee, Ranch Foreman). Grasses are mature. Observation by monitoring personnel as well as monitoring data indicate that the bunchgrasses are not being utilized by elk or cattle. This is an indication that the plants are dominated by older grasses and that tillering is stifled. In addition, of the forested portion of the valle, about 10% of the cover is represented by pine seedlings.

ABILITY TO COMPARE RESPONSES BY CATTLE AND ELK: The Valle Toledo is used in the livestock management program. Monitoring information exists for both cattle and elk use patterns prior to using prescribed fire.

ARCHAEOLOGICAL OPPORTUNITIES: Sample surveys indicate lithic artifacts which would be exposed by the prescribed fire, offering an opportunity to investigate a continuous portion of a valle.

2.1.2 Reducing Acreage Treated

The Trust considered limiting the use of prescribed fire to a smaller area immediately adjacent to the established data plots. This would meet the purpose and need for measuring the direct effects of the fire to plants and soil however, limiting treatment to a small, concentrated area would not allow the Trust to meet the purpose and need of measuring the effects and the effectiveness of using prescribed fire as a management tool at a landscape scale.

2.1.3 Alternative Season

Prescribed burning can theoretically be accomplished in spring, summer or fall. A summer burn is not being assessed in a detailed analysis due to the increased risk of escape. In addition burning under summer conditions consumes the greatest amounts of duff potentially increasing the effects to soil, water and air and increasing the likelihood of plant mortality.

A spring burn was considered but eliminated from a detailed analysis. Logistically, burning in the spring is less feasible than fall due to the complex array of monitoring that is associated with the purpose and need for this project. The spring “window” (environmental opportunity for burning) is less predictable in timing and duration than the fall window. In addition, there is a very short period prior to the spring window that the project area is accessible due to winter road conditions.

2.1.4 Alternative Treatment Methods

The stewardship action is being proposed to provide the Trust with quantitative information on the outcomes and effectiveness of using prescribed fire in the grasslands on the Preserve. While there is a need to consider the use of other tools to manage the forest and rangelands of the Preserve, the use of fire is integral to the purpose and need for the proposed stewardship action.

2.2 Alternatives Analyzed in Detail

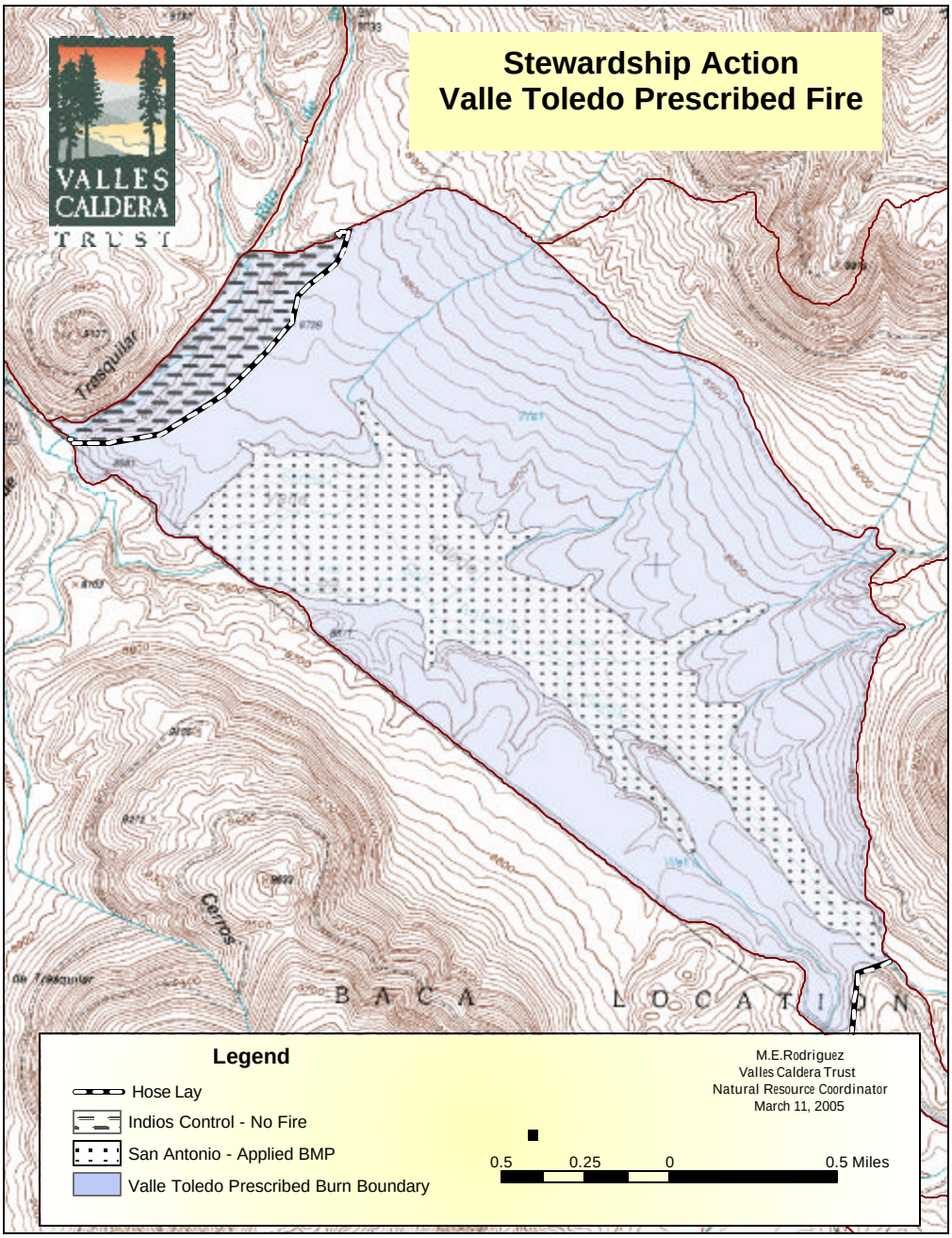
2.2.1 No Action

This alternative would result in no implementing decision.

2.2.2 The Proposed Stewardship Action

See 1.1 for a description of the proposed stewardship action.

Map 2.1 Valle Toledo Prescribed Fire Planning Area



Chapter 3 Environmental Consequences

This chapter summarizes the effects to the natural and human environment expected to occur as a result of either taking no action or implementing the proposed action. No significant issues were identified in the analysis process. The analysis focuses on effects to the cultural and natural resources that may be affected by the proposed action.

The expected environmental consequences are presented in a comparative form with the effects of no action followed by the effects of the proposed action. A description of the affected environment is provided as a baseline.

Effects are measured by context (the spatial or temporal extent of the effect) and intensity (the magnitude of the effect). Effects may be beneficial or adverse and may be either direct, indirect, or cumulative. A summary of the context and intensity of the effects is presented followed by a supporting narrative that briefly explains the basis for the conclusions presented in the summary. The spatial extent of an effect is described in a narrative statement. The temporal extent of the effect is defined by three categories of duration:

Short-term:	0-3 Years
Mid-term:	3-10 Years
Long-term:	10+ years

The intensity of the effect is defined by four levels of magnitude (intensity is influenced by context):

Negligible:	No change would occur or the magnitude of change would be not be measurable.
Minor:	Changes would be measurable but would not alter the structure, composition, or function of the resource and would be limited in context.
Moderate:	Changes would be measurable and may somewhat influence the structure, composition, or function of the resource but would be limited in context.
Major:	Changes would be measurable, would alter the structure, composition or function of the resource and may be extensive in context.

3.1 Effects to Flora

3.1.1 Affected Environment

Four distinct grassland plant associations dominate the planning area (upper montane, lower montane, montane wet meadows and montane wetlands[3]) with a fringe of ponderosa pine woodland along the northeast boundary. Inclusions of spruce-fir and mixed conifer moist-mesic forests are contained in the drainages of the ponderosa pine fringe (NMNH November 2004).

The upper and lower montane grasslands primarily contain associations of bunchgrasses such as Arizona, Thurber, and Idaho fescues, Parry's danthonia, pine dropseed, Letterman's needlegrass and prairie junegrass. Also abundant is the non-native, sod forming Kentucky bluegrass. The wet meadows and wetlands include sedges and rushes as well as Kentucky bluegrass, common dandelion and tufted hairgrass. The ponderosa pine fringe extends into the montane grasslands (NMNH 2005). No threatened or endangered plants grow in the planning area (Valles Caldera Trust, 2002).

3.1.2 No Action

Summary:

Effect	Context	Intensity
Adverse, Indirect	Short– and mid-term; limited to the planning area	Minor

Narrative: Light to moderate litter accumulating at the base of the plants serve to hold moisture in the soil, increasing the drought tolerance of the plant and protecting seeds during germination. Over time, the accumulation of litter becomes excessive, actually intercepting moisture and blocking sunlight, reducing tillering at the base of the plant and creating a barrier for the establishment of new seeds. Over time, the growth of young shoots from the base of the plant and the establishment of seedlings would be expected to decrease. Coverage by the bunchgrass species would be expected to decrease over time. Space between plants may revert to soil/litter, hardier forbs, or Kentucky bluegrass depending on the specific habitat type and seasonal weather.

Within the ponderosa pine fringe, there is approximately 10% cover by seedlings. These seedlings would establish, encroachment would continue and would likely increase.

[3] "Wetlands" was the unit designation for the plant association; jurisdictional delineation of the Preserve has not been completed.

3.1.3 The Proposed Stewardship Action

Summary:

Effect	Context	Intensity
Adverse, Direct/Indirect	Short-term; limited to the planning area	Negligible/Minor
Beneficial, Direct/Indirect	Short– to mid-term; limited to the planning area	Minor/Moderate

Narrative: The mortality of plants and their subsequent recovery from fire is influenced by the fire behavior, fire duration, the pattern of fuel consumption, and the amount of subsurface heating (Brown, James K.; Smith, Jane Kapler, 2000). During grassland fires, the fire front passes quickly and temperatures 1 inch (2.5 cm) below the soil surface rise very little [Daubinmire, R 1968].

Plant mortality depends on the amount of meristematic tissues killed. The likelihood of plant tissue being killed by fire depends upon the amount of heat it receives. The amount of heat a plant receives is determined by the temperature reached and the duration of the plants exposure to that temperature. Other factors such as when the fire occurs in relation to the growth cycle of the plant and whether the plant is insulated from heat by bark or litter and soil would also affect the mortality rate of the plants (Brown, James K.; Smith, Jane Kapler, eds. 2000).

Fall burning (following the growth season) reduces or eliminates the likelihood of affecting the plant's meristematic tissue. In addition, the plants have had the opportunity to establish ample reserves of carbohydrates to initiate spring growth. Due to its early and vigorous growth habit, abundant seed production, and successful seedling establishment, the abundance of the bunchgrasses would be expected to increase.

Indirectly the plants are likely to become more palatable by ungulates. The increase in use by ungulates is expected to be distributed across the landscape, reducing the intensity of the effects caused by increased utilization. Use by livestock will be adjusted in either timing, duration, or both to reduce negative effects to grasses. The increase in utilization in the bunchgrasses is expected to occur with a *decrease* in the utilization of riparian plants, indirectly benefiting these communities. The intensity of this effect would be anticipated to be minor as these plant communities will continue to be desirable to ungulates.

Ponderosa pine seedlings are likely to be consumed by fire where sufficient litter is present. A 70% reduction of the seedlings <2" could occur. Reductions in seedlings 2-4" would be highly variable. A reduction in ponderosa pine trees greater than 4" would be predicted to be minor.

3.2 Effects to Fauna

3.2.1 Affected Environment

The planning area contains habitat for the diverse faunal population of the Preserve. It contains or is adjacent to cover, forage and water suitable for many species. No threatened or endangered species reside in the planning area although bald eagles (threatened) roost nearby and forage along the San Antonio Creek in the late fall, early winter and spring. There are no Important Bird Areas (IBA) identified in the Preserve. There are no associations or important links between the project area and the closest known IBA's.

3.2.2 No Action

Summary:

Effect	Context	Intensity
Adverse/beneficial, Indirect	Short-term; limited to the planning area	Negligible
Adverse/beneficial, Indirect	Short– to mid-term, limited to the planning area	Minor/moderate

Narrative: The changes in the structure, composition, and distribution in plants would be reflected in changes in habitat. Changes would be minor to moderate. In context with the Preserve as a whole not taking action in the Valle Toledo would not be significant. Changes would likely be beneficial to some species and adverse to other species.

3.2.3 The Proposed Action

Summary:

Effect	Context	Intensity
Adverse, Direct	Short-term; limited to the planning area	Negligible/minor
Beneficial Direct/Indirect	Short- to mid-term; limited to the planning area	Minor/moderate

Narrative: Fires affect animal populations mainly through effects on their habitat. Fires often cause short-term increases in wildlife foods that contribute to increases in populations of some animals. These increases are moderated by the animals' ability to thrive in the altered, often simplified, structure of the post-fire environment. The extent of fire effects on animal communities generally depends on the extent of change in habitat structure and species composition caused by fire (Smith 2000).

In grasslands, the pre-fire structure of the vegetation reasserts itself quickly as a new stand of grass springs up from surviving root systems. Standing dead stems and litter are reduced. The proportion of forbs usually increases

in the first or second post-fire year. In about 3 years, the grassland structure is usually reestablished (Bock and Bock 1990), and faunal populations are likely to resemble those of the pre-burn community.

Responses by individual animals to fire may include injury, mortality, immigration, or emigration. The season, intensity, severity, uniformity and size of a fire determine an animal's response to the event. Young animals with limited mobility are more vulnerable to injury and mortality than mature animals. Animal species are adapted to survive the pattern of fire frequency, season, size, severity, and uniformity (fire regime) that characterized their habitat in presettlement times (Smith, 2000).

Fires generally favor raptors by reducing hiding cover and exposing prey. Small carnivores respond to fire effects on small mammal populations (either positive or negative). Large carnivores and omnivores are opportunistic species with large home ranges. Their populations change little in response to fire, but they tend to thrive in areas where their preferred prey is most plentiful—often in recent burns.

Ungulates would be expected to benefit from the new, vigorous growth in the bunchgrasses. The benefit would be somewhat modified by the relatively small treatment area and the abundance of other vigorous grasses such as Kentucky bluegrass and the various wet meadow species present in and around the proposed treatment area.

Effects to aquatic populations from the proposed action is predicted to be negligible to minor in intensity and of short-term duration. Aquatic populations can be negatively impacted by changes in water quality following fire. Performance requirements have been developed (1.5.3) to reduce effects to San Antonio Creek resulting from the proposed action. These performance requirements would serve to protect aquatic populations from being indirectly affected by changes in water quality. Changes in the abundance of fish and aquatic invertebrates will be monitored.

3.3 Effects to Air Resources

3.3.1 Affected Environment

The planning area is within the Middle Rio Grande Airshed in Sandoval County, New Mexico and downwind of the Upper Rio Grande Airshed in Los Alamos and Rio Arriba Counties. These airsheds are attainment areas, considered having air quality as good as or better than the National Ambient Air Quality Standards. These standards are set to protect human health and general welfare.

The State of New Mexico has established procedures, NMAC 20.2.65 Smoke Management, to manage the air quality impacts of smoke from all sources of fire in the State of New Mexico. The use of prescribed fire by federal land managers is regulated by these procedures.

3.3.2 No Action

Effect	Context	Intensity
Any	Any	Negligible

There would be no effect to air quality as a result of taking no action.

3.3.3 Proposed Action

Effect	Context	Intensity
Adverse, Direct	Short-term; upwind from the planning area <1 Mile and down San Antonio Creek and Jaramillo Creek drainages.	Negligible/minor

Narrative: The amount of smoke produced, the duration of smoke production, and the subsequent distribution of smoke determine the impact to air quality.

The proposed action will burn mainly grass and litter in fuel loadings which range from .74 tons per acre in the grasslands (about 1600 acres) to fuel loadings up to 4-tons per acre of grass and litter in the ponderosa pine fringe (about 200 acres) (Anderson, 1982).

The amount of smoke produced depends on the amount of biomass available to burn and the efficiency of the combustion process. Consumption during the actual passage of the fire (the burning of fine fuels such as grass and litter) produces the least smoke. Consumption through smoldering following the passage of the fire (the burning of heavy fuels such as down logs and duff) produces the most smoke. Generally, fire burning through grass and litter produces the least amount of smoke for the shortest duration, while a fire burning through large woody debris and deep layers of organic material produces the greatest amount of smoke over the longest duration (Sandberg, David V.; Ottmar, Roger D.; Peterson, Janice L.; Core, John. 2002).

There are no residences or communities in immediate proximity to the planning area. The off-site dispersion of smoke from the proposed action is predicted to be limited. The light fuel loadings burning under low intensities typically do not form a cohesive convection column for transportation of smoke during burning operations. The lack of large fuels and organic material will limit the production of smoke following burning, thus limiting the settling of smoke into drainages (and communities) in the evenings. The community most likely to experience smoke from prescribed burning operations would be La Cueva during the evening and morning hours.

Area residents will be notified of prescribed burning operations as required by NMAC 20.2.65 Smoke Management. Smoke dispersion will be monitored using through observations and photography.

3.4 Effects to Soil Resources

3.4.1 Affected Environment

The valley floor and stream terrace is characterized by deep, poorly drained soils with moderate permeability and high water capacity. The mountain valley terraces are characterized by two soil types one of which is deep and somewhat poorly drained. Permeability of this soil is slow and water capacity is high. Runoff is medium and the hazard of water erosion is moderate. The other soil type is deep and well drained with moderate permeability. Runoff is slow and the hazard of water erosion is slight. The upper portion of the planning area represents the toe of the slope moving into the mountain terrace. The soils in this area are characterized by silty loams and are deep and well drained with moderate to moderately slow permeability. Runoff is medium and the hazard of water erosion is moderate (SSURGO 2000 data).

3.4.2 No Action

Summary:

Effect	Context	Intensity
Adverse, Direct/Indirect	Short-term, within and downstream of planning area	Negligible/Minor

Narrative: There would be no direct effect resulting from no action. Indirectly, soil along the stream could be affected. As plant vigor declined in the uplands, vigorous growth in riparian areas would continue to be favored by ungulates contributing to erosion along stream banks. The portion of this effect, which could indirectly be attributed to taking no action, would be negligible to minor as use adjacent to streams is distributed beyond the planning area. In addition, vigorous plant growth adjacent to water will always be attractive to ungulates.

3.4.3 Proposed Action

Summary:

Effect	Context	Intensity
Adverse, Direct/Indirect	Short-term, isolated areas within the planning area.	Negligible/Minor
Beneficial, Direct/Indirect	Short– or mid-term, within and down stream of the planning area	Minor

Narrative: Fire changes the form, distribution, and amount of nutrients available in soils. Nutrients may be lost during burning through volatilization or convection. Conversely, nutrients normally bound in organic matter can be converted to a form available for use by plants following fire. Burning may decrease the *total* amount of nitrogen on a site while increasing the *available* amount of nitrogen on a site (McNabb, Cromack Jr, 1990). Fire may also

create changes in the water holding capacity of soil as well as the porosity and infiltration rates.

Generally, the greater the severity of the fire, the greater the intensity of the effects to soil resources will be. The severity of the burn is related to fuel loading and fuel moisture. Heavy fuels, such as large woody debris and deep concentrations of organic material, when very dry, sustain fire over a long period, consuming organic material completely and creating a sustained downward flux of heat into the soil. High severity burns can have long-lasting, detrimental effects to soils.

The proposed stewardship action would burn through light fuels (grass and litter) with low severity. An expected measurable outcome of the prescribed fire would be a pulse of available nitrogen from the combusted organic material. This pulse would serve to "prime" the mineralization process leading to an increase in soil mineralization rates. The reduction of litter and increased vigor of the plants would be predicted to lower the carbon to nitrogen ratio, further stimulating the nitrogen mineralization process.

Besides effects to soil nutrient and structural properties, fire can indirectly affect soil by removing vegetative cover and exposing mineral soil. Exposed mineral soil is vulnerable to increased erosion from wind and precipitation. Prescribed fire activities are proposed for the fall. The project area will over winter and snowmelt will occur prior to plant regeneration or the establishment of new seeds. Performance requirements have been proposed to reduce the intensity of post fire erosion (1.5.3). The effectiveness of these requirements will be measured using erosion pins and automatic as well as manual water sampling methods.

The proposed action is predicted to improve forage in the upper and lower montane grasslands. Indirectly this would benefit soils by attracting ungulate away from fragile streambanks. Changes in ungulate grazing will be measured using cameras and traditional sampling methods.

3.5 Effects to Water and Riparian Resources

3.5.1 Affected Environment

There are two perennial streams within the planning area. The Rito de los Indios, which flows south along the western boundary of the planning area into San Antonio Creek and Upper San Antonio Creek which flows westerly along the southern portion of the planning area.

The Rito de los Indios is nearly four and one-half miles long from the headwaters to its confluence with San Antonio Creek; roughly one mile of stream flows adjacent to the planning area. Designated uses for the stream are: Domestic Water Supply, Fish Culture, High Quality Coldwater Fishery, Irrigation, Livestock Watering, Secondary Contact, and Wildlife Habitat.

New Mexico Environment Department (NMED) assessed the Total Maximum Daily Loads (TMDLs) in this stream in January of 2003. The stream was found to be fully supporting all designated uses aside from Secondary Contact (not assessed) and High Quality Coldwater Fishery (Not Supporting). The probable cause of impairment was identified as aluminum occurring from natural sources (NMED 2004).

San Antonio Creek is nearly 25 miles long from its headwaters to its confluence with the East Fork of the Jemez River. About two miles of the creek flows through the planning area. It has the same designated uses as the Rito de los Indios. TMDLs for San Antonio Creek were also assessed in January of 2003. San Antonio Creek was found to be supporting all designated uses aside from High Quality Coldwater Fishery. The probable causes of impairment were identified as Aluminum, Dissolved Oxygen, pH, temperature. Probable sources of impairment were identified as roads, loss of riparian habitat, natural sources, other recreational pollution, grazing, site clearance, streambank modification/destabilization. The sample site was in the lower San Antonio, sonde data collect within the planning area indicate a lower water temperature within the planning area.

3.5.2 No Action

Summary:

Effect	Context	Intensity
Adverse, Direct	Short-term	Negligible
Adverse, Indirect	Short– mid-term, Planning area and downstream	Minor

Narrative: There would be no direct effect to water or riparian resources if no action were taken. Without taking action to improve the health and vigor of bunchgrass communities, elk and cattle will continue to concentrate in the wet meadows and riparian areas. Cattle management in the Valle Toledo will continue to be laborious and cattle use of the Valle Toledo will continue to be minimum. The intensity of this effect is reduced when considered in the context. Not taking action to improve the upland grass communities within the planning area will not have a significant effect in context with San Antonio Creek as a whole.

3.5.3 Proposed Action

Summary:

Effect	Context	Intensity
Adverse, Direct	Short-term, isolated areas within the planning area and immediately downstream	Negligible
Adverse, Direct	Short-term, isolated areas within the	Minor

	planning area	
Beneficial, Indirect	Short – mid-term; within and downstream of the planning area	Minor

Narrative: Effects to water and riparian resources from fire are generally indirect and are related to the effects to soil. Because fire can cause an increase in rates of erosion and overland flow, it can affect water resources through sediment deliver and increased turbidity. Nutrients mineralized during prescribed burning can also be concentrated in overland flow or leached into streams. Water yields may also increase following burning due to the loss of vegetative cover.

Where low-severity fires occur, much of the organic matter remains after burning. In these situations, the effects of burning are generally insignificant with regard to a wide range of hydrologic and water-quality variables (Beschta 1990). Performance requirements have been proposed to reduce the intensity of post fire erosion (1.5.3). The effectiveness of these requirements will be measured using erosion pins and automatic (sonde) as well as manual water sampling methods.

The proposed action is predicted to improve the health and vigor of the upland grass communities. Indirectly this could benefit the water and riparian resources by attracting elk and cattle from the riparian areas to the improved upland forage. Elk and cattle distribution will be monitored using automatic cameras and traditional utilization sampling techniques.

3.6 Cultural Resources

3.6.1 Affected Environment

Previously disturbed areas (open roads, natural gas pipeline) and areas of light surface vegetation reveal obsidian artifacts, indicating that the planning area was used prehistorically for the collection of obsidian and the making of tools. No standing structures (historic or prehistoric) are within the planning area. Surface artifacts are not visible over the majority of the Valle due to cover by vegetation and litter.

In situ artifacts have likely been affected by fire numerous times in the past. By examining the growth rings from trees surrounding the valles on the Preserve, it has been estimated that fires burned through these montane grasslands at a frequency of 9-11 years between 1679 and 1896; soil core samples show frequent charcoal layers dating back 9000 years (Craig Allen, unpublished data 2004).

3.6.2 No Action:

Summary:

Effect	Context	Intensity

Any	Any	Negligible

3.6.3 Proposed Action

Summary:

Effect	Context	Intensity
Adverse, Direct	Long-term, isolated occurrences	Negligible/Minor
Beneficial, Indirect	Short- Mid-term Knowledge gained could be applied outside the planning area	Moderate

Narrative: Obsidian artifacts can be adversely affected by fire through vesiculation, the forming of residue, and alteration of hydration bands (used for dating obsidian). The degree to which these effects occur depends on the heat, duration of heating and the chemical composition of the obsidian (Deal and McLemore 2002, Solomon, 2002, Steffen 2002).

Effects resulting from the proposed action would be anticipated to be minor due to the light fuel loadings and the proposed use of low intensity fire. During grassland fires, the fire front passes quickly and temperatures 1 inch (2.5 cm) below the soil surface rise very little [Daubinmire, R 1968].

The temperature and associated affects to obsidian would be a monitored outcome of the proposed action.

A major beneficial indirect effect could result from knowledge gained by the implementation of the proposed action. By exposing obsidian artifacts on a continuous landscape, archaeologists would have the opportunity to assess the density and composition of the obsidian artifacts within a valle on the Preserve. This knowledge would contribute to the understanding and ultimate protection of significant deposits.

3.7 Human Uses/Activities

3.7.1 Affected Environment

The Trust hosts fishing and hunting opportunities within the planning area. Fishing is limited to occupation by five people, four days per week, from May through October. The number of hunters is similarly limited. Management activities that occur within the planning area include, grazing, road maintenance, inspection and maintenance of the PNM natural gas pipeline and a variety of inventory projects.

3.7.2 No Action

Summary:

Effect	Context	Intensity
Any	Any	Negligible

Narrative: There would be no measurable effect if no action were taken.

3.7.3 Proposed Action:

Summary:

Effect	Context	Intensity
Adverse, Direct	Short-term	Negligible
Indirect, Beneficial/Adverse	Short- mid-term	Minor

Narrative: The proposed action is being proposed between hunts and fishing activities. If implementation dates crossed over into fishing or hunting days then fishing beats and hunting unit assignments would be adjusted to avoid conflict. Grazing plans would be developed to maximize (protect) the beneficial effects of the proposed action on forage production and fully test the effectiveness of the proposed action. Inventory activities would increase for three years following the proposed action to monitor outcomes.

3.8 Public and Firefighter Safety

3.8.1 Affected Environment

Prescribed burning is inherently dangerous work. A system of qualifications and protocols for evaluating, planning and implementing prescribed fire projects has been developed and documented in interagency policy (Interagency Standards for Fire and Fire Aviation Operations 2005). The Wildland Fire Management Policy of the Valles Caldera Trust complies with these standards. Human life is the first priority for all wildland fire activities.

3.8.2 No Action

Summary:

Effect	Context	Intensity
Any	Any	None

3.8.3 Proposed Action

Summary:

Effect	Context	Intensity
Adverse, Direct	Short- to Long-term;	Negligible with risk for major

Hazards associated with the proposed action, including traveling to and from the proposed action, have been identified and mitigated using a Job Hazard Analysis process (Valles Caldera Trust 2004). In addition, the conditions

under which the proposed action is being planned contributes to reducing the risk inherent in prescribed fire activities.

The proposed action is being conducted following the cessation of fire season when conditions are moving towards cooler temperatures and higher humidities and statistically, the likelihood of a significant fire event (extreme fire danger conditions) occurring is past. Either open roads or hose-lays strategically placed based on fuels and topography would be used for control lines. Contingency resource needs have been identified and additional open roads as well as changes in topography and fuels have been identified to support contingency planning. Operational planning has been documented in a Prescribed Fire Plan developed to meet standards identified in Forest Service Manual 5140 Direction. The fire management staff of the Santa Fe National Forest has reviewed and approved this plan.

3.8 Social Economic

The planning area is positioned or associated within, or proximity to, any cities, communities, or populated areas in a manner where the proposed action would have any direct, indirect or cumulative social or economic effect on any city, community or populated area (see map 1.1 Vicinity Map).

3.8.1 No Action

Summary:

Effect	Context	Intensity
Any	Any	None

3.8.2 Proposed Action

Summary:

Effect	Context	Intensity
Any	Any	Minor/Negligible

The proposed prescribed burn will generate a minor effect in the local economy through the purchase of meals and incidental accommodations as well as possible employment for operations and monitoring personnel. This proposal would not create any ongoing changes in the local economy. It would not affect local communities or affect any low-income or otherwise less empowered individuals.

3.9 Cumulative Effects

Other Past, Present or Foreseeable Future Actions:

Past activities include logging, grazing and hunting. Present activities include hunting, fishing, and grazing. Foreseeable future activities include the continuation and increase of existing activities as well as thinning, road maintenance and additional prescribed burning. The effects of the proposed prescribed burn are limited both in context and intensity; it is unlikely that

the proposed action would combine with another action to a significant (a major effect over an expanded area of influence) degree.

To ensure that incremental activities do not have an unintended, cumulative effect that significantly affects the environment, the Trust is required to complete a "State of the Preserve" every five years (or less). The State of the Preserve means, "*a concise account of the systematic review of monitored outcomes and interpretive information from, but not limited to, observations, studies, public comment, research investigations, natural resources data or information summaries, and other sources to provide the technical and scientific basis for considering the cumulative effects of the past, present, and reasonable foreseeable future actions of the Trust (Federal Register, July 2003)*".

List of Agencies and Others Consulted

- Valles Caldera Board of Trustees
- Agencies consulted:

  U.S. Fish and Wildlife Service

  U.S. Forest Service

  State Historic Preservation Office
- National Range Society
- Jemez Watershed Group
- Valles Caldera Coalition
- Back Country Horsemen
- Tribal Consultation
- PNM
- Valles Caldera Trust Website

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