Chapter 4
Environmental Consequences

This "Environmental Consequences" chapter discusses the effects on the natural and human environment expected to occur as a result of either taking no action or implementing an action alternative. 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 direct, indirect, or cumulative, described in more detail below.

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4. Environmental Consequences

The discussion of each resource topic includes a list of guiding regulations and policies, and a methodology for analyzing impacts. Where regulations and policies specific to the VCT exist, they were used as guidance for impact analysis. Where such directives did not exist, USFS policies were referenced (where applicable) because the preserve is a unit of the national forest system as defined under the Valles Caldera Preservation Act of 2000.

A summary of the context and intensity of the effects is presented followed by a supporting narrative. The spatial extent of an effect is described in a narrative statement. The temporal extent of the effect is defined by two categories of duration:

- short term: 0–3 years
- long term: 3+ years
- An impact is either beneficial or adverse. For adverse impacts, the intensity of the effect is defined by the following four levels of magnitude (intensity is influenced by context):
  - Negligible: The magnitude of change would 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 influence the structure, composition, or function of the resource but would be limited in context.
  - Major: Changes would be measurable, would substantially alter the structure, composition, or function of the resource, and may be extensive in context.

Cumulative Impacts Analysis Method

The CEQ regulations for implementing NEPA require the assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). As stated in the CEQ handbook, "Considering Cumulative Effects" (CEQ 1997a), cumulative impacts need to be analyzed in terms of the specific resource, ecosystem, and human community being affected and should focus on effects that are truly meaningful. Cumulative impacts are considered for all alternatives, including the no-action alternative.

Spatial and temporal boundaries are the two critical elements that were considered in deciding which actions to include in the cumulative effects analysis. These boundaries set the limits for selecting those actions that are most likely to contribute to cumulative effects. The effects of those actions overlap in space and time, producing a potential cumulative impact.

Spatial boundaries define the affected area for each resource, which is the area in which the resource may be affected by management actions. Affected areas can vary in size by the resource and type of effect that may occur. Because affected areas are resource dependent, their boundaries are generally physical or biological rather than political. For example, water quality in a river may be affected by actions on nearby USFS, state, and private lands within the same watershed. It is also important to understand how the proposed action may interact with other past, present, and future actions across time. The time frames depend on the duration of the effects that the actions would produce on the resource. For example, a fence can be constructed in a few days, but the effects it has on big game movement may last decades (USFS 2011a).

Cumulative impacts were determined by combining the impacts of the alternatives with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other ongoing or reasonably foreseeable future projects and plans at the preserve and, if applicable, the surrounding area. Table 4-1 summarizes these actions that could affect the preserve's resources.

The cumulative impact analysis was accomplished using four steps:

1. Identify resources affected by the alternatives.
2. Identify appropriate spatial and temporal boundaries for each resource.
3. Identify the cumulative action scenario by determining which past, present, and reasonably foreseeable future actions to include for each resource.
4. Summarize the impacts of these other actions (x) plus the impacts of the proposed action (y) to arrive at the total cumulative impact (z).

Table 4-1: Cumulative Actions

Agency	Time	Action	Location	Impact Topics
N/A	Past (late 1800s)	Increased hunting decimated populations of mule deer and wild turkey (VCT 2010b).	Regional, Preserve	Wildlife
N/A	Past (late 1800s, early 1900s)	45,000 sheep grazed the preserve during summer months. Stream, soil, and vegetation conditions were degraded during early grazing period (VCT 2009b).	Preserve	Vegetation Water Geology and Soils
N/A	Past (late 1800s, early 1900s)	Stocking of nonnative trout led to extirpation of Rio Grande cutthroat trout from Valles Caldera streams (VCT 2010b).	Preserve	Special-status Species
N/A	Past (1910)	Elk eradicated across New Mexico (VCT 2010b).	Statewide, Preserve	Wildlife
N/A	Past (1916)	USFS initiated predator control program to exterminate gray wolves and mountain lions.	Regional, Preserve	Wildlife
N/A	Past (1920s)	Black-tailed prairie dog towns poisoned by ranchers and federal government (VCT 2010b).	Regional, Preserve	Wildlife
N/A	Past (1932)	Last New Mexican gray wolf killed in Valle Grande (VCT 2010b).	Statewide, Preserve	Wildlife
NMDOT	Past (1935)	NM-4 constructed.	Local, Regional	Visitor Experience Visual Resources Transportation Vegetation Fish and Wildlife Geology and Soils Water Natural Sounds Socioeconomics Carbon Footprint and Air Quality
N/A	Past (1940s, 1950s; 1970)	Mixed herds of cattle and sheep were grazed on the preserve (cattle herd sizes as high as 12,000 head) (1940s, 1950s). Only cattle grazed on the preserve for last 40 years (VCT 2009b).	Preserve	Vegetation Geology and Soils Water
N/A	Past (1959–1983)	Several geothermal test wells were drilled on west side of Redondo Creek and other canyons; plugged and abandoned by 1984 (VCT 2010b).	Preserve	Geology and Soils
NMDGF	Past (1947–1965)	NMDGF released elk into Río de las Vacas valley west of the Baca Location (VCT 2010b).	Regional, Preserve	Wildlife
N/A, VCT	Past (1960s, 1970s; 2000)	Decline in livestock numbers on the preserve prior to federal acquisition (VCT 2009b). Upon federal acquisition or preserve (2000), livestock numbers continued to drop and have remained low (VCT 2009b).	Preserve	Vegetation Fish and Wildlife Water Geology and Soils
N/A	Past (1963–1972), Present, Future	Timber harvest occurred primarily by clear-cutting; required building hundreds of roads and stream-crossings into the hillsides, creating narrow, linear patches in forests. Created vehicular access to areas in SFNF and the preserve, allows for continued and future use of roads by motor vehicles. Resulted in accelerated runoff and erosion, which still occurs (VCT 2009b).	Preserve; Santa Fe National Forest	Visual Resources Vegetation Geology and Soils Water Natural Sounds Socioeconomics
N/A	Past (1984, 1986, 1988)	Three geothermal wells were drilled for scientific purposes. No wells have been drilled on the preserve since 1988 (VCT 2010b).	Preserve	Geology and Soils

Agency	Time	Action	Location	Impact Topics
USFS	Past (1987)	Completed *SFNF Land and Resource Management Plan EIS/ROD* (for next 10–15 years) (USFS 1987). • Emphasized management for threatened and endangered species on 19,275 acres with goal of removing them from threatened and endangered lists. • Rehabilitated 21 recreation sites, constructed 6 new sites and 20 trailheads. • Constructed/reconstructed 16 miles of trails/year (compared to ~2/year over the past decade). • Performed trail maintenance on 525 miles of trail per year (compared to ~150 miles/year). • Managed 161,851 acres of roadless areas for semi-primitive nonmotorized recreation opportunities. • Provided increased wilderness recreation opportunities in heavily used, sensitive ecosystems; proposed two new areas totaling 2,138 acres for wilderness designation. • Increased old growth management areas from 10% to 15%. • Constructed fewer new roads through reconstruction and use of existing roads to protect watersheds and wildlife habitat; eliminated 66 miles of unneeded roads each year. • Accelerated rangeland improvement through range allotment plans to balance capacity with use. • Authorized four demonstration timber sales on slopes greater than 40% (15 million board feet of timber over 10 years). • Decreased sawtimber sales for annual total allowable sale of 455 million board feet. • Established special interest area containing Canadian dogwood in East Fork of the Jemez River drainage (extreme southern range of species). • Accelerated improvement of forest-wide watershed conditions. • Improved condition of riparian habitats. • Recommended portions of Chama, Pecos, and East Fork of the Jemez Rivers for inclusion in WSR system. • Designated 37,920 acres to protect and manage cultural resources and recognize uniqueness of Native American religious sites.	Regional	Visitor Experience Visual Resources Transportation Vegetation Fish and Wildlife Special-status Species Geology and Soils Water Natural Sounds Cultural Resources Socioeconomics Carbon Footprint and Air Quality
N/A	Past (1988, 1990)	Rio Chama included in WSR system in 1988; Pecos and East Fork of the Jemez Rivers included in 1990 (NWSR 2011).	Regional, Preserve	Visitor Experience Visual Resources Water
USFS	Past (1993)	JNRA Act became PL 103-104; JNRA's northwestern boundary follows southern edge of the preserve (USFS n.d.a): • Constructed fewer new roads through reconstruction and use of existing roads to protect watersheds and wildlife habitat; eliminated 66 miles of unneeded roads each year. • Called for provision of recreation facilities, visitor center, and interpretive facilities in or near JNRA. • Allowed for timber harvesting for commercial purposes and livestock grazing. • Emphasized preservation, stabilization, and protection of cultural resources. • Allowed for temporary closure of portions of JNRA to general public to protect uses by local Tribes. • Emphasized conservation and protection of wildlife, including species listed as sensitive by USFS, and compliance with the Endangered Species Act.	Regional	Visitor Experience Transportation Vegetation Wildlife Special-status Species Cultural Resources Socioeconomics Environmental Justice
NMDOT	Past (1997)	Jemez Valley NM-4 corridor received national scenic byway status (Sandoval County 2007).	Regional, Preserve	Visitor Experience Visual Resources Transportation Socioeconomics
NMDGF	Past (late-1990s early 2000s)	NMDGF reduced elk herd size in Jemez Mountains; this reduced the herd size in the Jemez Mountains from 7,000-9,000 to the current number of 4,000-6,000.	Regional, Preserve	Fish and Wildlife
N/A	Past (2000)	Upon federal acquisition of preserve, stream conditions were nonfunctioning or functioning at risk in many locations; poorly engineered roads contributed to runoff due to past grazing activities (VCT 2009b).	Preserve	Fish and Wildlife Water
VCT	Past (2000)	Federal government purchased 87.5% of preserve's mineral rights.	Preserve	Geology and Soils
VCT	Past (2001)	4,000–6,000 elk used Baca Ranch for summer range (VCT 2010b).	Preserve	Wildlife

Agency	Time	Action	Location	Impact Topics
USFS	Past (2002)	*East Fork of the Jemez WSR Management Plan* establishes programmatic management direction for the East Fork of the Jemez River. Attracts visitors, swimmers, anglers, and hikers. Managed as semi-primitive, nonmotorized recreation (USFS 2002a).	SFNF Forest-wide, Regional	Visitor Experience Visual Resources Water Socioeconomics
USFS	Past (2003)	SFNF signed a Finding of No Significant Impact and Decision Notice adopting the JNRA as a Forest Plan Management Area under the *JNRA Management Plan (2010)*, incorporating proposed standards and guidelines for management. (USFS 2010f)	SFNF Forest-wide, Regional	Visitor Experience Transportation Vegetation Wildlife Special-status Species Cultural Resources Socioeconomics Environmental Justice
VCT	Past (2003–2008)	VCT operated annual programs for domestic livestock grazing under interim grazing program (VCT 2010b).	Preserve	Vegetation Fish and Wildlife Water Geology and Soils Socioeconomics Preserve Management and Operations
VCT	Past (2004)	VCT scientific team used core-drilling rig to take a sediment core to ~500 feet in the Valle Grande (VCT 2004b).	Preserve	Geology and Soils
N/A	Past (2006)	Cuba 550 Express public transit service, serving communities along US 550 and NM-4, ceased operation.	Local	Transportation
NMDOT	Past (2006)	USDOT provided the preserve $1.24 million to construct wildlife viewing area on NM-4, upgrade the preserve's entrance on NM-4, install highway safety signs on all public roads, and complete a survey of all roads open to public use (MRCOG 2006).	Preserve	Visitor Experience Transportation Preserve Management and Operations
VCT	Past (2006)	VCT terminated construction of Valle Grande Overlook due to substantial cultural resource impacts expected (VCT 2006a).	Preserve	Visitor Experience Cultural Resources
NPS	Past (2006)	PL 109-338 designated Rio Arriba, Taos, and Santa Fe Counties as Northern Rio Grande National Heritage Area (NRGNHA) under the NPS; designates landscapes that reflect interactions of environment and cultures and represent important parts of United States history. Directs federal funding and assistance to support cultural landscape planning and preservation (Rio Arriba County 2010).	Regional	Cultural Resources
USFS	Past (2006)	USFS condemned remaining mineral rights to prevent geothermal power development on the preserve.	Preserve	Geology and Soils
VCT, NMDOT, USFS	Past (2007)	VCT, NMDOT, and USFS upgraded Valle Grande entrance and improved line-of-sight to meet state and federal highway safety standards; added access and egress lanes (VCT 2007b; Rodriguez, pers. comm. 2011a).	Preserve	Visitor Experience Transportation
VCT	Past (2007)	VCT expanded Borrow Pit #2 (west of Cerro Abrigo in the Puerto del Abrigo subbasin) by ~1.7 surface acres (from 2.6 acres to 4.3 acres) to provide local material for road maintenance work (VCT 2007a).	Preserve	Geology and Soils Preserve Management and Operations
VCT	Past (2010)	VCT improved several preserve roads, including VC09, VC08, VC03, and VC02. Included major road and erosion improvements with installation of culverts and erosion control measures (VCT 2010d).	Preserve	Visitor Experience Transportation Preserve Management and Operations
VCT	Past	Road building, logging, geothermal development, infrastructure development, and livestock and elk grazing have impacted archeological resources. Because most archeological resources are soil deposits that contain remnants of prehistoric cultural activities, their condition is correlated with recovery of vegetation communities, stream health, and reduced erosion.	Preserve	Cultural
VCT	Past	VCT completed facility maintenance and upgrades in headquarters area; included replacing existing water and gas distribution system and installing vacant conduit to provide for future upgrades or maintenance of electrical or communication lines (VCT 2004a).	Preserve	Preserve Management and Operations
VCT	Past (2010)	Mineral rights were withdrawn on the preserve (VCT 2010b).	Preserve	Geology and Soils
VCT	Past (2003, 2004, 2008), Present	VCT opened the preserve for seasonal winter recreation use from December to March (VCT 2003b); implemented interim recreation programs for hiking, equestrian use, summer recreation, and camping (VCT 2005f).	Preserve	Visitor Experience Preserve Management and Operations

Agency	Time	Action	Location	Impact Topics
N/A	Past (2003–2007), Present, Future	Rio Arriba County oil revenues doubled. Oil and gas production in western Rio Arriba County (San Juan Basin) produced "enormous" revenues for state, local governments. Some communities exist because of oil and gas development. Approximately 150 new oil and gas wells are drilled in the county each year. Rio Arriba County to allow further oil and gas development (Rio Arriba County 2010).	Regional	Socioeconomics
VCT	Past (2009), Present, Future	VCT prepared *Multiple Use and Sustained Yield of Forage Resources EA* and initiated program for domestic livestock grazing and managing ranch infrastructure (VCT 2009b, VCT 2010b). • Allocated 60% of forage produced annually to remain on site to sustain ecosystems and a portion of the remaining 40% for domestic livestock grazing or other purposes based on annual conditions and expected use by the preserve's elk herd. • Is adjusted annually based on environmental conditions or in support of other programs and activities. • Provides summer cattle grazing to area ranchers; constituted 0.7% to 2.5% of cattle in Sandoval and Rio Arriba Counties from 2002 to 2007. • Provides traditional land uses and cultural tie to the land for local ranchers.	Preserve	Vegetation Fish and Wildlife Geology and Soils Water Socioeconomics Preserve Management and Operations
VCT	Past (2009), Present, Future	VCT completed *San Antonio Watershed—Wetlands and Riparian Restoration EA*; began several projects in the San Antonio and Sulphur Creek sixth-level Hydrologic Unit Code (San Antonio Creek, Rito de los Indios, Sulphur Creek, Redondo Creek) and Jaramillo Creek, East Fork of the Jemez River to restore and protect riparian and wetland systems (VCT 2009f, VCT 2010b).	Preserve	Visual Resources Vegetation Fish and Wildlife Water Preserve Management and Operations
VCT	Past (2010), Present, Future	VCT completed *Landscape Restoration Management Plan* (LRMP), a 10-year strategy for restoration and management of preserve's forest, grassland, shrubland, and riparian ecosystems (VCT 2010b). Includes post-fire rehabilitation. VCT preparing Draft EIS for preserve-wide LRMP.	Preserve	Vegetation Water Geology and Soils Preserve Management and Operations
N/A	Past (2011); Present, Future	Las Conchas fire burned 156,000+ acres in the preserve, Bandelier National Monument, and SFNF; all were temporarily closed to visitors during peak season (summer). • Is adjusted annually based on environmental conditions or in support of other programs and activities. • 30,000+ acres burned within the preserve. Forested areas within the Las Conchas Fire burned mostly with moderate to high severity; grasslands burned with low severity and are revegetating. • Over 60% of Bandelier National Monument's landscape burned; upper canyons were deforested (NPS 2012): • Wildlife in the monument was killed or displaced. • Fire vitrified (converted to glass) the ground in some areas of the monument. • Ensuing heavy rains led to widespread flooding in the monument, likely resulting in soil erosion. Associated potential runoff in preserve waters. • Extensive damage to the monument limited recreation. • Archeological resources may have been exposed. • Continued impacts to visitor experience and limited public access due to safety hazards and impacts to roads expected. • Visitation expected to resume with recovery. Plants like oaks and lupines are sprouting and blooming within fire's perimeter. Wildlife is starting to reoccupy areas of the monument. Some (e.g., turkey vultures and coyotes) are flourishing as food sources become more available. Others (e.g., black bears) may not return for a long time. Some (e.g., Jemez Mountain salamanders and Goat Peak pika) may never be found in the monument again (NPS 2012). VCT is preparing EIS for landscape restoration, including post-fire rehabilitation. The recent Los Conchas fire likely expanded favorable habitat by restoring meadow habitats on the forested domes on the eastern third of the preserve, although it is too recent to quantify this supposition.	Regional, Preserve	Visitor Experience Visual Resources Transportation Vegetation Fish and Wildlife Special-status Species Geology and Soils Water Cultural Resources Socioeconomics Carbon Footprint and Air Quality
N/A	Past (2011), Present, Future	Pacheco wildfire in SFNF burned 10,116+ acres in vicinity of Santa Fe Ski Basin (Inciweb 2011).	Regional	Same as Las Conchas fire, above.
VCT	Past, Present, Future	VCT's *Wildland Fire Management Plan* requires suppression of all unplanned ignitions (lightning and human caused), but permits prescribed burning under NEPA-compliant plans. Active/completed forest management actions to reduce wildland fire hazard and restore fire-adapted species and processes include mechanical treatments along NM-4 at the southwest corner, surrounding the historic buildings in the Valle Grande, and in Redondo Canyon (VCT 2010b).	Preserve	Same as Las Conchas fire, above.
VCT	Past (2007), Future	The condition of 18 buildings throughout the preserve were documented and evaluated for NRHP listing; a strategy was developed for their continued preservation.	Preserve	Cultural Resources
N/A	Present	Illegal dumping, trash being left by recreational users (Sandoval County 2007).	Local	Visitor Experience

Agency	Time	Action	Location	Impact Topics
Jemez Springs	Present	Small-scale commercial services are provided in Jemez Springs on NM-4 (Sandoval County 2007).	Local	Socioeconomics
USFS	Present	SFNF manages and maintains five campgrounds and several picnic areas along NM-4, attracting visitors to the area (MRCOG 2006).	Local	Visitor Experience Natural Sounds Socioeconomics
MRCOG	Present	Entire Jemez Valley Corridor on NM-4 is part of MRCOG's designated bike corridor (MRCOG 2007).	Local	Visitor Experience Transportation
VCT	Present	VCT replaced portable visitor facilities at the Valle Grande Visitor Center with a new portable facility that includes expanded interpretive and retail space and vault toilets. The Valles Grande Staging area is open year round; hours of operation and available activities vary by season.	Preserve	Visitor Experience Preserve Management and Operations
USFS	Present	SFNF is analyzing Cebolla and San Antonio grazing allotments (west of the preserve and 7 miles north of Jemez Springs) for reissuance of 10-year-term grazing permit (USFS 2010a).	Region	Vegetation Fish and Wildlife Geology and Soils Water Socioeconomics
VCT	Present	Driving on preserve roads by visitors is currently limited.	Preserve	Visitor Experience Transportation Natural Sounds
VCT	Present	Since cessation of logging, forest cover has returned to preserve's mountains. Mature stands of pine, spruce, and fir flank hillsides; dense stands of young conifers are expanding. Some lands traditionally grazed by livestock are being encroached on by forests (VCT 2009b).	Preserve	Vegetation Fish and Wildlife Special-status Species Geology and Soils Carbon Footprint and Air Quality
VCT	Present	Range conditions are improving due to reclamation activities. Past grazing disturbance is evident, but is moderate to high. Strong regrowth potential with water as limiting factor; stream conditions have improved rapidly (VCT 2009b).	Preserve	Vegetation Fish and Wildlife Geology and Soils Water Socioeconomics
USFS	Present	USFS is analyzing rehabilitation of Redondo Creek and San Antonio Creek through elk fencing, native tree planting, and bank stabilization in the Upper Jemez watershed (USFS 2011c).	Preserve	Vegetation Fish and Wildlife Water
VCT	Present	Road reclamation activities are decreasing the amount of surface runoff in the preserve (VCT 2009b).	Preserve	Geology and Soils Water
NMDOT	Present	Traffic on NM-4 is heavily impacted by recreational facilities in Jemez National Forest and the preserve (Sandoval County 2007).	Regional, Preserve	Transportation Natural Sounds
NMDOT	Present	NM-4 is negatively impacted by runoff onto the highway from soil erosion (Sandoval County 2007).	Regional, Preserve	Transportation Geology and Soils

Agency	Time	Action	Location	Impact Topics
USFS	Present, Future	*SFNF Land and Resource Management Plan EIS/ROD* (1986) updated to include JNRA Management Plan; manages the JNRA in accordance with the 1993 JNRA Act (to (USFS n.d.a): • Disallow use of marketing to increase visitation. • Permit hunting and fishing. • Provide recreational facilities and manage roads to preserve and protect wildlife and soil, water, and cultural resources. • Protect religious and cultural sites and provide access to them by Indian peoples for traditional cultural and customary uses. • Reduce impacts from overuse. • Eliminate illegal dump sites and other garbage and debris. • Manage hot/warm springs to protect visitor safety and resources. • Designate Soda Dam as a geologic special interest area and interpret/protect its geologic features. • Provide system of designated trails for motorized/nonmotorized use; maintain trails for multiple uses, minimize conflicts, and close trails with resource damage. • Close 14 miles of roads and decommission 84 miles of roads within 5 years; prohibit/restrict motorized vehicle use in accordance with travel designations. • Allow for natural recovery from wildfire; take corrective action following wildfires to stabilize/minimize impacts on soil productivity. • Permit timber harvesting for commercial purposes. • Encourage vegetative diversity and resilience. • Control spread of invasive, nonnative species, especially in riparian areas. • Permit livestock grazing; protect upland range and riparian resources from unacceptable grazing effects. • Provide undisturbed areas for wildlife to access water resources and other important habitats. • Minimize potential for conflicts between black bears and recreationists. • Minimize area of impact of roads/trails on riparian zones and wet meadows; locate construction equipment outside riparian areas. • Consider key elements of habitat management in planning and management activities. • Provide opportunities for Tribes, local rural communities, and user groups to present information on culture and traditions to visitors. • Maintain character of Civilian Conservation Corps facilities. • Manage for "high" scenic integrity objective throughout JNRA. • Work with state highway department and local communities to minimize impacts from increasing traffic volumes.	Regional	Visitor Experience Vegetation Fish and Wildlife Geology and Soils Water Natural Sounds Cultural Resources Socioeconomics Carbon Footprint and Air Quality
VCT	Present, Future	VCT implements annual program to control and eradicate Canada, bull, and musk thistle and oxeye daisy (noxious weeds) with herbicide and mechanical removal. Canada and musk thistle are now eradicated in half the known locations and reduced 80%–90% in other treated locations. VCT to continue current efforts and reduce the risk of introducing new noxious weed species or spreading existing species (VCT 2010b).	Preserve	Vegetation Preserve Management and Operations
VCT	Present, Future	Project-level forest thinning being implemented on preserve. Income and labor benefits being created by thinning and utilization of small wood products.	Preserve	Vegetation Fish and Wildlife Special-status Species Geology and Soils Natural Sounds Socioeconomics

Agency	Time	Action	Location	Impact Topics
USFS	Present, Future	SFNF published *DEIS for Travel Management on the Santa Fe National Forest*, a comprehensive, forest-wide travel management plan (USFS 2010e): • Minimize area of impact of roads/trails on riparian zones and wet meadows; locate construction equipment outside riparian areas. • Includes system of roads, trails, and areas designated for motorized use. • Prohibits driving off roads except in designated corridors for motorized dispersed camping or motorized big game retrieval. • Allows motorized use on ~350+ miles of roads/trails not currently open to motorized use. • Closes ~2,475 miles of open roads/trails to all motorized use. • Adds ~90 new motorized routes. • Changes vehicles classes and seasons of use. SFNF planning to release Final EIS and ROD in 2012 (USFS 2011d).	Regional	Visitor Experience Visual Resources Transportation Vegetation Water Natural Sounds Cultural Resources Carbon Footprint and Air Quality
VCT, USFS	Present Future	VCT and SFNF awarded funding for collaborative restoration across 210,000 acres; includes 86,200 acres of the preserve, 110,000 acres of SFNF, and some state, private, and tribal lands. Will restore sustainable ecological forest conditions in southwest (SW) Jemez Mountains (comprises entire upper Jemez River watershed). USFS and VCT to receive up to $4 million/year over next 10 years (USFS 2011f). SFNF to prepare an EIS for Collaborative Forest Landscape Restoration on USFS land.	Preserve	Vegetation Fish and Wildlife Geology and Soils Water Carbon Footprint and Air Quality Preserve Management and Operations
VCT	Present, Future	VCT is developing and implementing a cultural landscape approach to preservation that recognizes multiple layered cultural landscapes.	Preserve	Cultural Resources
VCT	Present, Future	Deferred maintenance backlog for Valle Grande facilities is $1.2 million; needed to prevent ongoing deterioration and bring buildings to standards (VCT 2007a).	Preserve	Preserve Management and Operations
USFS	Future	Development of Continental Divide Trail on SFNF northwest of the preserve may attract more recreationists to area (USFS 2011e).	Local	Visitor Experience Socioeconomics
VCT	Future	VCT will continue improvements to the Casa de Baca Lodge, A-frames, and the bunkhouse with parking, surfaces, and ramps to meet ADA compliance requirements (VCT 2009b).	Preserve	Visitor Experience Preserve Management and Operations
MRCOG	Future	MRCOG to create bike loop with additional designated bike corridors on US 550 and NM-126; would bring more bicycle traffic (MRCOG 2007).	Regional	Visitor Experience Transportation Carbon Footprint and Air Quality
MRCOG	Future	MRCOG to implement statewide transportation improvement projects (STIPs) (MRCOG 2006): • Minimize area of impact of roads/trails on riparian zones and wet meadows; locate construction equipment outside riparian areas. • Replace four bridges on NM-4. • Implement phases 1 and 2 of Jemez Mountain Scenic Bypass, including sidewalks and bikeways. • Design for wider shoulders and/or bike lanes on designated bike corridors. • Jemez Springs to receive STIP funding to build segments of Jemez Springs Walkway.	Local	Visitor Experience Transportation
MRCOG	Future	MRCOG to provide public transportation service to areas along US 550, NM-4, and other areas in Sandoval County (MRCOG 2006).	Local	Transportation Carbon Footprint and Air Quality
VCT	Future	VCT proposes to change current road density from an average of 9 miles of road per square mile of land to 1.5 miles per square mile. Requires closing and/or decommissioning ~1,000 miles of road over 10 years. Road closure and decommissioning includes ~150 miles of physical decommissioning and rehabilitation; the remainder to be achieved through administrative closure and natural rehabilitation (VCT 2010b).	Preserve	Transportation Carbon Footprint and Air Quality Preserve Management and Operations
VCT	Future	VCT proposes to provide maintenance on ~52 miles of roads to restore hydrology or halt ongoing erosion. Deferred maintenance includes reshaping and resizing existing road prism, altering grades, and constructing lead-outs, or installing or replacing culverts to improve drainage (VCT 2010b).	Preserve	Transportation Preserve Management and Operations
Sandoval County	Future	Sandoval County to regulate county residential densities and commercial and industrial locations to minimize impacts on water quality; will encourage community water supply and waste treatment where feasible (Sandoval County n.d.).	Local	Water
Sandoval County	Future	Sandoval County proposes to realign NM-4 through Jemez Pueblo (Sandoval County 2007).	Local	Transportation

Agency	Time	Action	Location	Impact Topics
Sandoval County	Future	Sandoval County to implement scenic byway status and preserve scenic values of NM-4 (Sandoval County 2007).	Local	Visual Resources Transportation
Sandoval County	Future	Sandoval County to control ridgetop development to protect viewshed (Sandoval County 2007).	Local	Visual Resources
Sandoval County	Future	Sandoval County to (Sandoval County 2007): • Develop trails (no specific areas identified). • Encourage joint use of shared facilities to expand availability of education and recreation programs. • Provide community-scale commercial amenities for local communities and tourists from NM-4. • Further develop the Jemez Springs commercial district. • Identify sites for industrial and commercial facilities and encourage new businesses to locate at these sites. • Work with state and local agencies to identify and publicize sites where increased tourism is feasible.	Local	Visitor Experience Socioeconomics
Sandoval County	Future	Sandoval County to identify and preserve traditional cultural practices and regulate future land use in the county to be consistent with them (Sandoval County n.d.).	Local	Cultural Resources
Los Alamos County	Future	Los Alamos County to (Los Alamos County 2005): • Help create 1,000 new non–Los Alamos National Laboratory jobs by 2015. • Use regional and state tourism programs to promote regional arts, culture, science, and environmental centers; sporting events; and local amenities to visitors. • Seek to have headquarters of any new Valles Caldera–related national park or preserve unit located in Los Alamos County.	Regional	Visitor Experience Socioeconomics
Rio Arriba County	Future	Rio Arriba County to develop and promote outdoor-oriented historical and culturally based tourism program (Rio Arriba County 2010).	Regional	Visitor Experience Cultural Resources Socioeconomics
N/A	Future	Expected population increase of 29% in 20 years; slow rate of growth and development expected (MRCOG 2006). Increase in state's population could increase amount of outdoor recreational use (USFS 2011e).	Preserve	Visitor Experience Fish and Wildlife Natural Sounds

* Fish and wildlife includes special-status species unless otherwise specified.

N/A = Not Applicable. SFNF = Santa Fe National Forest; EOI = expression of interest; JNRA = Jemez National Recreation Area; CFLR = Collaborative Forest Landscape Restoration; NRGNHA = Northern Rio Grande National Heritage Area; SW = southwest; EA = environmental assessment; LRMP = landscape restoration and management plan; NWSR = National Wild and Scenic Rivers

Visitor Experience

Guiding Regulations and Policies

The Valles Caldera Preservation Act includes provisions that affect visitor experience. These specific provisions direct the preserve to

- "protect and preserve the … recreational values of the preserve, and provide for multiple use" (16 USC 698v-3[b])
- provide "the public [with] reasonable access to the preserve for recreation purposes" (16 USC 698v-6[e])
- "develop a comprehensive program for the management of lands, resources, and facilities within the preserve" (16 USC 698v-6[d])

USFS FSM 2300 addresses recreation and related resource management. Although FSM direction does not apply to the VCT, it is helpful to review and adopt applicable objectives and policies. Several objectives and policies apply to this analysis:

- Provide a broad range of nature- and heritage-based outdoor recreation and tourism opportunities for the responsible use and enjoyment of local communities and their visitors.
- Provide sustainable recreation opportunities and programs that equitably serve the needs of local communities and visitors.
- Provide a wide range of recreation settings and opportunities, from the most primitive and wild to the highly developed.
- Provide opportunities for a variety of recreational pursuits, with emphasis on activities that harmonize with the natural environment.
- Provide recreation uses that are appropriate to the natural setting and that balance the needs of national and local communities.
- Limit regulation, constraint, and supervision of recreation use to the minimum necessary for resource protection, visitor satisfaction, and safety.

The goals of providing recreational opportunities at the preserve are also evident in the purpose of this plan. With regard to recreation and conservation, the purpose states that this EIS should

1. establish a long-term vision of how public access and use would be managed on the preserve
2. implement the development of a portal or physical point of access to the preserve as the first step in transitioning from the current interim recreation program to facilitate long-term public access and use

In support of this plan's purpose, one of the objectives is to expand access and enjoyment of the preserve to local, regional, national, and international visitors to the Jemez Mountains while protecting and preserving cultural and natural resources and values.

Methodology for Analyzing Impacts

The methodology for determining impacts on visitor experience is based on the guidance above. The geographic area of concern is the preserve. This analysis involves identifying and assessing how the following elements would affect the needs of local communities and visitors:

1. a portal or physical point of access to the preserve
2. the range of proposed outdoor recreation opportunities that harmonize with the natural environment, from the most primitive to the highly developed
3. expanded access to the preserve
4. establishment of a long-term vision for public access and use

Alternative 1: No Action

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: moderate and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: major and adverse Long term: major and adverse
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

This alternative would result in the removal of the Valle Grande and Banco Bonito Staging Areas and the elimination of the interim recreation programs and activities. No additional structures or facilities would be built to accommodate visitors. This alternative would not meet one of the purposes of this plan as stated in chapter 1, which is to implement the development of a portal or physical point of access to the preserve. Information provided to visitors about the preserve would be limited to the website and the Jemez Springs administrative facility. Impacts at the implementation level would be measurable and would influence recreational opportunities at the preserve. Impacts would therefore be moderate and adverse in the short and long term compared to existing conditions.

Under the no-action alternative, recreational activities managed from the Valles Grande and Banco Bonito Staging Areas would be discontinued.

Programmatic Level

The recreational activities currently offered by the preserve have not evolved through a planning context. Therefore, under the no-action alternative, recreational activities managed from the Valles Grande and Banco Bonito Staging Areas would be discontinued if not previously addressed under a specific planning process. Visitors would be able to hike the trails with access off NM-4 (Coyote Call and Valle Grande trails), but other spontaneous access to the preserve would be limited due to the elimination of current activities. As mentioned in chapter 3, slightly more than half

Spontaneous access to the preserve would be limited due to the elimination of current activities under alternative 1.

(52.2 percent) of survey respondents believe that public access to the preserve is neither adequate nor satisfactory. Approximately 77 percent and 41 percent of respondents believe that limited access and limited activities, respectively, have prevented them from participating in activities on the preserve. This alternative would not establish a long-term vision for public access and use. The resulting impact would be measurable and would extensively alter recreational opportunities at the preserve. Therefore, impacts would be major and adverse in the short and long term compared to existing conditions.

Cumulative Impacts

Actions and activities that would affect visitors include those listed in table 4-1 for visitor experience. Several past actions on lands near the preserve had beneficial impacts on visitor experience, particularly in the Santa Fe National Forest due to rehabilitation and construction of new recreational facilities and increased opportunities. Current actions will continue to have beneficial impacts, such as the proposed visitor center for the Jemez National Recreation Area and a variety of trails and other recreational facilities. Current and future plans to enhance biking opportunities and develop trails in the area would also benefit visitors.

Some adverse impacts could occur resulting from increased visitation to the area; however, these impacts would be offset by the ongoing plans to increase recreational opportunities in the area, which would disperse use.

The Las Conchas fire that burned much of Bandelier National Monument and the eastern third of the preserve during the summer of 2011 resulted in both areas being temporarily closed to visitors. Although both have reopened, it is possible that visitors may avoid the region for some time if they believe that the damage would degrade their experience. As time passes, more visitors would be expected to return.

Overall, impacts on visitor experience from other past, present, and future actions, primarily in the surrounding area, would be measurable and beneficial.

When the moderate to major adverse impacts expected under the no-action alternative are combined with the overall beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be minor and adverse. Effects from the elimination of approximately 25,000 yearly visitors (2010) would be measurable, but other nearby recreation resources would remain functional and the impact would be limited in context (i.e., to the preserve).

Alternative 2: Banco Bonito Visitor Contact Station

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: beneficial
Cumulative	Actions listed in table 4-1	Beneficial

Direct/Indirect Impacts

Implementation Level

Under alternative 2, the location of the visitor contact station would be disassociated with the Valle Grande, the preserve's main attraction, potentially resulting in visitors backtracking to the visitor contract station.

Under alternative 2, the existing Banco Bonito Staging Area would be removed and new development would occur. A small-scale visitor contact station would be developed (up to 5,000 square feet), with associated day-use facilities, a small parking area, and roads to provide access to the preserve for personal vehicles and/or shuttles, which would be used on high-use days to accommodate increased visitation. Nonmotorized access from the visitor contact station to the existing network of trails in the area would be generally open and unlimited. This alternative would meet this EIS's purpose of providing a portal or physical point of access to the preserve.

Short-term construction impacts would occur during the closure and decommissioning of the Banco Bonito Staging Area, the construction of the visitor contact station and associated parking and day-use facilities, and modifications to NM-4. Access to the preserve is currently restricted, and many current visitors such as anglers do not use the Banco Bonito area of the preserve. Therefore, there would be no measurable change during construction activities. Impacts would be localized and of short duration, resulting in negligible adverse effects.

Because the visitor contact station would be located south of the Valle Grande, minor adverse impacts could occur because visitors traveling from the east would have to bypass the preserve's main attraction and therefore may not access it through, or associate it with, the visitor contact station farther down the road. In addition, visitors unfamiliar with the area traveling from the west may pass the visitor contact station and then decide to explore the preserve further after seeing the Valle Grande, requiring them to turn around and backtrack to the visitor contact station. Creating a sense of arrival as described in chapter 2 would help mitigate these possibilities.

The alternative 2 visitor contact station is not expected to be a primary stand-alone destination due to the limited day-use activities that would be provided there.

This alternative would greatly increase visitation. It is estimated that visitation to the preserve and participation in programs and activities would double from present levels. This level of annual visitation was favorably supported by the majority of the 2010 survey respondents as described in chapter 3; 38.1 percent of respondents would prefer annual visitation of 20,000–50,000. Such an increase could adversely affect visitors seeking solitude and could result in congestion both at the visitor contact station and on NM-4. However, visitors would be able to leave the area and travel directly to their destinations in the preserve. The visitor contact station is not expected to be a primary stand-alone destination due to the limited day-use activities that would be provided there. Because much more of the preserve would be accessible, visitor use would be distributed, providing opportunities for solitude to those seeking it. Congestion would be managed by the use of shuttle buses on high-use days and through appropriate traffic management design on NM-4 (see the "Transportation" section for more information).

As noted in chapter 3, the lack of adequate infrastructure continues to be the biggest challenge for winter recreation. The visitor contact station would provide a

location for winter recreationists to assemble for guided winter activities provided by the trust. Winter recreationists would also be able to snowshoe and ski on the trails in proximity to the visitor contact station.

The new visitor contact station would improve how visitors experience and use the preserve by providing a physical portal through which visitors could obtain information about how to access and use the preserve, as well as educational and cultural information to enhance their experience of the preserve. The associated day-use facilities, such as picnic and group staging areas, would provide recreational facilities for visitors with limited time or resources. Long-term impacts at the implementation level would be beneficial.

Programmatic Level

Under alternative 2, visitors would be able to spontaneously access the majority of the preserve using personal vehicles on improved roads.

Programmatic-level actions proposed under alternative 2 would result in more recreational opportunities with a wider range of options compared to current conditions. It would also result in increased opportunities for learning about the preserve and the surrounding regional areas. Visitors would be able to spontaneously access the majority of the preserve using personal vehicles on improved roads. The use of a shuttle system on high-use days would help ensure a quality visitor experience by alleviating congestion and providing an alternative to driving. Recreational facilities would be developed to include fishing access, trailheads, overlooks, and picnic areas. The trail system would be enhanced preserve-wide. Based on demand, pedestrian, equestrian, camping, and mountain biking access would be managed to reduce conflicts while minimizing controls and restrictions. Limited access would no longer be a factor preventing people from participating in recreational activities on the preserve. Regulations, constraints, and supervision of recreation use would be limited, allowing more spontaneous access. However, tours would continue to be provided for visitors wishing a more structured experience. Recreational opportunities would range from primitive (backpacking and hiking) to moderately developed (shuttle tours and campgrounds). In response to public comments indicating a desire for minimal development, no highly developed facilities such as high-end lodging would be built. The opportunities provided would harmonize with the natural environment and would be appropriate to the natural setting.

Short-term construction impacts would occur as the preserve's roads are upgraded. Similar impacts would occur during construction of campgrounds, overlooks, and other recreational facilities. Access to many of these areas is currently restricted, so few visitors would be affected. Therefore, there would be no measurable change during construction activities. Impacts would be localized and of short duration, resulting in negligible adverse effects.

As mentioned under "Implementation Level" for this alternative, visitation is expected to essentially double under alternative 2 compared to existing conditions. Local, repeat visitors to the preserve who prefer solitude may be adversely affected by such an increase. Recreationists who use the reservation systems, such as anglers, may be most affected if more people choose to participate in those activities, potentially providing more competition for use. Fishing programs would

be adjusted annually as necessary to improve visitor experience, which would help mitigate these impacts. Alternative 2 would meet the latent demand for specific recreational activities not currently allowed on the preserve, such as backpacking and campsite camping, which many people indicated they participate in at other public lands and would like to see more of at the preserve (see chapter 3).

Hikers and winter recreationists would continue to use Valle Grande and Coyote Call trails accessible from NM-4. Details at the programmatic level would be refined in future planning, which would more fully address winter recreational activities at the preserve that have proven to be popular. At that time, the trust would consider expanding winter recreational opportunities, such as snowshoeing and cross-country skiing.

This alternative would meet the objective to expand access and enjoyment of the preserve to local, regional, national, and international visitors to the Jemez Mountains while protecting and preserving cultural and natural resources and values. In addition, the programmatic actions under this alternative would meet the purpose of establishing a long-term vision of how public access and use would be managed on the preserve. Impacts on how visitors use and experience the preserve would be beneficial in the long term.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 2 as well. When the long-term beneficial impacts expected under alternative 2 are combined with the beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be beneficial.

Alternative 3A: Entrada del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: beneficial
Cumulative	Actions listed in table 4-1	Beneficial

Direct/Indirect Impacts

Implementation Level

Locating the visitor center in the preserve on the edge of the Valle Grande under alternative 3A may also draw visitors into it and encourage them to explore further.

The central feature of alternative 3A is the development of a full-service visitor center. A wide variety of visitor services and amenities would be offered from the visitor center, including a theater, exhibit halls, classroom space, retail and food service space, and indoor and outdoor observation decks. Associated day-use facilities would include access to the East Fork of the Jemez River and South Mountain for hiking and fishing, as well as group staging and picnic areas. The visitor center would be up to 10,000 square feet, accommodating substantially more visitors than the existing Valle Grande Staging Area, which would be removed. This alternative would meet the purpose of providing a portal or physical point of access to the preserve.

Like alternative 2, short-term deconstruction and construction impacts would occur. This alternative would require an extensive rework to NM-4 (see the "Transportation" section for more details). In addition, construction impacts would be visible from NM-4 as travelers pass by the Valle Grande (see the "Visual Resources" section for more details). The VCT would work with NMDOT on changes to NM-4 to minimize impacts. Impacts would be localized and of short duration, resulting in minor adverse effects.

The entrance and associated "sense of arrival" would easily intercept visitors traveling east and west along NM-4, all of whom would see the Valle Grande in the distance at this point, which may entice them to visit and learn more about the preserve. Locating the visitor center in the preserve on the edge of the Valle Grande may also draw visitors into it and encourage them to explore further.

This alternative would greatly increase visitation. It is expected that approximately 120,000 guests would visit the visitor center each year, compared to approximately 25,000 visitors who participated in public programs in 2010. This level of annual visitation is preferred by 27.9 percent of people who responded in the 2010 visitor survey described in chapter 3. Such an increase at this location could adversely affect visitors seeking solitude and could result in congestion both at the visitor center and on NM-4. Because much more of the preserve would be accessible, visitor use would be distributed, providing opportunities for solitude to those seeking it (more details are provided under "Programmatic Level" for this alternative).

The highly developed visitor center and associated day-use facilities proposed for alternative 3A could become a destination in itself.

The highly developed visitor center and associated day-use facilities could become a destination in itself due to the extent of its offerings, drawing people to the site even if they explore the preserve no further. These facilities would also appeal to people with limited mobility or time constraints by providing educational and interpretive opportunities in one easily accessible location. The visitor center and associated facilities would provide substantially more recreational opportunities that would appeal to a wider audience compared to existing conditions. The visitor center would provide a location for winter recreationists to assemble for guided winter activities provided by the trust, and would provide access to snowshoe and

cross-country ski trails directly from the building. The result would be a long-term beneficial impact on visitor experience.

Programmatic Level

Programmatic-level actions under this alternative would be similar to those under alternative 2, resulting in negligible adverse effects in the short term from construction activities.

Similar to alternative 2, programmatic-level actions proposed under alternative 3A would provide increased access and recreational opportunities throughout the preserve. Primary visitor access would be via shuttle bus during peak season, with limited personal vehicle access through a permit system. Visitors would be able to bike into the preserve along a dedicated bike path, and drive personal vehicles to the Banco Bonito Staging Area for horseback riding and special events on the existing network of trails in the area. Hunters would continue to drive to their destinations, as would visitors to the Banco Bonito Staging Area. Cyclists could bike to their destinations or would have to park at the visitor center and take a shuttle to their biking destinations. The trail system would be enhanced preserve-wide, and new interpretive facilities and programs would be provided. During winter, visitors would recreate using trails at the visitor center; no shuttle or private access would be allowed. Winter recreationists would continue to use Valle Grande and Coyote Call trails accessible from NM-4. Details at the programmatic level would be refined in future planning, which would more fully address winter recreational activities at the preserve that have proven to be popular. At that time, the trust would consider expanding winter recreational opportunities, such as snowshoeing and cross-country skiing.

Areas would be developed to support environmental education and ecotourism. In the future, the VCT would identify additional points of nonmotorized access and would seek to expand programs and facilities for horseback riding. Like alternative 2, this alternative would provide opportunities for activities not currently offered, such as backpacking and campsite camping, which many people have indicated they would like to do at the preserve. Recreational opportunities would range from primitive (backpacking and hiking) to highly developed (the visitor center). All these elements would have beneficial impacts on visitor experience.

The shuttle system proposed under alternative 3A would control access to the preserve and reduce the possibility for congestion and traffic accidents, as well as minimize noise and visual impacts.

The shuttle system would control access to the preserve and reduce the possibility for congestion and traffic accidents, as well as minimize noise and visual impacts that would be associated with unrestricted personal vehicle access. However, shuttle use would adversely impact solitude and aesthetics (see the "Natural Sounds" and "Visual Resources" sections for details). Shuttles would be equipped with trailers to transport biking, backpacking, and other recreational gear to provide broad access to the preserve. Shuttle transfer stations would facilitate travel to desired destinations. Some visitors may prefer the use of a shuttle system to driving, enjoying the scenery during the ride and the lack of congestion at parking areas. The shuttle system would have a beneficial impact for these reasons.

As noted in chapter 3, 80 percent of survey respondents indicate that recreational access should be limited, and approximately 53 percent believe that increased access is less important than the possible negative environmental effects associated with it. Shuttle use would support these views. Although slightly more people who responded to the 2010 visitor survey described in chapter 3 do not want the preserve to favor shuttles over personal vehicle access, the majority would support the use of shuttles to decrease the need for additional infrastructure. Shuttle use is gaining popularity in national parks to address congestion and other related issues, and has been implemented at Rocky Mountain, Grand Canyon, Yosemite, Sequoia–Kings Canyon, Zion, Bryce, Denali, Glacier, Mount Rainier, and Acadia National Parks (Burnett 2009). Visitors who have commented on shuttle buses at some of these parks underscore the benefits of such systems. For example, the Zion National Park shuttle bus received a positive ranking of 4.5 out of a possible 5 by 43 reviewers. The vast majority found the shuttle bus experience positive. Some examples of visitors' experiences at national parks follow:

> *The Denali shuttle bus system is an epic nature tour. (Burnett 2009)*
>
> *My wife and I used [the Denali shuttle system] two years ago, and had an incredible trip. I was free to enjoy the wildlife and scenery instead of having to concentrate on driving … I can also recall the 'old days' at Grand Canyon, when the sunset traffic jams on the West Rim Drive were a mess—when the parking areas along the Rim filled up, people just pulled off the road anywhere (no concern about impacts on the resource) or simply parked with their car blocking part of the road. The shuttle system is a huge improvement on all counts. (Burnett 2009)*
>
> *I was resistant at first, but was won over quickly by the [Zion] shuttle. First class service with a shuttle every 10–15 min. This is QUICKER than driving (which you can't do in the park anyway). Bring your backpack, lunch, and water and there's no need to leave the park or go back to your car. (Trip Advisor 2011)*
>
> *The Zion park shuttle has three major benefits: (1) it keeps the traffic in the park down, (2) It gives you great little facts about the park, and (3) makes it so you never have to worry about trailhead parking being full. It also makes it very easy to stay outside of the park and just ride the shuttle into various points within the park. (Trip Advisor 2011)*
>
> *Brilliant idea and very well executed. No parking hassles, hardly any cars, little noise. (Trip Advisor 2011)*
>
> *We visited Zion on two consecutive days in October. On both days we parked our car at the visitor's center and used the shuttle to explore the park. It is a very convenient, relaxing way to see the canyon. The shuttle allows you to sit back and enjoy the beautiful scenery. (Trip Advisor 2011)*
>
> *Shuttle vastly improves [Zion] canyon experience—less smog, less traffic, and it's so easy on and off; they should run it all year long. (Trip Advisor 2011)*

An assessment of visitor satisfaction with public transportation services at Denali National Park and Preserve, where visitor access to the park's interior is controlled,

found that the majority of visitors (71 percent) found the shuttles a "good" or "excellent" place for viewing wildlife. Eighty-seven percent said that wildlife observations from the bus was a factor that contributed to satisfaction regarding the transportation system. Seventy-two percent agreed that the bus provided freedom to view the park instead of focusing on driving, which also contributed to visitor satisfaction. Overall, 79 percent agreed or strongly agreed that the transportation service buses enhanced their visit to the park, and 88 percent rated the bus service good to excellent. Authors of the assessment concluded that "the transportation system in Denali not only allows visitors to experience the wild beauty of the park and its wildlife, but also affords a high degree of resource protection and visitor safety" (Miller and Wright 1999).

However, visitors may prefer the more spontaneous and direct access that driving personal vehicles would provide (see the alternative 3B discussion). As noted in chapter 3, many anglers liked being able to drive their own vehicles to fishing locations, although some requested a shuttle service. Under this alternative, fishing access would be provided via shuttle. Some visitors may choose not to use the shuttle system at all, therefore avoiding the preserve altogether. For these visitors, impacts would be adverse.

As mentioned under "Implementation Level" for this alternative, visitation is expected to increase substantially under alternative 3A compared to existing conditions. Like under alternative 2, the preserve would adaptively manage recreational activities in time and space to mitigate impacts on solitude from overcrowding.

This alternative would meet the objective to expand access and enjoyment of the preserve to local, regional, national, and international visitors to the Jemez Mountains while protecting and preserving cultural and natural resources and values. In addition, the programmatic actions under this alternative would meet the purpose of establishing a long-term vision of how public access and use would be managed on the preserve. Impacts on how visitors use and experience the preserve would be beneficial in the long term.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3A as well. In addition, as noted in table 4-1, MRCOG may provide public transportation service to areas along NM-4. If this included a stop at the proposed visitor center, this action would combine with the preserve's shuttle system to bring people with limited vehicular access into the preserve—a beneficial impact. When the long-term beneficial impacts expected under alternative 3A are combined with the beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be beneficial.

Alternative 3B: Entrada del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: beneficial
Cumulative	Actions listed in table 4-1	Beneficial

Direct/Indirect Impacts

Implementation Level

Impacts under alternative 3B at the implementation level would be the same as alternative 3A.

Alternative 3B would differ from alternative 3A in that visitors would access the preserve using personal vehicles rather than shuttle buses, discussed under "Programmatic Level" for this alternative. Implementation-level impacts would be the same as alternative 3A: minor and adverse in the short term and beneficial in the long term.

Programmatic Level

Impacts at the programmatic level would be the same as described for alternative 3A, with the exception of transportation. Personal vehicles would follow the same loop route described for shuttle vehicles under alternative 3A. Shuttles would be used for tours and group events, or to reduce congestion on high-use days. The preserve roads would be improved to accommodate the mix of shuttles and personal vehicles. Parking lots would be developed at trailheads, fishing access sites, picnic areas, and overlooks to accommodate more personal vehicles.

Short-term construction impacts would be negligible and adverse, as described for alternative 3A.

The use of personal vehicles would provide spontaneous access to the preserve. Visitors would be able to drive directly to their destinations whenever they wish. Reservations would continue to be used for anglers and hunters to avoid conflicts and provide safety. Therefore, impacts on visitor experience of the preserve would be beneficial compared to existing conditions.

Visitors would experience both beneficial and adverse impacts from actions under this alternative. Beneficial impacts would result from visitors being able to experience more areas of the preserve and more activities, such as camping, on a spontaneous basis. Visitors may enjoy the experience of driving to their destinations. As noted in chapter 3, 42.5 percent of the 2010 visitor survey respondents do not favor the use of shuttle buses over personal vehicles, compared to 35 percent who do. Some visitors to Zion National Park did not find the shuttle experience enjoyable:

We had no idea that a bus could be soooo hot!! The windows barely open and there is no air conditioning. You really can't see anything unless you hike so the shuttle is pointless. And did I mention they are packed with stinky, sweaty hikers. Not a good experience for us. (Trip Advisor 2011)

I know others seem to really like the shuttle, so I guess I'm an exception. I would prefer to drive my own car. We arrived at the park around 10:30 a.m. The shuttle bus was completely loaded, not even standing room available. So, we got on the next shuttle. We had a seat, but it quickly filled up with standing passengers. We wanted to get off at the last stop and work our way down. It seemed to take forever to get to our stop! Almost all of the buses throughout the day had passengers standing. The buses do run very frequently, which is good because we had more than one bus pull off as we were approaching it to board. We like taking photographs along the drive, which we were unable to do on the bus. Also, I get motion sickness, especially on curvy roads such as these. It does not affect me if I'm driving, but riding as a passenger causes nausea. In addition, we had to carry a backpack with lunch, snacks, water, etc., which we normally just have in the car. So, overall the shuttle detracted from our park experience. (Trip Advisor 2011)

Under alternative 3B, the use of personal vehicles would provide spontaneous access to the preserve. Adverse impacts would result from congestion, traffic safety risks, noise, and exhaust.

Adverse impacts would result from congestion, traffic safety risks, noise, and exhaust. A mix of vehicles using the preserve roads, ranging from motorcycles to passenger vehicles to RVs and shuttle buses operating at various speeds, could lead to frustration, congestion, and accidents. Such events would diminish visitors' experience compared to existing conditions, depending on the severity of the impact. Vehicular access would also impact solitude and aesthetics (see the "Natural Sounds" and "Visual Resources" sections for details).

Visitors would not be required to stop at the visitor center to obtain interpretive information. It would be difficult for VCT staff to provide such information to these visitors, who may miss educational or other opportunities that could enhance their experience. If access fees are implemented, a fee booth or something similar would be required at the main entrance to the preserve.

This alternative would meet the objective to expand access and enjoyment of the preserve to local, regional, national, and international visitors to the Jemez Mountains while protecting and preserving cultural and natural resources and values. The programmatic actions under this alternative would also meet the purpose of establishing a long-term vision of how public access and use would be managed on the preserve. Overall, long-term impacts on visitor experience would be beneficial as a result of more direct access to the preserve and additional recreational opportunities.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3B as well. When the long-term beneficial impacts expected under alternative 3B are combined with the beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be beneficial.

Alternative 4A: Vista del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: beneficial
Cumulative	Actions listed in table 4-1.	Beneficial

Direct/Indirect Impacts

Implementation Level

Under alternative 4A, visitors from the northeast may bypass the visitor center to access the entrance road, and then have to turn around to reach the visitor center and take a shuttle. Visitors traveling from the south and west may try to use the entrance road and have to return to NM-4 to continue to the visitor center.

Like alternative 3A, the central feature of alternative 4A is the development of a full-service visitor center, with similar amenities and facilities. Alternative 4A would focus on views of the Valle Grande, interpretation of geology, and proximity to adjacent day use at Bandelier National Monument. The visitor center would provide a location for winter recreationists to assemble for guided winter activities provided by the trust, and would provide access to snowshoe and cross-country ski trails directly from the building. The location of this visitor center makes it readily accessible from NM-4, which may attract visitors with limited time who are just passing by. In addition, as noted in chapter 2, views of the Valle Grande provide the casual visitor the highest motivation to stop at a visitor center along NM-4 to investigate the preserve. This alternative would meet the purpose of providing a portal or physical point of access to the preserve.

The visitor center would be located east of the preserve's main entrance road. Visitors from the east (from Los Alamos and beyond) may bypass the visitor center to access the entrance road, and then have to turn around to reach the visitor center and take a shuttle. Likewise, visitors traveling from Jemez Springs to the south and west may try to use the entrance road and have to return to NM-4 to continue to the visitor center. Advance planning strategies would be used to guide visitors to the visitor center to mitigate this effect. More details are provided in the "Transportation" section.

Although the focus of the visitor center would differ slightly from alternative 3A, the same range and variety of visitor amenities and services would be provided. Therefore, impacts would be minor and adverse in the short term due to construction activities and beneficial in the long term for the reasons described for alternative 3A.

Programmatic Level

Under alternative 4A, programmatic level impacts would be similar to alternative 3A.

Programmatic-level actions proposed would result in more recreational opportunities with a wider range of options compared to current conditions. Visitors would be able to spontaneously access the majority of the preserve using personal vehicles on Level 4 roads. Approximately 120,000 visitors are expected annually, as with alternative 3A. Although recreational amenities offered at the programmatic level would differ very slightly from alternative 3A due to the resources and landscape features near the visitor center, there would be no measurable difference to visitor experience. Recreational opportunities would range from primitive (backpacking and hiking) to highly developed (the visitor center).

This alternative would meet the objective to expand access and enjoyment of the preserve to local, regional, national, and international visitors to the Jemez Mountains while protecting and preserving cultural and natural resources and values. In addition, the programmatic actions under this alternative would meet the purpose of establishing a long-term vision of how public access and use would be managed on the preserve. Impacts on how visitors use and experience the preserve would be beneficial in the long term.

Impacts would be negligible and adverse in the short term and beneficial in the long term for the reasons described for alternative 3A.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 3A would apply to alternative 4A as well. When the long-term beneficial impacts expected under alternative 4A are combined with the beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be beneficial.

Alternative 4B: Vista del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: beneficial
Cumulative	Actions listed in table 4-1	Beneficial

Direct/Indirect Impacts

Implementation Level

Implementation-level impacts under alternative 4B would be similar to alternative 4A. Programmatic-level impacts would be similar to alternative 3B.

Like alternative 3B compared to alternative 3A, alternative 4B would differ from alternative 4A in that visitors would access the preserve using personal vehicles rather than shuttle buses. Implementation-level impacts would be the same as alternative 4A: minor and adverse in the short term and beneficial in the long term.

Programmatic Level

Short-term impacts would be negligible and adverse and long-term impacts would be beneficial, as described for alternative 3B, because only slight differences exist between the alternatives.

Cumulative Impacts

Cumulative impacts would be beneficial, as described for alternative 3B.

Visual Resources

Guiding Regulations and Policies

Although FSM direction does not apply to the VCT, it is helpful to review and adopt applicable objectives and policies. FSM 2300 (USFS 2003) directs units of the USFS to use the basic concepts, elements, principles, and variables defined in *Landscape Aesthetics: A Handbook for Scenery Management* (USFS 1995) to manage landscape aesthetics and scenery. The handbook defines a "scenery management system" for the inventory and analysis of aesthetic values. The process involves identifying scenery components, mapping the components, and assigning a value to these components (described in chapter 3). The evaluation of the alternatives includes a description of predicted changes to key ecosystem elements. Impacts are focused on changes determined by the following indicators (USFS 1995):

- Landscape character changes:
  - Determine whether existing landscape character will be sustained or changed.
  - Determine whether changes to landscape character will exceed the limits of its historic range (described in chapter 3), as well as any influences that changes may have on its sustainability.
  - Determine whether opportunities for enhancement of the existing landscape character and scenic attractiveness would be achieved, and to what degree.
- Scenic integrity effects:
  - Determine whether areas of high and very high existing scenic integrity would be significantly or irreversibly altered.
  - Determine whether opportunities for restoration of scenic integrity would be achieved, and to what degree.

Methodology for Analyzing Impacts

Simulations depicting the visual outcome of the implementation-level actions for the proposed action alternatives were created based on preliminary site designs, which are conceptual and subject to change. The purpose of the simulations is to demonstrate potential changes to the visual resource for each alternative. The simulations were compared to existing conditions to determine changes to landscape character and scenic integrity using the guidance above.

These implementation-level changes considered the seen area, distance zones, and sensitivity levels described in chapter 3. For example, a slight change in landscape character may be more considerable depending on the view and the viewers. The scenic importance of a landscape may substantially increase when large numbers of viewers with high concern for scenery view a landscape in detail for a long period of time. Conversely, the scenic importance of a landscape may substantially decrease if a small number of viewers with low concern for scenery view a landscape fleetingly. Sometimes only a small number of people view certain landscapes, but these people have high concern for scenic quality and high expectations of outstanding scenic beauty. When associated with other related experience opportunities, such as spiritual activities or introspection, these landscapes have even higher scenic importance and value.

Changes to landscape character and scenic integrity at the implementation level were also evaluated in the context of the ability of the landscape to absorb human alterations and whether the resulting changes would conflict with the zoning suggested under the preserve's *Master Plan for Interpretation* (VCT 2005g), as described in chapter 3.

At the programmatic level, impacts were assessed more qualitatively based on the location of major landscape features, logging roads and disturbed areas, and rock features, water, and vegetation (as described under "Visual Setting" in chapter 3) relative to the proposed changes.

Alternative 1: No Action

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: beneficial Long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: beneficial Long term: beneficial
Cumulative	Actions listed in table 4-1	Beneficial

Direct/Indirect Impacts

Implementation Level

This alternative would result in the removal of the Valle Grande and Banco Bonito Staging Areas and the elimination of the interim recreation programs and activities. No additional structures or facilities would be built to accommodate visitors. A reduction in the number of visitors, which would result from the elimination of the interim recreation program, would also benefit visual resources.

Programmatic Level

Under alternative 1, removing the portable buildings used at the staging areas would have a beneficial impact on visual resources.

Removing the portable buildings used at the staging areas would have a beneficial impact on visual resources, particularly at the Valle Grande Staging Area, which can be seen in the Valle Grande from many viewing points, including NM-4. Visitors would be able to hike the trails at Rabbit Mountain, but spontaneous access to the preserve would be restricted. The result would be a slight beneficial impact on visual resources from a reduction in visitors and recreational activities in the preserve. Although the preserve's visual resources would be beneficially affected, potential visitors would be adversely affected because views from the staging areas would no longer be available to them (impacts on visitors are described under "Visitor Experience").

Cumulative Impacts

The inclusion of the Rio Chama, Pecos, and East Fork of the Jemez River in the Wild and Scenic Rivers system, which includes rivers that possess outstandingly remarkable scenic and other values, protects the rivers in their free-flowing condition for the benefit and enjoyment of present and future generations. The *East Fork of the Jemez Wild and Scenic River Management Plan* (USFS 2002a) will help protect scenic resources associated with the river. Similarly, the identification of NM-4 as a national scenic byway will help recognize, preserve, and enhance this road. Restoration activities under VCT's landscape restoration plan will also beneficially impact visual resources by restoring the natural ecosystem.

Other actions have had adverse effects on visual resources, particularly logging in the preserve and on adjacent USFS lands. However, in the preserve, forest cover has returned to the preserve's mountains since the cessation of logging—a beneficial impact. Oil and gas drilling on nearby USFS lands has had, and will continue to have, an adverse impact on lands around the preserve. Wildfires that burned in 2011 had an adverse impact on visual resources in the short term, but the ecosystem is starting to recover, and long-term impacts will be beneficial as a result. The implementation of the Jemez National Recreation Area management plan's high scenic integrity objective will have a beneficial impact. Sandoval County's plans to preserve scenic values and control ridgetop development will also have beneficial impacts.

Although some past actions have had substantial adverse impacts, current and future restoration activities will result in beneficial impacts that will help offset past actions,

particularly the visual scars from logging in the preserve. Overall, the effects of these actions are expected to be primarily beneficial.

When the beneficial impacts expected under the no-action alternative are combined with the overall beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would remain beneficial.

Alternative 2: Banco Bonito Visitor Contact Station

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: negligible to minor and adverse
Cumulative	Actions listed in table 4-1	Beneficial

Direct/Indirect Impacts

Implementation Level

The addition of the new facilities proposed under alternative 2 may help unify the disturbed, open ground and scattered amenities.

Under alternative 2, the existing Banco Bonito Staging Area would be removed and a small-scale visitor contact station would be developed (up to 5,000 square feet). Associated day-use facilities, a small parking area, and roads to provide access to the preserve for personal vehicles and/or shuttles (which would be used on high-use days to accommodate increased visitation) would also be developed. Nonmotorized access from the visitor contact station to the existing trail network in the area would be generally open and unlimited.

Figure 4-1 shows the existing visual resource conditions at the proposed visitor contact station location from one specific vantage point. The photograph was taken just beyond the existing entrance from NM-4 to the left of the entrance road. The entrance road is somewhat discernible to the right. Figure 4-2 is a simulation of what the visitor contact station and associated facilities might look like in this setting.

Landscape Character, Including Scenic Attractiveness and Deviations from Historic Range

Because the Banco Bonito site has been previously disturbed, little or no vegetation would be removed to accommodate the new facilities. The visitor contact station's footprint and low profile would occupy a small amount of the scene, as shown in the simulated photo in figure 4-2. These characteristics are in keeping with sustainable design guidelines described in chapter 2, which help minimize visual impacts. In addition, the simulation shows the visitor contact station at the edge of the clearing—another sustainable design characteristic.

Figure 4-1: Existing Conditions, Alternative 2

Figure 4-2: Simulation of Proposed Alternative 2 Visitor Contact Station

The conceptual rendering of the visitor contact station shown in figure 2-6 in chapter 2 adheres to the USFS Rocky Mountain Province design guidelines described in chapter 2, which stress matching the scale of the surrounding environment. The rendering incorporates design guidelines such as a well-defined main entry, simple forms, and broad porches. The visitor contact station would be a visually pleasing facility that presents minimal contrast and harmonizes with the surroundings. The parking areas and roads would be designed to be as natural, simple, and unobtrusive as possible.

The addition of the new facilities may help unify the disturbed, open ground and scattered amenities, providing slightly more coherence compared to existing conditions. The visitor contact station would be designed to better fit into the landscape than the temporary Banco Bonito Staging Area, which has an awkward and haphazard appearance, thereby improving unity and balance. The proposed changes would not substantially alter scenic attractiveness at this location: coherence, harmony, pattern, and balance would remain positive. The current landscape character for this site is class B, typical. Under alternative 2, the site would remain class B.

For the purposes of this analysis, the Banco Bonito location is currently considered natural appearing primarily because the site has been previously disturbed. Under alternative 2, the site would continue to express predominantly natural evolution, but also human intervention in the form of the visitor contact station and associated facilities. Therefore, there would be no deviation from the current historic range for alternative 2. Changes to the landscape character would not exceed the limits of the historic range, which would be sustained under this alternative.

The landscape character of the Valle Grande would be improved because the temporary visitor contact station currently located there would be removed. The portable facilities and parking area that comprise the visitor contact station would no longer be visually evident from various viewpoints, including NM-4, which would restore the landscape character of the Valle Grande.

Scenic Integrity

The alternative 2 visitor contact station would not likely be visible from public highways, roads, and recreational amenities in the preserve.

As under current conditions, the landscape would appear slightly altered, but noticeable deviations (i.e., the visitor center and associated facilities) would be visually subordinate to the landscape character for the reasons described above. A water pumping system may be needed to transport water from the Jemez Falls Campground. This pumping system would not likely affect scenic integrity due to the vegetation surrounding the site. Therefore, scenic integrity would remain moderate. Scenic integrity would be slightly restored compared to existing conditions, because the facilities would provide slightly more coherence and thus completeness.

Removing the temporary visitor contact station currently located in the Valle Grande would restore its scenic integrity because these manmade facilities would no longer alter the Valle Grande landscape.

Landscape Visibility

As mentioned in chapter 3, the visitor contact station would not likely be visible from public highways, roads, and recreational amenities in the preserve due to vegetation

density and height. The location is previously disturbed and primarily enclosed by vegetation (i.e., the location does not provide views beyond the vegetation), reducing the amount of foreground views. A large number of visitors (50,000 are expected under this alternative) would view this landscape in detail for a fairly long period of time. However, this is an area where visitors are expected to be "less sensitive" to visual quality. Therefore, siting the visitor contact station at this location would have minimal impacts on viewer concern levels.

Landscape visibility would be enhanced by removing the temporary visitor contact station currently located in the Valle Grande, which would provide more unrestricted views of the preserve's natural conditions, particularly its signature landscape.

Visual Absorption Capability

The site's vegetation provides a high capability to absorb human alterations to the landscape. The visitor contact station would not be visible from NM-4, because existing vegetation would screen the facility from the highway. However, an event such as a fire would eliminate this capability, potentially exposing the visitor contact station and facilities to the highway or other viewpoints until vegetation growth returned to near current conditions. No other visual absorption factors would apply, such as slope or geological formations, to screen the facilities. Motor vehicles would be seen entering and exiting the visitor center, and additional traffic from increased visitation would be visible on NM-4.

Landscape character and scenic integrity would not substantially change from existing conditions, and the changes would be beneficial.

Visitor Capacity Zoning

Constructing the visitor contact station at this location would be compatible with the visitor capacity zoning recommended in the preserve's *Master Plan for Interpretation* (VCT 2005g). The plan notes that the preserve's clear areas in the southwestern part of the preserve, specifically Banco Bonito, are suitable for medium use, particularly at forest edges, as shown in the simulation in figure 4-2. Medium zoning areas such as this are best for group activities, circulation, and observation; visitors can see without being seen. Alternative 2 would take advantage of the existing cleared area and, by situating the visitor contact station along the forest edges, would remain compatible with the medium-level zoning specified for this area.

Conclusion

The alternative 2 site has high capability for visual absorption, although this ability is susceptible to change because the forests that provide cover could be removed by fire.

Short-term visual impacts would result from deconstruction and construction activities. These impacts would be negligible, because visitation is currently limited at the preserve and would continue to be so until the visitor contact station and programmatic-level infrastructure was in place. The preserve would also restrict access during construction to protect visitor safety. In addition, the site is screened by vegetation from NM-4, which would minimize construction-related visual impacts.

Although long-term adverse impacts would apply due to the presence of new human-made facilities, these facilities are expected to be an improvement over existing conditions, helping to unify and add coherence and balance to a setting that already shows signs of human disturbance. Landscape character and scenic integrity would not substantially change from existing conditions, and the changes would be beneficial. The

site has high capability for visual absorption, although this ability is susceptible to change because the forests that provide cover could be removed by fire. The views into and from the Valle Grande would be improved by removing the current temporary staging area facilities presently visible from a variety of viewpoints. Programmatic direction would guide any future development to ensure long-term protection of the scenic corridor along the Valle Grande. For these reasons, long-term impacts would be primarily beneficial.

Programmatic Level

Programmatic-level actions proposed under alternative 2 would result in up to 50,000 visitors accessing the majority of the preserve using personal vehicles. A shuttle system would be used on high-use days. The presence of more personal vehicles and shuttles throughout the preserve would adversely affect visual resources. Vehicles and visitors would be seen across the valles, which have low capability to block views. However, transportation would remain restricted to existing roads at the edges of the valles, minimizing the amount of visual intrusion on the preserve's signature grasslands. Doing so would be compatible with the low visitor capacity zoning recommended for the valles in the preserve's *Master Plan for Interpretation* (VCT 2005g).

Short-term visual impacts would result from the construction of the transportation infrastructure and associated facilities, such as picnic areas. These impacts would be negligible and adverse, because visitation is currently limited at the preserve and would continue to be so until the visitor contact station and programmatic-level infrastructure was in place. Because the VCT would also restrict access during construction to protect visitor safety, few visitors would be exposed to short-term impacts.

Vehicles and visitors would be seen across the valles under alternative 2. At other locations in the preserve, high slopes and taller vegetation would shield views of motor vehicles and visitors.

At other locations in the preserve, high slopes and taller vegetation would shield views of motor vehicles and visitors. As the transportation route winds through the preserve, high peaks such as Redondo and the hills to the north would provide visual absorption capabilities due to slope and vegetation.

No additional roads would be built, and new trails would be restricted to existing roads. Additional facilities associated with the transportation infrastructure, such as picnic areas, would be small in scale and would have negligible adverse impacts on visual resources. Therefore, the preserve's rock, water, and vegetation features would not substantially change.

Because impacts at the programmatic level would be primarily related to the number of visitors traveling and recreating in the preserve, the degree of change would fluctuate with visitation levels and vary by season. Changes during high levels of visitor use would be measurable, but would not alter the structure, composition, and function of the preserve's visual resources and would be limited in context. Therefore, long-term impacts would range from negligible and adverse during off-peak season to minor and adverse during peak season.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 2 as well. When the long-term beneficial to

minor adverse impacts expected under alternative 2 are combined with the overall beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would remain beneficial.

Alternative 3A: Entrada del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short-term: negligible and adverse Long-term: minor and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short-term: negligible and adverse Long-term: minor to moderate and adverse
Cumulative	Actions listed in table 4-1	Beneficial

Direct/Indirect Impacts

Implementation Level

The central feature of alternative 3A is the development of a full-service visitor center. The visitor center would be up to 10,000 square feet, accommodating substantially more visitors than the existing Valle Grande Staging Area, which would be removed. Associated day-use facilities would include access to the East Fork of the Jemez River and South Mountain for hiking and fishing, as well as group staging and picnic areas. This alternative would greatly increase visitation. It is expected that approximately 120,000 guests would visit the visitor center each year, compared to approximately 25,000 visitors who participated in public programs in 2010.

The parking lot under alternative 3A would be sized to accommodate visitors leaving their cars to ride shuttle buses into the preserve. In addition to the visitor center structure, views of the alternative 3A site would include shuttle buses queuing in line for passengers, and numerous personal vehicles. Visitors would also be seen using the recreational facilities associated with the visitor center. Cars would be seen entering and exiting the visitor center, and additional traffic from increased visitation would be visible on NM-4.

The alternative 3A site would provide scenic views of the Valle Grande to the north.

Figure 4-3 shows the existing visual resource conditions at the proposed visitor center location when viewed from the south. Figure 4-4 is a simulation of what the visitor center and associated facilities might look like in this setting. The building's roof would be slightly visible beyond the small hill in the approximate center of the photograph. The parking lots and entrance road are not expected to be readily discernible in this view. Figure 4-5 shows the existing visual resource conditions at the proposed visitor center location when viewed from the north. Figure 4-6 is a simulation of what the visitor center and associated facilities might look like in this setting. The parking lots and access road would be beyond the structure and not likely visible in this view.

Landscape character, scenic integrity, and landscape visibility would all benefit from removal of the temporary visitor contact station currently located in the Valle Grande as described for alternative 2.

Figure 4-3: Existing Conditions, Alternative 3A/3B, from the South

Figure 4-4: Simulation of Proposed Alternative 3A/3B Visitor Center, from the South

Figure 4-5: Existing Conditions, Alternative 3A/3B, from the North

Figure 4-6: Simulation of Proposed Alternative 3A/3B Visitor Center, from the North

Landscape Character, Including Scenic Attractiveness and Deviations from Historic Range

As described in chapter 2, this site is one of the most desirable and attractive lands available for development, and meets most of the criteria for site selection defined by FSM 2300 (USFS 2003). The site would be closely associated with recreation features, such as the East Fork of the Jemez River, which would be accessible by a new roadway from NM-4 that would be developed for this alternative, and would have attractive vegetative cover and gentle topography. The existing road would be closed to the public. As shown in the photographs in chapter 3, the site is located on a grassy hilltop surrounded by stands of evergreen trees near rock outcrops, and the site would provide scenic views of the Valle Grande to the north.

The hilltop where the alternative 3A/3B visitor facilities would be constructed is undisturbed, although the structure built for the movie "The Missing" is visible in the foreground. The new facilities would be estimated to impact between 5 and 10 acres of previously undisturbed vegetation composed primarily of lower and upper montane grassland, wet meadow, mixed-conifer forest, ponderosa pine forest, and blue spruce fringe forest. Most of the impacts would result from the construction of the new access road, which would skirt the edge of the Valle Grande before reaching the visitor center (see the "Vegetation" section for a detailed discussion of impacts). The visitor center would incorporate the sustainable design concepts described in chapter 2 to help minimize visual impacts. Development footprints would be kept to a minimum, and disturbance and grading would be minimized by following the contours of the land and locating the visitor center near existing roads and utilities.

Under this alternative, the existing Valle Grande Staging Area would be removed. Although the structures at the Valle Grande Staging Area are small, they are visible from NM-4 and other locations, such as the trails near Rabbit Mountain, and are close to the Valle Grande. Large numbers of visitor vehicles that park at the Valle Grande Staging Area on public recreation days make it even more visible. Removing the Valle Grande Staging Area from the Valle Grande would have a beneficial impact on visual resources.

The alternative 3A facilities would represent a new human-made structure where one currently does not exist. Existing natural features would help them blend into the landscape.

The addition of the new facilities would represent a new human-made structure where one currently does not exist. The visitor center would adhere to the USFS Rocky Mountain Province design guidelines described in chapter 2, which stress matching the scale of the surrounding environment, as demonstrated in figure 4-6. The figure shows the structure in proportion to the tall evergreen trees that surround it, as well as the large rock outcrop that fronts it. These features provide a natural enclosure for the building that helps it blend into the landscape, thus mitigating the intensity of the impacts to the scenic corridor along the Valle Grande. The building's design would incorporate elements of coherence, harmony, pattern, and balance. Parking areas and roads would be designed to be as simple and unobtrusive as possible. The changes under alternatives 3A and 3B would adversely impact the site's visual resources because no structure or facilities currently exist where the visitor center and associated facilities are proposed. However, the site's

scenic attractiveness would remain class A, distinctive, because of the visitor center being enclosed or obstructed by the natural surroundings (e.g., the small hill in figure 4-4) and the implementation of design components that would harmonize with the surroundings.

For the purposes of this analysis, the alternative 3A/3B location is currently considered naturally evolving primarily because the site shows limited human intervention. Under this alternative, the site would continue to express natural evolution of biophysical features and processes, but with new signs of human intervention. Therefore, the historic range would change to natural appearing, and would remain that way as long as the facilities are in place.

Scenic Integrity

As under current conditions, the landscape would appear primarily intact. Although deviations (i.e., the visitor center) would repeat the form, line, color, texture, and pattern common to the landscape character as much as possible, the presence of a large parking area and a substantial number of visitors and vehicles would alter the landscape. In addition, this alternative would require a rework of NM-4 and the addition of a new access road. A water pumping system may be needed to transport water to the hilltop where the visitor center would be located. This pumping system may reduce scenic integrity, depending on its location and visibility. These changes would represent a new visual impact where one currently does not exist. However, these noticeable deviations would be visually subordinate to the overall landscape character. Therefore, scenic integrity at this site would be reduced from very high to moderate.

Incorporating techniques from chapter 2 to minimize the development footprint and using nature's design intelligence instead of relying on human-made materials and energy would make it easier to restore scenic integrity at this site. As strategically planted native vegetation matures, the signs of human disturbance would be slightly diminished, also helping to restore scenic integrity.

Landscape Visibility

The new alternative 3A site would be located behind hill topography, which would help obscure views of it from the highway.

The visitor center and associated facilities would be visible from certain vantage points along NM-4, as well as from some roads and recreational amenities in the preserve. However, as noted in chapter 2, the site would be located behind hill topography, as shown in figure 4-4, which would help obscure views from the highway. The existing trees and rock outcrops would also help shield the building from view. Chapter 2 notes that the site may be screened with vegetation to reduce visibility from the Valle Grande and NM-4. This is an area where visitors are expected to be "moderately sensitive" to visual quality. Therefore, impacts on visual resources here would adversely affect visitors' concern levels, particularly those of local residents, who have memory of the site as undisturbed.

Visual Absorption Capability

As mentioned above, the visitor center structure would be obscured by hills and located between some tall stands of evergreen trees and beyond a rock outcrop,

which help absorb human alterations to the landscape. The visitor center would be visible from some vantage points along NM-4, from which cars would be seen entering and exiting the facility. Additional traffic from increased visitation would also be visible on NM-4. Views of the visitor center would be blocked by terrain from the majority of the preserve, which would minimize visual impacts.

Visitor Capacity Zoning

Based on the visitor capacity zoning recommended in the preserve's *Master Plan for Interpretation* (VCT 2005g), this site was identified as a low to medium visitor capacity area because it is located on the southern edge of the Valle Grande in an open grassland area, but near forest edges to the west. The structure would be partially obscured by low hills from southern vantage points and absorbed by clusters of trees and rock outcrops. This would help limit potential disruption of views, which the zoning levels are intended to address. For these reasons, the alternative 3A/3B site is not expected to adversely impact visitor capacity zoning.

Conclusion

Short-term visual impacts would result from deconstruction and construction activities. These impacts would be negligible and adverse, primarily affecting people traveling NM-4. The changes would be measurable but limited in context. Because visitation is currently limited at the preserve and would continue to be so until the visitor contact station and programmatic-level infrastructure was in place, few visitors to the preserve would be affected during construction. The VCT would also restrict access during construction to protect visitor safety.

Scenic integrity would be reduced from very high to moderate as a result of constructing a facility on an undisturbed hilltop.

Long-term impacts would apply due to the presence of new human-made facilities, although there would be no change to scenic attractiveness, which would remain class A, distinctive. Changes would not be in keeping with the site's historic range, which would change from naturally evolving to natural appearing. Scenic integrity would be reduced from very high to moderate as a result of constructing a facility on an undisturbed hilltop. Visitors are "moderately sensitive" to visual quality at this location, so changes to visual resources here would adversely affect visitors, particularly locals with memory of the undisturbed scene. The site's visual absorption capability would help minimize visual impacts of the new facility. Changes would be measurable and would alter the structure, composition, or function of the preserve's visual resources, but would be localized and therefore limited in context. Therefore, long-term impacts would be minor and adverse.

Programmatic Level

Like alternative 2, visual changes at the programmatic level would be related primarily to views of people traveling in the preserve. This would include sights of shuttle buses and people. No additional roads would be built, although more existing roads would be upgraded to a higher level. New trails would be restricted to existing roads. Additional facilities associated with the transportation infrastructure, such as picnic areas, would be of small scale. New campgrounds and other recreational facilities would be developed to accommodate the substantially

increased visitation. These facilities would be sited in high visitor capacity zones and would make the best use of visual absorption capabilities. Therefore, views of the preserve's important rock, water, and vegetation features would not substantially change.

Short-term visual impacts from the construction of the transportation infrastructure and associated facilities would be negligible and adverse, as described for alternative 2.

The existing Valle Grande Staging Area, which is located in the Valle Grande, would be removed. New portable buildings have been incrementally added to this location over the years, giving it a haphazard appearance in the preserve's signature grassland. Numerous cars and trucks are parked at this location during recreational events, increasing the staging area's visibility (see chapter 3). Removing the Valle Grande Staging Area from view from the Valle Grande and NM-4 would have a beneficial visual impact on visual resources.

The primary impact at the programmatic level for alternative 3A would be the presence of shuttle buses traveling the preserve's roads. Shuttles would minimize the number of vehicles traveling in the preserve.

The primary impact at the programmatic level would be the presence of shuttle buses traveling the preserve's roads. The use of shuttle buses would help minimize the number of vehicles traveling in the preserve by concentrating more visitors into fewer vehicles. The number of shuttles in use would vary with demand. As with alternative 2, the degree of change would fluctuate with visitation levels and vary by season. Changes during high levels of visitor use would be measurable and would alter the structure, composition, and function of the preserve's visual resources, but would be limited in context. Therefore, long-term impacts would range from minor during off-peak season to moderate during peak season.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3A as well. In particular, beneficial impacts from actions to protect the East Fork of the Jemez River through inclusion in the Wild and Scenic Rivers system would mitigate the impacts of providing access to it under this alternative. When the long-term minor to moderate adverse impacts expected under alternative 3A are combined with the overall beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would remain beneficial.

Alternative 3B: Entrada del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor to moderate and adverse
Cumulative	Actions listed in table 4-1	Beneficial

Direct/Indirect Impacts

Implementation Level

Implementation level impacts for alternative 3B would be similar to alternative 3A.

Because the primary difference between alternatives 3A and 3B is the mode of transportation visitors would use to recreate in the preserve, there would be few measurable differences at the implementation level. The parking lot at the visitor center would be somewhat smaller because fewer long-term parking spaces for personal vehicles would be required. For the same reasons described under alternative 3A, short-term impacts would be negligible and adverse, and long-term impacts would be minor and adverse.

Programmatic Level

Visual changes at the programmatic level would be related primarily to views of people traveling in the preserve. This would include sights of personal vehicles and people. Views of the preserve's rock, water, and vegetation features would not substantially change for the same reasons given under alternative 3A.

Short-term visual impacts resulting from the construction of the transportation infrastructure and associated facilities would be negligible and adverse, as described for alternative 2.

The primary impact at the programmatic level for alternative 3B would be a substantially higher number of personal vehicles traveling the preserve's roads.

The primary impact would be the presence of personal vehicles traveling the preserve's roads. A substantially higher number of personal vehicles would be visible in the preserve compared to existing conditions. Vehicle type would vary from low-profile, small vehicles, such as motorcycles, to high-profile, large vehicles, such as campers and RVs. Vehicles would be concentrated at parking areas near high-use recreation sites, but would also be visible in small quantities in the preserve's more primitive areas. As with alternative 2, the degree of change would fluctuate with visitation levels and vary by season. Changes during high levels of visitor use would be measurable and would alter the structure, composition, and function of the preserve's visual resources, but would be limited in context. Therefore, long-term impacts would range from minor and adverse during off-peak season to moderate and adverse during peak season.

Cumulative Impacts

Cumulative impacts would be beneficial, as described for alternative 3A.

Alternative 4A: Vista del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor to moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor to moderate and adverse
Cumulative	Actions listed in table 4-1	Negligible and adverse

Direct/Indirect Impacts

Implementation Level

Like alternative 3A, the central feature of alternative 4A is development of a full-service visitor center, with similar amenities and facilities. Alternative 4A would focus on views of the Valle Grande, interpretation of geology, and proximity to adjacent day use at Bandelier National Monument.

Figure 4-7 shows the existing visual resource conditions at the proposed visitor contact station location. The photograph was taken just beyond NM-4 looking south towards Rabbit Mountain. The existing trailhead at this location is shown at the gate at the end of the small paved area in the center of the image. Figure 4-8 is a simulation of what the visitor center and associated facilities might look like in this setting (the visitor center is visible in the middleground on the right side of the photo). The gate to the existing trailheads would be removed and the road would be improved to serve as the entrance road to the new visitor center.

Landscape character, scenic integrity, and landscape visibility would all benefit from removal of the temporary visitor contact station currently located in the Valle Grande as described for alternative 2.

Landscape Character, Including Scenic Attractiveness and Deviations from Historic Range

As described in chapter 2, this site is one of the most desirable and attractive lands available for development, and meets most of the criteria for site selection defined by FSM 2300 (USFS 2003). As shown in the photographs in chapter 3, the site is located primarily in a grassy meadow near the edge of a forest at the foot of Rabbit Mountain with sweeping views of the Valle Grande. The alternative 4A/4B site is undisturbed; some trees would be removed to accommodate the new facilities (see "Vegetation" section); however, post-construction landscaping would mitigate the intensity of the effect. As with alternatives 3A and 3B, the visitor center would incorporate the sustainable design concepts described in chapter 2 to help minimize visual impacts. Development footprints would be kept to a minimum, and disturbance and grading would be minimized by following the contours of the land and locating the visitor center near existing roads and utilities. Locating the visitor center at the edge of the forest would incorporate another sustainable design characteristic.

Figure 4-7: Existing Conditions, Alternative 4A/4B, from NM-4

Figure 4-8: Simulation of Proposed Alternative 4A/4B Visitor Center from NM-4

Under alternative 4A, the addition of the facilities would represent a new human-made structure where one currently does not exist.

The addition of the new facilities would represent a new human-made structure where one currently does not exist. Like alternatives 3A and 3B, the visitor center would adhere to the USFS Rocky Mountain Province design guidelines described in chapter 2, which stress matching the scale of the surrounding environment. The building's design would incorporate elements of coherence, harmony, pattern, and balance. The parking areas and roads would be designed to be as simple and unobtrusive as possible. The changes under alternatives 4A and 4B would adversely impact the site's visual resources because no structure or facilities currently exist at the location. However, the site's scenic attractiveness would remain class A, distinctive, due to the proposed facility's natural surroundings and the implementation of design components that would harmonize with them.

Implementing the signature-based design components described in chapter 2 would provide opportunities to enhance landscape character and scenic attractiveness, such as incorporating natural remediation (e.g., constructed wetlands), providing for wildlife movement and habitats, and designing to reflect cultural influences. In addition, the massing and scale of the structures would be in harmony with their natural settings, and would maintain integrity and coherence.

For the purposes of this analysis, the alternative 4A/4B location is currently considered naturally evolving primarily because the site shows very limited human intervention, despite its proximity to NM-4. As shown in the photographs in chapter 3, NM-4 is not readily visible from the proposed visitor center location. Under this alternative, the site would continue to express natural evolution of biophysical features and processes, but with new signs of human intervention. Situating the visitor center and associated facilities close to NM-4 would lessen the degree of impact in undisturbed areas, minimizing deviations from historic range. Therefore, the historic range would change to natural appearing, and would remain that way as long as the facilities are in place.

Scenic Integrity

As under current conditions, the landscape would appear primarily intact. Although deviations (i.e., the visitor center) would repeat the form, line, color, texture, and pattern common to the landscape character as much as possible, the presence of a large parking area and a substantial number of visitors and vehicles would alter the landscape.

Under alternative 4A, a water pumping system would be required in the open grasslands of the Valle Grande, the preserve's signature landscape.

As noted in chapter 2, a water pumping system would be required in the open grasslands of the Valle Grande, connecting to a spring approximately 1 mile away. If the pumping system traversed 1 mile of the Valle Grande, it would cover about one-third of the grassland's linear distance as viewed from the proposed visitor center toward the headquarters area. This would create a visual impact on travelers along NM-4 and other viewers of the Valle Grande. Such an impact would influence the structure, composition, or function of the preserve's visual resources and would be limited in context to the Valle Grande. However, because the Valle Grande is the preserve's signature landscape, impacts could be extensive depending on the degree of disruption created by the pumping system. For these reasons, scenic integrity at

this site would be reduced from high to moderate or low, depending on the level of visual impact on the Valle Grande from the pumping system.

Incorporating techniques from chapter 2 to minimize the development footprint and using nature's design intelligence would make it easier to restore scenic integrity at this site. As strategically planted native vegetation matures, the signs of human disturbance would be slightly diminished, also helping to restore scenic integrity.

Landscape Visibility

Under alternative 4A, the visitor center would be visible from the vicinity of the headquarters area across the Valle Grande.

The visitor center would be visible from NM-4, as well as from some roads and recreational amenities in the preserve. This is an area where visitors are expected to be "moderately sensitive" to visual quality. Therefore, impacts on visual resources here would adversely affect visitors' concern levels, particularly those of local residents, who have memory of the site as undisturbed. In addition, the visitor center would be visible from the vicinity of the headquarters area across the Valle Grande, a place where visual quality is of high concern to visitors. A visual simulation was created of the proposed visitor center as seen across the Valle Grande, shown below in figures 4-9 and 4-10 (the visitor center is visible at the treeline).

Although it appears small in the distance and would be designed to fit into the natural surroundings, the proposed visitor center would be visible across the Valle Grande, representing the sole human-made structure in the scene. The water pumping system may also be visible across the Valle Grande, depending on its location and size. NM-4 travels horizontally across the image at the base of the evergreen vegetation, but is difficult to see from this distance in the photo. According to *Landscape Aesthetics* (USFS 1995), scenic values increase as the terrain allows people to have longer views and clear air allows them to observe crisp detail, which would generally be the case from this view, depending on weather conditions. In addition, a large number of viewers (up to 120,000 visitors expected under this alternative) with high concern for scenery may view the Valle Grande landscape for long periods of time, which can substantially increase the scenic importance of the landscape (USFS 1995). As shown in figure 3-23, "Seen Area Map," in chapter 3, the Valle Grande provides several recreational opportunities that provide foreground and middleground views. Visitors fishing the East Fork of the Jemez River and anglers driving to San Antonio Creek also experience views of the Valle Grande, as well as visitors taking tours of the headquarters area. In addition, the Valle Grande is the only area in the preserve where winter activities are currently allowed. For these reasons, the facilities would have an adverse impact due to their visibility in a landscape that visitors hold in high concern.

Figure 4-9: Existing View of Alternative 4A/4B Site across the Valle Grande

Figure 4-10: Simulation of Proposed Alternative 4A/4B Visitor Center across the Valle Grande

Visual Absorption Capability

The site's location at the base of a slope provides a moderate capability to absorb human alterations to the landscape. The visitor center would be visible from NM-4, with few existing shielding features such as topography. Motor vehicles would be seen entering and exiting the facility from NM-4. Additional traffic from increased visitation would also be visible on NM-4. Views of the visitor center would be blocked by terrain from the majority of the preserve, which would minimize visual impacts, with the exception of the Valle Grande. When viewed across the Valle Grande from the headquarters area, the grasslands would have minimal ability to absorb the visual changes created by the facility.

Visitor Capacity Zoning

Constructing the visitor center at this location would be compatible with the visitor capacity zoning recommended in the preserve's *Master Plan for Interpretation* (VCT 2005g). The plan notes that forest edges, such as shown in figure 4-8 above, are suitable for medium use. Medium zoning areas such as this are best for circulation and observation; visitors typically can see without being seen. However, because the visitor center would be visible across the Valle Grande, vehicles and shuttle buses might be seen from the headquarters area and by anglers fishing in the Valle Grande.

Conclusion

Scenic integrity under alternative 4A would be reduced from very high to moderate and possibly low.

Short-term visual impacts would result from deconstruction and construction activities. These impacts would be negligible, primarily affecting people traveling NM-4. However, the visual attraction of the Valle Grande on the opposite side of the highway would likely draw travelers' attention rather than the visitor center structure. The changes would be measurable but limited in context. Because visitation is currently limited at the preserve and would continue to be so until the visitor center and programmatic-level infrastructure was in place, few visitors to the preserve would be affected. The VCT would also restrict access during construction to protect visitor safety, so few visitors would be exposed to short-term impacts.

Long-term impacts would apply due to the presence of new human-made facilities, although there would be no change to scenic attractiveness, which would remain class A, distinctive. Changes would not be in keeping with the site's historic range, which would change from naturally evolving to natural appearing. Scenic integrity would be reduced from very high to moderate and possibly low as a result of constructing a facility in an undisturbed location and from a pumping system crossing approximately 1 mile of the Valle Grande. Visitors are "moderately sensitive" to visual quality at this location, so changes to visual resources here would adversely affect visitors, particularly locals with memory of the undisturbed scene. The site's visual absorption capability would help minimize the visual impacts of the new facility. However, adverse impacts would occur related to landscape visibility and visual absorption capability regarding views of the facility from across the Valle Grande. For these reasons, long-term impacts would be primarily adverse. Changes would be measurable and would alter or influence the structure, composition, or function of the preserve's visual resources, and would be limited in

context. Therefore, impacts would be minor to moderate and adverse, primarily as a result of the water pumping system in the Valle Grande.

Programmatic Level

Programmatic-level impacts under alternative 4A would be similar to alternative 3A.

Visual changes at the programmatic level would be related primarily to views of people traveling in the preserve, including sights of shuttle buses and people. Programmatic-level impacts would be similar to those under alternative 3A. Because the visitor center would be northeast of the preserve's main entrance, there would be a slight difference in that shuttle buses would be seen traveling NM-4 to take visitors into and out of the preserve. Short-term visual impacts would be negligible and adverse, as described for alternative 2. Long-term impacts would range from minor and adverse during off-peak season to moderate and adverse during peak season for the reasons described for alternative 3A.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 4A as well. When the long-term minor to moderate adverse impacts expected under alternative 4A are combined with the overall beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would become negligible and adverse because of alternative 4A's adverse impacts related to views of the visitor center from across the Valle Grande. The adverse impacts expected under alternative 4A would offset some of the beneficial effects of other actions, such as the vegetation regrowth occurring at the alternative 4A site resulting from the 2011 wildfires.

Alternative 4B: Vista del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor to moderate and adverse
Cumulative	Actions listed in table 4-1	Beneficial

Direct/Indirect Impacts

Implementation Level

Implementation-level impacts would be similar to alternative 4A, although the parking area at the visitor center under alternative 4B would be smaller because long-term parking for visitors using shuttle buses would not be required. Short-term visual impacts would result from deconstruction and construction activities. These impacts would be negligible and adverse, primarily affecting people traveling NM-4, as described for alternative 4A. Long-term impacts would be the same as those expected for alternative 4A: minor and adverse.

Programmatic Level

Programmatic-level impacts would be similar to those under alternative 3B. Short-term visual impacts would be negligible and adverse, as described for alternative 2 and alternative 3B. There would be a slight difference related to the two turning movements required for vehicles on NM-4 (one to enter/exit the preserve and one to enter/exit the visitor center). This difference would not measurably change the level of impact, which would be the same as for alternative 3B: minor and adverse during off-peak season to moderate and adverse during peak season.

Cumulative Impacts

Cumulative impacts would be beneficial, as described for alternative 4A.

Transportation

This section evaluates the alternatives and describes how each would affect the proposed transportation system in the preserve and the surrounding area. Roads and traffic volumes would be affected by the expansion of facilities and activities in the preserve and associated improvements to existing and new roads, parking areas, new developments, access controls, shuttle routes, bike and pedestrian amenities, and backcountry sites. Transportation changes can affect the proposed actions through congestion and positive or negative impacts on visitor experience.

Guiding Regulations and Policies

The Valles Caldera Preservation Act (July 25, 2000) directs the VCT to provide "public use of and access to the preserve for recreation." The act directs the VCT to "construct and upgrade roads and bridges, and provide other facilities for activities… Roads … constructed within the preserve shall meet public safety standards applicable to units of the National Forest System and the State of New Mexico."

The Highway Capacity Manual for 2010 (TRB 2010) is used by transportation engineers and planners to assess the traffic and environmental effects of highway projects. The manual provides methods of examining traffic management in relation to both demand and capacity.

Methodology for Analyzing Impacts

Impacts from implementation-level actions were assessed based on proposed improvements to visitor contact station / visitor centers, parking lots, and access from NM-4. Impacts from programmatic-level actions were assessed based on proposed improvements to the preserve's transportation system infrastructure, personal vehicle access, multimodal amenities (shuttle system, bicycle paths), and parking availability at destinations and the associated visitor use projections. Impacts from both implementation-level and programmatic-level actions were also determined in the context of the visitor use projections for each alternative. Changes to LOS for affected roads were determined by estimating three measures of effectiveness as defined in the *Highway Capacity Manual*: average travel speed, percent time spent flowing, and percent free-flow speed. These definitions loosely

translate into mobility, maneuverability, and ability to travel at the speed limit (TRB 2010).

Alternative 1: No Action

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: none Long term: beneficial
Cumulative	Actions listed in table 4-1	Beneficial

Direct/Indirect Impacts

Implementation Level

Alternative 1 would result in a decrease in traffic volumes on preserve roads and NM-4.

This alternative would result in the removal of the Valle Grande Staging Area and Banco Bonito Staging Area staging areas and the elimination of the interim recreation program. The VCT would phase out current access through these staging areas as well as interim programs and activities. The result would be a decrease in traffic volumes on preserve roads compared to existing conditions. NM-4 would also experience a decrease in traffic volumes because vehicles destined for the preserve would be removed from the road network. Any vehicle conflicts and safety issues associated with vehicles turning onto the preserve roads from NM-4 would be reduced. The overall performance along NM-4 would remain unchanged at LOS B or improve to LOS A during peak travel periods. Any vehicular delay caused by vehicles traveling to or from the preserve would decrease, as would existing vehicle conflicts at the intersections of the preserve entrances and NM-4. Negligible short-term adverse impacts would result from equipment traveling on NM-4 to decommission and remove the existing staging areas. Overall, long-term impacts on the transportation system from implementation-level actions would be beneficial as a result of decreased traffic volumes and potential vehicle conflicts.

Programmatic Level

Visitor access would be limited to the two trails near Rabbit Mountain. No recreational programs would be offered, and additional spontaneous visitor access would not be allowed. The result would be a decrease in traffic volumes in the preserve and along NM-4 compared to existing conditions. Overall, no short-term impacts would be expected and long-term impacts on the transportation system from programmatic-level actions would be beneficial as a result of decreased traffic volumes and potential vehicle conflicts.

Cumulative Impacts

Actions and activities that would affect transportation include those listed in table 4-1. Many of the past projects and activities in the preserve and the surrounding area have had a minor impact on transportation in the preserve and along NM-4. NM-4 is heavily used by recreationists in the area, and has been and is likely still used by

heavy equipment for oil and gas drilling operations, as well as past logging operations. These impacts are measurable but have not altered the structure, composition, or function of the transportation system. Current and future actions will have beneficial impacts, such as upgrading NM-4, establishing a bike corridor, implementing projects in the STIP, and providing public transportation service. The overall result of these current and future actions combined with past actions would be beneficial impacts on the transportation system. When the beneficial impacts of the past, present, and reasonably foreseeable future activities are combined with the long-term beneficial impacts expected under alternative 1, the result would be a beneficial cumulative impact.

Alternative 2: Banco Bonito Visitor Contact Station

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: moderate and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: moderate and adverse
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

Improvements to the access road, VC07, from NM-4 and the alternative 2 facilities would adequately accommodate the increase in traffic volumes.

Under alternative 2, the existing Banco Bonito Staging Area would be removed and a small-scale visitor contact station would be developed in the Banco Bonito area. The visitor contact station would have a small gravel or paved parking area and an access road from NM-4 for personal vehicles and/or shuttles. VC01, the existing access to the Valle Grande from NM-4, would be closed to visitors. Over 50,000 guests would be expected to visit the visitor contact station each year under alternative 2, compared to the approximately 25,000 visitors who participated in public programs in 2010.

Implementation-level actions under alternative 2 would result in an increase in traffic volumes along NM-4 and in the preserve. Existing traffic volumes in the Banco Bonito area are light, because the Valle Grande area is the main attraction and point of access to the majority of the preserve. The incorporation of prominent informational road signs along NM-4, the presence of the new visitor contact station, and the closure of VC01 would result in a substantial increase in traffic volumes in the Banco Bonito area, a moderate impact. Improvements to the access road, VC07, from NM-4 and the small parking lot at the visitor contact station would adequately accommodate the increase in traffic volumes in the area. Traffic volumes along NM-4 would increase under alternative 2. Additionally, vehicle conflicts at the VC07 and NM-4 intersection would increase. However, improvements to the intersection, including acceleration and deceleration lanes, turn lanes, and directional, regulatory, and warning road signs, would mitigate any impact on intersection performance. Safety concerns would also be mitigated by

intersection improvements that meet design standards. Vehicle conflicts at the VC01 and NM-4 intersection would essentially be eliminated with the closure of VC01 to visitors.

Under alternative 2, performance on the highway would primarily continue to be LOS B or better. During summer holidays or high-use weekends, performance may degrade to LOS C during peak hours.

The increase in traffic destined for the preserve would result in moderate impacts on traffic flow along NM-4. Currently, the highway operates at or near free-flow conditions, or LOS B or better. Under alternative 2, performance on the highway would primarily continue to be LOS B or better. Although highway performance may degrade slightly, NM-4 would still function well, and delays to travelers would be minimal. The highway would continue to operate near free-flow operation during off-peak hours. However, during holiday or high-use weekend days during the peak season, performance on the highway may degrade to LOS C during peak hours, a moderate impact.

Short-term construction impacts would occur during the deconstruction of the Banco Bonito Staging Area, the construction of the visitor contact station and associated parking and day-use facilities, and modifications to the NM-4/VC07 intersection. Delays along NM-4 would likely occur during construction, though impacts would be localized and of short duration. Therefore, short-term impacts would be moderate and adverse. Overall, long-term impacts at the implementation level would be measurable but would not alter road functionality inside and outside the preserve and would be limited in context, resulting in moderate adverse effects.

Programmatic Level

Road and parking improvements proposed under alternative 2 would adequately accommodate increased traffic on preserve roads.

Programmatic-level actions proposed under alternative 2 would provide visitors access to the majority of the preserve using personal vehicles on Level 3 and Level 4 roads. VC07/VC02, the road connecting the Banco Bonito area with the Valle Grande and the majority of the preserve, would be upgraded to a Level 4, double-lane facility. A shuttle system would be implemented on high-use days to alleviate congestion and provide an alternative to personal vehicle use. Additional parking lots for up to 10 vehicles would be developed at the preserve's backcountry sites. Many sites would also accommodate shuttle stops.

Traffic along VC07/VC02 would experience an increase in volume. Planned improvements to upgrade the road to a Level 4, double-lane facility would adequately accommodate the increase in traffic volume. The other preserve roads would also experience an increase in traffic volume as visitor volume increases. Vehicle conflicts would occur, but improvements to these single-lane roads would help minimize impacts. The small parking lots planned at destination sites throughout the preserve would adequately accommodate parking demand.

Short-term construction impacts would occur as the preserve's roads are upgraded. Impacts could include some delays and traffic queues. These short-term impacts would be localized and staggered in time, resulting in minor adverse effects. Long-term impacts at the programmatic level would be moderate and adverse as traffic volumes would increase throughout the preserve.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 2 as well. When the long-term moderate adverse impacts expected under alternative 2 are combined with the overall beneficial impacts of other past, present, and reasonably foreseeable future activities listed in table 4-1, the result would be a minor adverse cumulative impact on the transportation system both inside and outside the preserve.

Alternative 3A: Entrada del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: moderate and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: moderate and adverse
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

Under alternative 3A, a full-service visitor center would be developed in the southwest area of the Valle Grande near the entrance of NM-4. The existing visitor contact station at the Valle Grande Staging Area would be relocated to the Banco Bonito Staging Area. The new visitor center would accommodate substantially more visitors than the existing Valle Grande Staging Area visitor contact station. The visitor center would have a visitor parking area for approximately 100 vehicles.

A new entrance road from NM-4 would be created, and the existing road, VC01, would be closed to visitors. The new entrance road would be a paved, double-lane, Level 4 facility. The new access point on NM-4 would include turn lanes and directional, regulatory, and warning road signs.

The new access road and its central location would minimize the likelihood of visitors backtracking along NM-4 under alternative 3A.

Like alternative 2, this alternative would result in short-term impacts during the construction of the visitor center and associated parking, the new access road, and the new intersection of the access road with NM-4. Delays along NM-4 would likely occur during construction, resulting in moderate adverse impacts, though impacts would be localized and of short duration.

This alternative would greatly increase visitation. It is expected that approximately 120,000 guests would visit the visitor center each year. Such an increase would result in increased traffic volumes at the visitor center and along the entrance road. Traffic volumes entering the preserve would be substantially greater than existing volumes. The new NM-4 access and entrance road to the visitor center would adequately serve the increase in traffic volumes. The large parking lot at the visitor center would accommodate the increased parking demand. The implementation of alternative 3A would result in measurable long-term adverse impacts on the

transportation system in the preserve, a moderate impact on the transportation system.

Under alternative 3A, performance on the highway would primarily continue to be LOS B or better. During summer holidays or high-use weekends, performance on the highway may degrade to LOS C during peak hours.

NM-4 would also experience an increase in traffic volumes from vehicles destined for the preserve. The new access road and its central location would minimize the likelihood of visitors backtracking along NM-4 because visitors traveling in both directions would be easily intercepted. Traffic along the Banco Bonito access road from NM-4 would be limited to personal vehicles with permits. Vehicle conflicts associated with vehicles turning onto the preserve roads from NM-4 would increase. However, the new access intersection with NM-4 would include acceleration and deceleration lanes and directional, regulatory, and warning road signs. By meeting design standards, the intersection would perform adequately, minimizing vehicle conflicts and potential accidents.

The increase in traffic destined for the preserve would result in impacts on traffic flow along NM-4. Currently, the highway operates at or near free-flow conditions, or LOS B or better. Under alternative 3A, performance on the highway would primarily continue to be LOS B or better. Impacts would be limited and the highway would continue to operate at or near free-flow operation during non-peak hours, and traffic delays would be minimal. However, during the peak season, the highway performance may degrade to LOS C during peak hours, resulting in a measurable impact that may influence transportation on this road. Long-term impacts outside the preserve would be moderate and adverse.

Programmatic Level

Under alternative 3A, the number of personal vehicles entering the preserve would be limited by the permit and shuttle systems, which would minimize potential traffic congestion, vehicle conflicts, and accidents.

Programmatic-level actions proposed under alternative 3A would provide increased access and recreational opportunities throughout the preserve. Access in the preserve would be primarily by use of a shuttle system. The shuttle route would follow a loop composed of Level 4, double-lane roads through the preserve. Other roads in the preserve would be upgraded to Level 3 facilities. Some personal vehicle access would be allowed by permit. Shuttle stops and small parking lots for up to five vehicles for visitors with permits would be provided at the preserve's backcountry sites. Additionally, a new bike lane or path would parallel the Level 4 loop road through the preserve.

As mentioned under "Implementation Level" for this alternative, visitation is expected to increase substantially under alternative 3A. The preserve's road system would experience an increase in traffic volumes as access increases. However, the number of personal vehicles entering the preserve would be limited by the permit system and shuttle system. This would minimize potential traffic congestion, vehicle conflicts, and accidents. The designated bike lane or separated path would reduce bicycle/automobile conflicts and provide safety. The small parking lots planned at destination sites throughout the preserve would adequately accommodate parking demand.

The implementation of alternative 3A at the programmatic level would result in short-term construction impacts as the preserve's roads are upgraded. Though the short-term impacts would be localized and staggered in time, construction would

result in minor adverse impacts including some vehicle delays and traffic queues. Measurable long-term impacts on the transportation system in the preserve would also occur under this alternative. Though the alternative would not alter the function of the transportation system, the impacts would be moderate and adverse.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3A as well. Public transportation service to areas along NM-4 and new biking facilities would provide an alternative to driving to the preserve. These facilities would combine with the preserve's shuttle system to help reduce personal vehicle use to the preserve and thus reduce traffic volumes on NM-4, resulting in a slight beneficial impact. When the long-term moderate adverse impacts on transportation are combined with the beneficial impacts of other past, present, and reasonably foreseeable future activities listed in table 4-1, the result would be a minor adverse cumulative impact on the transportation system.

Alternative 3B: Entrada del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: moderate and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: moderate and adverse
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Like alternative 3A, on high-use days during the peak season, performance on the highway may degrade to LOS B or LOS C during peak hours for alternative 3B.

Alternative 3B would differ from alternative 3A in that visitors would primarily travel in the preserve using personal vehicles rather than shuttle buses, as discussed under "Programmatic Level."

Implementation Level

Like alternative 3A, on high-use days during the peak season performance on the highway may degrade to LOS C during peak hours. Implementation-level impacts would be moderate and adverse in the short and long term, like those for alternative 3A.

Programmatic Level

Like alternative 3A, programmatic-level actions proposed under alternative 3B would provide increased access and recreational opportunities throughout the preserve. Unlike for alternative 3A, personal vehicles would serve as the primary mode of access to the preserve under alternative 3B. Personal vehicles would follow the same loop route described for shuttle vehicles under alternative 3A. Shuttles would be used for tours and group events, or to reduce congestion on high-use days. The preserve roads would be improved to Level 3 and Level 4 roads to

accommodate the mix of shuttles and personal vehicles. Parking lots would be developed at backcountry sites in the preserve to accommodate more personal vehicles.

Under alternative 3B, safety concerns due to the increased traffic volume and mix of vehicles would become more prominent, and visitor distribution throughout the preserve may become uneven.

The use of personal vehicles would result in increased traffic volumes throughout the preserve. The improvements to the Level 4 double-lane loop road and Level 3 roads would alleviate some potential congestion and traffic conflicts. However, safety concerns due to the increased traffic volume and mix of vehicles would become more prominent, and vehicle conflicts may increase. Additionally, small parking lots at popular backcountry areas may become full on high-use days. Unlimited access with no permitting system may result in uneven visitor distribution throughout the preserve and a parking supply unable to meet parking demand. Visitors would be required to park only in designated areas as posted, which would be enforced to limit access. Strict adherence to parking capacities could support a more even distribution of visitors. The use of the shuttle system on high-use days would alleviate some congestion and provide an alternative to personal vehicle use. The designated bike lane or separate path paralleling the Level 4 loop road would reduce potential bicycle/automobile conflicts and improve safety.

With personal vehicles as the primary mode of access to the preserve, the main entrance would become more congested and vehicle conflicts would become more frequent. Improving the intersection to meet design standards would mitigate vehicle conflicts and safety concerns. These improvements would include acceleration and deceleration lanes and warning signs.

Short-term construction impacts as a result of the implementation of this alternative would be minor and adverse, as described for alternative 3A. Long-term impacts would be moderate and adverse as a result of increased traffic volumes, increased vehicle conflicts, and potential parking supply limitations in the preserve. These changes would be measurable and would influence transportation in the preserve, but in localized areas.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3B as well. When the long-term moderate adverse impacts of this alternative are combined with the beneficial impacts of other past, present, and reasonably foreseeable future activities listed in table 4-1, the result would be a minor adverse cumulative impact inside and outside the preserve.

Alternative 4A: Vista del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: moderate and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: moderate and adverse
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

Like alternative 3A, a full-service visitor center is the central feature of alternative 4A. The visitor center would be developed to the south of NM-4 below Rabbit Mountain. The existing visitor contact station located at the Valle Grande Staging Area would be relocated to the Banco Bonito Staging Area. The visitor center would accommodate substantially more visitors than the existing Valle Grande Staging Area visitor contact station. The visitor center would have a visitor parking area for approximately 100 vehicles.

A new entrance road from NM-4 would be created to access the visitor center. The new road would extend from an existing intersection with NM-4 currently used by visitors hiking the trail system south of NM-4 near Rabbit Mountain. NM-4 would be upgraded in this area to include acceleration and deceleration lanes and directional, regulatory, and warning road signs.

Like alternative 3A, this alternative would greatly increase visitation, with approximately 120,000 guests expected at the visitor center each year. Visitors would be directed to the new visitor center by signs along NM-4, resulting in most of the preserve's traffic using the new access road.

The new access road and large parking lot at the visitor center would adequately accommodate the traffic volumes and parking demand associated with alternative 4A. Although traffic volumes at the visitor center access road intersection with NM-4 would increase substantially, the improvements to the intersection and road signs would minimize vehicle conflicts and potential accidents by meeting design standards.

Like alternative 3A, short-term impacts would occur at the new intersection of the visitor center access road with NM-4 and at the existing NM-4/VC01 intersection. Delays along NM-4 would likely occur during construction, resulting in moderate adverse impacts, though impacts would be localized and of short duration.

Traffic volume along VC01 accessing the Valle Grande from NM-4 would be limited to shuttles. Traffic along the Banco Bonito access road from NM-4 would be limited to personal vehicles with permits. Turning movements at both of these preserve

access road intersections with NM-4 would be limited, resulting in few vehicle conflicts.

NM-4 would experience an increase in traffic volumes from vehicles destined for the preserve. Visitors from the west would be required to pass the preserve's main entrance to reach the visitor center, requiring visitors to backtrack along approximately 2 miles of NM-4 to access the visitor center and use the shuttle system. Additionally, visitors from the east may bypass the visitor center to access the entrance road, only to then backtrack to the visitor center to take a shuttle. Improved directional signs would guide visitors to the visitor center or preserve entrances, limiting visitor confusion and backtracking as much as possible.

Under alternative 4A, highway performance may degrade to LOS C during peak hours during the peak season.

Like alternative 3A, the increase in traffic destined for the preserve would result in adverse impacts on traffic flow along NM-4. During the peak season, highway performance may degrade to LOS C during peak hours. The highway would continue to operate at or near free-flow conditions during off-peak hours and traffic delays would be minimal. Because this measurable change may alter the function of this road, but would be limited in context, impacts on transportation outside the preserve would be moderate and adverse.

Programmatic Level

Programmatic-level actions proposed under alternative 4A would be essentially the same as in alternative 3A, providing increased access and recreational opportunities throughout the preserve. Access to the preserve would be primarily by use of a shuttle system and personal vehicles with permits.

As with alternative 3A, the preserve's road system would experience an increase in traffic volumes as access increases. However, traffic volumes would be limited by the permit system and shuttle system. Traffic volumes would increase measurably and the resulting impact to the preserve's transportation system would be moderate and adverse.

In addition to increased traffic volumes from visitor vehicles, the preserve's shuttle system would also contribute to increased traffic along NM-4 between the visitor center access road and the Valle Grande access road under alternative 4A.

As mentioned under "Implementation Level" for this alternative, NM-4 would be impacted by increased traffic volumes destined for the preserve. In addition to the increased traffic volumes from visitor vehicles, the preserve's shuttle system would also contribute to increased traffic along NM-4 between the visitor center access road and the Valle Grande access road. This increase in volume would be minimal but would result in increased traffic volumes along this 2-mile stretch of NM-4 and the potential for increased passenger vehicle / shuttle conflicts at the intersections. Improvements to the intersections that meet design standards would mitigate for vehicle conflicts and safety concerns.

Alternative 4A would result in short-term construction impacts as preserve roads and the NM-4 intersections are upgraded. Much of the construction would occur to the south of NM-4 on undeveloped land. Short-term impacts would be localized and staggered in time, resulting in minor adverse impacts on the transportation system. The implementation of alternative 4A at the programmatic level would result in measurable long-term impacts to the transportation system in the preserve. The

impacts would be moderate and adverse as traffic volumes would increase throughout the preserve.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 4A as well. When the long-term moderate adverse impacts of alternative 4A are combined with the beneficial impacts of other past, present, and reasonably foreseeable future activities listed in table 4-1, the result would be a minor adverse cumulative impact on the transportation system inside and outside the preserve.

Alternative 4B: Vista del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: moderate and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: moderate and adverse
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation-level impacts under alternative 4B would be similar to alternative 4A. Programmatic-level impacts would be similar to alternative 3B.

Alternative 4B would differ from alternative 4A in that visitors would primarily travel within the preserve using personal vehicles rather than shuttle buses, discussed under "Programmatic Level."

Implementation Level

Short-term and long-term implementation-level impacts under alternative 4B would be moderate and adverse, as in alternative 4A.

Programmatic Level

Impacts at the programmatic level would be the same as for alternative 3B: minor and adverse in the short term and moderate and adverse in the long term.

Cumulative Impacts

Cumulative impacts would be the same as alternative 3B: minor and adverse inside and outside the preserve.

Vegetation

Guiding Regulations and Policies

The following laws, regulations, and policies guide or constrain the management of vegetation on the preserve. Many of these regulations guide habitat management indirectly through the management of fish and wildlife resources.

The Valles Caldera Preservation Act of 2000 includes provisions that affect the management of vegetation. These specific provisions direct the preserve to

- protect and preserve the …fish, wildlife… values of the preserve, and provide for multiple use … (16 USC 698v-3[b])
- develop a management plan that will provide for multiple use and sustained yield of renewable resources within the preserve
- develop a comprehensive program for the management of lands, resources, and facilities within the preserve (16 USC 698v-6[d])

Although USDA and USFS directives and policies do not apply to the VCT, it is helpful to review and adopt applicable objectives and policies. USDA Departmental Regulation 9500-4 directs the USFS to recognize and enhance, where possible, habitats for fish and wildlife, both terrestrial and aquatic (USDA 1983):

- Habitats for plants, fish, and wildlife species must be managed to maintain "at least viable populations of such species."
- Habitat must be provided for the number and distribution of individuals to ensure the continued existence of a species throughout its geographic range.
- Land and water management activities must integrate fish and wildlife habitat needs with other resources and programs and will, where possible, mitigate habitat losses.

Although FSM direction does not apply to the VCT, it is helpful to review and adopt applicable objectives and policies. *FSM 2600—Wildlife, Fish, and Sensitive Plant Habitat Management* (USFS 1991) stipulates policies and procedures for management of wildlife and fish habitat and reiterates policy from USDA 9500-4. Specific objectives to support that policy include:

- Integrate habitat planning into… project plans.
- Provide a sound base of information to support management decision making affecting wildlife and fish, including endangered, threatened, and sensitive animal and plant species, and their habitats.
- Identify opportunities and management strategies to maintain and improve habitats (USFS 1991).

Executive Order 11987, "Exotic Organisms" (42 FR 26949), directs executive agencies (including the USDA) to restrict the introduction of exotic species into the natural ecosystems on their lands.

Authority for the management of noxious weeds in New Mexico is granted to the NMDA by the Noxious Weed Control Act of 1959. Further management direction is provided by Executive Order 00-22, dated June 8, 2000. The Noxious Weed Control Act directs the NMDA to develop a noxious weed list for the state, identify methods of control for designated species, and educate the public about noxious weeds. The NMDA coordinates weed management among local, state, and federal

land managers as well as private landowners (NMDA 2012). Vegetation along NM-4 is managed by the NMDOT's Integrated Vegetation Management Program.

Methodology for Analyzing Impacts

The analysis of impacts on vegetation at the implementation level included the quantification of vegetation loss and evaluation of other potential effects, such as loss of habitat integrity or vulnerability to invasion by nonnative species. Vegetation maps were overlaid with project plans to quantify the amount of vegetation loss compared to the overall amount of vegetation present. For the programmatic level, impacts were evaluated on a qualitative basis and considered the potential changes in the geographic extent and continuity of plant communities, changes to the integrity of plant communities, and the resilience of affected plant communities. This analysis also included an evaluation of the potential for proposed actions to affect forage allocation for grazing and to favor the establishment and/or expansion of exotic plant species.

Alternative 1: No Action

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: beneficial Long term: beneficial
Cumulative	Actions listed in table 4-1	Beneficial

Direct/Indirect Impacts

Implementation Level

Throughout the preserve, impacts to vegetation would be beneficial due to reduced human activity under alternative 1.

This alternative would result in the removal of the Valle Grande and Banco Bonito Staging Areas and the elimination of the interim recreation program. The deconstruction of the existing staging areas would have no measurable effects on vegetation, resulting in short-term negligible adverse impacts. The VCT would phase out current access through these staging areas, as well as interim programs and activities. The result would be a long-term beneficial impact on vegetation from reducing human activity levels in the preserve, which would reduce the potential sources of nonnative vegetation and invasive weeds, particularly from the concentration of horses and their food stores.

Programmatic Level

Short- and long-term beneficial impacts on vegetation would result from the elimination of the interim recreation program, because existing levels of human activity would decrease. Impacts on vegetation in the preserve would continue to be influenced by current grazing practices. No change to grazing allocations would occur.

Cumulative Impacts

Actions and activities that would affect vegetation include those listed in table 4-1 for vegetation. Past actions, including livestock grazing and timber harvest, have had substantial effects on the current vegetation patterns on the preserve. As many as 100,000 sheep were grazed on the Baca land grant during 1917 and 1918 (VCT 2007b). Sheep grazing transitioned to cattle grazing during the middle of the 20th century, with as many as 12,000 cattle on the preserve during the 1950s (VCT 2007b). Livestock grazing had substantial effects on the morphology and riparian vegetation structure of preserve's rivers and streams, particularly those in the valles. Logging was a considerable factor affecting vegetation on the preserve starting in 1935, when the New Mexico Land and Timber Company purchased timber rights to the Baca location from the Redondo Development Corporation. Between 1935 and 1962, approximately 25,600 acres of the preserve's forests were logged, mostly at lower elevations. Between 1962 and 1972, advancements in technology allowed large-scale clear-cut logging of high-elevation forests. More than 10,500 acres were harvested in less than a decade, and more than 1,000 miles of logging roads were constructed, many of them zig-zagging up the slopes of the forested domes (VCT 2007b). These destructive logging practices fragmented many forest habitat types, fundamentally altered the species composition of the plant associations, and encouraged the spread of nonnative and invasive species.

However, current management practices in the preserve are restoring many ecosystem characteristics, including forest cover and rangeland condition. The implementation of the preserve's *Wildland Fire Management Plan* (VCT 2010b) will include the use of prescribed fire and management of natural fire to improve forest densities, restore fire-adapted species and processes, and reduce the potential for wildland fire.

The *Jemez National Recreation Area Management Plan* (USFS n.d.a) will improve habitat conditions, as will implementation of the collaborative forest landscape restoration project in the southwest Jemez Mountains (including the preserve). Structural diversity of the preserve's forests will be increased and mature and old growth forest conditions will be promoted. Invasive/exotic plant populations will be greatly reduced and native riparian plant communities will be increased. The landscape will be more dominated by large fire-adapted tree species, resulting in a greatly reduced risk of high-severity wildfire (USFS n.d.a).

The Las Conchas fire that burned much of the Bandelier National Monument and part of the preserve in 2011 had an adverse impact on vegetation. About 30,000 acres, comprising one-third of the preserve, were burned (DeVault 2011). Of the area that burned within the preserve, 65 percent was forest habitat (consisting primarily of mixed conifer), 25 percent was grass, and 7 percent was riparian (Rodriguez, pers. comm. 2012b). Habitat suitability was reduced and in some cases potentially eliminated through hardening of the soil, as was the case at Bandelier National Monument. However, at both the preserve and Bandelier, vegetation is beginning to regrow, and the overall long-term result will be beneficial to vegetation.

Although past actions from grazing and logging were substantial, the restorative recent, current, and future actions are expected to counter those adverse effects, resulting in overall beneficial impacts. When the long-term beneficial impacts anticipated under the no-action alternative are combined with the beneficial impacts of past, present, and reasonably foreseeable future activities, cumulative impacts on vegetation would be beneficial.

Alternative 2: Banco Bonito Visitor Contact Station

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: minor and adverse
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

Construction of the visitor contact station and associated facilities for alternative 2 would affect approximately 3 acres of grassland and forested land, but would not likely affect rare plants.

Under alternative 2, the existing Banco Bonito Staging Area would be removed and new development would occur. The removal of the existing facilities could result in short-term adverse impacts on vegetation that may occur in the immediate area from deconstruction and construction activities. Most vegetation in the vicinity of the Banco Bonito Staging Area is already disturbed, particularly understory vegetation. The construction of the new visitor contact station, day-use facilities, roads, recreational facilities, and parking lots would result in permanent and temporary impacts on vegetation. Forested areas adjacent to NM-4 would be permanently affected by the construction of an acceleration and deceleration lane on each side of the road. Approximately 3.0 acres of grassland and forest habitat would be affected by the construction of the visitor contact station, parking lots, picnic area, and road improvements. The proposed visitor contact station and associated day-use facilities would not be located where rare plants typically occur in the preserve. As noted in chapter 3, most of the preserve's rare plants occur in wet environments, which do not occur at the Banco Bonito location.

The construction of new recreational facilities would increase visitation to this area, increasing the risk of spreading nonnative and invasive plant species, such as Canada thistle or musk thistle. These weeds could displace native vegetation and reduce habitat value for wildlife. These impacts would be mitigated by ongoing implementation of the preserve's noxious weed management actions. Overall, long-term impacts would be measurable and would influence the structure, composition, or function of the preserve's vegetation, but impacts would be limited in context. Therefore, alternative 2 would have minor short-term and moderate long-term adverse impacts at the implementation level due to the removal of the existing Banco Bonito Staging Area and an increase in human activity in the vicinity of the new visitor contact station.

Programmatic Level

Increased human activity under alternative 2 would increase the risk of spreading noxious weeds. Based on expected visitation levels, these impacts would be minor.

The presence of the visitor contact station and associated recreational facilities would increase visitation substantially over existing conditions. Visitors would recreate beyond the immediate location of the visitor contact station, increasing human activity and horse use in previously undisturbed or less disturbed vegetated areas in other areas of the preserve. However, new trail construction would be limited and would occur only when necessary. Development would be avoided where rare plants are located, such as montane grasslands or other wet or riparian environments. No roads currently exist in Alamo Canyon, where the rare bog birch plant association occurs; therefore, no road improvements and associated impacts would occur in that location. Although the existing road to the headquarters area would be improved, there would be no impacts on the old-growth forest in that area.

Improvements to the preserve's Level 3 and Level 4 roads and the development of additional parking lots throughout the preserve would also occur. Short-term construction impacts on vegetation would be localized, minor, and adverse; the changes in vegetation would not be measurable outside the construction areas or road prism.

This alternative would not affect forage allocation for grazing activities. There would be no measurable change in the geographic extent of the preserve's plant communities, their integrity, or their resilience. Long-term impacts (mostly related to disturbance) would be minor and adverse because, although substantial increases in human visitation would occur, most disturbances would continue to occur along existing trails and Level 1 roads, where vegetation is previously disturbed. In addition, the management of noxious weeds, which includes annual inventory and identification of new populations, would continue as appropriate to keep spreading under control. Measurable changes would not alter the structure, composition, or function of the preserve's vegetation, and would be limited in context.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 2 as well. When the long-term localized adverse impacts of alternative 2 are combined with the mostly beneficial impacts of present and reasonably foreseeable future activities, cumulative impacts on vegetation would be minor and adverse.

Alternative 3A: Entrada del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: minor and adverse
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

The visitor center constructed for alternative 3A would affect 5-10 acres of previously undisturbed habitat, including rare wet meadow habitat.

Under alternative 3A, the existing Valle Grande Staging Area would be removed and new development would occur in a new location closer to NM-4 and the periphery of the Valle Grande. This new construction would consist of a new full-service visitor center, day-use facilities, roads, recreational facilities, and parking lots. Vegetation impacts would result from the following construction elements:

- A new approach road approximately 1 mile long, starting at NM-4 and connecting to existing VC01, would consist of permeable fill and incorporate culverts to address seasonal drainage issues. The new road would require a slight realignment of NM-4 in the vicinity of the access road, including the addition of acceleration and deceleration lanes.
- A full-service visitor center up to 10,000 square feet would be built, with supporting administrative facilities of up to an additional 5,000 square feet. It is anticipated that more than 120,000 guests would visit this facility each year.
- Parking would be provided for up to 100 vehicles, with RV, bus, and overflow parking to support high-use days and special events.
- An ADA-compliant day-use area would be developed from the visitor center, including access to the East Fork of the Jemez River, overlooks, picnic areas, staging for groups and special events, and interpretive sites. From here, additional trails would provide access to the interior of the preserve.

Overall, these new facilities would be estimated to impact between 5 and 10 acres of previously undisturbed habitat composed of primarily lower and upper montane grassland, wet meadow, mixed-conifer forest, ponderosa pine forest, and blue spruce fringe forest. Most of the forest impacts would result from the construction of the new access road, which would skirt the edge of the Valle Grande before reaching the new visitor center. Alternative 3A would impact grassland habitat and wet meadow habitat, and would have potential adverse impacts on rock outcrops, which can be used as shelter and breeding habitat for a number of wildlife species. The construction of new trails along the East Fork of the Jemez River may have

moderate adverse impacts on riparian habitat. These impacts would be localized and thus limited in context. As noted in chapter 3, these vegetation types are typically considered rare. Given the location of the proposed facilities at the edge of the Valle Grande, the impacts would be measurable and would influence the structure, composition, or function of these vegetation types, but the impact would be limited in context. In addition, current fire and noxious weed management policies would continue. Overall, localized and adverse impacts on vegetation at the implementation level would be minor in the short term and moderate in long term within the areas of disturbance,

Programmatic Level

Increased human activity under alternative 3A would increase the risk of spreading noxious weeds. Based on expected visitation levels and the use of shuttle buses for visitors, these impacts would be minor.

The presence of the visitor center and associated recreational facilities would increase visitation substantially over existing conditions. Although hiking would continue to occur primarily on Level 1 roads, hiking trails would be expanded preserve-wide to provide short day loops and multi-day backpacking opportunities. Where trail users are limited to existing roads, impacts would be similar to alternative 2, but with substantially more use. Improvements to the preserve's Level 3 and Level 4 roads and the development of additional parking lots throughout the preserve would also occur, and a bicycle path would be created to parallel the loop road.

Short-term construction impacts on vegetation would be minor, localized, and adverse. Impacts would be related to road developed of localized facilities, such as campgrounds, upgrades, and parking lot development rather than new road development.

As described for alternative 2, no programmatic-level development would occur where rare plants are located, and no impacts on the old-growth forest at the headquarters area would occur. This alternative would not affect forage allocation for grazing activities. There would be no measurable change in the geographic extent of the preserve's plant communities, their integrity, or their resilience. Long-term impacts would result from disturbance but would be limited in context. Impacts would be minor and adverse due to the increase in shuttle buses using the Level 4 roads in considerably greater numbers, the increase in human presence and horse use on trails and roads, possible increased infestations of noxious weeds, and an increased number of ignition sources for wildfire. These potential impacts would be minimized by ongoing implementation of fire and noxious weed management actions. In general, despite the substantial increase in human activity, the change would be measurable and would not alter the structure, composition, or function of the preserve's vegetation but would be limited in context. Impacts on vegetation would be minor and adverse, depending on the extent to which new facilities such as hiking trails and parking lots are located in previously undisturbed native vegetation areas.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3A as well. When the long-term minor to

moderate adverse impacts anticipated under alternative 3A are combined with the mostly beneficial impacts of present and reasonably foreseeable future activities, cumulative impacts would be minor and adverse.

Alternative 3B: Entrada del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: minor and adverse
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

Under alternative 3B, visitors would be able to access the preserve in their own vehicles, which could increase the spread of noxious weeds compared to shuttle use.

Alternative 3B would differ from alternative 3A in that visitors would access the preserve using personal vehicles rather than shuttle buses. The transportation system would include the development of a Level 4, two-lane paved or gravel road that would create a loop through the preserve, as shown in chapter 2. Although the parking area at the visitor center would be smaller than that under alternative 3A, larger parking areas would be developed at recreation areas throughout the preserve to accommodate personal vehicles at those locations. These differences would result in some measurable change to vegetation compared to alternative 3A due to increased development that would be expected in the future. Minor adverse short-term and moderate long-term impacts would be anticipated for the reasons described for alternative 3A.

Programmatic Level

Under alternative 3B, the use of personal vehicles rather than shuttle buses would increase the number of potential ignition sources for wildfire, which can produce considerable changes in vegetation patterns (vehicle fires can result from mechanical or electrical failures or malfunctions). Also, a greater number of personal vehicles would increase the likelihood of noxious weeds entering the preserve. These potential impacts would be minimized by ongoing implementation of fire and noxious weed management actions. Changes would be measurable but would not alter the structure, composition, or function of the preserve's vegetation. Thus, impacts would be minor and adverse in the short term and long term.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3B as well. When the long-term minor to moderate adverse impacts expected under alternative 3B are combined with the overall beneficial impacts of other present and reasonably foreseeable future activities, cumulative impacts would be minor and adverse.

Alternative 4A: Vista del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: minor and adverse
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

The location of the alternative 4A visitor center would result in the disturbance of 5-10 acres of grassland and forested land. Most of the disturbed areas would be near NM-4 and are already affected by human use.

This alternative is similar to alternative 3A but would locate the full-service visitor center south of NM-4 below Rabbit Mountain. Where alternative 3A focuses on day-use experience involving access to the East Fork of the Jemez River and hiking at South Mountain, alternative 4A would develop a day-use area focused on views of the Valle Grande, interpretation of geology, and proximity to the adjacent day-use area at Bandelier National Monument, which consists of a cross-country ski trail and hiking trail leading from the preserve boundary. An underpass would be developed to provide access below NM-4 for wildlife viewing and hiking. Interpretive trails and picnic areas would be developed south of NM-4, also emphasizing views of the Valle Grande. Like under alternatives 2 and 3A, NM-4 would be modified to include acceleration and deceleration lanes. The VCT would work with NMDOT on these changes during design and implementation. Also like alternative 3A, this alternative proposes a shuttle system that would serve as the primary mode of access into the preserve.

Several slope wetlands, which are relatively rare in the southern Rocky Mountains, could be affected by trail or utility construction under alternative 4A.

Vegetation impacts from this alternative would be similar to those under alternative 3A, with a similar-sized visitor center, parking, day-use area, and trails. However, the access road from NM-4 would be substantially shorter, and the construction of the facility would require cutting into a slope. The type of vegetation impacted by this alternative would be limited primarily to grassland and forests, and some trees would be removed at the proposed location of the visitor center. This location does not include montane grasslands. However, several slope wetlands, which are relatively rare in the southern Rocky Mountains, are located near the treeline and could be affected by trail or utility construction. Trail and utility line construction would be avoided near treeline and slope wetlands to the extent possible. Mitigation measures would be adopted to minimize the potential for downslope erosion near NM-4 that could occur from underpass and highway lane modifications.

Most of the affected vegetation would be located relatively close to NM-4 and therefore would have experienced prior disturbance. Proposed facilities farther from the visitor center, such as utilities or trails, would have a higher likelihood of impacting undisturbed vegetation.

Impacts on vegetation as a result of the implementation-level actions would be minor and adverse in the short term and moderate in the long term for reasons described for alternative 3A, as well as the proximity to NM-4 and minimal effects on forest and stream habitat.

Programmatic Level

Programmatic-level impacts on vegetation would be similar to those described under alternative 3A, with substantial increases in human activity in other areas of the preserve and further permanent impacts from parking lots, shuttle bus stops, and other ancillary actions. Short-term impacts would be localized, minor and adverse; long-term impacts would be minor and adverse for the reasons described for alternative 3A, depending on the actual level of visitor use and the specific location of additional facilities.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 4A as well. In addition, the wildfires that occurred in 2011 burned the area of the preserve where this alternative is proposed. However, the fire did not affect the suitability for development at this location. Vegetation is starting to regrow, and long-term impacts on vegetation will be beneficial. When the long-term minor to moderate adverse impacts expected under alternative 4A are combined with the overall beneficial impacts of other present and reasonably foreseeable future activities, cumulative impacts would be minor and adverse.

Alternative 4B: Vista del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: minor and adverse
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

Implementation-level impacts under alternative 4B would be similar to alternative 4A. Programmatic-level impacts would be similar to alternative 3B.

Alternative 4B would differ from alternative 4A in that visitors would access the preserve using personal vehicles rather than shuttle buses. Therefore, implementation-level impacts would be minor and adverse in the short term and moderate and adverse in the long term.

Programmatic Level

Very little measurable change would occur at the programmatic level under alternative 4B compared to alternative 3B. Therefore, impacts would be similar: minor and adverse in the short and long term.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 4B as well. When the long-term minor to moderate adverse impacts expected under alternative 4B are combined with the overall beneficial impacts of other present and reasonably foreseeable future activities, cumulative impacts would be minor and adverse.

Fish and Wildlife

Guiding Regulations and Policies

The following laws, regulations, and policies guide or constrain the management of fish and wildlife on the preserve.

The Valles Caldera Preservation Act of 2000 includes provisions that affect the management of vegetation. These specific provisions direct the preserve to

- protect and preserve the [fish and wildlife] values of the preserve, and provide for multiple use (16 USC 698v-3[b])
- develop a management plan that will provide for multiple use and sustained yield of renewable resources within the preserve
- develop a comprehensive program for the management of lands, resources, and facilities within the preserve (16 USC 698v-6[d])

While policies that guide or constrain actions of the USFS do not apply to the VCT or the management of the preserve, such direction has been considered where applicable. USDA Departmental Regulation 9500-4 directs the USFS to recognize and enhance, where possible, the values of fish and wildlife, both terrestrial and aquatic. The regulation also "recognizes the rights of individual states to manage fish and wildlife populations under their jurisdictions" (USDA 1983). Fish and wildlife in New Mexico are regulated under chapters 30–36, title 19, of the New Mexico Administrative Code, including regulations for hunting, fishing, trapping, and management of wildlife habitat and lands.

FSM 2600—Wildlife, Fish, and Sensitive Plant Habitat Management (USFS 1991) stipulates policies and procedures for the management of wildlife and fish habitat, and reiterates policy from USDA 9500-4. The manual includes an objective to "Provide a sound base of information to support management decision making affecting wildlife and fish" (USFS 1991).

Methodology for Analyzing Impacts

Potential impacts on fish and wildlife were analyzed based primarily on two factors: documented presence of species and presence of suitable habitat. If a particular species is not documented to exist in the study area, but suitable habitat is present and potentially affected by one of the alternatives, then it was assumed that the species would be potentially affected.

The area of impact includes locations of proposed development and the extent of potential influence of project activities. The farthest extent of impacts to wildlife would be from construction noise, vehicle noise during operations, and recreational activities. The impact to wildlife was analyzed on the basis of existing conditions, documented wildlife use, and presence of suitable habitat.

Disturbance may have both immediate and long-term effects on wildlife. The immediate response of many animals to disturbance is a change in behavior, such as cessation of foraging, feeding, or altering reproductive behavior. Over time, energetic losses from flight, decreased foraging time, or increased stress levels come at the cost of energy needed for individuals' survival, growth, and reproduction. Noise, like outdoor recreation, has the potential to disturb wildlife, resulting in energetic costs, impacts to animals' behavior and fitness, and avoidance of otherwise suitable habitat (Taylor and Knight 2003).

Cole (1993) states that recreational impact occurs when there is interaction between recreational users and an environment that is vulnerable to disturbance. The spatial and temporal effects of noise and recreation, including the amount of recreational use, type of recreational activity, and behavior of recreationists, were assessed and compared to the spatial and temporal needs of wildlife to determine the level of impact.

Alternative 1: No Action

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: beneficial Long term: beneficial
Cumulative	Actions listed in table 4-1	Beneficial

Direct/Indirect Impacts

Implementation Level

Throughout the preserve, impacts to fish and wildlife would be beneficial due to reduced human activity under alternative 1.

This alternative would result in the removal of the Valle Grande and Banco Bonito Staging Areas and the elimination of the interim recreation program. The VCT would phase out current access through these staging areas, as well as interim programs and activities. Negligible adverse short-term impacts may result from deconstruction activities associated with removing existing temporary facilities. The removal of the Valle Grande Staging Area would also reduce disturbance and pollutants resulting from the concentration of people and vehicles. The long-term result would be a beneficial impact on fish and wildlife by reducing human activity levels in the preserve, which would reduce disturbance to all wildlife species.

Programmatic Level

Short- and long-term beneficial impacts on fish and wildlife would result from the elimination of the interim recreation program, because existing levels of human activity would decrease. Current grazing and other approved land management activities would continue on the preserve, with no measurable changes to wildlife compared to existing conditions.

Cumulative Impacts

Actions and activities that would affect fish and wildlife include those listed in table 4-1 for fish and wildlife. Past actions have had considerable effects on the presence of individual species of fish and wildlife in the preserve, including the extirpation of the Rio Grande cutthroat trout through the introduction of nonnative stocked trout, the extirpation of the gray wolf by overhunting, the extirpation of black-tailed prairie dogs due to poison control, and the extensive use of the preserve for livestock grazing, which created widespread ecological changes for many wildlife species. Also, logging of the high-elevation forests on the preserve have changed available habitat for species such as Mexican spotted owl, northern goshawk, southern red-backed vole, and American marten. However, since the cessation of logging, forest cover has returned to the preserve's mountains, and the implementation of the Multiple Use and Sustained Yield of Forage Resources program allocates forage to the needs of wildlife, plant regrowth and ecosystem services before providing an allocation to livestock or other use. The preserve still provides extensive protected habitat for a wide variety of fish and wildlife species.

The Las Conchas fire that burned much of the Bandelier National Monument and one-third of the preserve in 2011 had an adverse impact on individual wildlife through direct mortality. As a result of the Las Conchas fire, overland flows moved debris into stream channels throughout the preserve. Fish populations declined in the upper reaches of the East Fork of the Jemez River, and almost all fish in the headwaters of San Antonio Creek were killed (DeVault 2011). Habitat suitability for terrestrial wildlife was reduced and in some cases potentially eliminated through hardening of the soil, as was the case at Bandelier. Habitat loss at Bandelier may influence some terrestrial species to migrate to the preserve. This may be particularly true for black bears, which the national monument believes will take

some time to return to Bandelier. However, at both the preserve and Bandelier, vegetation is beginning to regrow, with beneficial impacts on specific species such as coyote and deer. As burned areas recover, impacts on wildlife will become more beneficial. This benefit would be enhanced by the reduction in human presence under the no- action alternative.

The current update of the *Santa Fe National Forest Land and Resource Management Plan* (USFS 1987) to include the *Jemez National Recreation Area Management Plan* (USFS n.d.a) will improve habitat conditions for fish and wildlife, as will the implementation of the Collaborative Forest Landscape Restoration project (USFS and VCT 2010) in the southwest Jemez Mountains (including the preserve). Treatments are designed to improve terrestrial wildlife habitat for a wide variety of native species. Many of the recommendations target improvements to riparian and aquatic ecosystems. These restorative actions will beneficially affect the preserve's fish and wildlife populations. Specifically, tens of thousands of acres of habitat will be improved for the northern goshawk and peregrine falcon. Improvements to riparian habitat will also benefit beavers, as well as many birds and small mammals. Removing conifers and restoring historic meadows and grasslands, and increasing forest openings filled with herbaceous vegetation would greatly improve foraging habitat for deer, elk, bear, small mammals, and many bird species (USFS 2010d).

The USFS has eliminated several miles of unneeded roads on nearby lands, and plans to close and decommission more in the future. In addition, the VCT also plans to close or decommission approximately 1,000 miles of roads in the preserve over the next 10 years. These actions would support future transportation planning, reduce vehicular use, and improve habitat connectivity, beneficially impacting wildlife, especially elk. Daily movements and size of home ranges of elk may decrease when open road density decreases, which could lead to energetic benefits that translate into increased fat reserves or productivity and reduced stress levels. Road closure may also decrease illegal poaching levels (Rowland 2005).

The extirpation of some individual species from the preserve and past logging activities within the preserve have resulted in adverse impacts. One extirpated species, elk, have been re-established and the population has stabilized. In 1947 the NMDGF released 47 head of elk imported from the Yellowstone, Wyoming, area into the Río de las Vacas valley west of the Baca Location (Allen 1997, as cited in Martin 2003). Although the Jemez Mountains grasslands provided favorable habitat, the introduced elk herd increased at a slow rate, with the population reaching only an estimated 200 animals in 1961. The NMDGF introduced another 58 elk from Jackson Hole, Wyoming, between 1964 and 1965. The populations continued their slow increase in the Valles Caldera over the next decade (Allen 1997, as cited in Martin 2003). Dramatic ecological change that had both an immediate and great impact on local elk demography occurred in 1977. In June of that year, the 25,000-acre [10,000-ha] La Mesa fire burned in the ponderosa pine forests on the Pajarito Plateau at Bandelier National Monument. The fire converted the forest into grassland and opened considerable winter habitat for the Jemez elk population. With favorable climatic conditions, the elk herd expanded to about 7,000 in 1989. In 2001 it was estimated that between 4,000 and 6,000 elk used the Baca Ranch for

summer range (Allen 1997, as cited in Martin 2003). The preserve's elk population is now far greater than has previously been the case in the long-term natural history of the caldera (VCT 2005i) — a beneficial result.

Reasonably foreseeable future actions are beneficial overall, and would affect a wide variety of fish and wildlife species exist at the preserve. When the long-term beneficial impacts anticipated under the no-action alternative are combined with the adverse and beneficial impacts of past, present, and reasonably foreseeable future activities, cumulative impacts would be beneficial because the current and future long-term beneficial impacts are expected to outweigh or reasonably overcome the past adverse effects through regional and local restoration activities.

Alternative 2: Banco Bonito Visitor Contact Station

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: moderate with localized major and adverse Long term: minor and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: minor to moderate and adverse
Cumulative	Actions listed in table 4-1	Minor to moderate and adverse

Direct/Indirect Impacts

Implementation Level

Noise generated during construction may not directly harm individual animals, but could affect feeding and breeding behaviors.

Under alternative 2, the existing Banco Bonito Staging Area would be removed and new development would occur, as described in chapter 2. As described in the "Vegetation" section, the new construction would affect mostly lower and upper montane grassland and some surrounding ponderosa pine forest. Forested areas adjacent to NM-4 would be permanently affected by the construction of an acceleration and deceleration lane on each side of the road. Approximately 3.0 acres of grassland and forest habitat would be affected by construction of the visitor contact station, parking lots, picnic area, and road improvements. The loss of this habitat would displace a variety of wildlife, including rodents, reptiles, game birds, songbirds, small and large carnivores, and foraging raptors. The type of forest impacted (mid-age closed ponderosa pine forest) is abundant in the area. Large predators such as black bears, coyotes, and mountain lions would only be expected to be present in this area on a transient basis. Elk now concentrate on the grassland valles in the east and north sections of the preserve, so the proposed visitor contact station is not expected to substantially affect elk calving or foraging. Fish habitat would not be affected by this alternative because none exists at this location.

Noise generated during deconstruction and construction from heavy equipment, such as bulldozers, dump trucks, and excavators, would affect wildlife. The equipment would not generally be operated continuously or simultaneously, resulting in variable noise levels. Noise generated during construction may not

directly harm individual animals, but could affect feeding and breeding behaviors, which could have adverse indirect impacts on long-term population levels. The result would measurably alter the structure, composition, or function of wildlife species during construction, but within a localized area.

Some wildlife may have become habituated to human presence at the alternative 2 site, although noise from increased visitation would reduce the likelihood that wildlife would use this area.

Alternative 2 would have moderate with localized major adverse short-term impacts which would temporarily displace wildlife most affected by construction noise. Some of these species may return, particularly those least affected by human presence.

Only 15 percent of all motorized access onto the preserve comes through the Banco Bonito Staging Area. Motorized access onto the preserve beyond the Banco Bonito Staging Area is currently limited to administration, and some hunting and weekend hiking shuttles. The construction of new recreational facilities would increase visitation to this area, increasing the level of noise from pedestrian and vehicle sources as well as increasing the amount of regular, routine maintenance activity in and around the visitor contact station. These indirect impacts would reduce the likelihood that wildlife would use this immediate area on a transient basis in the future.

Conversely, humans can provide refuge from some prey species that may habituate to areas of human use to avoid predators. However, the displacement of predator species by humans can potentially have indirect effects on interacting prey species (Muhly et al. 2011). Some wildlife, such as bears, may be attracted to human presence and new sources of food. Visitors may also be tempted to feed wildlife, which can result in human/animal conflicts and alter animal behavior. In many recreational areas, animals like black bears, raccoons, squirrels, chipmunks, mice, crows, and jays actively forage for garbage and food items in areas such as picnic areas. The degree of this activity depends on location and the types of animals in the area. Bears in particular can become habituated to people and also conditioned to human foods.[9] Mitigation to offset these potential problems would include preventing wildlife from consuming artificial food sources, implementing regulatory actions, providing information and education to visitors, controlling any problem animals, and conducting research and monitoring (MADGF n.d.).

Alternative 2 would have adverse long-term impacts due to an increase in human activity in the vicinity of the new visitor contact station. This site is already used as a staging area and some wildlife may have become habituated to human presence. The location is not an elk calving or grazing area. Mitigation would help address adverse impacts of habituation. Changes at the implementation level would be measurable but would not alter the structure, composition, or function of the preserve's wildlife and would be limited to the visitor contact station location. For these reasons, impacts are expected to be minor.

[9] "Habituation" implies tolerance of the close proximity of people once the animal perceives no consequence as a result. "Food conditioning" occurs when the animal then makes an association between humans and food.

Programmatic Level

At the programmatic level, most impacts would result from disturbance rather than direct impacts to wildlife.

The presence of the visitor contact station and associated recreational facilities would increase visitation over existing conditions. Visitors would recreate beyond the immediate location of the visitor contact station, increasing human activity in habitats where such activity is currently limited and increasing human presence in areas potentially used by fish and wildlife species. Although some day-use amenities would be provided under this alternative, the visitor contact station would not likely function as a primary destination for the majority of visitors. Most visitors are expected to drive beyond the visitor contact station to access the preserve's interior.

Off-road motorized access is currently restricted on the preserve. Routes from this visitor center location would be limited to high clearance vehicles until future transporation planning and associated improvements to roads were made.The presence of roads has been shown to have pervasive effects on elk, including reduced habitat use. However, elk have also been shown to adapt to human disturbance along roads that experience normal and heavy use. Although elk have also been shown to tolerate people watching them from parking areas and roads, unpredictable or intrusive human behavior could lead to displacement or collisions with vehicles. Elk primarily graze in the central parts of the Valle Grande, where they would be a sufficient distance from roads. Elk also graze and calve along VC01 and VC02 roads around the valles, where they could be affected by increased traffic.

Improvements to the preserve's Level 3 and Level 4 roads and development of additional small parking lots throughout the preserve would also occur. Short-term construction impacts on fish and wildlife habitat would be minor and adverse. There would be long-term increases in human activity and numbers of vehicles along these existing corridors, which can create barriers to wildlife movement across habitats, with decreased animal abundance near roads and adverse effects to landscape connectivity. Most impacts would result from noise or recreational disturbance rather than direct impacts to wildlife as improvements would be designed to minimize new impacts on wildlife habitat. Road improvements would improve access for hunters and anglers, potentially increasing harvesting pressure on fish and wildlife resources. However, these activities would continue to be managed on a permit fee basis, which allows the preserve to manage the removal pressure. Also, the paving of any roads would lead to potential roadside effects from an increased runoff rate, additional associated roadside scour, and sedimentation in adjacent aquatic habitats, which could lead to further degradation of fish habitat and habitat for amphibians such as the northern leopard frog. However, a hard road surface may allow for more precise runoff control.

Long-term increases in visitation would increase traffic volumes on preserve roads and on NM-4. Increases in traffic would increase the risk of animal/vehicle collisions, which can harm humans and wildlife. There is no current data on roadkill in the preserve, but anecdotal observations indicate that individuals from multiple species, including elk, Abert's squirrels (*Sciurus aberti*), chipmunks, raccoons, and various reptiles, occasionally die from vehicle strikes (Parmenter, pers. comm. 2011).

NMDGF staff members have stated that about four elk are hit by motor vehicles annually on the stretch of NM-4 within preserve boundaries (Trujillo, pers. comm. 2011a). The expected increases in daily and seasonal vehicle trips to the new visitor contact station and along various internal preserve roads would likely lead to increased mortality rates for various wildlife species.

Increased visitation would increase noise levels along the preserve's roads and at recreational facilities throughout the preserve such as campgrounds, picnic areas, and trailheads. Wildlife can be adversely affected by sounds that intrude on their habitats and would therefore avoid these places, slightly reducing the amount of available habitat. The development of campgrounds and picnic areas would have potential adverse impacts on wildlife, and increase the chance of negative wildlife/human interactions, which can lead to the need for lethal and nonlethal animal control actions. Deliberate and inadvertent feeding of wildlife by humans may lead to conflicts and property damage, as well as alterations in animal behavior, foraging habits, reproductive rate, physical size, distribution, and numbers (MADGF n.d.). As mentioned above, mitigation measures to prevent habituation could be employed to reduce the level of impact and the need for lethal control. By concentrating use in specific areas, animals could habituate to predictable level of human activity, reducing the adverse effects of flight response. Other animals may respond to frequent and predictable encounters by avoiding them.

Hikers, mountain bikers, and equestrians would recreate on existing trails and primitive roads within the preserve. The majority of the preserve's equestrian and mountain biking trails are located in forested areas near Banco Bonito, which does not contain the open habitats of the valles that elk use for grazing. Therefore, minor impacts to elk recreating on the mountain bike and horseback trails near Banco Bonito are expected. Changes to elk behavior would be measurable but would not alter the structure, composition, or function of the preserve's herd and would be limited in context.

Visitors' attempts to get close to animals may have detrimental effects on elk. An increase in visitation throughout the preserve may cause indirect effects on daily and seasonal habitat use patterns by individuals of these species. Existing wildlife movement and migration patterns could be affected. Most disturbances would continue to occur along existing trails on Level 1 roads, albeit at an increased level.

Elk generally have greater perceptions of risk when disturbed in open habitats, such as the preserve's valles. No development or recreational facilities are being proposed in the Valle Grande or Valle Jaramillo, a key calving and nursing area. The VCT would route recreation facilities and activities away from calving, foraging, and quality habitat areas. Blinds or visibility shields could be incorporated to reduce human intrusions on elk activity while facilitating visitor viewing. Signs would be used to inform users of the importance of keeping a distance from elk calving areas.

During winter, snowshoers and cross-country skiers would recreate off designated trails in the Valle Grande, where elk are more likely to concentrate during seasons with heavy snow. Because humans on foot can be perceived as most threatening to elk, such winter activities would have adverse impacts on elk. The VCT would route

winter-use facilities, trails, and/or roads away from key ungulate wintering areas. The VCT would use signs to inform users of the importance of ungulate winter range and to keep a specific distance from elk and deer.

Elk would continue to experience adverse impacts during hunting, including direct mortality and increased flight response. As noted in chapter 3, hunting designed to control regional elk populations would have less of an impact than focused hunting. Studies vary on whether hunted elk populations will habituate to or avoid humans during non-hunting seasons. If the latter, increased recreational activity in the preserve may result in a sustained level of movement by elk throughout the year. However, these activities would continue to be managed on a permit fee basis, which allows the preserve to manage the removal pressure.

Rumble, Benkobi, and Gamo note that "estimating elk response to disturbance such as recreation may be difficult because timing may constrain occurrence of human activity to weekends or hunting seasons." According to Richens and Lavigne (1978, cited in Stankovich 2008), "it is not uncommon for species to show short-term effects on flight behavior but suffer no long term ill effects." However, adverse impacts would occur to some extent with increased visitor use. To avoid and minimized these impacts, the VCT would implement these additional mitigation measures:

- Evaluate and monitor wildlife impacts and apply adaptive management to address both recreation and wildlife concerns as needed (e.g., spatially and temporally separate humans and wildlife from key areas at critical times by closing roads or trails, changing access points, and/ or implementing a zoning strategy in which recreational uses are allowed in carefully selected areas).
- Implement programs to educate visitors about the effects of their activities on wildlife, with a goal of influencing the behavior of recreationists and reducing the potential negative effects on wildlife. Integrate ecological research and monitoring into education programs, and stress that management may be necessary to protect species. Educational and interpretation programs would (1) make people aware of the link between in appropriate behavior and specific ecological problems, (2) clearly demonstrate appropriate ways for visitors to behave so that problems can be avoided, and (3) encourage a sense of commitment in people to do something about these problems (Cole 1993). Educational programs would also be designed to address behavior of visitors in proximity to habituated animals, such as feeding wildlife.
- Further refine and identify key critical life history locations for wildlife and analyze potential flight impacts to avoid and minimize flight response from noise and various recreation activities.

In the short term, minor adverse impacts on fish and wildlife would be expected at the programmatic level due to construction activities within the preserve's interior at specific locations. Long-term impacts (mostly related to disturbance) would be minor to moderate and adverse because increases in human visitation could cause

measurable changes in habitat use patterns, particularly in sensitive areas such as elk calving areas and riparian zones. Disturbance would be most severe during the summer when visitation is highest and animals such as elk use the preserve as critical summer range. Impact levels would be lower during the winter and spring when visitation is lowest. The degree of disturbance would be based on results of mitigation, which would be adaptively managed to minimize impacts.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 2 as well. When the potential long-term minor to moderate adverse impacts of alternative 2 on fish and wildlife species are combined with the adverse and beneficial impacts of past, present, and reasonably foreseeable future activities, cumulative impacts would be minor to moderate and adverse.

Alternative 3A: Entrada del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: moderate with localized major and adverse Long term: minor to moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: minor to moderate and adverse Long term: minor to moderate and adverse
Cumulative	Actions listed in table 4-1	Minor to moderate and adverse

Direct/Indirect Impacts

Implementation Level

A variety of wildlife species could use some portion of the alternative 3A implementation areas as breeding habitat, foraging habitat, or cover. Elk that may use the area for summer foraging and calving habitat may be disturbed.

Under alternative 3A, the existing Valle Grande Staging Area would be removed and new development would occur in a new location closer to NM-4 and the periphery of Valle Grande. This new construction would consist of a new full-service visitor center, day-use facilities, roads, recreational facilities, and parking lots, all located just west of the existing main gate on NM-4. Habitat impacts would result from the following construction elements:

- A new approach road approximately 1 mile long would be added, starting at NM-4 and connecting to the existing VC01. This road would consist of permeable fill and would incorporate culverts to address seasonal drainage issues. The new road would require a slight realignment of NM-4 in the vicinity of the access road, including the addition of acceleration and deceleration lanes.
- A full-service visitor center up to 10,000 square feet would be built, with supporting administrative facilities of up to an additional 5,000 square feet. It

is anticipated that more than 120,000 guests would visit this facility each year.

- Parking would be provided for up to 100 vehicles, with RV, bus, and overflow parking to support high-use days and special events.
- From the visitor center, an ADA-compliant day-use area would be developed, including access to the East Fork of the Jemez River, overlooks, picnic areas, staging for groups and special events, and interpretive sites. From here, additional trails would provide access to the interior of the preserve.

These new facilities would be estimated to impact between 5 and 10 acres of previously undisturbed habitat composed primarily of lower and upper montane grassland, wet meadow, mixed-conifer forest, ponderosa pine forest, and blue spruce fringe forest. Some trees would likely be removed, although the number and size cannot be determined at this time. Most of the forest impacts would result from the construction of the new access road, which would skirt the edge of the Valle Grande before reaching the new visitor center. A variety of wildlife species could use some portion of the implementation areas as breeding habitat, foraging habitat, or cover during daily movements. These include rodents, reptiles, game birds, songbirds, small and large carnivores, and foraging raptors. Impacts would occur on grassland habitat and wet meadow habitat, as well as potentially on rock outcrops. Rock outcrops can be used as shelter and breeding habitat for a number of wildlife species, such as gray fox and coyote. Elk that are known use the southern edge of the Valle Grande for summer foraging and calving habitat may be disturbed or displaced. Approximately 80 percent of the preserve's visitation occurs from May through October, overlapping with the mid-May through June elk calving season. Under this alternative, the new access road proposed from NM-4 would divert visitor and shuttle bus traffic from VC01, along which elk graze and calve. Visitors would no longer drive along VC01 to reach the Valle Grande Staging Area, resulting in a beneficial effect. Mitigation measures identified under alternative 2 would also be applied to minimize the level of impact, particularly to calving. The construction of new trails along the East Fork of the Jemez River may have minor impacts on riparian habitat.

As described for alternative 2, some wildlife species may become attracted to the visitor center and its associated recreational facilities, such as picnic sites. Visitors may also be tempted to feed wildlife, and animals can become habituated to people and conditioned to human foods. To address this potential issue, the VCT would implement the mitigation measures described for alternative 2.

Noise impacts would occur as described for alternative 2, but to a greater extent due to the substantially increased visitation, larger parking facilities, and new access road. Wildlife would not likely use this immediate area on a transient basis in the future.

Overall, moderate with localized major adverse effects would occur in the short term, with some wildlife permanently displaced as described for alternative 2.

Visitation and human presence is expected to increase substantially in the long term, affecting all habitats to some degree. The location of the entrance and visitor center in the Valle Grande is expected to attract an extensive amount of visitors compared to existing conditions. Minor to moderate adverse impacts are expected in the long term as wildlife habituate to the new facilities and adjust their daily and seasonal use patterns.

Programmatic Level

The presence of the visitor center and associated recreational facilities would increase visitation over existing conditions. Although hiking would continue to be primarily on Level 1 roads, hiking trails would be expanded preserve-wide to provide short day loops and multi-day backpacking opportunities. Where trail users are limited to existing roads, impacts would be similar to alternative 2, but with substantially more use. Improvements to the preserve's Level 3 and Level 4 roads and development of additional parking lots throughout the preserve would also occur, and a bicycle path would be created to parallel the loop road. Short-term construction impacts on fish and wildlife species would be minor to moderate and adverse because these actions would be related to campground and trailhead development and road upgrades, rather than new road development. Long-term impacts due to disturbance would be minor to moderate and adverse due to the increase in number and frequency of shuttle buses using the Level 4 roads. There would also be an increase in human presence on trails and roads, and possible increased roadside scour and sedimentation impacts from an increase in impervious surface along paved roads, which could affect fish habitat. However, like alternative 2, a hard road surface may allow for more precise runoff control.

Similar to alternative 2, increased visitation would likely increase fishing and hunting pressure in the long term, as well as potentially increasing wildlife mortality from vehicle collisions, but to a greater degree.

As described for alternative 2, recreational activities in campgrounds can promote habituation and a conditioned response to human foods. Feeding of wildlife by humans may result in adverse effects on both humans and animals (MADGF n.d.). As mentioned above, mitigation measures to prevent habituation could be employed to reduce the level of impact.

Noise disturbance would occur as described for alternative 2, but with substantially more visitors using recreational facilities in the preserve. The use of a shuttle system would offset disturbance in the preserve's interior that would be expected with a considerable increase in visitation.

Management actions that disperse animals from roadsides and other visitor use areas and that close roads and trails to protect animals reduce chances of visitors seeing animals. Wright (1998) notes that "innovative techniques are needed to allow visitors the opportunity to view wildlife without causing disruptions." Ongoing research has demonstrated that a public transportation system, such as shuttle bus use within some national parks, lessens impacts to wildlife along road corridors and greatly increases wildlife viewing opportunities (Wright 1998). Although visitation

would increase substantially under this alternative, the use of shuttle buses would help contain and manage recreational impacts to wildlife. While some visitors would expect to use the shuttle to access specific destinations to pursue recreational activities, others would be satisfied to simply tour the Level 4 loop road and remain on the shuttle. Wildlife, especially elk and mule deer, may habituate to predicable shuttle schedule and route, along with predictable visitor behavior along roads, decreasing the likelihood of flight and lessening associated impacts. Canfield et al. (1999) note that the most detrimental disturbances to wintering ungulates are those that are unanticipated.

Impacts to elk from recreational disturbance and increased road use would occur as described under alternative 2. These impacts would be greater given the substantially higher levels of visitation expected, yet would be mitigated to a certain degree by the use of a shuttle system, which would consolidate visitors from multiple vehicles into one. The VCT would implement the same mitigation measures described for alternative 2. In addition, shuttle buses would avoid some elk calving areas along VC01, using the new access road to reach the visitor center and circumventing a section of VC01 to transport visitors farther into the preserve. Shuttle drivers would be educated about the sensitivity of the grazing and calving areas along VC01 and VC02 as they follow the proposed loop route through the preserve.

If facilities are located in riparian or wetland habitats, impacts would be more likely to affect fish and aquatic wildlife.

As noted under alternative 2, it is difficult to precisely predict how wildlife, particularly elk, would be affected by increased recreational activity and road use. In general, the substantial increase in human activity would create minor to moderate adverse disturbance impacts on fish and wildlife species in the long term at the programmatic level. Similarly, wildlife impacts would be minor to moderate and adverse depending on the specific locations and sizes of ancillary facilities (parking lots, additional staging area / visitor contact areas, etc.). If these facilities are located in riparian or wetland habitats, impacts would be more likely to affect fish and aquatic wildlife, as well as species such as frogs, which inhabit wet areas.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3A as well. When the long-term minor to moderate adverse impacts anticipated under alternative 3A are combined with the adverse and beneficial impacts of past, present, and reasonably foreseeable future activities, cumulative impacts would be minor to moderate and adverse, primarily because of impacts in previously undisturbed areas and substantial increases in human activity.

Alternative 3B: Entrada del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: moderate to localized major and adverse Long term: minor to moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: minor to moderate and adverse Long term: moderate and adverse
Cumulative	Actions listed in table 4-1	Moderate and adverse

Direct/Indirect Impacts

Implementation Level

Alternative 3B would differ from alternative 3A in that visitors would access the preserve using personal vehicles rather than shuttle buses, as described below. Implementation-level impacts would be the same as those under alternative 3A: moderate to localized major and adverse in the short term, and minor to moderate and adverse in the long term.

Programmatic Level

The use of personal vehicles under alternative 3B would create more frequent, persistent, and widespread disturbance to terrestrial wildlife than a shuttle system.

The transportation system would include the development of a Level 4, two-lane paved or gravel road. Although the parking area at the visitor center would be smaller than for alternative 3A, larger parking areas would be developed at recreation areas throughout the preserve to accommodate personal vehicles at those locations. The use of personal vehicles would create more frequent, persistent and widespread disturbance to terrestrial wildlife than a shuttle system, and would likely result in more collisions with wildlife. Personal vehicles would be more widespread throughout the preserve, using Level 2 as well as Level 1 roads. Personal vehicles would also come in a wider variety of engine types, sizes, and noise levels compared to a presumably more similar set of shuttles. Therefore, impacts from noise would be greater than those under alternative 3A due to higher traffic volume.

Impacts to elk from recreational disturbance and increased road use would occur as described under alternative 2, but to a greater degree due to substantially increased visitation. Like alternative 3A, a portion of VC01 where elk calving occurs would be closed to vehicular use, resulting in a localized beneficial effect in that area. However, calving areas farther along VC01 and VC02 would experience increased adverse effects from more motorized use. More access via personal vehicle could also result in potential illegal hunting and further loss of undisturbed habitat areas for elk breeding, calving, and foraging. These differences would result in increased measurable changes to fish and wildlife compared to alternative 3A. Short term impacts would be minor to moderate adverse. Localized moderate impacts within

the construction site would be expected in the long term for the reasons described for alternative 3A.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3B as well. When the long-term primarily moderate adverse impacts expected under alternative 3B are combined with the adverse and beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be moderate and adverse.

Alternative 4A: Vista del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: moderate with localized major and adverse Long term: minor and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: minor to moderate and adverse Long term: minor to moderate and adverse
Cumulative	Actions listed in table 4-1	Minor to moderate and adverse

Direct/Indirect Impacts

Implementation Level

Under alternative 4A, most of the affected habitat is relatively close to NM-4, which would reduce its value to wildlife.

This alternative is similar to alternative 3A but would locate the full-service visitor center south of NM-4 below Rabbit Mountain. Where alternative 3A focuses on day-use experience around access to the East Fork of the Jemez River and hiking at South Mountain, alternative 4A would develop a day-use area focused on views of the Valle Grande, interpretation of geology, and proximity to the adjacent day-use area at Bandelier National Monument, which consists of a cross-country ski trail and hiking trail leading from the preserve boundary. An underpass would be developed to provide access below NM-4 for wildlife viewing and hiking. Interpretive trails and picnic areas would be developed south of NM-4, also emphasizing views of the Valle Grande. Like under alternatives 2 and 3A/B, NM-4 would be modified to include acceleration and deceleration lanes. Also similar to alternative 3A, a shuttle system would serve as the primary mode of access into the preserve.

Habitat impacts from this alternative would be similar to those under alternative 3A, with a similar-sized visitor center, parking, picnic area, and trails. However, the access road from NM-4 would be considerably shorter, and the construction of the facility would require cutting into a slope. The type of habitat impacted by this alternative would be limited primarily to grassland habitat, with some trees removed at the proposed location of the visitor center. Several wetlands are located near the treeline that could be affected by trail or utility construction. These wetlands would be avoided to the extent possible.

The visitor center and associated infrastructure would be developed away from large streams. Most of the affected habitat is relatively close to NM-4, which would reduce its value to wildlife. Proposed facilities farther from the visitor center, such as utilities or trails, would have more likelihood of impacting undisturbed wildlife habitat.

Impacts from potential wildlife habituation and conditioning to human food at the visitor center would be mitigated as described under alternative 2. Noise impacts would also be similar to those under alternative 3A, although the proximity of this alternative to NM-4 may mean that wildlife will have adjusted to some human-caused noise or may avoid the area.

As mentioned in chapter 3, a large population of mountain lions has been documented on Bandelier National Monument, which is adjacent to the preserve, making migration between the two areas likely. Although mountain lions are most active at night, the presence of a large visitor center and a substantial increase in human presence at this location could affect mountain lion migration. However, mountain lions can coexist with human presence, and the species may currently avoid areas near NM-4.

The alternative 4A location is not widely used by large game due to its exposure and proximity to NM-4.

The Vista del Valle location is not widely used by large game due to its exposure and proximity to NM-4. The underpass and wildlife viewing area associated with alternative 4A would provide an unobtrusive vantage point for visitors to observe elk and other wildlife from a distance.

Moderate with localized major adverse short term impacts on fish and wildlife would result, as described for alternative 2. Long-term impacts would be minor and adverse because of the proximity to NM-4 and the minimal impacts on forest and stream habitat. Changes proposed under this alternative would be measurable but would not alter the structure, composition, or function of the preserve's wildlife.

Programmatic Level

Programmatic-level impacts on fish and wildlife would be similar to those under alternative 3A, resulting from increases in human activity and noise in the preserve and the development of parking lots, shuttle bus stops, and other ancillary actions. Unlike alternative 3A, shuttle buses would follow VC01, along which elk calve, to access the preserve from NM-4. Shuttle buses would also increase the level of traffic along the Valle Grande on NM-4 between the proposed visitor center and VC01, potentially increasing disturbance to elk. Short-term and long-term impacts would be minor to moderate and adverse at the programmatic level, depending on the level of visitor use and the specific location of additional facilities.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 4A as well. The wildfires that occurred in 2011 burned the area of the preserve where this alternative is proposed. Direct mortality to some individual wildlife occurred, and habitat quality was reduced in the short term. Mountain lion migration has likely ceased until sufficient habitat is

restored at Bandelier and the preserve. As at Bandelier National Monument, the burned area at the preserve is recovering and wildlife will respond. Some wildlife species are attracted to burned areas, which provide new browse for herbivores such as deer and elk. When the long-term minor to moderate adverse impacts expected under alternative 4A are combined with the adverse and beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be minor to moderate and adverse.

Alternative 4B: Vista del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: moderate with localized major and adverse Long term: minor and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: Moderate and adverse Long term: Moderate and adverse
Cumulative	Actions listed in table 4-1	Moderate and adverse

Direct/Indirect Impacts

Implementation Level

Implementation-level impacts under alternative 4B would be similar to alternative 4A. Programmatic-level impacts would be similar to alternative 3B.

Alternative 4B would differ from alternative 4A in that visitors would access the preserve using personal vehicles rather than shuttle buses, as evaluated below. Implementation-level impacts would be the same as those under alternative 4A: moderate with localized major and adverse in the short term and minor and adverse in the long term.

Programmatic Level

Personal vehicle use would increase the level of traffic along the Valle Grande on NM-4 between the proposed visitor center and VC01, potentially increasing disturbance to elk. Overall, visitor access to the preserve using personal vehicles would have similar impacts to alternative 3B: moderate and adverse in the short and long term.

Cumulative Impacts

Cumulative impacts would be moderate and adverse, as described for alternative 4A.

Special-status Species

Guiding Regulations and Policies

In addition to the regulations and policies that are pertinent to general fish and wildlife species, which are described in the "Fish and Wildlife" section, the following laws, regulations, and policies guide or constrain the management of special-status species in the preserve.

Section 7 of the Endangered Species Act (16 USC 1531 et seq.) requires each federal agency to ensure that its actions to authorize, permit, or fund a project do not jeopardize the continued existence of any threatened or endangered species. Section 7 requires federal agencies to determine whether their actions may affect federally listed threatened or endangered species and species of special concern, or designated and proposed critical habitat. If the VCT determines that a proposed action may affect such resources (in this case, critical habitat for the Mexican spotted owl), the VCT must request concurrence from the USFWS or request formal consultation with the USFWS. Both actions require the submittal of a written analysis to the USFWS that records the conclusions and supporting rationale regarding the effects of proposed actions on federally listed species and/or critical habitat. The USFWS has defined specific determinations to use in the analysis, described below (USFWS 2011b).

1. No effect: there would be no impacts, positive or negative, to listed or proposed species or habitat. No listed resources would be exposed to the action and its environmental consequences.
2. May affect, but not likely to adversely affect: All effects would be beneficial, insignificant, or discountable. Beneficial effects have positive effects without any adverse effects to the species or habitat. Insignificant effects relate to the size of the impact and include those effects that are undetectable, not measurable, or cannot be evaluated. Discountable effects are those extremely unlikely to occur.
3. May affect, and is likely to adversely affect: listed resources are likely to be exposed to the action or its environmental consequences and would respond in a negative manner to the exposure.

The Migratory Bird Treaty Act, administered by the USFWS, makes it unlawful to take, import, export, possess, sell, purchase, or barter any migratory bird, with the exception of the taking of game birds during established hunting seasons. The law also applies to feathers, eggs, nests, and products made from migratory birds. Executive Order 13186 outlines federal agency responsibilities for protecting migratory birds under the Migratory Bird Treaty Act and other statutes.

The Bald and Golden Eagle Protection Act, administered by the USFWS, makes it unlawful to take, import, export, sell, purchase, or barter any bald or golden eagle or their parts, products, nests, or eggs. Take includes pursuing, shooting, poisoning, wounding, killing, capturing, trapping, collecting, molesting, or disturbing the eagles. Permits may be issued by the USFWS for scientific or exhibition use, or for traditional and cultural use by Native Americans.

While the policies of the USFS do not apply to the VCT or management of the preserve, it is helpful to review and consider such guidance and incorporate applicable recommendations such as the following:

FSH 1909.15—National Environmental Policy Act Handbook Chapter 10—Environmental Analysis states, "When evaluating the severity of an impact, consider the degree to which the action may adversely affect an endangered or threatened

species or its habitat that has been determined to be critical under the Endangered Species Act of 1973" (USFS 2011a).

USDA Departmental Regulation 9500-4 directs the USFS to conduct activities and programs to assist in the identification and recovery of threatened and endangered plant and animal species, and to avoid actions that may cause a species to become threatened or endangered.

FSM 2600—Wildlife, Fish, and Sensitive Plant Habitat Management identifies biological diversity requirements. The manual states that "plans should identify known sensitive species and … ensure conservation when an activity or project is proposed that would affect the habitat of a sensitive species." The manual also states, "There must be no impacts to sensitive species without an analysis of the significance of adverse effects on the populations, its habitat, and on the viability of the species as a whole" (USFS 1991). Adverse effect is defined under FSM 2600 Chapter 2670 as

> an action that has an apparent direct or indirect adverse effect on the conservation and recovery of a species listed as threatened or endangered. Such actions include, but are not limited to
>
> a. any action that directly alters, modifies, or destroys critical or essential habitats or renders occupied habitat unsuitable for use by a listed species, or that otherwise affects its productivity, survival, or mortality
>
> b. any action that directly results in the taking of a listed species
>
> c. any action involving the disposal of land that is essential to achieving recovery objectives (USFS 2005a).

Chapter 2670 of FSM 2600 stipulates policies and procedures for threatened, endangered, and sensitive plants and animals. Relevant guidance includes:

- Avoid all adverse impacts on threatened and endangered species and their habitats…
- Avoid or minimize impacts to species whose viability has been identified as a concern.
- Analyze, if impacts cannot be avoided, the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole (USFS 2005a).

Threatened and endangered species listed by the State of New Mexico are regulated under Chapter 33, Title 19, of the New Mexico Administrative Code.

Methodology for Analyzing Impacts

This section analyzes effects on the populations, habitat, and viability of special-status species as a whole, as well as actions that would directly result in a taking (USFS 2005a). Potential impacts on special-status species are analyzed based on (1) documented presence of species and (2) presence of suitable habitat. If a particular species is not documented to exist in the study area, but suitable habitat is present and potentially affected by one of the alternatives, then it is assumed that the species

would be affected. This assessment considers changes in the amount and connectivity of habitat, the integrity of habitat, and the potential for disturbance.

Because the Mexican spotted owl is federally listed as threatened under the Endangered Species Act, the USFWS determinations defined above were used to assess impacts on this species. No other species described in chapter 3 are listed as threatened or endangered under the Endangered Species Act; therefore, these determinations were not used to assess impacts on them.

Alternative 1: No Action

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: beneficial Long term: beneficial
Cumulative	Actions listed in table 4-1	Beneficial

Direct/Indirect Impacts

Implementation Level

Alternative 1 would decrease human activity in the preserve, creating long-term benefits for special-status species, including the Mexican spotted owl.

This alternative would result in the removal of the Valle Grande and Banco Bonito Staging Areas and the elimination of the interim recreation program. The VCT would phase out current access through these staging areas, as well as interim programs and activities. The result would be a beneficial impact on special-status species by reducing human activity levels in the preserve, which would reduce disturbance to all wildlife species, including special-status species. The removal of the Valle Grande Staging Area would reduce disturbance and pollutants resulting from the concentration of people and vehicles. Short-term negligible adverse impacts may result from the deconstruction activities associated with removing existing temporary facilities. Implementation-level impacts may affect, but are not likely to adversely affect, the Mexican spotted owl because long-term impacts from implementation activities are expected to be beneficial.

Programmatic Level

Short- and long-term beneficial impacts on special-status species would result from the elimination of the interim recreation program, because existing levels of human activity would decrease. Impacts on special-status species would be beneficial. Programmatic-level impacts may affect, but are not likely to adversely affect, the Mexican spotted owl because short- and long-term programmatic-level activities are expected to be beneficial.

Cumulative Impacts

Actions and activities that would affect special-status species include those listed in table 4-1 for fish and wildlife and special-status species. Past actions have had considerable effects on the presence of special-status species in the preserve. These

actions have included the extirpation of the Rio Grande cutthroat trout through the introduction of nonnative stocked trout, the extirpation of the gray wolf by overhunting, the extirpation of black-tailed prairie dogs due to poison control, and the widespread use of the preserve for livestock grazing, which created extensive ecological changes for many wildlife species. Also, logging of the high-elevation forests on the preserve has changed available habitat for species such as Mexican spotted owl, northern goshawk, southern red-backed vole, and American marten.

The Las Conchas fire that burned much of the Bandelier National Monument and part of the preserve in 2011 had an adverse impact on individuals of special-status species through direct mortality. Resulting debris flows resulted mortality to fish as described in the "Fish and Wildlife" section. Habitat suitability was also reduced and, in some cases, potentially eliminated through hardening of the soil, as was the case at Bandelier. Specific impacts are expected for the following special-status species.

Mexican Spotted Owl: The Las Conchas fire likely burned a substantial amount of potential owl habitat, reducing its suitability for the owl. Of the area that burned within the preserve, 65 percent was forest habitat, the majority of which was mixed conifer (36 percent dry mixed conifer and 23 percent moist mixed conifer) — the owl's most commonly used habitat (Rodriguez, pers. comm. 2012b). However, also as shown in chapter 3, other non–critically designated areas of potential Mexican spotted owl habitat exist in the preserve, which owls could potentially populate. As the burned areas regrow, suitable habitat could return in the long term. Surveys conducted for the Mexican spotted owl have yielded negative results preserve-wide. Habitat characteristics where the utilities are currently proposed are not unique on the preserve or in the region.

Jemez Mountain Salamander: The NPS notes that Jemez Mountain salamanders may never be found in Bandelier again (NPS 2012). As stated in chapter 3, Jemez Mountain salamanders are rarely encountered aboveground, and much of their life cycle occurs underground. They also have specific moisture requirements and require surface-dwelling invertebrates for their diet. Therefore, the fire would have resulted in direct mortality to most individuals. Changes to habitat resulting from the fire (such as drier ground and fewer food sources) would inhibit recolonization. Figure 3-31 in chapter 3 shows that these salamanders have historically inhabited the preserve's eastern area, particularly the southeastern section, which burned in the fire. Figure 3-31 also shows a substantial historical population in Bandelier. A few small areas of historical salamander presence exist on the western part of the preserve, with more outside the preserve to the west. However, through burning a considerable amount of Bandelier and the eastern third of the preserve, the Las Conchas fire had a major impact on the Jemez Mountain salamander. It is now likely that no source population exists in the monument to populate the preserve.

Landscape restoration treatments proposed under the 2010 *Southwest Jemez Mountains Collaborative Forest Landscape Restoration* "will maintain or improve habitat for Jemez Mountain salamander in selected locations within approximately 18,000 acres of occupied or potential habitat, such as by increasing the amount of downed

logs and reducing the risk of stand-replacing fires" (USFS 2010d). The result would be a beneficial impact on the salamander in the future.

Goat Peak Pika: Substantial impacts from the Las Conchas fire also occurred on the Goat Peak pika, another ground dweller that nests under rocks and rock outcrops. The NPS notes that the Goat Peak pika may also never be found in Bandelier National Monument again (NPS 2012).

At both the preserve and Bandelier, vegetation is beginning to regrow, with beneficial impacts on specific species. As burned areas recover, impacts on many special-status species will become more beneficial. For example, the New Mexico meadow jumping mouse could benefit in the long term from recovered grassland in formerly forested areas, because fire tends to encourage grassland habitat. Snags and downed wood would become more abundant in burned areas, which would benefit species like the American marten.

The current update of the Santa Fe National Forest land and resource management plan to include the *Jemez National Recreation Area Management Plan* (n.d.a) and implementation of the Collaborative Forest Landscape Restoration project in the southwest Jemez Mountains (including the preserve) will substantially improve fish and wildlife habitat, especially for special-status species, through proposed riparian and aquatic habitat treatments. In particular, improved riparian habitat will benefit the New Mexico jumping mouse and northern leopard frog, and riparian and aquatic ecosystem treatments will increase or improve habitat for sensitive fish species, including potential Rio Grande cutthroat trout habitat. Treatments will also improve habitat within portions of 15,000 acres of suitable Mexican spotted owl habitat, and will increase the abundance of large trees, snags, and downed logs, which are PCEs for the owl (see chapter 3). Treatments will also maintain or improve habitat within approximately 18,000 acres of Jemez Mountain salamander habitat (USFS 2010d).

Several past actions described above had adverse effects on some special-status species, yet the restoration projects being implemented will benefit the majority of special-status species in and near the preserve. As burned areas regrow, habitat for many special-status species will return. Therefore, the overall impact of these actions is both adverse and beneficial.

When the long-term beneficial impacts anticipated under the no-action alternative are combined with the adverse and beneficial impacts of the past, present, and reasonably foreseeable future activities described above, cumulative impacts would be beneficial.

Alternative 2: Banco Bonito Visitor Contact Station

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor and adverse
Cumulative	Actions listed in table 4-1	Negligible and adverse

Direct/Indirect Impacts

Implementation Level

The alternative 2 visitor contact station would be located in areas generally not suitable for special-status species.

Under alternative 2, the existing Banco Bonito Staging Area would be removed and new development would occur. Deconstruction activities during the removal of the existing facilities could result in short-term negligible adverse impacts on special-status species that may be present in the immediate area on a transient basis. Golden eagles could be adversely impacted by deconstruction and construction activities; however, surveys for golden eagle nests would be conducted prior to these actions. These activities would also be scheduled to avoid impacts on special-status species, including migratory birds. The construction of the new visitor contact station, day-use facilities, roads, recreational facilities, and parking lots would result in permanent and temporary impacts on general wildlife habitat, but in most cases, not to suitable habitat for special-status species.

Forested areas adjacent to NM-4 would be permanently affected by the construction of an acceleration and deceleration lane on each side of the road. Approximately 3.0 acres of grassland and forest habitat would be affected by the construction of the visitor contact station, parking lots, picnic area, and road improvements. This area is not likely to provide suitable habitat for any special-status species, with the possible exception of the northern goshawk, which could forage in this area. Foraging habitat for the goshawk is not limited in the preserve, so the impacts on forested habitat from this alternative would not be expected to have long-term adverse effects on the goshawk population in the preserve. No Mexican spotted owl critical habitat, as defined by the USFWS, exists in this area. Small, isolated pockets of potential Mexican spotted owl habitat exist in the vicinity. However, because this area has been previously disturbed, few trees that are preferred by the owl for habitat would be removed. No impacts, positive or negative, would be expected on Mexican spotted owl habitat, resulting in no adverse effect.

The construction of new recreational facilities would increase visitation to this area, increasing the level of noise from pedestrian and vehicle sources, as well as increasing the amount of regular, routine maintenance activity in and around the visitor contact station. These impacts would reduce the likelihood that special-status species would use this immediate area on a transient basis in the future.

As noted in chapter 3, American martens may be attracted to human structures because their prey (e.g., mice) takes advantage of created habitat and forage found in and adjacent to human-made structures. This could lead to visitors feeding martens or other adverse impacts from human interaction. As described in the "Fish and Wildlife" section, mitigation measures would be implemented to address such impacts.

Changes to special-status species would be measurable but would not alter the structure, composition, or function of these species, and changes would be limited in context. Therefore, alternative 2 would have minor adverse long-term impacts due to an increase in human activity in the vicinity of the new visitor contact station.

Programmatic Level

The VCT would avoid situating recreational amenities, such as campgrounds and picnic areas, where habitats for special-status species exist.

Visitors would recreate beyond the immediate location of the visitor contact station, increasing human activity in habitats potentially used by special-status species in other areas of the preserve. This activity may cause indirect effects on daily and seasonal habitat use patterns by individuals of these species. However, new trail construction would be limited and would occur only when necessary. Most disturbance would continue to occur along existing trails and Level 1 roads, where wildlife is presumably acclimated to human activity. Potential increases in disturbance would be most likely in summer, when visitation is at its highest levels and animals such as New Mexico meadow jumping mouse are actively breeding. However, many special-status species are restricted to areas that would continue to have low levels of human disturbance, such as areas of high elevation. The VCT would avoid situating recreational amenities, such as campgrounds and picnic areas, where habitats for special-status species (e.g., Jemez Mountains salamander, Mexican spotted owl, wood lily, etc.) exist. At the programmatic level, impacts may affect, but are not likely to adversely affect, the Mexican spotted owl because impacts would be insignificant in that they would be undetectable, not measurable, or unable to be evaluated.

Under all action alternatives increased visitation could result in the VCT's fishing program being operated at full capacity on most summer weekends. An increase in the number of anglers could impact special-status fish through direct mortality, and could disturb species that inhabit wetlands and aquatic areas, such as the wrinkled marshsnail, northern leopard frog, long-tailed vole, and water shrew. The wood lily, which is a wetland plant sensitive to wetland damage, could experience impacts from trampling and possible collection. Similarly, the trampling of lentic vascular hydrophytes that grow in waterlogged soil could affect the prey base for spotted bats. However, these impacts are expected to be isolated and slight.

Increased visitation would increase noise levels along the preserve's roads and at recreational facilities such as campgrounds, picnic areas, and trailheads throughout the preserve. Wildlife, including special-status species, can be adversely affected by sounds that intrude on their habitats and would therefore avoid these places, slightly reducing the amount of available habitat. However, sufficient habitat exists in the preserve that adverse physiological and/or behavioral changes to special-status species would not be anticipated.

Improvements to the preserve's Level 3 and Level 4 roads and development of additional parking lots throughout the preserve would also occur. Short-term construction impacts on special-status species habitat would be negligible and adverse. There would presumably be long-term increases in human activity along these existing corridors. Improvements would be designed to minimize new impacts on wildlife habitat.

Negligible adverse short-term impacts on special-status species would be expected at the programmatic level because minimal construction would occur; the magnitude of change would not be measurable. Long-term impacts (mostly related to disturbance) would be minor and adverse because changes would be measurable but localized and would not alter the structure, composition, or function of these species.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 2 as well. The long-term minor potential adverse impacts of alternative 2 on suitable habitat and documented presence of special-status species would result in negligible and adverse cumulative impacts when combined with the adverse and beneficial impacts of other past, present, and reasonably foreseeable future activities.

Alternative 3A: Entrada del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor to moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor to moderate and adverse
Cumulative	Actions listed in table 4-1	Moderate and adverse

Direct/Indirect Impacts

Implementation Level

Several special-status species could be present in the area around the proposed alternative 3A visitor center and other new facilities.

Under alternative 3A, the existing Valle Grande Staging Area would be removed and new development would occur close to NM-4. This new construction would consist of a new full-service visitor center, day-use facilities, roads, recreational facilities, and parking lots, all located just west of the preserve's existing main entrance on NM-4. Habitat impacts would result from the same construction elements as those described under "Fish and Wildlife."

Overall, new facilities would be estimated to impact between 5 and 10 acres of previously undisturbed habitat composed of primarily lower and upper montane grassland, wet meadow, mixed-conifer forest, ponderosa pine forest, and blue

spruce fringe forest. Most of the forest impacts would result from the construction of the new access road, which would skirt the edge of the Valle Grande before reaching the new visitor center. None of these facilities would impact known populations of special-status species.

However, several special-status species could be present in the affected habitats, including southern red-backed vole (which has been found in association with rocks and blue spruce), wrinkled marshsnail (which has been found in aquatic habitat near Cerro La Jara about 1 mile from the proposed visitor center), dwarf shrew, water shrew, Gunnison's prairie dog (which has been observed at the existing Valle Grande Staging Area and near the proposed site), American marten (which is associated with undisturbed forest), and long-tailed vole. Any of these species could use some portion of the implementation areas as breeding habitat, foraging habitat, or cover during daily movements.

Surveys for golden eagle nests would be conducted prior to deconstruction and construction activities. The VCT would allow a 660-foot buffer between the nest or key use areas and the use of heavy equipment or land clearing. These activities would be scheduled to avoid impacts on special-status species, including migratory birds.

Small areas of potential Mexican spotted owl habitat exist at the base of South Mountain, to the west and south of the proposed visitor center location. Few, if any, trees at the base of South Mountain would be removed, and substantially more potential habitat exists elsewhere throughout the preserve. Therefore, impacts may affect, but are not likely to adversely affect, the Mexican spotted owl because impacts would be insignificant in that they would be undetectable, not measurable, or unable to be evaluated.

Short-term impacts due to deconstruction and construction activities associated with alternative 3A would be negligible and adverse, as described for alternative 2. Long-term potential impacts on special-status species due to project implementation would be minor to moderate and adverse because measurable changes may influence the structure, composition, or function of special-status species, and the impacts would be limited in context.

Programmatic Level

Although hiking would continue to occur primarily on Level 1 roads, hiking trails would be expanded preserve-wide to provide short day loops and multi-day backpacking opportunities. Where trail users are limited to existing roads, impacts would be similar to alternative 2, but with substantially more use. Improvements to the preserve's Level 3 and Level 4 roads and development of additional small parking lots (for five vehicles or fewer) throughout the preserve would also occur, and a bicycle path would be created to parallel the loop road.

Under all action alternatives increased visitation could result in the VCT's fishing program being operated at full capacity on most summer weekends. Increased fishing activity in the preserve would result in similar but more extensive impacts to

special status fish species than those under alternative 2 due to the substantial increase in visitation expected under alternative 3A.

Noise impacts would occur as described for alternative 2, but to a greater extent due to the substantially increased visitation, larger parking facilities, and new access road. Special-status species would not likely use newly developed areas on a transient basis in the future.

At the programmatic level, impacts may affect, but are not likely to adversely affect, the Mexican spotted owl because impacts would be insignificant in that they would be undetectable, not measurable, or unable to be evaluated.

Short-term construction impacts on special-status species under this alternative would be negligible and adverse because. In general, the increase in human activity would create long-term minor to moderate adverse disturbance impacts on special-status species. Similarly, long-term wildlife impacts would be minor to moderate and adverse, depending on the specific location and size of ancillary facilities (campgrounds, picnic areas, etc.). If these facilities are located in riparian or wetland habitats, impacts would be more likely to affect individuals of special-status species, including fish. The development of recreational facilities in these areas would be avoided to the extent possible.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3A as well. When the long-term minor to moderate adverse impacts anticipated under alternative 3A are combined with the adverse and beneficial impacts of past, present, and reasonably foreseeable future activities, cumulative impacts would be moderate and adverse, primarily because of impacts in previously undisturbed areas and increases in human activity.

Alternative 3B: Entrada del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor to moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor to moderate and adverse
Cumulative	Actions listed in table 4-1	Moderate and adverse

Direct/Indirect Impacts

Implementation Level

Alternative 3B would differ from alternative 3A in that visitors would access the preserve using personal vehicles rather than shuttle buses, as described below. Implementation-level impacts would be the same as alternative 3A: negligible and adverse in the short term, and minor to moderate and adverse in the long term.

Programmatic Level

Increased access via personal vehicle under alternative 3B could result in increased collection of special-status species, such as the wood lily, or illegal hunting of special-status species.

The transportation system under alternative 3B would include development of a Level 4 two-lane paved or gravel road. Although the parking area at the visitor center would be smaller than that under alternative 3A, larger parking areas would be developed at recreation areas throughout the preserve to accommodate personal vehicles at those locations. The use of personal vehicles would create more frequent, widespread disturbance to terrestrial special-status species than a shuttle system. Personal vehicles would be more widespread throughout the preserve, using Level 2 as well as Level 1 roads. Personal vehicles would also come in a wider variety of engine types, sizes, and noise levels, compared to a consistent type of shuttle. Impacts from noise would be similar to those under alternative 3B, with slightly more disturbance from different motor vehicle engines. However, personal vehicles would be using existing roads, so special-status species would presumably already be somewhat accustomed to this disturbance, although not to the higher visitation levels that would occur under this alternative. The limited range and habitat associations of many of the documented special-status species on the preserve would limit their potential interaction with personal vehicles on existing roads.

More unlimited access via personal vehicle could result in increased collection of special-status species, such as the wood lily, or illegal hunting of special-status species. This impact would be slight because this type of activity would not be expected of the majority of visitors.

These differences would result in little measurable change to special-status species compared to alternative 3A. Negligible adverse short-term and long-term impacts would be anticipated for the reasons described for alternative 3A. Therefore, impacts would be similar: minor to moderate and adverse both in the short term and in the long term.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3B as well. When the long-term minor to moderate adverse impacts expected under alternative 3B are combined with the adverse and beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be moderate and adverse, primarily because alternative 3B would result in disturbing an undisturbed area.

Alternative 4A: Vista del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor to moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor to moderate and adverse
Cumulative	Actions listed in table 4-1	Moderate and adverse

Direct/Indirect Impacts

Implementation Level

This alternative is similar to alternative 3A but would locate the full-service visitor center south of NM-4 below Rabbit Mountain. Alternative 4A would develop a day-use area focused on views of the Valle Grande, interpretation of geology, and proximity to the adjacent day-use area at Bandelier National Monument, which consists of a cross-country ski trail and hiking trail leading from the preserve boundary. An underpass would be developed to provide access below NM-4 for wildlife viewing and hiking. Interpretive trails and picnic areas would be developed south of NM-4, also emphasizing views of the Valle Grande. Like under alternatives 2 and 3A, NM-4 would be modified to include acceleration and deceleration lanes. Also like alternative 3A, under this alternative a shuttle system would serve as the primary mode of access into the preserve.

Habitat impacts from this alternative would be similar to those under alternative 3A, with a similar-sized visitor center, parking, picnic area, and trails. However, the access road from NM-4 would be shorter, and the construction of the facility would require cutting into a slope. The type of habitat impacted by this alternative would be limited primarily to grassland habitat, with some trees to be removed at the proposed location of the visitor center. Several wetlands are located near the treeline that could be affected by trail or utility construction.

Surveys for golden eagle nests would be conducted prior to deconstruction and construction activities. The VCT would allow a 660-foot buffer between the nest or key use areas and the use of heavy equipment or land clearing. These activities would also be scheduled to avoid impacts on special-status species, including migratory birds.

Similar to alternative 3A, this alternative would not affect any documented locations where special-status species are known to exist. However, the potential habitat of several species could be affected. Potential suitable habitat for Mexican spotted owl has been mapped on the south side of a small knoll behind the proposed visitor center, where utilities are currently proposed. However, additional potential Mexican spotted owl habitat exists throughout the preserve. Impacts may affect, but

are not likely to adversely affect, the Mexican spotted owl because impacts would be insignificant in that they would be undetectable, not measurable, or unable to be evaluated.

The Jemez Mountains salamander has been found within 1.0 mile of the proposed visitor center and peregrine falcon may nest nearby.

Several historical Jemez Mountains salamander locations exist within 1 mile of the proposed visitor center. The footprint of the visitor center and parking lots would eliminate underground habitat for the salamander. Also, as noted in chapter 3, cliffs on the eastern boundary of the preserve present marginal potential for American peregrine falcon nesting, which could be affected by increased human activity in this area.

Short-term impacts related to deconstruction and construction under alternative 4A would be similar to those under alternative 3A: negligible and adverse. In the long term, impacts on special-status species as a result of the implementation-level actions would be minor to moderate and adverse due to the expected increase in human activity in the area of the visitor center, depending on the presence of individuals of these species or their habitat, particularly the Mexican spotted owl and Jemez Mountain salamander.

Programmatic Level

Programmatic-level impacts on special-status species would be similar to those under alternative 3A, resulting from increases in human activity in the preserve and the development of small parking lots and shuttle bus stops, as well as other ancillary actions. Short-term impacts would be negligible and adverse and long-term impacts would be minor to moderate and adverse, depending on the level of visitor use and the specific location of additional facilities.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 4A as well. The effects of the Las Conchas fire would be more prominent under this alternative because the area in the preserve that burned encompasses the proposed visitor center site. As vegetation continues to regrow at this location, the presence of the visitor center and day-use facilities may preclude some special-status species from returning to this area. When the long-term minor to moderate adverse impacts expected under alternative 4A are combined with the adverse and beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be moderate, primarily because alternative 4A would result in disturbing an area previously undisturbed by humans. Disturbance caused by the Las Conchas fire would eventually result in beneficial effects as the area regrows.

Alternative 4B: Vista del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor to moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor to moderate and adverse
Cumulative	Actions listed in table 4-1	Moderate and adverse

Direct/Indirect Impacts

Implementation Level

Alternative 4B would differ from alternative 4A in that visitors would access the preserve primarily by using personal vehicles rather than shuttle buses, as discussed under "Programmatic Level." Implementation-level impacts would be the same as those under alternative 4A: negligible and adverse in the short term and minor to moderate and adverse in the long term.

Programmatic Level

Visitor access to the preserve using personal vehicles would have similar impacts to those under alternative 3B: negligible in the short term and minor to moderate in the long term.

Cumulative Impacts

Cumulative impacts would be as described for alternative 4A: moderate and adverse.

Geology and Soils

Guiding Regulations and Policies

The purposes of the preserve, as defined by the Valles Caldera Preservation Act of 2000, include protecting and preserving its geologic values. Although FSM direction does not apply to the VCT, it is helpful to review and adopt applicable objectives and policies. Direction for sustaining soil quality in units of the USFS is contained in *FSM 2500—Watershed and Air Management Chapter 2500—Soil Management* (USFS 2010b). According to this FSM, the USFS's objective is to maintain or restore soil quality on national forest system lands and to manage soils on those lands to sustain ecological processes and functions so that desired ecosystem services are provided in perpetuity. The USFS is directed to manage ecosystems to maintain or improve soil quality, and to use soil properties to assess the potential effects on soils when planning and implementing project activities.

Methodology for Analyzing Impacts

Geology and soils would be affected through construction activities, e.g., clearing, grading, and excavating for visitor contact station / visitor center buildings, as well as for the development of parking lots, upgrades to existing roads, and development of new trails and campgrounds. Geology and soils also have the potential to affect the actions proposed under this alternative; e.g., swelling soils and susceptibility to erosion can have adverse impacts on the structural integrity of buildings.

FSM 2500 directs managers to assess and analyze soil resources to determine how changes in soil properties will affect desired soil conditions and objectives related to ecosystem function. Soil quality assessments should include the type, degree, and amount of change. According to FSM 2500, methods of analyzing impacts on soil quality can be qualitative or quantitative. This analysis uses a qualitative method, which is generally used to make initial evaluations of the effects of management activities on soils. In most cases, qualitative estimates are considered sufficient to meet assessment, analysis, and monitoring objectives (USFS 2010b).

Impacts from implementation-level actions were qualitatively assessed based on the soils' suitability for the development of commercial buildings (e.g., the proposed visitor centers), local roads, shallow excavations, and septic tank absorption using data from the USDA NRCS, as described in the "Affected Environment" chapter. Impacts were also assessed based on the soils' runoff potential, including the potential for ponding and flooding, and susceptibility to water and wind erosion. In addition, the soils' heat-transfer properties were evaluated regarding the use of a GHP. Impacts were assessed for programmatic-level actions based on a soil's suitability for recreation activities, such as camping, hiking, biking, and horseback riding.

Alternative 1: No Action

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: beneficial Long term: beneficial
Cumulative	Actions listed in table 4-1	Beneficial

Direct/Indirect Impacts

Implementation Level

A beneficial impact on soils would occur under alternative 1 due to the removal of the structures and the cessation of trampling and soil disturbance around them.

This alternative would result in the removal of the Valle Grande and Banco Bonito Staging Areas and the elimination of the interim recreation program. The VCT would phase out current access through these staging areas, as well as interim programs and activities. Slight temporary effects would result from disturbance to soils during deconstruction activities associated with the removal of existing temporary structures, resulting in negligible adverse short-term impacts. The long-term result would be a beneficial impact on soils due to the removal of the structures and the cessation of associated trampling and soil disturbance around them. No additional structures or facilities would be built, with no associated long-term adverse impacts on soils.

Programmatic Level

Short- and long-term beneficial impacts would result from the elimination of the interim recreation program, because visitors would not disturb soils by driving on roads or recreating on most of the preserve's trails. Hiking would remain open on the two trails near Rabbit Mountain that are accessible from NM-4. Resulting impacts would not be measurable because the trails are established and soils are already disturbed. Regular trail maintenance would minimize erosion and other soil loss hazards.

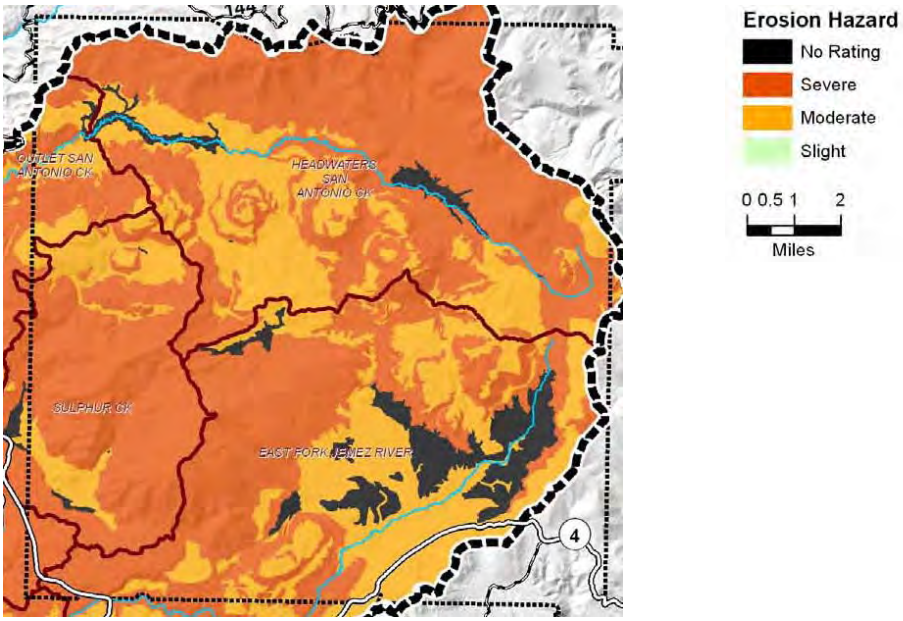
At the programmatic level, there would be no change to impacts on soils compared to existing conditions under alternative 1.

Access for grazing or other land management activities would continue consistent with the decisions and environmental documents guiding those specific actions, specifically the preserve's 2009 *Multiple Use and Sustained Yield of Forage Resources Environmental Assessment* (VCT 2009b). Continued grazing would adversely impact soils, although grazing would be managed according to the 2009 environmental assessment, under which the VCT would adopt ecological goals, objectives, and monitored outcomes. Soil impacts expected under the environmental assessment's selected alternative include the loss of plant litter, along with physical impacts from cattle trailing. Indirectly, grazing-induced changes to plant composition would impact soil function as a result of the shift in plant species. Any potential impacts from a loss of soil cover would be addressed through the level of grazing allowed on the preserve. Forage would be allocated to maintain and protect ecosystem processes. The VCT is targeting no more than 40 percent grazing use in any area across its lands (VCT 2009b). Therefore, there would be no change to impacts on soils from continued grazing activities compared to existing conditions.

Cumulative Impacts

Actions and activities that would affect soils include those listed in table 4-1 for geology and soils. Most of the past actions in the preserve, such as timber harvesting and drilling, would have had an adverse impact on soils. Soil erosion rates in the southwest Jemez Mountains landscape, which includes the vast majority of the preserve, have greatly increased as ground vegetation and water availability have severely declined (USFS and VCT 2010). Figure 4-11, produced by the Santa Fe National Forest and the preserve in 2010, shows erosion hazards for the preserve

as a result of past actions (the thin dotted line delineates the preserve). The southwestern area of the preserve (site for the alternative 2 visitor contact station) shows severe erosion hazards; erosion hazards are moderate for the proposed locations of the visitor centers along NM-4 in the southeastern area (alternatives 3A/3B and 4A/4B).



Source: USFS and VCT 2010.

Figure 4-11: Erosion Hazards on the Preserve from Past Actions

The Las Conchas and Pacheco wildfires that burned in the summer of 2011 vitrified some soils in nearby Bandelier National Monument. Loss of groundcover made the soils susceptible to erosion from flooding, which occurred in August. Heavy rains in the Jemez Mountains led to widespread flooding in all the monument's east-facing canyons. The fire also burned the eastern third of the preserve, which also affected soils and runoff potential.

Although runoff and erosion resulting from past actions still occurs, road reclamation activities in the preserve are decreasing the amount of surface runoff. Future road maintenance activities in the preserve will also help curtail ongoing erosion. The fire management actions the VCT plans to undertake will help reduce the potential for wildland fire, which can result in increased water repellency and soil loss through erosion. Wildfires can pose a substantial risk of soil degradation, because nutrient loss can be considerable during intense wildfires. Conversely, such loss is generally much less for prescribed burns. In addition, hot fires typically have a more substantial and longer-lasting impact on soil biota (living soil organisms) than low-intensity fires (British Columbia Ministry of Agriculture n.d.). In addition, sustainable ecological forest conditions will be restored on the nearly 86,000 acres of the preserve under the Collaborative Forest Landscape Restoration project (USFS and VCT 2010) during the next 10 years, which is expected to considerably benefit soils. The goal of the project is to improve the resilience of ecosystems to

recover from wildfires and other natural disturbance events. Reaching this goal involves reducing land use impacts from roads, recreational uses, livestock grazing, and invasive plant species, which adversely affect soils. Actions will be taken to reduce soil erosion, rehabilitate bare soils, increase soil moisture, increase soil productivity, allow the infiltration of precipitation into soils, revegetate denuded soils, and promote the growth of understory ground vegetation. The resulting structurally, compositionally, and biologically diverse landscape is expected to support much more productive soils (USFS and VCT 2010). These current and future actions will help offset the adverse effects on soils that occurred in the past, resulting in overall beneficial impacts on soils.

Outside the preserve, past actions in the surrounding Santa Fe National Forest, such as timber sales, road development, and oil and gas leasing, would have had adverse effects that could also affect soils in the preserve given the proximity of the national forest. Current and future actions being implemented under the Jemez National Recreation Area management plan (USFS n.d.a) would have beneficial impacts on soils in the Santa Fe National Forest. Oil and gas leasing will continue to occur in the national forest, with associated adverse impacts. However, the USFS would also implement the Collaborative Forest Landscape Restoration project and the travel management plan in the Santa Fe National Forest (USFS and VCT 2010; USFS 2011d), which would result in beneficial impacts on soils as described above. These actions would help mitigate past adverse impacts on soils and ongoing impacts related to oil and gas leasing, resulting in overall beneficial impacts on soils.

When the long-term beneficial impacts expected under the no-action alternative are combined with the adverse and beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be beneficial.

Alternative 2: Banco Bonito Visitor Contact Station

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor and adverse
Cumulative	Actions listed in table 4-1	Negligible and adverse

Direct/Indirect Impacts

Implementation Level

Under alternative 2, the existing Banco Bonito Staging Area would be removed and new development would occur. Constructing the new small-scale visitor contact station, day-use facilities, roads, recreational facilities, and parking lots would result in impacts on soils both in the short and long term.

Soil types at the alternative 2 site have very limited suitability for commercial building (e.g., a visitor contact station), shallow excavation, and septic tank absorption.

Soil types at the alternative 2 site would be suitable for gathering heat for a GHP.

Flooding at the alternative 2 site is a serious limitation but rare.

Soil types at the alternative 2 site are more compactable and potentially more erosion-prone.

As shown in chapter 3, the location of the proposed visitor contact station and the surrounding area consists almost exclusively of Totavi and Jemez soils. Table 3-16 in chapter 3 indicates that both soil types have very limited suitability for commercial building (e.g., a visitor contact station), shallow excavation, and septic tank absorption. As noted in chapter 3, such limitations generally cannot be overcome without substantial soil reclamation, special design, or expensive design features (USDA NRCS 2008). The most serious limitations are flooding for the building itself; cutbanks[10] caving and depth to hard bedrock for shallow excavations such as utility lines; and filtering capability, bottom layer seepage, depth to bedrock, and slow water movement for septic tank absorption, which can affect absorption of the effluent. The soils at this location would be suitable for gathering heat for a GHP for the visitor contact station because soils 60 inches deep at this location are expected to be generally composed of sand, which has high thermal conductivity (USDA NRCS 2008).

Flooding affects a soil's load-supporting capacity, ease of excavation and grading, and traffic-supporting capacity. Although flooding and ponding frequency for Jemez soils is identified by NRCS data as a serious limitation, it is also noted as rare (no data is available for the other soil types) (USDA NRCS 2008). Designing the visitor contact station to withstand these rare yet serious occurrences would help minimize impacts.

The construction of the visitor contact station, access road, visitor parking, and day-use recreation amenities would result in soil compaction. Compaction would occur on new impervious surfaces such as parking lots and day-use amenities at the visitor contact station. When they are compacted, soils pack together more tightly, impeding soil aeration and water percolation. This can result in increased runoff, which greatly increases the potential for erosion. Reduction in water infiltration rates is the most important environmental consequence of compaction, and erosion is the most permanent, and therefore most serious, of soil impacts. Whereas soil compaction will recover to some degree during periods of non-use, erosion usually continues once initiated, whether use continues or not. In general, the soil types most prone to compaction are loams, due to their wide range of particle size (Hammitt and Cole 1998). As shown in table 3-19, the topsoils for Totavi soils are sandy loams, and for Jemez soils, loams, making them more compactable and potentially more erosion-prone. Table 3-17 shows that the susceptibility of soils in this area to water erosion and wind erosion is low to moderate (0.24 and 0.37 on a scale of 0 to 0.69 for water and 3 and 5 on a scale of 1 to 8 for wind). Impacts related to erosion would be measurable but limited to a localized area, and would therefore be minor and adverse.

[10] Near-vertical cliffs produced by erosion of the banks of a stream.

NM-4 would be modified to include acceleration and deceleration lanes, which would result in impacts on the Totavi-Jemez soils in this area. The suitability of these soils for local roads[11] is categorized by NRCS as somewhat limited. The improvements would be designed to minimize impacts on soils through the use of culverts and flood control devices as necessary. Short-term impacts due to construction would be negligible and adverse. Long-term impacts related to the modification of NM-4 would be measurable but localized, and therefore minor and adverse.

Grazing impacts would continue as described for alternative 1.

Impacts to soils at the alternative 2 site would be minor because this area of the preserve has been previously disturbed.

Short-term impacts under alternative 2 related to soil disturbance and dust generation during construction and removal of the existing facilities would be negligible and adverse. In general, long-term impacts on soils as a result of the implementation-level actions would be minor and adverse because this area of the preserve has been previously disturbed. Changes would be measurable but would not alter the structure, composition, or function of soils and would be limited in context.

Programmatic Level

Recreational activities throughout the preserve would continue on existing Level 1 roads, which have already been disturbed and compacted.

The presence of the visitor contact station and associated recreational facilities would increase visitation substantially over existing conditions—approximately 50,000 visitors would be expected annually. Visitors would recreate beyond the immediate location of the visitor contact station, impacting soils primarily through trampling, which causes compaction and can lead to erosion. However, under alternative 2, new trail construction would be limited and would occur only when necessary; hiking, horseback riding, and mountain biking would continue on existing Level 1 roads, which have already been disturbed and compacted.

Improvements to the preserve's Level 3 and Level 4 roads and development of additional parking lots throughout the preserve would also occur. Compaction and erosion would result in long-term adverse impacts, which would be negligible because the roads already exist and soil compaction has already occurred. Improvements would be designed to minimize continued erosion and address any existing problems. Increased dust would be generated during dry weather from more visitors driving on Level 3 roads, depending on the surface type used.

Negligible adverse short-term impacts would be expected at the programmatic level because minimal construction would occur and the magnitude of change would not be measurable. Long-term impacts would be minor and adverse because changes would be measurable but localized.

[11] The NMDOT classifies NM-4 as a minor arterial. An arterial is a continuous long-distance travel route that connects urban and rural communities. It is therefore considered a "local road" for this analysis.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 2 as well. The restoration activities in the preserve under the Collaborative Forest Landscape Restoration project are expected to considerably benefit soils given the extent of the project throughout the preserve and the long time frame (10 years). When the primarily minor adverse long-term impacts expected under alternative 2 are combined with the adverse and beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be negligible and adverse.

Alternative 3A: Entrada del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor and adverse
Cumulative	Actions listed in table 4-1	Moderate and adverse

Direct/Indirect Impacts

Implementation Level

Soil types at the alternative 3A site have no limitations for commercial building, meaning that the soil has features that are very favorable for building a visitor center.

Under alternative 3A, the existing Valle Grande Staging Area would be removed and new development would occur. Constructing the new visitor center, day-use facilities, roads, recreational facilities, and parking lots would result in adverse impacts on soils both in the short term and in the long term.

As shown in chapter 3, the location of the proposed visitor center would be on Cajete soils. Table 3-15 in chapter 3 indicates that Cajete soils, which are composed of gravelly loam, have no limitations for commercial building, meaning that the soil has features that are very favorable for building a visitor center. Suitability for local roads is only somewhat limited. However, suitability for shallow excavation (e.g., for utility lines) and septic tank absorption is very limited due to cutbanks caving and bottom layer seepage, respectively. As noted in chapter 3, these limitations generally cannot be overcome without substantial soil reclamation, special design, or expensive design features (USDA NRCS 2008). The Vastine-Jarola soils directly east of this site have very limited suitability for commercial building, local roads and streets, shallow excavations, and septic tank absorption field; therefore, a visitor center in this area should be sited to avoid the Vastine-Jarola soils. These soils would be somewhat suitable for gathering heat for a GHP for the visitor center because soils 60 inches deep at this location are expected to be generally composed of loams, which have a higher thermal conductivity than clay but lower than sand.

Soil types at the alternative 3A site would be somewhat suitable for gathering heat for a GHP.

Water erosion susceptibility is low where the alternative 3A visitor center would be located and moderate where the access road would be located; wind erosion susceptibility is moderate at both locations.

The construction of the visitor center, relocated access road, visitor parking, overflow parking, environmental and ecotourism facilities, and associated day-use recreation amenities would occur in a previously undisturbed area and result in soil compaction. As shown in table 3-19, the topsoils that would be affected are gravelly loams and silt loams, making them compactable and potentially erosion-prone. Compaction would reduce water infiltration rates and increase runoff and erosion, particularly on new impervious surfaces such as parking lots and day-use amenities at the visitor center. Table 3-17 shows that the susceptibility of soils in this area to water erosion is low for Cajete soils, on which the visitor center would be located (0.20 on a scale of 0 to 0.69), and moderate for Vastine-Jarola soils, on which the access road would be located (0.43 on a scale of 0 to 0.69). Wind erosion for both soil types is moderate (6 and 5, respectively, on a scale of 1 to 8). Erosion impacts would be minor at the proposed visitor center and moderate where the new access road would be located because impacts would be measurable but would not alter the structure, composition, or function of the resource.

Flooding at the alternative 3A site is rare.

Flooding potential is rare and ponding is not an issue for the Jarola soils; no data is available for the other soil types. Therefore, minimal impacts related to these actions would be expected.

NM-4 would be modified to include acceleration and deceleration lanes, which would result in impacts on the Vastine-Jarola soils in this area. Improvements would require a large permeable fill and two 24- to 36-inch culverts to address 100-year flood events. The suitability of these soils for local roads is categorized as very limited, primarily due to frost action. The improvements would be designed to minimize impacts on soils and would benefit soils in this area by addressing existing and potential flooding issues. The removal of the existing facilities would result in short-term negligible adverse impacts on soils related to dust generation and some soil disturbance. Short-term impacts due to construction activities would also be negligible and adverse for similar reasons. Long-term impacts would be beneficial.

Grazing impacts would continue as described for alternative 1.

In general, short-term impacts related to soil disturbance and dust generation during construction as a result of implementation-level actions under alternative 3A would be negligible and adverse. Long-term impacts on soils as a result of the implementation-level actions would be primarily moderate and adverse due to the disturbance of an undisturbed site, the extent of the disturbance, and the creation of a new access road. Changes would be measurable and may influence the structure, composition, or function of soils but would be limited in context.

Programmatic Level

The presence of the visitor center and associated recreational facilities would increase visitation substantially over existing conditions—approximately 120,000 visitors would be expected annually. Visitors would recreate beyond the immediate location of the visitor center, impacting soils primarily through trampling, which causes compaction and can lead to erosion. Although hiking would continue to be primarily on Level 1 roads, hiking trails would be expanded preserve-wide to

provide short day loops and multi-day backpacking opportunities. If trail users are limited to existing roads, impacts would be similar to those under alternative 2, but there would be substantially more use. If new trails are developed on undisturbed land, compaction would occur. The direct weight loads to the ground surface from hikers, backpackers, horses, and bicycles can impose considerable stress on soils (Hammitt and Cole 1998). However, it is expected that new trails would remain limited to existing roads, minimizing the amount of impact.

Compaction occurs rapidly even with light use. The nature and severity of impacts vary with the type of recreational activity. Paths made by horses and bikes create conditions that accelerate gully erosion. Horse use causes substantial compaction to underlying soils due to weight, which reduces water infiltration and increases runoff. The action of a horse hoof also tends to dig up and puncture the soil surface, making it more prone to erosion. A comparison of the erosional impacts of hikers, horses, mountain bikes, and off-road motorcycles showed that sediment yields from horse trails were greater than other uses. However, horseback riding currently constitutes a small percentage of overall recreational use, representing a small user population; this percentage is not expected to measurably change. In addition, the severity of recreational impacts tends to increase rapidly with initial use, stabilize, and then remain relatively constant for long periods of time. Usually a little use causes the most impact, and additional use causes less and less additional impact (Hammitt and Cole 1998). Because equestrian use would be limited to existing roads, which have already become compacted by motor vehicle use, increased equestrian use is not expected to measurably impact soils.

Medium-textured soils, such as sandy loams, fine sandy loams, and loams, have the fewest limitations for campsites and trails. These soils have good drainage, are not highly erodible, and have a high potential for plant growth. Their main drawback is susceptibility to compaction, which can increase erosion. The general soil types throughout the preserve consist of various types of loams. The Redondo and Palon soils on the preserve's mountain slopes are coarse sandy loams and very cobbly sandy loams, respectively, making these good locations for siting trails and campgrounds where slopes are low (erosion potential increases with slope). Sandy soils are particularly resistant sites for camping (a resistant site can tolerate recreational use with minimal change or disturbance). In addition, the general soil types that exist throughout the preserve are very deep. Deep soils are often better suited to recreational use than shallow soils due to the latter's high erodibility (Hammitt and Cole 1998).

Impacts from new development and use at the programmatic level would be minimal, particularly after initial use has occurred and areas become established.

Because the preserve's soils consist primarily of deep loams, impacts from new development (e.g., campgrounds) and use would be minimal, particularly after initial use has occurred and areas become established. By concentrating recreational facilities on low slopes with deep, loamy soils, the preserve would minimize recreational impacts on soils.

Improvements to the preserve's Level 3 and Level 4 roads and development of additional parking lots throughout the preserve would also occur, and a bicycle path would be created to parallel the loop road. Long-term impacts would be moderate

and adverse due to the limitations of the soil type for road construction, which generally cannot be overcome without substantial soil reclamation, special design, or expensive installation features (USDA NRCS 2008). Shuttle buses would use Level 4 roads, which would be paved, limiting dust generation from shuttles driving on preserve roads.

Overall, negligible adverse short-term impacts would occur at the programmatic level from construction activities. Minor adverse long-term impacts would be expected due to the extent of development and use of new recreational facilities. Changes would be measurable but would not alter the structure, composition, or function of the preserve's soils and impacts would be localized.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3A as well. The restoration activities in the preserve under the Collaborative Forest Landscape Restoration project are expected to considerably benefit soils given the extent of the project throughout the preserve and the long time frame (10 years). When the long-term minor to moderate adverse impacts expected under alternative 3A are combined with the adverse and beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be moderate and adverse, primarily because alternative 3A would result in disturbing an undisturbed area. Impacts may influence the structure, composition, or function of the soils but would be limited in context.

Alternative 3B: Entrada del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor and adverse
Cumulative	Actions listed in table 4-1	Moderate and adverse

Direct/Indirect Impacts

Implementation Level

Implementation- and programmatic level impacts under alternative 3B would be similar to alternative 3A.

Alternative 3B would differ from alternative 3A in that visitors would access the preserve using personal vehicles rather than shuttle buses. The transportation system would include the development of a Level 4 paved or gravel road. Although the parking area at the visitor center would be smaller than under alternative 3A, larger parking areas would be developed at recreation areas throughout the preserve to accommodate personal vehicles at those locations. These differences would result in little measurable change to soils compared to alternative 3A. Short-

term construction impacts would be negligible and adverse and long-term impacts would be moderate and adverse for the reasons described for alternative 3A.

Programmatic Level

Very little measurable change would occur at the programmatic level under alternative 3B compared to alternative 3A. Access to the preserve using personal vehicles rather than shuttle buses would not measurably affect soils because access would be limited to existing roads, which would be improved. Therefore, impacts under this alternative would be similar to those under alternative 3A: negligible and adverse in the short term and minor and adverse in the long term.

Cumulative Impacts

Because impacts under alternative 3B would be similar to those under alternative 3A, cumulative impacts would also be similar for the same reasons: moderate and adverse.

Alternative 4A: Vista del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor and adverse
Cumulative	Actions listed in table 4-1	Moderate and adverse

Direct/Indirect Impacts

Implementation Level

Soil types at the alternative 4A site have very limited suitability for commercial buildings, local roads, shallow excavation, and septic tank absorption.

Under alternative 4A, the existing Valle Grande Staging Area would be removed and new development would occur, similar to alternative 3A.

As shown in chapter 3, the location of the proposed visitor center would be on Redondo soils, which are a cobbly coarse sandy loam. Redondo soils are located on mountain slopes and contain large stones, making their suitability very limited for commercial buildings (e.g., a visitor center), local roads, shallow excavation (e.g., for utility lines), and septic tank absorption. As noted in chapter 3, the limitations of such soils generally cannot be overcome without substantial soil reclamation, special design, or expensive design features (USDA NRCS 2008). Soils would be somewhat suitable for gathering heat for a GHP for the visitor center because soils 60 inches deep at this location are expected to be generally composed of loams, which have a higher thermal conductivity than clay but lower than sand.

Soil types at the alternative 4A site would be somewhat suitable for gathering heat for a GHP.

The construction of the visitor center, access road, visitor parking, overflow parking, environmental and ecotourism facilities, and associated day-use recreation amenities would occur in a previously undisturbed area and result in soil compaction. Redondo topsoils are cobbly, coarse, sandy loams, making them more

compactable and therefore more erosion-prone. Table 3-17 shows that the susceptibility of the Redondo soils in this area to water erosion is low (0.10 on a scale of 0 to 0.69), and susceptibility to wind erosion is moderate (5 on a scale of 1 to 8). Impacts may influence the structure, composition, or function of the soils but would be limited in context and would therefore be minor and adverse.

Impacts from potential flooding are unknown at the alternative 4A site. Flooding may be minimal, because the alternative 4A location is on a sloping hillside.

No data about flooding potential is available, so impacts from potential flooding are unknown. However, because this location is on a sloping hillside, flooding may be minimal.

An underpass would be developed under NM-4, where soil types are Cosey-Jarmillo. Cosey soils have very limited suitability for shallow excavation due to cutbanks caving; Jarmillo soils are somewhat limited. Both soils are moderately susceptible to water erosion and wind erosion (0.43 on a scale of 0 to 0.69, and 5 on a scale of 1 to 8, respectively). No flood data is available for either soil type. Erosion impacts related to the underpass would be moderate and adverse.

NM-4 would be modified to include acceleration and deceleration lanes, which would result in impacts on the Cosey-Jarmillo soils in this area. The suitability of these soils for local roads is categorized as somewhat limited. Long-term impacts would be measurable but localized, and therefore minor and adverse.

Grazing impacts would continue as described for alternative 1.

Overall, short-term construction impacts on soils would be the same as those described for alternative 3A: negligible and adverse. Long-term impacts on soils as a result of the implementation-level actions would be moderate, primarily due to the disturbance of an undisturbed site, the extent of the disturbance, and the unsuitability of soils for a commercial building and associated development. Changes would be measurable and may influence the structure, composition, or function of soils but would be limited in context.

Programmatic Level

Under alternative 4A, impacts at the programmatic level would be similar to alternative 3A.

Similar to alternative 3A, the presence of the visitor center and associated recreational facilities under alternative 3B would increase visitation to approximately 120,000 visitors annually. Visitors would recreate beyond the immediate location of the visitor center, impacting soils primarily through trampling. Although hiking would continue to be mostly on Level 1 roads, hiking trails would be expanded preserve-wide to provide short day loops and multi-day backpacking opportunities. Where trail users are limited to existing roads, impacts would be similar to those under alternative 2, but there would be substantially more use. Where new trails are developed, compaction would occur as described for alternative 3A.

Because the preserve's soils consist primarily of loams, impacts from new development (e.g., campgrounds) would be minimal, as described for alternative 3A.

Improvements to the preserve's roads, development of additional parking lots throughout the preserve, and the development of a bicycle path would occur as under alternative 3A. Long-term impacts would be minor and adverse due to the moderately favorable features of the soil for road development. Like under

alternative 3A, shuttle buses would use Level 4 roads, which would be paved, limiting dust generation.

Overall, negligible adverse short-term impacts would occur at the programmatic level from construction activities. Minor adverse long-term impacts would be expected due to the extent of development and use of new recreational facilities.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 4A as well. The effects of the Las Conchas fire would be more prominent under this alternative, which would be located where the fire burned the preserve. However, the results of the fire did not degrade the suitability of this site for development, and the area is beginning to recover. When the long-term minor to moderate adverse impacts expected under alternative 4A are combined with the adverse and beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be moderate and adverse, primarily because alternative 4A would result in disturbing an undisturbed area. Impacts may influence the structure, composition, or function of the soils but would be limited in context.

Alternative 4B: Vista del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor and adverse
Cumulative	Actions listed in table 4-1	Moderate and adverse

Direct/Indirect Impacts

Implementation Level

Implementation- and programmatic level impacts under alternative 4B would be similar to alternative 4A.

Alternative 4B would differ from alternative 4A as described for alternative 3B compared to alternative 3A. These differences would result in little measurable change to soils compared to alternative 4A. Access to the preserve using personal vehicles rather than shuttle buses would not measurably affect soils because access would be limited to existing roads, which would be improved. Short-term construction impacts would be negligible and adverse and long-term impacts would be moderate and adverse for the reasons described for alternative 4A.

Programmatic Level

Very little measurable change would occur at the programmatic level under alternative 4B compared to alternative 4A. Therefore, impacts would be similar: negligible and adverse in the short term and minor and adverse in the long term.

Cumulative Impacts

Because impacts under alternative 4B would be similar to those under alternative 4A, cumulative impacts would also be similar for the same reasons: moderate and adverse.

Water

Guiding Regulations and Policies

The following laws, regulations, and policies guide or constrain the management of water resources on the preserve.

The Valles Caldera Preservation Act of 2000: The act includes provisions that affect the management of water. These specific provisions include the following:

- Protect and preserve for future generations the scientific, scenic, historic, and natural values of the Baca ranch, including rivers and ecosystems (16 USC 698v).
- Develop a management plan that will provide for multiple use and sustained yield of renewable resources within the preserve.
- Develop a comprehensive program for the management of lands, resources, and facilities within the preserve (16 USC 698v-6[d]).

Executive Order 11988, "Floodplain Management": Executive Order 11988 requires federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. In accomplishing this objective, "each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by flood plains in carrying out its responsibilities" for the following relevant actions:

- providing federally undertaken, financed, or assisted construction and improvements
- conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing activities

The guidelines address an eight-step process that agencies should carry out as part of their decision-making on projects that have the potential for impacts on or in the floodplain. The applicable steps, summarized below, reflect the decision-making process required in Section 2(a) of the executive order.

- Identify and evaluate practicable alternatives to locating in the base floodplain, including alternative sites outside the floodplain.
- Identify impacts of the proposed action.

- If impacts cannot be avoided, develop measures to minimize the impacts and restore and preserve the floodplain, as appropriate.

The Interagency Task Force on Floodplain Management emphasizes the requirement for agencies to select alternative sites for projects outside the floodplains, if practicable and to develop measures to mitigate unavoidable impacts.

The Clean Water Act: The Clean Water Act was established to restore and maintain the chemical, physical, and biological integrity of the nation's waters. The following sections of the act apply to this EIS (USEPA 2011b).

Section 402: The Clean Water Act makes it illegal to discharge pollutants from a point source to the waters of the United States. Section 402 of the act created the National Pollutant Discharge Elimination System (NPDES) regulatory program. The NPDES program requires construction site operators engaged in clearing, grading, and excavating activities that disturb 1.0 acre or more, including smaller sites in a larger common plan of development or scale, to obtain coverage under an NPDES permit for their stormwater discharges. The USEPA, not the state of New Mexico, is authorized to implement the stormwater NPDES permitting program in the state. Where the USEPA is the permitting authority, construction stormwater discharges are almost all permitted under the construction general permit. The construction general permit requires the development of a site-specific stormwater pollution prevention plan covering both the construction and postconstruction phases of the project. A stormwater pollution prevention plan must include a site description, including a map that identifies sources of stormwater discharges on the site, anticipated drainage patterns after major grading, areas where major structural and nonstructural measures will be employed, surface waters, including wetlands, and locations of discharge points to surface waters. The stormwater pollution prevention plan also describes measures that will be employed, including at least protection of existing vegetation wherever possible, plus stabilization of disturbed areas of the site as quickly as practicable (USEPA 2011b).

Section 404: Any activity resulting in the placement of dredge or fill material to waters of the United States requires a permit from the USACE under Section 404 of the Clean Water Act. Fill is defined as any material that replaces any portion of a water of the United States with dry land or changes the bottom elevation of any portion of a water of the United States. Navigable waters, tributaries to navigable waters, and wetlands that abut any of these waters are considered waters of the United States under the Clean Water Act. Wetlands that are hydrologically isolated are not waters of the United States based on the U.S. Supreme Court ruling of the *Solid Waste Agency of Northern Cook County vs. U.S. Army Corps of Engineers* (SWANCC Decision 2001), No. 99-1178, January 9, 2001. Isolated waters, including wetlands, do not require permitting to fill, but still have ecological value.

The essence of Section 404 policies is the concept of "sequencing," described below (USEPA 2011b).

1. Avoidance. Whenever practical, filling of waters of the United States should be avoided. A key issue in avoidance is whether the proposed activity is

dependent on being located on or adjacent to a body of water. Another issue is whether the plot of property on which the proposed project would be located contains sufficient amounts of dry land to accommodate the project.

2. Minimization. If an impact on wetlands cannot be avoided entirely, then attempts to minimize the impacts are required. Often, changes in the position or design of a project can significantly reduce the amount of wetland acreage affected.
3. Compensation. A federal policy called "no net loss" of wetlands drives compensation requirements under Section 404. For every acre of wetland lost, at least one functionally equivalent acre of wetland must be restored. "Creation" of wetlands at sites where wetlands did not naturally occur is less acceptable than restoration of destroyed or degraded wetlands. Only in exceptional circumstances will the preservation of existing healthy wetlands be accepted as mitigation for loss of wetlands permitted under Section 404.

Section 401: New Mexico is not delegated permitting authority for dredging or filling under Section 404. Therefore, a permit is required from the USACE to fill waters of the United States. However, the state is involved in both of these permitting programs through its Section 401 certification responsibilities. Section 401(a) of the Clean Water Act requires that, before issuing a license or permit that may result in any discharge to waters of the U.S., a federal agency must obtain from the state a certification that the discharge is consistent with the act. Clean Water Act provisions to which Section 401 certification applies include USEPA-issued NPDES permits (described in Section 402) and Section 404 permits from the USACE (USEPA 2011b).

While USFS directives and policies do not apply to the VCT or the management of the preserve, such directives were reviewed and incorporated where applicable, including the following:

FSH 1909.15—National Environmental Policy Act Handbook Chapter 10—Environmental Analysis: This handbook states that, when evaluating the severity of an impact, the agency should consider the "unique characteristics of the geographic area such as proximity to … ecologically critical areas" (USFS 2011a). Such areas could include riparian areas and wetlands, as described below.

FSM 2500—Watershed and Air Management Chapter 2520—Watershed Protection and Management: This manual stipulates policies and procedures for the protection and management of watersheds, including riparian areas, floodplains, and wetlands (USFS 2004a). Specific policies for management of riparian areas include the following:

- Manage riparian areas under the principles of multiple use and sustained yield, while emphasizing protection and improvement of soil, water, and vegetation, particularly because of their effects upon aquatic and wildlife resources. Give preferential consideration to riparian-dependent resources when conflicts among land use activities occur.

- Give special attention to land and vegetation for approximately 100 feet from the edges of all perennial streams, lakes, and other bodies of water. This distance shall correspond to at least the recognizable area dominated by the riparian vegetation (36 CFR 219.27e). Give special attention to adjacent terrestrial areas to ensure adequate protection for the riparian-dependent resources (USFS 2004a).

FSM 2520 requires the analysis of a proposed action's potential to result in long- and short-term adverse impacts associated with the occupancy or modification of floodplains; the destruction, loss, or degradation of wetlands; and the direct or indirect support of construction of new wetlands (USFS 2004a). FSM 2520 includes the following relevant policies regarding floodplains and wetlands:

- Avoid adverse impacts that may be associated with the occupancy and modification of floodplains and with the destruction, loss, or degradation of wetlands. Avoid filling of land within wetlands wherever practicable.
- Do not permit floodplain development and new construction in wetlands wherever there is a practicable alternative.
- Preserve and, where needed and feasible both economically and technically, enhance the natural and beneficial function and values of wetlands (USFS 2004a).

Surface water and groundwater in New Mexico are regulated by the NMED Water and Waste Management Division. The Surface Water Quality Bureau of NMED administers most of the pertinent state regulations and policies. Surface waters of the state are "all interstate waters, including interstate wetlands, and all intrastate waters, such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, reservoirs or natural ponds the use, degradation, or destruction of which would affect interstate or foreign commerce." "Surface waters of the state" also means all tributaries of such waters, including adjacent wetlands, and any manmade bodies of water that were originally created in surface waters of the state or resulted in the impoundment of surface waters of the state (State of NM 2005).

In New Mexico, the Bureau of Land Management and the USFS are designated management agencies for non-point-source pollution control under the New Mexico statewide water quality management plan. The New Mexico Surface Water Quality Bureau reviews federal activities to determine consistency with the state's program and directs comments to the federal agencies. In accordance with Executive Order 12372, "Intergovernmental Review of Federal Programs" (1982), a federal agency must either make efforts to accommodate the state's concerns or explain its decision not to make accommodations.

Methodology for Analyzing Impacts

This analysis of water resource impacts focuses on proposed changes that would create any new adverse erosion and sedimentation situations, create a change in existing drainage patterns and subsequent runoff, occupy or modify floodplains,

adversely affect groundwater, or potentially violate the water quality regulations and agency policies described above. Potential impacts on water resources are analyzed based primarily on the size and severity of impacts that are likely to occur in the short and long term as a result of implementation-level and programmatic-level project actions.

The area of impact for the Waters of the U.S. was determined through geographic information system (GIS) analysis of the wetland or stream locations within the construction limits of the project alternatives. Digitized spatial data of potential wetland areas (wetlands, wet meadows, and montane riparian shrublands) at a 3-meter resolution were used to determine a maximum potential area of impact to wetland habitat types. Streams impacts assumed full roadways at crossings. Actual impact values are anticipated to be lower with delineations, culvert planning, and incorporation of avoidance and minimization measures during development of final design.

Alternative 1: No Action

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: beneficial Long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: beneficial Long term: beneficial
Cumulative	Actions listed in table 4-1	Beneficial

Direct/Indirect Impacts

Implementation Level

This alternative would result in the removal of the Valle Grande and Banco Bonito Staging Areas and the elimination of the interim recreation program. The VCT would phase out current access through these staging areas, as well as interim programs and activities. The result of this alternative would be a short- and long-term beneficial impact on water resources from reducing human activity levels in the preserve, including areas close to wetlands and wet meadows near La Jara Creek. Reduced use in this area would also reduce potential erosion and sedimentation impacts from human activity. There would be no measurable change to existing drainage patterns and runoff. The elimination of the interim recreation program also would reduce water use on the preserve, increasing base flow in La Jara Creek, which is currently being used as the drinking water source for the lodge and cabins available for rental at the headquarters area (Griffin 2009). No water quality regulations or policies would be violated.

Programmatic Level

Water use on the preserve would decrease under alternative 1 due to reduced visitor use; reduced fishing would result in decreased riparian impacts, though they would not likely be measurable.

Short- and long-term beneficial impacts on water resources would result from the elimination of the interim recreation program, because existing levels of human activity would decrease along with the accompanying water requirements. Reduced use would reduce potential erosion and sedimentation impacts from human activity, and there would be no measurable change to existing drainage patterns and runoff. A reduction in fishing activity along the preserve's streams would have an imperceptible beneficial impact by reducing human impacts on the riparian zone. However, the current conditions of the preserve's streams as described in chapter 3 (impaired, functioning at risk, etc.) would not change as a result of implementing this alternative because any beneficial effects would not be measurable. No water quality regulations or policies would be violated. There would be no occupancy or modification of the preserve's floodplains.

Cumulative Impacts

Other actions and activities that would affect water resources include those listed in table 4-1. Past actions have had substantial effects on water resources on the preserve, including livestock grazing and timber harvest. Livestock grazing had considerable effects on the morphology and riparian vegetation structure of preserve rivers and streams, particularly those in the valles. Between 1962 and 1972, advancements in technology allowed large-scale clear-cut logging of high-elevation forests. More than 10,500 acres were harvested in less than a decade. More than 1,000 miles of logging roads were constructed, many of them zigzagging up the slopes of the forested domes (VCT 2007b). These destructive logging practices created substantial runoff into preserve streams, negatively affecting water quality (see photographs in "Visual Resources" in chapter 3). Current management practices in the preserve are restoring many of these past impacts, including restoring streambanks by dramatically reducing grazing pressure, upgrading and closing roads, and improving water flow under roads by upgrading culverts. Aquatic habitat conditions have been on an upward trend for the last decade (VCT 2007b).

The Las Conchas fire burned much of Bandelier National Monument and the eastern third of the preserve in the summer of 2011. Ensuing flooding in the monument resulted in soil erosion and likely increased sedimentation in streams. The same is true for the preserve, but to a lesser degree.

As shown in chapter 3, the preserve's actions have improved surface water quality in a short period. As these actions continue, additional improvement is expected. The current update of the *Santa Fe National Forest Land and Resource Management Plan* to include the Jemez National Recreation Area management plan will also improve habitat conditions for fish and wildlife, as will the implementation of the Collaborative Forest Landscape Restoration project in the southwest Jemez Mountains (including the preserve). Many of the recommendations target improvements to riparian and aquatic ecosystems. The USFS is analyzing the rehabilitation of Redondo Creek and San Antonio Creek through elk fencing, native tree planting, and bank stabilization in the Upper Jemez watershed (table 4-1). Although impacts from past grazing and logging were adverse, the restorative recent

and future actions are expected to counter those adverse effects. When the long-term beneficial impacts anticipated under the no-action alternative are combined with the beneficial impacts of present and reasonably foreseeable future activities, cumulative impacts on water resources would be beneficial.

Alternative 2: Banco Bonito Visitor Contact Station

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor to moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: negligible and adverse
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

No wetlands, streams, or wet meadows would be affected by the construction of the visitor contact station.

Under alternative 2, the existing Banco Bonito Staging Area would be removed and new development would occur. As shown in chapter 3, no wetlands, wet meadows, or streams with associated riparian areas exist in the Banco Bonito area. Therefore, the removal of the existing facilities and construction of the new visitor contact station, day-use facilities, roads, recreational facilities, and parking lots would result in no permanent and temporary impacts to wetlands, streams, or wet meadows. No dredge or fill material would be placed in waters of the United States, including wetlands, with no violations to Section 404 of the Clean Water Act. Because the area is previously disturbed, there would be no measurable change to erosion or sedimentation. The small gravel or paved parking area for the visitor contact station would result in minimal changes to drainage patterns and runoff, particularly if the surface is permeable, as is its current condition.

Visitor use would increase water use to 2 million gallons of water per year.

The development of alternative 2 would require approximately 2 million gallons of water per year. The nearest available source of water is an existing well at Jemez Falls Campground in the Santa Fe National Forest, approximately 8,000 linear feet away. Water would need to be pumped from this location to the site of the new visitor center. The current volume and production of this well is unknown, but it is likely to be insufficient for the proposed development (VCT 2009e). As mentioned in chapter 2, the VCT would assess the potential for using nonpotable water sources. Potable water would be used only for human consumption. The VCT would consider the use of recycled and reclaimed water, would capture and harvest water, and would use graywater for irrigation and possibly in restroom toilets. These techniques could help reduce the amount of water required at the implementation level and would be consistent with the NMED regulations and guidelines.

Also as discussed in chapter 2, the VCT would consider the use of constructed wetlands to treat stormwater and wastewater. No wetlands naturally exist at this

site, and it may not be possible to create a naturally self-sustaining wetland because the soils are not conducive to holding water. However, if such an action is possible, the creation of wetlands would enhance the natural and beneficial function and values of wetlands, as directed by FSM 2520.

As shown in chapter 3, the visitor contact station would be located outside the preserve's 100-year floodplain. Therefore, no floodplain impacts would be expected because no floodplains would be occupied or modified under this alternative.

Construction activities could result in short-term adverse impacts. As stormwater flows over a construction site, it can pick up pollutants like sediment, debris, and chemicals and transport these to a nearby storm sewer system or directly to a river, stream, or lake. Polluted stormwater runoff can harm or kill fish and other wildlife. Sedimentation can destroy aquatic habitat, and high volumes of runoff can cause streambank erosion (USEPA 2011b). In compliance with the Clean Water Act, the VCT would obtain a construction general permit, under which it would develop a stormwater pollution prevention plan. The stormwater pollution prevention plan would address these potential impacts, resulting in no measurable change to water quality from construction-related activities. Therefore, short-term impacts would be negligible and adverse.

The implementation of alternative 2 would have negligible short-term impacts on water resources. However, impacts on water supply requirements would be measurable and may influence the structure, composition, or function of the preserve's water resources. Therefore, potentially moderate adverse long-term impacts due to water supply requirements would occur. These moderate adverse long-term impacts could be reduced to minor and adverse through the implementation of the sustainable water use practices described above.

Programmatic Level

The presence of the visitor contact station and associated recreational facilities would increase visitation substantially over existing conditions. Visitors would recreate beyond the immediate location of the visitor contact station, increasing human activity in previously undisturbed or less disturbed areas in other sections of the preserve. However, new trail construction would be limited and would occur only when necessary. Most disturbance would continue to occur along existing trails and Level 1 roads, where water resources would be avoided.

Increases in automobile traffic could increase contaminants and road runoff from roads in the preserve.

Improvements to the preserve's Level 3 and Level 4 roads and development of additional parking lots throughout the preserve would also occur. Potential short-term construction impacts on water resources, such as erosion and sedimentation, would result from runoff or construction staging in wet areas. These impacts would be mitigated by the development of a stormwater pollution prevention plan in compliance with the Clean Water Act, as described above.

Minor adverse short-term impacts on water resources would be expected at the programmatic level because construction and road improvements may occur close to wetlands and streams. However, as directed by FSM 2520, the VCT would avoid disturbing land and vegetation approximately 100 feet from the edges of all perennial

streams, lakes, and other water bodies to ensure adequate protection for riparian-dependent resources. Also in accordance with FSM 2520 and Section 404 of the Clean Water Act, the VCT would avoid impacts on wetlands to the greatest extent practicable.

Increases in human visitation and vehicle use would potentially increase the amount of automobile contaminants and road runoff that would enter the preserve's streams. However, as noted in chapter 3, the preserve's watersheds are in fair to good condition, and are improving. The degree of additional automobile contaminants and runoff would not affect the level of impairment of the preserve's surface waters. Road upgrades would be expected to improve and restore floodplain connections and reduce scour effects at stream crossings through the installation of larger culverts that would be better able to pass large flows without creating physical barriers. For these reasons, long-term programmatic-level impacts would be negligible and adverse.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 2 as well. When the potential long-term negligible to moderate adverse impacts of alternative 2 on water resources are combined with the mostly beneficial impacts of past, present, and reasonably foreseeable future activities, cumulative impacts would be generally minor and adverse, related primarily to cumulative water availability in areas supplying water to the proposed visitor center.

Alternative 3A: Entrada del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: minor and adverse
Cumulative	Actions listed in table 4-1	Negligible to minor and adverse

Direct/Indirect Impacts

Implementation Level

Under alternative 3A, the existing Valle Grande Staging Area would be removed and new development would occur in a new location closer to NM-4 and the periphery of the Valle Grande. This new construction would consist of a new full-service visitor center, day-use facilities, roads, recreational facilities, and parking lots, all located just west of the existing main gate on NM-4. Water impacts would result from the following construction elements:

- A new approach road approximately 1.0 mile long would be constructed starting at NM-4 and connecting to existing VC01. This road would consist

of permeable fill and would incorporate culverts to address seasonal drainage issues. The new road would require a slight realignment of NM-4 in the vicinity of the access road, including addition of acceleration and deceleration lanes.

- A full-service visitor center up to 10,000 square feet would be built, with supporting administrative facilities of up to an additional 5,000 square feet. It is anticipated that more than 120,000 guests would visit this facility each year.
- Parking would be provided for up to 100 vehicles, with RV, bus, and overflow parking to support high-use days and special events.
- From the visitor center, an ADA-compliant day-use area would be developed, including access to the East Fork of the Jemez River, overlooks, picnic areas, staging for groups and special events, and interpretive sites. From here, additional trails would provide access to the interior of the preserve.

Up to 7.8 acres of wetlands could be affected by the construction of roads and facilities for alternative 3A.

Up to 7.8 acres of wetlands would be directly affected by the construction of the access road and other facilities. These impacts would occur primarily in two areas: one in a small drainage crossed by the access road near the existing NM-4 and a second on the north side of the small knoll where the new visitor center would be built. The latter area would be affected primarily by utilities. Assuming that the wetlands, wet meadows, and montane riparian sbrublands qualify as wetlands regulated under Section 404 of the Clean Water Act, these impacts would be avoided and minimized to the greatest extent practicable. Unavoidable impacts will be fully mitigated on-site with restoration of in-kind resources.

Up to 1,379 feet at two stream crossings potentially could be affected by the construction of the access road and facilities. Although the new approach road would consist of permeable fill and would incorporate culverts, this alternative would result in increased impervious surfaces, which can increase runoff and affect drainage patterns, resulting in impacts on erosion and sedimentation. As described in chapter 2, sustainable design concepts would help address water quality impacts at the site. Constructed wetlands using native species would be developed for wastewater treatment and stormwater storage. Runoff from paved roads and parking areas would be directed to islands in the parking area or natural low areas, where it would be collected and treated with the constructed wetlands and directed into toilets as graywater (if composting toilets are not used). Graywater systems would be integrated into the surrounding landscape to create new wet habitats. Plants with different moisture requirements would be used at slope gradient changes; e.g., larger plants would be used in areas of water concentration rather than on slopes. These techniques would also support the FSM 2520 policy of enhancing the natural and beneficial function and values of wetlands where possible.

Culverts would be constructed on the new 1-mile long access road to accommodate seasonal drainage.

The construction of new trails along the East Fork of the Jemez River may have minor impacts on riparian habitat. As described above, in accordance with FSM 2520, the VCT would avoid disturbing land and vegetation approximately 100 feet

from the edges of all perennial streams, lakes, and other water bodies to ensure adequate protection for riparian-dependent resources. The removal of the Valle Grande Staging Area would have beneficial impacts on water quality in the East Fork of the Jemez River by removing pollutant sources such as horse and vehicle collection points close to wetlands and other surface waters that drain to the East Fork of the Jemez River.

Similar to alternative 2, under this alternative the VCT would obtain a construction general permit under which it would develop a stormwater pollution prevention plan. The stormwater pollution prevention plan would address potential construction impacts, resulting in no measurable change to water quality from construction-related activities. Therefore, short-term impacts would be negligible and adverse.

Visitors would use an estimated 4.4 million gallons of water each year under alternative 3A.

Long-term impacts on water resources from the implementation of this alternative would be related primarily to water use. This alternative would be estimated to require approximately 4.4 million gallons of water annually. Water could be supplied by three springs about 1,300 feet away. If the springs are not viable, a well would be drilled with an associated water pumping system powered by solar energy or electrical power from an existing transmission line. Like under alternative 2, the VCT would assess the potential for using nonpotable water sources, which could help reduce the amount of water required, consistent with NMED regulations and guidelines. Such techniques would be essential for mitigating impacts to the East Fork of the Jemez River, possibly reducing them to minor and adverse.

Floodplains impacts from this alternative would be minor and adverse. The visitor center is located on a knob above the valle floor away from all mapped floodplains. New trails could be constructed in the floodplain of the East Fork of the Jemez River, but these trails would not change the structure, function, or composition of the floodplain or its storage capacity substantially, so the impact would be minor and adverse.

Overall, impacts on water resources at the implementation level are anticipated to be negligible and adverse in the short term and moderate and adverse in the long term, with previously undisturbed wet meadows potentially being permanently affected by the new facilities. Impacts would be avoided and minimized to the greatest extent practicable. Impacts on the water supply have the potential to influence the structure, composition, or function of the local water table, but would be limited in context.

Programmatic Level

The presence of the visitor center and associated recreational facilities would increase visitation substantially over existing conditions. Although hiking would continue to be primarily on Level 1 roads, hiking trails would be expanded preserve-wide to provide short day loops and multi-day backpacking opportunities. Where trail users are limited to existing roads, impacts would be similar to those under alternative 2, but there would be substantially more use. Improvements to the preserve's Level 3 and Level 4 roads and development of additional parking lots

throughout the preserve would also occur, and a bicycle path would be created to parallel the loop road.

Minor adverse short-term impacts on water resources would be expected at the programmatic level, as described for alternative 2.

Shuttle buses could release contaminants into waterways within the preserve.

Long-term impacts would result due to the increase in shuttle buses using the Level 4 roads in greater numbers, which could lead to increased runoff of human-generated pollutants into adjacent surface waters during storm events. Alternative 3A would involve the conversion of existing Level 3 roads to a Level 4 road to support a new shuttle route. Portions of this route parallel Jaramillo Creek, San Antonio Creek, Sulphur Creek, and Redondo Creek. Of these streams, Jaramillo Creek has been identified as impaired for temperature, turbidity, and aluminum due to road and bridge runoff, among other sources. The upgraded Level 4 road under this alternative would parallel Jaramillo Creek for approximately 2 miles. In this reach, additional contaminants could be introduced to the creek by stormwater runoff from the increased numbers of shuttles using the road. Also, additional parking facilities, pullouts, trailheads, and hiking trails could have direct impacts on water resources if their footprints encompass wetlands, streams, or floodplains. Mapped floodplains along Jaramillo Creek, San Antonio Creek, and Redondo Creek could be affected by any road improvements or improvements to ancillary facilities that occur outside the current footprint of disturbed areas. In accordance with federal policies and regulations, the VCT would avoid disturbing land and vegetation approximately 100 feet from the edges of all perennial streams, lakes, and other water bodies; wetlands would also be avoided. Therefore, these impacts would be measurable but would not alter the structure, composition, or function of the preserve's water resources. Therefore, long-term impacts would be minor and adverse.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3A as well. When the long-term minor to moderate adverse impacts anticipated under alternative 3A are combined with the mostly beneficial impacts of past, present, and reasonably foreseeable future activities, cumulative impacts would be negligible to minor and adverse.

Alternative 3B: Entrada del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: minor and adverse
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

Alternative 3B would differ from alternative 3A in that visitors would access the preserve using personal vehicles rather than shuttle buses, as described below. Although the parking area at the visitor center would be smaller than under alternative 3A, larger parking areas would be developed at recreation areas throughout the preserve to accommodate personal vehicles at those locations. These differences would result in little measurable change to water resources compared to alternative 3A. Negligible adverse short-term impacts and moderate adverse long-term impacts would be anticipated for the reasons described for alternative 3A.

Programmatic Level

Personal vehicles could release contaminants into waterways within the preserve, along roads, in parking areas, and at trailheads, more so than shuttles.

Under alternative 3B, the use of personal vehicles rather than shuttle buses would increase the number of potential sources for pollutants in runoff along preserve roads and ancillary facilities like parking lots and trailheads, particularly along the upgraded Level 4 road where it is close to impaired water bodies like Jaramillo Creek. The extent of these potential impacts would be determined by the actual number of vehicles using the roads, how permeable the road surfaces are, and their proximity to wetlands and streams. Impacts would be minor and adverse in the short and long term. Although measurable impacts are possible, adherence to federal regulations and policies would keep the new facilities away from wetlands and streams.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3B as well. When the long-term minor to moderate adverse impacts expected under alternative 3B are combined with the overall beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be minor and adverse.

Alternative 4A: Vista del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: minor and adverse
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

The construction of the alternative 4A visitor center and associated facilities could affect wet meadows in the area.

This alternative is similar to alternative 3A but would locate the full-service visitor center south of NM-4 below Rabbit Mountain. Where alternative 3A focuses on day-use experience around access to the East Fork of the Jemez River and hiking at South Mountain, alternative 4 would develop a day-use area focused on views of the Valle Grande, interpretation of geology, and proximity to the adjacent day use area at Bandelier National Monument, which consists of a cross-country ski trail and hiking trail leading from the preserve boundary. An underpass would be developed to provide access below NM-4 for wildlife viewing and hiking. Interpretive trails and picnic areas would be developed south of NM-4, also emphasizing views of the Valle Grande. Like under alternatives 2 and 3A, NM-4 would be modified to include acceleration and deceleration lanes. The VCT would work with NMDOT on these changes during design and implementation. Also like alternative 3A, under this alternative a shuttle system would serve as the primary mode of access into the preserve.

Short-term impacts would be negligible and adverse, as described for alternative 2.

Visitors would use an estimated 4.4 million gallons of water each year. This alternative would also have potential long-term impacts by reducing available water for local wetlands and streams.

Long-term water resource impacts from this alternative would be less than those under alternative 3A, because the access road to NM-4 would be substantially shorter. Up to 1.8 acres of wetlands would be directly affected by the construction of the access road and facilities. Up to 504 feet at one stream crossing potentially could be affected. However, in accordance with federal policies and regulations, the VCT would avoid impacts on streams and wetlands to the greatest extent practicable and would fully mitigate unavoidable impacts. Also, the location of this alternative would avoid any impacts on the mapped floodplains associated with the East Fork of the Jemez River.

Water use requirements would be the same for alternative 4A as for alternative 3A. However, this site poses many obstacles to securing a viable water source. There is a spring with unknown production volume approximately 1 mile to the northeast, north of NM-4, which would require pumping water through part of the Valle Grande. Establishing this water source could result in direct impacts on wetlands and wet meadows in the Valle Grande. This alternative would also have potential long-term impacts by reducing available water for local wetlands and streams.

In summary, the implementation of alternative 4A would create impacts that would be measurable and may influence the structure, composition, or function of the preserve's water resources. Therefore, impacts on water resources would be moderate and adverse in the long term.

Programmatic Level

Programmatic-level impacts under alternative 4A would be similar to those under alternative 3A.

Programmatic-level impacts on water resources would be similar to those described under alternative 3A, with substantial increases in human activity in other areas of the preserve and further undefined permanent impacts due to road upgrades, the construction of parking lots and shuttle bus stops, and other ancillary actions. Alternative 4A would follow the same Level 4 shuttle route as alternative 3A. Therefore, short-term impacts at the programmatic level would be anticipated to be minor and adverse, depending on the actual level of visitor use and the specific location of additional facilities. Long-term impacts would also be anticipated to be minor and adverse due to potential measurable but unsubstantial impacts on floodplains and water quality in impaired streams.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 4A as well. When the long-term minor to moderate adverse impacts expected under alternative 4A are combined with the overall beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be minor.

Alternative 4B: Vista del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: minor and adverse
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

Implementation-level impacts under alternative 4B would be similar to alternative 4A. Programmatic-level impacts would be similar to alternative 3B.

Alternative 4B would differ from alternative 4A in that visitors would access the preserve using personal vehicles rather than shuttle buses. Although the parking area at the visitor center would be smaller than under alternative 4A, larger parking areas would be developed at recreation areas throughout the preserve to accommodate personal vehicles at those locations. These differences would result in little measurable change to water resources compared to alternative 4A. Negligible adverse short-term impacts and moderate adverse long-term impacts would be anticipated for the reasons described for alternative 4A.

Programmatic Level

Similar to the reasons described for alternative 3B, alternative 4B would have potential minor adverse impacts on water resources in the short term and long term.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 4B as well. When the long-term minor to moderate adverse impacts expected under alternative 4B are combined with the overall beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be minor and adverse.

Natural Sounds

Guiding Regulations and Policies

No guiding regulations or policies exist for the preserve or the national forest system specifically regarding the protection of natural sounds. The Valles Caldera Preservation Act (July 25, 2000) provides general guidance:

> *The purposes of the preserve, as defined by the Valles Caldera National Preservation Act of 2000, include protecting and preserving its natural values. The preserve's natural sounds contribute to its natural values, and can be altered by human-generated noise.*

Methodology for Analyzing Impacts

Based on the guidance above, this analysis considers both the natural acoustic environment and the effects of noise impacts on people experiencing that environment. Noise impacts on wildlife are assessed under the "Fish and Wildlife" and "Special-status Species" sections.

Impacts on Natural Sounds

The preserve's natural sounds would be affected by noise generated through increased visitation and public access to more areas of the preserve. Noise sources resulting from the implementation of the alternatives would include people's voices, personal vehicles, shuttles, and sounds associated with specific recreational activities, such as camping and hunting. Visitors to public lands may use transportation systems and visitor centers, and may engage in recreational activities, hunting, cultural events, and many other activities. These activities are often found to be appropriate even though they generate elevated sound levels. However, when activities (inside or outside public lands) generate excessive levels of noise, they can jeopardize the natural sounds resource and/or the purposes for which the area was created (NPS 2004). Therefore:

- This analysis determines the appropriateness of the impacts from the proposed actions based on the type of activity provided/expected, even if sound levels are elevated.
- This analysis determines whether elevated sound levels would be excessive and whether the natural sounds resource would be jeopardized. Excessive sound levels would interfere with the ability to experience natural sounds; natural sounds would be jeopardized if they were in danger of being eliminated from the affected area.

Impacts on Visitors

Direction for analyzing noise impacts on recreationists is provided by the USFS and USEPA document *Predicting Impact of Noise on Recreationists* (1980). Two human characteristics affect the impact of sound on the listener: knowledge of the source's presence and attitude toward the source. If a listener has previous knowledge that the source will be emitting sounds, detection is more likely than if the source is unexpected. The attitude of the listener—whether the sound is considered appropriate or inappropriate—is largely controlled by the listener's activity (USFS and USEPA 1980).

Predicting Impact of Noise on Recreationists (USFS and USEPA 1980) was used to the extent possible to help define the methodology for analyzing impacts on visitors, as follows:

1. Determine the opportunity type for actions proposed under the alternatives as defined in chapter 3 (modern, semi-modern, etc.).
2. Identify potential locations of sound sources and listener locations for each alternative.
3. Determine the detectability of sounds at the locations identified in step 2 based on distance from the source and location setting (e.g., vegetation type such as conifer, broadleaf, brush, grass; presence of dense stands of trees; prevailing weather patterns; presence of barriers or slopes; terrain characteristics).
4. Determine whether the detectability of the sound sources exceed the definition of the opportunity type.
   - If no, acceptable impacts would occur. Impacts would be appropriate even if sound levels are elevated.
   - If yes, adverse impacts would occur. The intensity of the impact is determined based on the duration of the sound, repetitiveness of the sound, and temporal aspect of the sound (e.g., day or night).

Because no acoustic monitoring data exists for the preserve to establish a baseline condition from which changes could be estimated, a qualitative analysis was used to assess impacts. Expected noise levels and sound propagation effects (as described in chapter 3) were estimated at various locations in the preserve to analyze impacts.

Alternative 1: No Action

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: none Long term: beneficial
Cumulative	Actions listed in table 4-1	Minor to moderate and adverse

Direct/Indirect Impacts

Implementation Level

Alternative 1 would result in beneficial impacts on the preserve's natural sounds due to the removal of existing structures and the cessation of sounds made by visitors and VCT staff using them.

This alternative would result in the removal of the Valle Grande and Banco Bonito Staging Areas and the elimination of the interim recreation program. The VCT would phase out current access through these staging areas, and as well as interim programs and activities. Slight temporary impacts would be expected from deconstruction activities related to the removal of existing temporary structures, resulting in negligible adverse short-term impacts. The long-term result would be a beneficial impact on the preserve's natural sounds due to the removal of existing structures and the cessation of sounds made by visitors and VCT staff using them. No additional structures or facilities would be built, with no associated noise impacts from visitor use and recreation.

Programmatic Level

No short-term construction-related impacts would occur at the programmatic level. Long-term beneficial impacts would result from the elimination of the interim recreation program, which would decrease visitation and the associated sounds made by visitors and recreation activities.

Access for grazing or other land management activities would continue, consistent with the decisions and environmental documents guiding those specific actions. Sounds associated with these activities would continue as under current conditions. Therefore, there would be no change to the preserve's sounds compared to existing conditions.

Cumulative Impacts

Actions and activities that would affect natural sounds include those listed on table 4-1 for natural sounds. Adverse impacts include previous road development in the Santa Fe National Forest and in the preserve, which allows for continued and future use by motor vehicles, including possible illegal all-terrain vehicle use. Current and future actions in the Santa Fe National Forest, such as new oil and gas drilling, would increase noise impacts. All actions planned by the preserve and local agencies for fire management, restoration, and other operations and maintenance activities (e.g., those defined under the Collaborative Forest Landscape Restoration project [USFS and VCT 2010]) would result in noise from vehicles, equipment operation, and employees talking and working. Slight beneficial impacts could result from the Santa Fe National Forest travel management plan (USFS 2011d), which would prohibit cross-country motorized travel outside the designated road system, thus concentrating noise impacts along official travelways rather than dispersing them throughout the forest. The VCT plans to close or decommission approximately 1,000 miles of road in the preserve over the next 10 years, which will restrict the amount of future road use.

Other actions taken and planned by local and regional agencies to increase tourism and recreational services in the area, such as those defined in the Jemez National Recreation Area management plan (USFS n.d.a), would increase noise impacts.

Efforts to encourage new industrial and commercial business development in the area could increase the local population, in addition to general population increases expected in the future. This would result in more traffic noise on NM-4 and increased visitation to the area, with associated noise impacts. Traffic on NM-4 is currently impacted by recreational facilities in the area. Plans to improve NM-4 may result in more use of the road.

Overall, other past, present, and future actions in the preserve and the surrounding area would be measurable and could influence noise levels by increasing them in some areas. In other areas, changes would be measurable but would not alter the structure, composition, or function of the ambient sounds. The changes would be limited in context. Therefore, these other actions would have minor to moderate adverse impacts.

When the long-term beneficial impacts expected under the no-action alternative are combined with the overall minor to moderate adverse impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would remain minor to moderate and adverse. The beneficial impacts of the no-action alternative would not substantially reduce the combined effects of the other actions.

Alternative 2: Banco Bonito Visitor Contact Station

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: moderate and adverse
Cumulative	Actions listed in table 4-1	Moderate and adverse

Direct/Indirect Impacts

Implementation Level

Noise generated at the alternative 2 visitor contact station would be somewhat absorbed by the vegetation that surrounds the site.

Under alternative 2, the existing Banco Bonito Staging Area would be removed and new development would occur. The removal of the existing facilities would result in short-term noise impacts from deconstruction activities. Constructing the new visitor contact station, day-use facilities, roads, recreational facilities, and parking lots would also result in short-term noise impacts. However, these short-term impacts would only affect visitors to the area who participate in the current interim recreation programs, and these programs would be limited or restricted from the area during deconstruction and construction. Noise detectability would be slight. Therefore, short-term impacts would be negligible and adverse and would result primarily from the construction on NM-4 to add acceleration and deceleration lanes, which would primarily affect highway drivers and would therefore be a localized impact of limited duration. (Noise impacts on wildlife are addressed under the "Fish and Wildlife" section.)

Potential locations of sound sources under alternative 2 include NM-4, the visitor contact station and associated recreational facilities, and the stretch of road (VC02) from the visitor contact station to the headquarters area, which would become a Level 4 road (see figure 2-4 in chapter 2). Because visitation would be expected to reach 50,000 per year and a large percentage of visitors would be expected to use this area to recreate, gather information, or further access the preserve via personal vehicle, noise levels would be increased substantially over existing conditions due to increased noise sources. This would result in a moderate impact to the natural sounds compared to existing conditions.

Noise from traffic on NM-4 from increased use of the highway as visitors enter and leave the preserve would be detectable to highway users. Visitors at the visitor contact station may be exposed to highway noise, although traffic noise may not be noticeable more than 500 feet from heavily traveled highways and would be absorbed to a certain extent by surrounding vegetation. Noise at the visitor contact station would be concentrated due to the proximity of visitors in the area. Noise from visitors driving to, parking at, and entering/exiting the visitor contact station would be detectable to other visitors, as would noise from visitors using the co-located day-use facilities, such as picnic areas. These sounds would be frequent and continuous (of long duration) and most prominent during the daytime at peak visitation. Because visitation would be expected to reach 50,000 per year and the majority of visitors would be expected to use this area to recreate, gather information, or further access the preserve during peak visitation, noise levels would be increased substantially over existing conditions. However, such sounds would be expected by visitors and deemed appropriate for the setting.

Noise generated at the visitor contact station would be somewhat absorbed by the vegetation that surrounds the site, which consists of ponderosa pine and conifer forests. Although these forests have been thinned, they may be tall and dense enough to provide some measurable noise reduction. This would beneficially affect the preserve's natural sounds and visitors recreating in the vicinity of the visitor contact station.

Noise detectability would be less during daytime and warm summer months, because sound waves would bend upward toward cooler air. However, more visitors would generate noise during summer months when visitation is at its peak, thus negating the effect of seasonal temperature changes. When winds are highest during spring months, ambient noise levels (from rustling leaves and needles) would increase, helping reduce the effect of human-generated noise.

NM-4 would remain classified as a modern setting, as described in chapter 3. Although noise currently occurs at the existing Banco Bonito Staging Area, the activities described above would result in substantially elevated sound levels compared to existing conditions. The Banco Bonito Staging Area is currently classified as a semi-primitive setting. Under alternative 2, this classification would change to semi-modern due to increased loudness, repetition, and duration of noise. However, visitors would find the sounds acceptable and appropriate for the setting. The elevated sound levels would be measurable but not excessive for the setting

and would not jeopardize the preserve's natural sounds resource. The ability to detect natural sounds would remain. Noise would be localized and limited to designated use areas. For these reasons, long-term impacts on the preserve's natural sounds and visitors experiencing them would be minor and adverse.

Programmatic Level

Noise would be noticeable along the Level 3 roads from vehicular traffic under alternative 2, particularly along the shuttle loop due to use by shuttles and personal vehicles during peak visitation.

Impacts related to constructing the facilities proposed under this alternative, such as additional parking areas, picnic areas, and trailheads, would be short term, negligible, and adverse for the reasons described under "Implementation Level," above.

Actions proposed under alternative 2 would increase visitation substantially over existing conditions: approximately 50,000 visitors would be expected annually. In addition, visitors in 2010 accessed the preserve primarily using shuttles, while under alternative 2 visitors would access the preserve primarily using personal vehicles. Noise from visitors would occur where they recreate beyond the immediate vicinity of the visitor contact station. Locations of visitor-generated sound sources would include fishing access sites, trailheads, campgrounds, overlooks, picnic areas, and parking lots for up to 10 vehicles in backcountry areas accessed by Level 3 roads.

Visitors desiring to access more of the preserve would leave the visitor contact station and drive the Level 4 road and the Level 3 roads that lead from it. Most vehicular use and associated noise would likely occur on the Level 4 road. Level 1 and Level 2 roads would provide further access for visitors with appropriate vehicles, which would likely be a substantially lower number than those using the Level 3 and Level 4 roads. On high-use days (i.e., summer weekends and holidays), a shuttle would follow the Level 4 road to the headquarters area, making a counter-clockwise loop on Level 3 roads back to Banco Bonito.

Noise levels would increase over existing conditions at these locations. A new source of noise would be present at some locations; an increase over existing conditions would occur at others. Noise would be noticeable along the Level 3 roads from vehicular traffic, particularly along the shuttle loop due to use by both shuttles and personal vehicles during peak visitation.

Sound would dissipate across large valles, such as the Valle Grande and Valle San Antonio.

Sound would dissipate across large valles, such as the Valle Grande and Valle San Antonio, as sound waves spread over large areas with "soft" surfaces. The narrow valley through which the Alamo shuttle travels on VC03 would accentuate sounds through the area, which would increase with additional motor vehicle use. An increase in the number of hikers recreating in Alamo Canyon would also result in accentuated sound levels because sounds echo in canyons. Where vegetation is dense with evergreens, such as the loop trail on Cerros del Abrigo, the increase in sound from additional use could be reduced by up to 5 dBA; the amount of reduction would vary based on where logging, regrowth, and thinning have occurred. On trails such as the loop on Cerro Seco, such sound attenuation would be less because much of the trail travels through deciduous forests and low-growth meadows and shrublands.

Visitors hiking higher-altitude trails would experience sound wave refraction because wind speed generally increases with altitude. Noise would be more

pronounced for hikers upwind of a sound source due to the effects of "valley wind." When high-speed winds blow through the preserve, particularly during April, ambient background levels would increase along trails through forested areas due to the rustling of leaves and tree needles, masking some of the noise caused by increased visitation. During hot arid days, such as in July, more sound would be lost by atmospheric absorption than at other times of the year, which would slightly offset noise from increased use during this peak visitation month. Campers and backpackers would experience more sound at night, when the path of sound waves bends toward the earth. Although sound would be dissipated when traveling across the valles, sound waves would bend toward the ground during temperature inversions, making them more audible.

Access for grazing or other land management activities would continue, consistent with the decisions and environmental documents guiding those specific actions. Sounds associated with these activities would continue as under current conditions.

As noted in chapter 3, the programmatic-level activities and facilities currently fall within the primitive opportunity category. Under alternative 2, this would change to the semi-modern or semi-primitive category, depending on the activity. Some activities would remain categorized as primitive. Noise would increase throughout the preserve, being loudest where use is more concentrated (e.g., along transportation routes under the semi-modern category) and less loud where use is less concentrated (e.g., hiking trails through dense evergreen forests under the primitive category).

Most of the sounds described above would be of limited duration and repetition. The elevated sound levels would be measurable and would influence the preserve's natural sounds resource. For these reasons, long-term impacts on the preserve's natural sounds and visitors experiencing them would be moderate and adverse.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 2 as well. When the long-term minor to moderate adverse impacts expected under alternative 2 are combined with the overall minor to moderate adverse impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would increase to moderate and adverse.

Alternative 3A: Entrada del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor to moderate and adverse
Cumulative	Actions listed in table 4-1	Minor to moderate and adverse

Direct/Indirect Impacts

Implementation Level

Under alternative 3A, the existing Valle Grande Staging Area would be removed and new development would occur. The removal of the existing facilities would result in short-term noise impacts from deconstruction and construction activities, as described for alternative 2. Under alternative 3A, substantial construction work would occur on NM-4, and a new approach road would be constructed to the proposed visitor center. This short-term noise would affect highway drivers and visitors using the existing hiking trails east of the highway near Rabbit Mountain. Impacts would be measurable but limited in context and duration, resulting in a short-term minor adverse impact.

Under alternative 3A, electric shuttle buses would be eventually phased in, which would be quieter than conventional gasoline-powered vehicles.

Potential locations of sound sources under alternative 3A include NM-4 and the new access road, the visitor center and associated recreational facilities, and the upgraded Level 4 roads that would create a loop through the preserve to and from the headquarters area (see figure 2-7 in chapter 2). Most visitors would be required to leave their personal vehicles at the visitor center to access the majority of the preserve using shuttle buses. Electric shuttle buses would be eventually phased in, which would be quieter than conventional gasoline-powered vehicles. Visitors would be able to access the Banco Bonito Staging Area, which would continue to provide horseback riding and special events, using personal vehicles. Visitors would also be able to ride bicycles on the separate dedicated path that would follow the Level 4 loop road.

Noise from traffic on NM-4 from increased use of the highway as visitors enter and leave the visitor center would be detectable to highway users. People at the visitor center may be exposed to highway noise, although traffic noise may not be noticeable more than 500 feet from heavily traveled highways. Noise at the visitor center would be concentrated due to the proximity of visitors in the area. Noise from visitors driving to, parking at, and entering/exiting the visitor center would be detectable to other visitors, as would noise from visitors using the co-located day-use facilities, such as picnic areas. These sounds would be frequent and continuous (of long duration) and most prominent during the daytime at peak visitation. Noise from shuttle buses entering and leaving the area would also be detectable, although electric engines would eventually help reduce noise output. Because visitation would be expected to reach 120,000 per year and the majority of visitors would be expected to use this area to recreate, gather information, or take a shuttle bus during peak visitation to further explore the preserve, noise levels would be increased substantially over existing conditions. Such sounds would be expected by visitors and deemed appropriate for the location.

Noise detectability based on seasonal atmospheric changes would be similar to that described for alternative 2. However, in spite of the increased number of visitors, alternative 3A would have fewer motorized vehicles due to shuttle use and less resulting noise.

NM-4 would remain a modern setting as described in chapter 3. Although noise currently occurs at the existing Valle Grande Staging Area, the activities described above would result in substantially elevated sound levels compared to existing conditions. As noted in chapter 3, the Valle Grande Staging Area is currently classified as a semi-primitive setting. Under alternative 3A, the Entrada del Valle Visitor Center would be classified as semi-modern due to increased loudness, repetition, and duration of noise. The ability to detect natural sounds would be diminished. However, impacts on visitors would be acceptable and appropriate for the setting. The elevated sound levels would be measurable but not excessive for the setting and would not jeopardize the preserve's natural sounds resource. Sounds would be localized and limited to designated use areas. For these reasons, long-term impacts on natural sounds and visitors experiencing them would be moderate and adverse.

Programmatic Level

Noise would be noticeable along the Level 4 roads from shuttle traffic.

Short-term impacts related to deconstructing and constructing the facilities proposed under this alternative, such as additional parking areas, picnic areas, and trailheads, would be negligible and adverse for the reasons described under alternative 2.

Actions proposed under alternative 3A would increase visitation substantially over existing conditions: approximately 120,000 visitors would be expected annually. Noise from visitors would occur where they recreate beyond the immediate location of the visitor center. Locations of visitor-generated sound sources include fishing access sites, trailheads, campgrounds, overlooks, and picnic areas.

Noise levels would increase over existing conditions at these locations. A new source of noise would be present at some locations; an increase over existing conditions would occur at others. Noise would be noticeable along the Level 4 roads from shuttle traffic. The level of detectability would decrease after electric vehicles are phased in. Noise would be substantially less on Level 1-3 roads because the shuttles would not use these roads.

Changes to sound levels based on location and sound propagation effects would be as described for alternative 2 at the visitor center location, although substantially more visitors would be present. Access for grazing or other land management activities would continue, consistent with the decisions and environmental documents guiding those specific actions. Sounds associated with these activities would continue as under current conditions.

As noted in chapter 3, the programmatic-level activities and facilities currently fall within the primitive opportunity category. Under alternative 3A, this would change to the semi-modern or semi-primitive category. Some activities would remain categorized as primitive. Although noise would increase throughout the preserve as described for alternative 2, the use of shuttles would reduce the impacts on visitors to a level that would be acceptable and appropriate for the setting despite a large increase in visitation. The elevated sound levels would be measurable but not excessive for the setting and would not jeopardize the preserve's natural sounds

resource. Sounds would be localized and limited to designated use areas, such as campgrounds. For these reasons, long-term impacts on the preserve's natural sounds and visitors experiencing them would be minor to moderate and adverse.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3A as well. When the long-term minor to moderate adverse impacts expected under alternative 3A are combined with the overall minor to moderate adverse impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would increase but remain minor to moderate and adverse.

Alternative 3B: Entrada del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: moderate and adverse
Cumulative	Actions listed in table 4-1	Moderate and adverse

Direct/Indirect Impacts

Implementation Level

Alternative 3B would differ from alternative 3A in that visitors would access the preserve using personal vehicles rather than shuttle buses. The parking area at the visitor center would be smaller than under alternative 3A, and larger parking areas would be developed at recreation areas throughout the preserve to accommodate personal vehicles at those locations. This difference would not measurably change construction-related impacts as described for alternative 3A. Therefore, short-term impacts would be minor and adverse for alternative 3B.

Under alternative 3B, noise impacts would be similar to alternative 3A, although they may be higher due to more frequent motor vehicle traffic.

The transportation system would include the development of a Level 4 paved or gravel road. Frequent noise would result from visitors as they enter and exit the visitor center location via personal vehicle. However, visitors would not be required to stop at the visitor center (e.g., to take a mandatory shuttle). Therefore, not all visitors would be expected to access the visitor center and its associated recreation facilities. This would be particularly true after local visitors, who compose the majority of the preserve's visitors, make their first visit. These visitors would be less likely to return to the visitor center and more likely to drive directly to desired destinations farther inside the preserve. Noise impacts would be similar to those under alternative 3A, although they may be higher due to more frequent motor vehicle traffic. Changes would be measurable but would not alter the composition or function of the preserve's natural sounds. Changes would be localized to the vicinity of the visitor center. Elevated sound levels would not be excessive, and the

natural sounds resource would not be jeopardized. For these reasons, long-term impacts on the preserve's natural sounds and the visitors experiencing them would be moderate and adverse.

Programmatic Level

Far more motor vehicles would use the preserve's roads, and a wide variety of engine types would result in a mixture of noise levels. Motor noise would also vary based on driving style.

Impacts related to deconstructing and constructing the facilities proposed under this alternative, such as additional parking areas, picnic areas, and trailheads, would be negligible and adverse for the reasons described under alternative 2.

Programmatic-level impacts would occur as described for alternative 3A, but with greater effects due to a substantial increase in gasoline-powered motor vehicle use throughout the preserve. Far more motor vehicles would use the preserve's roads compared to existing conditions and would likely be double the amount predicted under alternative 2 as the visitor center location would attract passing motorists. A wide variety of engine types (motorcycles, diesel-powered trucks, hybrid electric cars, etc.) would result in a mixture of noise levels. Engine noise would also vary as drivers idle, make frequent stops, illegally speed, and restart engines, resulting in inconsistent motor vehicle noise. Large parking lots would be developed at specific locations to accommodate day use, resulting in noise concentrated at those areas. Changes would be measurable and would influence the natural sounds at the preserve. Because most visitors would drive the Level 4 roads, impacts would be primarily concentrated in those and other high-use areas, limiting the context of the change. Therefore, long-term impacts would be moderate and adverse.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3B as well. When the long-term moderate adverse impacts expected under alternative 3B are combined with the overall minor to moderate adverse impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would increase to moderate and adverse.

Alternative 4A: Vista del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: minor to moderate and adverse
Cumulative	Actions listed in table 4-1	Minor to moderate and adverse

Direct/Indirect Impacts

Implementation Level

Under alternative 4A, the existing Valle Grande Staging Area would be removed and new development would occur. The removal of the existing facilities would result in short-term noise impacts from deconstruction and construction activities, as described for alternative 2. Under alternative 4A, a new approach road would be constructed to the proposed visitor center, as well as an underpass below NM-4 for wildlife viewing and hiking. This short-term noise would affect highway drivers and visitors using the existing hiking trails in this area. Impacts would be measurable but limited in context and duration, resulting in a short-term minor adverse impact.

Potential locations of sound sources under alternative 4A include NM-4 and the new access road, the visitor center and associated recreational facilities, and the upgraded Level 4 roads that would create a loop through the preserve to and from the headquarters area (see figure 2-10 in chapter 2). Most visitors would be required to leave their personal vehicles at the visitor center to access the majority of the preserve with shuttle buses, and would be able to access the Banco Bonito Staging Area as described for alternative 3A. Visitors would also be able to ride bicycles on the path that would follow the Level 4 loop road. The location of this visitor center may cause more pass-through drivers on NM-4 to stop and inquire about the preserve and/or view the Valle Grande overlook, resulting in more noise impacts than a visitor center less accessible from the highway.

The detectability of sounds from traffic on NM-4 and the visitor center and associated facilities would be the same as described for alternative 3A. Noise detectability based on season would also be as described for alternative 3A.

Noise from the alternative 4A site would be concentrated outside the preserve's main landscape on the periphery of its boundary, south of NM-4.

Because visitation would be expected to reach 120,000 per year and the majority of visitors would be expected to use this area to recreate, gather information, or take a shuttle bus during peak visitation to further explore the preserve, noise levels would be increased substantially over existing conditions. Such sounds would be expected by visitors and deemed appropriate for the location. Noise levels would be increased substantially over existing conditions, as described for alternative 3A. However, noise from the visitor center and associated visitor facilities would be concentrated outside the preserve's main landscape on the periphery of its boundary, south of NM-4. Although this location would not result in reduced sound levels, they may be unnoticeable to visitors continuing their journey farther into the main area of the preserve due to long-distance sound wave loss.

NM-4 would remain a modern opportunity category as described in chapter 3. As noted in chapter 3, the Valle Grande Staging Area is currently classified as a semi-primitive setting. Under alternative 4A, the Vista del Valle visitor center would be classified as semi-modern due to increased loudness, repetition, and duration of noise. The ability to detect natural sounds would be diminished. However, impacts on visitors would be acceptable and appropriate for the setting. The elevated sound levels would be measurable but not excessive for the setting and would not jeopardize the preserve's natural sounds resource. Sounds would be localized and

limited to designated use areas. For these reasons, long-term impacts on the preserve's natural sounds and visitors experiencing them would be moderate and adverse.

Programmatic Level

Noise impacts at the programmatic level for alternative 4A would be similar to alternative 3A.

Impacts related to deconstructing and constructing the facilities proposed under this alternative, such as additional parking areas, picnic areas, and trailheads, would be negligible and adverse for the same reasons described under alternative 2.

Actions proposed under alternative 4A would increase visitation substantially over existing conditions: approximately 120,000 visitors would be expected annually. Noise from visitors would occur where they recreate beyond the immediate location of the visitor contact station. Locations of visitor-generated sound sources include fishing access sites, trailheads, campgrounds, overlooks, and picnic areas.

Noise levels would increase over existing conditions at these locations, as described for alternative 3A. Changes to sound levels based on location and sound propagation effects would also be as described for alternative 3A. Access for grazing or other land management activities would continue, consistent with the decisions and environmental documents guiding those specific actions. Sounds associated with these activities would continue as under current conditions.

As noted in chapter 3, the programmatic-level activities and facilities currently fall within the primitive opportunity category. Under alternative 4A, this would change to the semi-modern or semi-primitive opportunity category. Some activities would remain categorized as primitive. Although noise would increase throughout the preserve, as described for alternative 3A, impacts on visitors would be acceptable and appropriate for the setting despite a large increase in visitation. The elevated sound levels would be measurable but not excessive for the setting and would not jeopardize the preserve's natural sounds resource; sounds would be localized and of limited duration. For these reasons, long-term impacts on the preserve's natural sounds and visitors experiencing them would be minor to moderate and adverse.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 4A as well. When the long-term minor to moderate adverse impacts expected under alternative 4A are combined with the overall minor to moderate adverse impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would increase but remain minor to moderate and adverse.

Alternative 4B: Vista del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: moderate and adverse
Cumulative	Actions listed in table 4-1	Moderate and adverse

Direct/Indirect Impacts

Implementation Level

Implementation-level impacts under alternative 4B would be similar to alternative 4A. Programmatic-level impacts would be similar to alternative 3B.

Alternative 4B would differ from alternative 4A as described for alternative 3B compared to alternative 3A. Short-term construction impacts would be minor and adverse and long-term impacts would be moderate and adverse.

Programmatic Level

Impacts would be similar to those under alternative 3B because no substantial differences exist that would affect the preserve's natural sounds. Impacts would be negligible and adverse in the short term and moderate and adverse in the long term.

Cumulative Impacts

Because impacts under alternative 4B would be similar to those under alternative 4A, cumulative impacts would also be similar for the same reasons: moderate and adverse.

Cultural Resources

Guiding Regulations and Policies

The identification of cultural resources and federal agency responsibilities for them are addressed by a number of laws, regulations, executive orders, programmatic agreements, and other requirements. The following regulations and policies provide guidance for analyzing impacts on cultural resources.

- **National Historic Preservation Act of 1966, as amended** (16 USC 470), and its implementing regulations, Protection of Historic Properties (36 CFR 800), is the principal federal law addressing cultural resources. The NHPA compliance procedure for cultural resources is called the Section 106 process, which outlines the steps for identifying and evaluating historic properties, for assessing the effects of federal actions on historic properties, and for consulting to avoid, reduce, or minimize adverse effects.
- **American Indian Religious Freedom Act of 1978, as amended** (PL 95-431; 92 Stat. 469; 42 USC 1996), resolves that it is the policy of the United States to protect and preserve the inherent right of freedom of American Indians to believe, express, and exercise their traditional religions,

including access to religious sites, use and possession of sacred objects, and freedom to worship through ceremonial and traditional rites. The act is a specific expression of First Amendment guarantees of religious freedom and has no implementing regulations.

- **Archaeological Resources Protection Act of 1979, as amended** (PL 96-95; 93 Stat. 721; 16 USC 47O et seq.), provides for felony-level penalties for excavating, removing, damaging, altering, or defacing any archeological resource more than 100 years old on public or Indian lands, unless authorized by a permit. It prohibits the sale, purchase, exchange, transportation, receipt, or offering of any archeological resource obtained in violation of any regulation or permit under the act or under any federal, state, or local law. It is implemented by regulations at 43 CFR part 7.
- **Native American Graves Protection and Repatriation Act of 1990, as amended** (PL 101-601; 104 Stat. 3048; 25 USC 3001 et seq.), establishes rights of Indian Tribes and Native Hawaiian organizations to claim ownership of certain cultural items, including human remains, funerary objects, sacred objects, and objects of cultural patrimony. Permits for excavating or removing cultural items protected by the act require Native American consultation, as do discoveries of cultural items made during federal land use activities. The Secretary of the Interior's implementing regulations are at 43 CFR part 10.
- **Executive Order 13007, "Indian Sacred Sites"** (1996), directs each federal agency that manages federal lands to "(1) accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and (2) avoid adversely affecting the physical integrity of such sacred sites."
- **Executive Order 13175, "Consultation and Coordination with Indian Tribal Governments"** (2000), establishes standards for regular and meaningful consultation with tribal officials to strengthen the government-to-government relationships with Indian Tribes.
- ***NEPA Procedures of the Valles Caldera National Preserve*** (VCT 2003a) includes the following management principles:
  - Recognizing that the preserve imparts a rich sense of place and qualities not to be found anywhere else, we commit ourselves to the protection of its ecological, cultural, and aesthetic integrity;
  - Recognizing the unique heritage of northern New Mexico's traditional cultures, we will be a good neighbor to surrounding communities, striving to avoid negative impacts from preserve activities and to generate positive impacts;
  - Recognizing the religious significance of the preserve to Native Americans, the trust bears a special responsibility to accommodate the religious practices of nearby Tribes and Pueblos (VCT 2003a).
- **The Valles Caldera Preservation Act** (July 25, 2000) states that the preserve was established to protect and preserve its scientific, scenic,

geologic, watershed, fish, wildlife, historic, cultural, and recreational values, and to provide for multiple use and sustained yield of renewable resources:

- **Section 108(d) Management Program.** The trust shall develop a comprehensive program for the management of lands, resources, and facilities within the preserve…Such [a] program shall provide for the protection and preservation of the scientific, scenic, geologic, watershed, fish, wildlife, historic, cultural and recreational values of the preserve (Valles Caldera Preservation Act, Section 108[d]).
- **Section 108(f) Applicable Laws, Consultation with Tribes and Pueblos.** The trust is authorized and directed to cooperate and consult with Indian Tribes and Pueblos on management policies and practices for the preserve which may affect them. The trust is authorized to allow the use of lands within the preserve for religious and cultural uses by Native Americans and, in so doing, may set aside places and times of exclusive use consistent with the American Indian Religious Freedom Act (42 USC 1996 and other applicable statutes) (Valles Caldera Preservation Act, Section 108[f]).

- **Valles Caldera Trust, Tribal Access and Use Policy** (May 14, 2004) describes the VCT's policy and process for tribal access in the preserve for religious and cultural uses consistent with the American Indian Religious Freedom Act and other applicable statutes. The primary purpose of this policy is to ensure that Pueblos and Indian Tribes that have a cultural affiliation to the preserve have access to the preserve and to allow those Pueblos and Indian Tribes use of the lands in the preserve for cultural and religious practices. A Tribe or Pueblo is considered to be culturally affiliated with the preserve if it has historically exercised cultural and religious practices or has maintained religious or cultural sites in the preserve.
- **VCT Cultural Resources Compliance Process** (October 30, 2003) provides procedures for implementing Section 106 compliance of the NHPA.

Methodology for Analyzing Impacts

This impact analysis follows established procedures and stipulations outlined in regulations implementing Section 106 of the NHPA (36 CFR 800) and compliance procedures specific to the preserve. These include

1. identifying areas and types of resources that could be impacted
2. assessing information regarding historic properties in this area and conducting additional inventories and resource evaluations, as necessary
3. comparing the location of the impact area with locations of important cultural resources
4. identifying the extent and types of effects

5. assessing those effects according to procedures established in the Advisory Council on Historic Preservation's regulations
6. considering ways to avoid, reduce, or mitigate negative effects

The VCT will document the required site-specific Section 106 compliance for the selected alternative at the implementation and programmatic levels in accordance with the referenced procedures.

This methodology focuses on the types of activities proposed in the alternatives, as well as areas containing known or anticipated cultural resources that would be most likely to be impacted. Limits to current knowledge add uncertainty to the effects analysis of the alternatives. In general, unsurveyed areas are assumed to contain cultural resources that would meet the criteria for eligibility for listing on the NRHP and unevaluated resources are treated as potentially eligible for listing until evaluated.

Under the NHPA, cultural resources that are NRHP eligible are called historic properties. The Section 106 process does not require historic properties to be preserved but does ensure that the decisions of federal agencies concerning the treatment of these places result from meaningful consideration of cultural and historic values and the options available to protect the properties.

If the agency finds that historic properties are present, it proceeds to assess possible adverse effects. An adverse effect is found when an action may alter the characteristics of a historic property that qualify it for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, workmanship, feeling, or association. Adverse effects may include reasonably foreseeable effects caused by the action that may occur later in time, be farther removed in distance, or be cumulative.

The criteria of adverse effect also provide a general framework for determining the context and intensity of potential impacts on ethnographic resources or traditional cultural properties. The assessment of impacts involving traditional cultural properties or effects on traditional practices or resources also requires focused consultation with the affected group by the VCT.

Direct and indirect impacts on cultural resources and traditional cultural properties are described with the assumption that the VCT will complete the requirements under the NHPA for the chosen alternative and that adverse effects on historic properties would be resolved. Information is provided regarding the known historic properties in the vicinity of the implementation-level actions, but a determination of site-specific effects for NHPA compliance is not appropriate for consideration in this EIS. For programmatic-level activities, the risk of impacts is described in general and in comparison with baseline conditions. For programmatic decisions it is also assumed that the implementation of the preferred alternative would include site- and project-specific NHPA compliance and the resolution of adverse effects.

For cultural resources, the duration of an impact is usually not considered in assessing effects in terms of the NHPA. Cultural resources are basically

nonrenewable resources, and damage or destruction to cultural resource sites is generally permanent. Effects on some cultural resources, such as the alteration of historic structures, can sometimes be reversed; however, until that happens, the effect is ongoing and potentially adverse. In a programmatic analysis where actions may increase the risk of permanent impacts on resources that have not been identified, the duration of the actions that increase risk may be a factor that is relevant in a NEPA analysis.

The main focus of the effects analysis for cultural resources is the intensity in the context of NRHP eligibility and integrity. The significance of cultural resources often depends on their context in the larger landscape as much as their immediate physical features. Activities that occur beyond the physical boundaries of the cultural resource can affect the historic property if they impact the larger, landscape-level setting and context.

Mitigation generally includes the avoidance of adverse effects. Standard mitigation measures for unavoidable impacts are included in a programmatic agreement and compliance procedures. Examples may include data recovery excavations of archeological sites or detailed documentation of structures.

Alternative 1: No Action

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the footprint and vicinity of the temporary facilities	Beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Beneficial
Cumulative	Actions listed in table 4-1	Beneficial

Direct/Indirect Impacts

Implementation Level

Alternative 1 would result in the removal of the Valle Grande and Banco Bonito Staging Areas, which would result in a slight beneficial effect toward restoring the historic cultural landscape.

This alternative would result in removal of the Valle Grande and Banco Bonito Staging Areas and the elimination of the interim recreation programs and activities. Effects associated with the removal of temporary facilities and restoration of the facility sites would be negligible and costs associated with cultural resource compliance would be incurred. These actions would be conducted in the context of the established cultural resource compliance procedures described above (e.g., NHPA compliance) to avoid impacts on any cultural resources that may be present. The removal of the Valle Grande Staging Area would have a slight beneficial effect toward restoring the historic cultural landscape of the Valle Grande.

Programmatic Level

Long-term beneficial effects on cultural resources would result from the no-action alternative. No additional structures or facilities would be built to accommodate visitors, resulting in no potential for impacts on cultural resources associated with facility construction, use, or access. In general, access restrictions are beneficial to

the preservation of cultural resources. The previous status of the preserve as a private ranch probably helped protect cultural resources. Recreational visitation, human activity, and vehicle use can impact cultural resources through unauthorized collection of artifacts, vandalism, surface disturbance of features and artifacts, increased erosion, and disturbance of cultural uses. Continuing current recreational access restrictions and decreasing current levels of human activity while maintaining Pueblo and Tribal cultural access would be beneficial to preserving cultural resources in the long term.

Reduced visitation levels under alternative 1 would reduce opportunities for education and interpretation of the historic and cultural history of the preserve.

Reduced visitation and loss of casual access via the temporary visitor facilities and the overview van tour, however, would reduce opportunities for education and interpretation of the historic and cultural history of the preserve. The loss of these opportunities could reduce public understanding, support, and advocacy for historic preservation and cultural resource protection.

Effects from grazing and access for scientific study, cultural uses, or other land management activities would continue, consistent with current preserve decisions and cultural resource procedures. No change from existing conditions would be anticipated in the potential for impacts on cultural resources from these ongoing activities.

Cumulative Impacts

Actions and activities that would affect cultural resources include those listed in table 4-1. Prior to the federal acquisition of the preserve, the effects of past road building, logging, geothermal development, infrastructure development, and livestock and elk grazing impacted archeological resources through surface disturbance, erosion, unauthorized collection, and vandalism. Pueblo access for cultural uses was not formally authorized. Historically, similar impacts on cultural resources have occurred on nearby private and public lands.

The Las Conchas fire in 2011 burned substantial acreage both in the preserve and in the surrounding area. The fire burned at different intensities and durations, with resulting impacts on cultural resources in the burn area. The impacts on cultural resources likely included direct disturbance or loss of cultural resources through the destruction or modification of structures, features, artifacts, cultural use areas, and culturally modified trees. Organic materials and the information that can be obtained from their study are especially vulnerable to heat damage, but intense fire can damage stone as well. In areas where intense fire removed vegetation, sites were vulnerable to impacts from erosion and the increased visibility of cultural resources. The exposure of undiscovered resources may lead to documentation; however, the visibility of these sites could also lead to unauthorized collection and vandalism. Fire control, suppression, and remediation efforts involving ground-disturbing activities could also directly impact cultural resources by altering the spatial relationships between artifacts and features. Federal agencies executed plans to avoid impacts when possible from these activities.

Recent past and present planning efforts regionally have emphasized the protection and preservation of cultural resources, cultural landscapes, and Native American

religious sites and practices. The preserve is developing and implementing a cultural landscape approach that recognizes the multiple layers of historic uses of this land. Other efforts to restore land and habitats, address stream health, and reduce erosion are beneficial for preserving or enhancing traditional uses and retaining the integrity of archeological resources.

Future trends and actions in Sandoval and Rio Arriba Counties include more population growth and recreational demand, implementation of the forest travel management plan, and oil and gas development that will put pressure on and increase the risks of impacts on nonrenewable cultural resources. However, plans include more protective measures for cultural resources, such as restrictions on open cross-country motorized recreation and measures explicitly acknowledging the preservation of traditional cultural practices and avoidance of cultural resources.

The effects of past, present, and reasonably foreseeable future actions and events have impacted cultural resources, but the current and future trends are largely beneficial. The no-action alternative would continue actions that would preserve the integrity of cultural resources and cultural uses and practices. Continued access and use restrictions would exclude the resources on the preserve from some of the risk of impacts on cultural resources in the cumulative impact study area that are anticipated in the future from other uses. When the beneficial impacts anticipated under the no-action alternative are combined with the primarily beneficial impacts of past, present, and reasonably foreseeable future activities, cumulative impacts would be beneficial.

Alternative 2: Banco Bonito Visitor Contact Station

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area for the proposed contact station	Localized major adverse permanent impacts possible, but would be resolved through Section 106 process
Programmatic level: direct/indirect	Within the bounds of the study area	Localized major adverse permanent impacts possible, but would be resolved through Section 106 process
Cumulative	Actions listed in table 4-1	Minor adverse impacts

Direct/Indirect Impacts

Implementation Level

Under alternative 2, the existing Banco Bonito Staging Area would be removed. Construction on the site would include a small-scale visitor contact station, day-use facilities, a small parking area, and roads to provide access into the preserve for personal vehicles and/or shuttles. The shuttles would be available on high-use days to accommodate increased visitation. Nonmotorized access from the visitor contact station to the existing network of trails in the area would be generally open and unlimited, but no motorized off-road access would be permitted.

Under alternative 2, 13 archeological sites are on or near the proposed visitor contact station site (primarily agricultural features from early Pueblo peoples). Construction would disturb approximately 3 acres of land.

As described in chapter 3, cultural resource surveys to date have identified 13 archeological sites on or near the proposed visitor contact station site. Of these, 12 have been determined to be eligible for or recommended as eligible for listing in the NRHP (Civitello 2011). These sites are primarily agricultural features from the early Pueblo peoples. If this alternative is chosen, an area of potential effects (APE)[12] for the proposed visitor contact station, parking lots, picnic area and road improvements would need to be identified and the Section 106 process completed to assess the effects of the construction and use of the new visitor facilities and removal of the Banco Bonito Staging Area. Although surveys have been conducted at the alternative 2 site, additional inventory would be needed and additional site discovery is highly likely. This work would be conducted in compliance with the laws, regulations, agreements, and policies referenced above and would include required consultations. Because historic properties are present, adverse effects would be expected. The VCT would seek to avoid, reduce, or minimize adverse effects on historic properties and areas important to Native American communities. Minimization of adverse effect may be possible through selection of the access route, placement of the building, and/or location of trails at the contact station. Although there is potential for avoiding direct construction impacts on many of the known sites under this alternative, impacts on some historic properties would be expected.

Although the current use of the Banco Bonito Staging Area as a staging area attracts visitors, the construction and use of the new facilities would increase activity and visitation to the area. Cultural resources in the surrounding areas, especially those exposed on the surface or above ground, would be impacted by trampling, vandalism, unauthorized collection, or visual intrusion.

Changes would be measurable and would alter the structure, composition, or function of the cultural resource sites for the reasons described above. Therefore, localized major adverse permanent impacts on cultural resources would be likely. If adverse effects are identified, appropriate mitigation would be developed through the Section 106 process to resolve adverse effects.

Programmatic Level

Programmatic-level actions proposed under alternative 2 would increase visitation substantially and greatly facilitate access throughout the preserve compared to existing conditions. Recreational facilities would be developed to include fishing access, trailheads, overlooks, and picnic areas. The trail system would be enhanced preserve-wide. Pedestrian, equestrian, camping, and mountain biking access would be allowed with minimal restrictions. Visitors would be able to access the preserve on upgraded roads using personal vehicles.

[12] According to 36 CFR 800.16(d), "Protection of Historic Properties," the APE is "the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if such properties exist."

The construction and maintenance of fishing access points, trailheads, trails, overlooks, day use areas, parking lots, shuttle stops, and road improvements would include ground disturbance that could affect cultural resources, if present. Cultural resources may be associated with existing roads and facilities that may be further impacted by the proposed improvements and more intensive uses. Cultural deposits at such sites may still contain valuable information, even though the surface has been modified for many years. Recreation site development and use may expose artifacts, which could contribute to illegal collecting and excavation. Ongoing camping and picnicking activities could mix and disperse archeological remains, fragment botanical remains, and introduce modern material (such as charcoal and trash) to sites, compromising scientific information.

Increased visitation would increase the risk of disturbing cultural resources, especially those exposed on the surface or above ground.

Increased visitation, recreational use, and access can impact cultural resources through direct disturbance, soil compaction, altered surface water drainage, erosion, intrusions to setting, and unauthorized collection or vandalism. Artifacts, especially worked obsidian, are common and visible in the preserve and are more vulnerable to removal by visitors when access is dispersed. Unsupervised access increases the risk of other vandalism and inadvertent damage to sites and cultural features. The potential for impacts on cultural resources would increase as recreational use increases or is concentrated in areas near trails, roads, and other facilities. The effect of repeated uses or visits over time could also increase the intensity of impacts due to natural processes. Access to and use of areas for dispersed recreation may conflict with areas of spiritual and cultural importance to Native American communities.

As outlined in the "Cultural Resources" section in chapter 3, approximately 11 percent of the preserve has been inventoried at a compliance level (Civitello 2011). The surveys have typically been conducted in response to the needs of particular undertakings or projects on the preserve. The results of these surveys are not necessarily representative of the complete range of resources present and may not be a reliable indicator of the overall sensitivity for undiscovered resources on the preserve. As such there is no full accounting of the resources that may be impacted at the programmatic level. However, recorded historic properties are likely present in areas that would be affected by the proposed programmatic actions or would be more accessible to the public under this alternative than under current access restrictions. The same is true for unevaluated resources that may be eligible for listing on the NRHP. Unsurveyed areas may contain historic properties and places that may be culturally important to Native American communities.

Prior to the implementation of the programmatic-level components, the Section 106 process would be completed to assess the effects of implementing these undertakings. Additional inventory would be needed and additional site discovery is highly likely. This work would be conducted in compliance with the laws, regulations, agreements, and policies referenced above and would include required consultations. A programmatic agreement with procedures specific to the proposed public access and use actions could be developed. Because historic properties are likely present and could be impacted, adverse effects would be possible. The VCT

would seek to avoid, reduce, or minimize adverse effects on historic properties and areas important to Native American communities.

Changes would be measurable and would alter the structure, composition, or function of individual cultural resource sites for the reasons described above. Therefore, localized major adverse permanent impacts on cultural resources would be possible. If adverse effects are identified, appropriate mitigation would be developed through the Section 106 process to resolve adverse effects.

Cumulative Impacts

Alternative 2 would include all of the past, present, and reasonably foreseeable future actions and associated impacts described for alternative 1. In addition, implementing alternative 2 would be expected to result in more potential for impacts and risk of impacts on cultural resources than alternative 1. These additional impacts would include construction, visitor use, dispersed recreation, and increased access, and would be subject to further identification, evaluation, effects assessment, and measures to avoid, reduce, or minimize adverse effects. While there would be a risk of residual impacts, primarily from dispersed recreation, after the resolution of adverse effects overall cumulative impacts would be minor and adverse when combined with the primarily beneficial impacts of other past, present, and reasonably foreseeable future activities.

Alternative 3A: Entrada del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area for the proposed visitor center	Localized major adverse permanent impacts possible, but would be resolved through Section 106 process
Programmatic level: direct/indirect	Within the bounds of the study area	Localized major adverse permanent impacts possible, but would be resolved through Section 106 process
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

Under alternative 3A, 11 archeological sites are on or near the proposed visitor contact station site (lithic scatters and trash and livestock pens). Construction would disturb approximately 5-10 acres of land.

Alternative 3A would include the removal of the existing Valle Grande Staging Area and the development of a large full-service visitor center at a location closer to NM-4. Day-use facilities would include access to the East Fork of the Jemez River and South Mountain for hiking and fishing, as well as group staging and picnic areas. Access to other parts of the preserve would be primarily by shuttle, although personal vehicles would be allowed by permit.

As outlined in the "Cultural Resources" section of chapter 3, cultural resource surveys have been completed for the project area in the vicinity of the proposed visitor center. Eleven archeological sites are on or near the proposed visitor center site. Of these, 10 have been determined to be eligible for or recommended as

eligible for listing in the NRHP. These sites consist of lithic scatters and early to mid 20th century trash and livestock pens (Civitello 2011). If this alternative is chosen, the APE for the proposed visitor contact station, parking lots, access road, and other visitor amenities at the site would need to be refined and the Section 106 process completed to assess the effects of the construction and use of the new visitor facilities and the removal of the Valle Grande Staging Area. Although surveys have been conducted, additional inventory would be needed to implement alternative 3A, and additional site discovery is highly likely. This work would be conducted in compliance with the laws, regulations, agreements, and policies referenced above and would include required consultations. Because historic properties are present, adverse effects would be likely. The VCT would seek to avoid, reduce, or minimize adverse effects on historic properties and areas important to Native American communities. Some reduction of adverse effect may be possible through selection of the access road, placement of the building, and/or location of trails at the visitor center. Direct construction impacts on known sites may be likely under alternative 3A. Impacts on some historic properties would be unavoidable, which may require data recovery excavations and incur cost for cultural resources compliance.

Changes would be measurable and would alter the structure, composition, or function of individual cultural resource sites for the reasons described above. Therefore, localized major adverse permanent impacts on cultural resources would be likely. If adverse effects are identified, appropriate mitigation would be developed through the Section 106 process to resolve adverse effects.

Programmatic Level

Programmatic-level actions proposed under alternative 3A would increase visitation substantially over existing conditions by providing increased access and recreational opportunities throughout the preserve. These facilities would include the construction and maintenance of fishing access points, trailheads, expanded trails, overlooks, day-use areas, smaller parking lots, shuttle stops, road improvements, and additional points for nonmotorized access. The existing temporary visitor contact station at the Valle Grande Staging Area would be moved to the Banco Bonito Staging Area, which would continue to provide access for horseback riding and staging for special events. Primary visitor access beyond the visitor center, however, would be via shuttle bus, with limited personal vehicle access through a permit system.

The use of a shuttle system for visitors would allow more control over public access to sensitive cultural resources compared to allowing personal vehicle use.

Programmatic-level impacts would be similar to those described for alternative 2. The potential impacts from the construction of the facilities would be similar, but there would be more risk of impacts on cultural resources from more intensive use and visitation of developed areas and ancillary facilities. Increased visitation, recreational use, and access could impact cultural resources through direct disturbance, soil compaction, altered surface water drainage, erosion, intrusions to setting, and unauthorized collection or vandalism. The use of shuttles to access areas beyond the visitor center would reduce the potential for some impacts from dispersed recreation and personal vehicle use, but the projected increase in visitor

numbers would be substantial when compared with existing conditions. Fewer parking areas would need to be developed when using a shuttle system and there would be more control over public access to sensitive cultural resources. Resources in the vicinity of the shuttle stops would potentially be subject to more intensive impacts.

Prior to the implementation of the programmatic-level components, the Section 106 process would be completed to assess the effects of implementing these undertakings. Additional inventory would be needed and additional site discovery is highly likely. Because historic properties are likely present and could be impacted, adverse effects would be possible. The VCT would seek to avoid, reduce, or minimize adverse effects on historic properties and areas important to Native American communities.

Major localized adverse permanent impacts on cultural resources would be possible. If adverse effects are identified, appropriate mitigation would be developed through the Section 106 process to resolve adverse effects.

Cumulative Impacts

Alternative 3A would include all of the past, present, and reasonably foreseeable future actions and impacts described for alternative 1. In addition, implementing alternative 3A would be expected to result in more potential for impacts and risk of impacts on cultural resources than alternative 1. These impacts would be from construction, visitor use, dispersed recreation, and increased access, and would be subject to further identification, evaluation, effects assessment, and measures to avoid, reduce, or minimize adverse effects. While there would be a risk of residual impacts, primarily from dispersed recreation, after the resolution of adverse effects overall cumulative impacts would be minor and adverse when combined with the primarily beneficial impacts of other past, present, and reasonably foreseeable future activities.

Alternative 3B: Entrada del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area for the proposed visitor center	Localized major adverse permanent impacts possible, but would be resolved through Section 106 process
Programmatic level: direct/indirect	Within the bounds of the study area	Localized major adverse permanent impacts possible, but would be resolved through Section 106 process
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

The use of personal vehicles within the preserve could require a smaller footprint at the visitor center location, but would require larger parking areas and associated facilities throughout the preserve compared to alternatives that use a shuttle system.

Alternative 3B would differ from alternative 3A in that visitors would access the preserve using personal vehicles rather than shuttle buses. Implementation-level impacts would be the same as those under alternative 3A, although a smaller disturbance footprint at the visitor center may be possible because fewer cars are expected to be parked there. Impacts would be localized, major and adverse, but appropriate mitigation would be developed through the Section 106 process to resolve adverse effects.

Programmatic Level

The impacts on cultural resources from the construction and maintenance of new visitor facilities would be similar to those under alternative 3A. The use of personal vehicles to access areas beyond the visitor center and the large number of visitors would increase the risk of impacts on cultural resources under alternative 3B from dispersed recreation and vehicle use. Personal vehicle access requires the construction and use of parking and visitor facilities at locations throughout the preserve, including remote areas, as well as more road improvements and more unguided use of the preserve. Localized major adverse permanent impacts on cultural resources would be possible. If adverse effects are identified, appropriate mitigation would be developed through the Section 106 process to resolve them.

Cumulative Impacts

Cumulative impacts under this alternative would be the same as those under alternative 3A: minor and adverse.

Alternative 4A: Vista del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area for the proposed visitor center	Localized, major adverse permanent impacts possible, but would be resolved through Section 106 process
Programmatic level: direct/indirect	Within the bounds of the study area	Localized, major adverse permanent impacts possible, but would be resolved through Section 106 process
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

Under alternative 4A, 11 archeological sites are on or near the proposed visitor contact station site (lithic scatters and ceramic pottery pieces). Construction would disturb approximately 5-10 acres of land.

Alternative 4A would include the development of a full-service visitor center south of NM-4 below Rabbit Mountain with similar amenities and facilities as those proposed under alternative 3A. Alternative 4A would focus on views of the Valle Grande, interpretation of geology, and proximity to adjacent existing day-use opportunities at Bandelier National Monument. The location of this visitor center may make it more visible and accessible from NM-4.

As outlined in the "Cultural Resources" section of chapter 3, seven cultural resource surveys have been conducted near the project area. Eleven archeological sites are on or near the proposed visitor center site. All 11 have been determined to be eligible for or recommended as eligible for listing in the NRHP. These sites consist of lithic scatters as well as ceramic pottery pieces not usually found at higher elevations (Civitello 2011). If this alternative is chosen, the APE for the proposed visitor center, parking lots, access, underpass, and other visitor amenities at the site would need to be refined and the Section 106 process completed to assess the integrity of the sites and the effects of the construction and use of the new visitor facilities and the removal of the Valle Grande Staging Area. This work would be conducted in compliance with the laws, regulations, agreements, and policies referenced above and would include required consultations. Because historic properties are present, adverse effects would be likely. The VCT would seek to avoid, reduce, or minimize adverse effects on historic properties and areas important to Native American communities. Some reduction of adverse effect may be possible through selection of the access route, placement of the building, and/or location of trails at the visitor center. Direct construction impacts on known cultural sites may occur at the alternative 4 location. Impacts on some historic properties would be unavoidable that would likely require data recovery excavations and incur cost for cultural resources compliance.

Changes would be measurable and would alter the structure, composition, or function of the preserve's cultural resources for the reasons described above. Therefore, localized major adverse permanent impacts on cultural resources would be likely. If adverse effects are identified, appropriate mitigation would be developed through the Section 106 process to resolve adverse effects.

Programmatic Level

Programmatic-level impacts under alternative 4A would be similar to alternative 3A.

The programmatic-level components and the estimated visitation under alternative 4A would be the same as those under alternative 3A, with similar impacts. The construction and maintenance of fishing access points, trailheads, trails, overlooks, day-use areas, parking lots, shuttle stops, and road improvements would include ground disturbance and could impact cultural resources, if present. Recreational use and access could impact cultural resources through direct disturbance, soil compaction, altered surface water drainage, erosion, intrusions to setting, and unauthorized collection or vandalism. The use of shuttles to access areas beyond the visitor center would reduce the potential for some impacts from dispersed

recreation and vehicle use, but the projected increase in visitor numbers would be substantial. Fewer parking areas would need to be developed when using a shuttle system and there would be more control over public access to sensitive cultural resources. Resources in the vicinity of the shuttle stops would potentially be subject to more intensive impacts.

Prior to the implementation of the programmatic-level components, the Section 106 process would be completed to assess the effects of implementing these actions. Additional inventory would be needed and additional site discovery is highly likely. Because historic properties are likely present and could be impacted, adverse effects would be possible. The VCT would seek to avoid, reduce, or minimize adverse effects on historic properties and areas important to Native American communities.

Localized, major adverse permanent impacts on cultural resources would be possible. If adverse effects are identified, appropriate mitigation would be developed through the Section 106 process to resolve them.

Cumulative Impacts

Alternative 4A would include all of the past, present, and reasonably foreseeable future actions and impacts described for alternative 1, although implementing alternative 4A would be expected to result in more potential for impacts and risk of impacts on cultural resources than under alternative 1. These additional impacts would be from construction, visitor use, dispersed recreation, and increased access. These actions would be subject to further identification, evaluation, effects assessment, and measures to avoid, reduce, or minimize adverse effects. The integrity of most sites was not likely compromised when the Las Conchas fire burned through the area in 2011 due to their presence in areas of low burn severity and outside areas of high post-fire geomorphic change. Although surveys have been conducted at the alternative 4 location, additional inventory would be needed and additional site discovery is highly likely. While there would be a risk of residual impacts, primarily from dispersed recreation, after the resolution of adverse effects overall cumulative impacts would be minor and adverse when combined with the primarily beneficial impacts of other past, present, and reasonably foreseeable future activities.

Alternative 4B: Vista del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area for the proposed visitor center	Localized major adverse permanent impacts possible, but would be resolved through Section 106 process
Programmatic level: direct/indirect	Within the bounds of the study area	Localized major adverse permanent impacts possible, but would be resolved through Section 106 process
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

Alternative 4B would have similar impacts as alternative 4A, but potentially higher disturbance of sites within the preserve due to the use of personal vehicles instead of shuttles.

Like alternative 3B compared to alternative 3A, alternative 4B would differ from alternative 4A in that visitors would access the preserve using personal vehicles rather than shuttle buses. Implementation-level impacts would be the same as those under alternative 4A, although a smaller disturbance footprint at the visitor center would be required for parking. Localized impacts would be major and adverse, but appropriate mitigation would be developed through the Section 106 process to resolve adverse effects.

Programmatic Level

The impacts on cultural resources from the construction and maintenance of new visitor facilities would be similar to those under alternative 4A. The use of personal vehicles to access areas beyond the visitor center and the large number of visitors would increase the risk of impacts on cultural resources under alternative 4B from dispersed recreation and vehicle use. Personal vehicle access would require the construction and use of parking and visitor facilities at more locations including remote areas, more road improvements, and more unguided use of the preserve. Localized, major adverse permanent impacts on cultural resources would be possible. If adverse effects are identified, appropriate mitigation would be developed through the Section 106 process to resolve adverse effects.

Cumulative Impacts

Cumulative impacts under this alternative would be the same as those under alternative 4A: minor and adverse.

Socioeconomics

Guiding Regulations and Policies

The following regulations and policies provide guidance for analyzing socioeconomic impacts. Although FSM direction does not apply to the VCT, it is helpful to review and adopt applicable objectives and policies.

- **The Valles Caldera Preservation Act** (July 25, 2000): The preserve was established to protect and preserve its scientific, scenic, geologic, watershed, fish, wildlife, historic, cultural, and recreational values, and to provide for multiple use and sustained yield of renewable resources:
  - **Section 108(d) Management Program:** The trust shall develop a comprehensive program for the management of lands, resources, and facilities within the preserve… Such [a] program shall provide for (4) public use of and access to the preserve for recreation; (5) renewable resource utilization and management alternatives that, to the extent practicable (A) benefit local communities and small businesses (Valles Caldera Preservation Act, Section 108[d]).

- **The National Environmental Policy Act of 1969:** This act requires the use of natural and social sciences in planning and decision making to fulfill the social, economic, and other requirements of present and future generations of Americans.
- **NEPA Procedures of the Valles Caldera National Preserve:** The term "Human Environment" shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment… When an environmental impact statement is prepared and economic or social and natural or physical environmental effects are interrelated, then the environmental impact statement will discuss all of these effects on the human environment (VCT 2003a).
- **Multiple Use Sustained Yield Act of 1960:** This act sets forth guiding principles for managing the resources of the national forest system. The direction to manage these resources for the greatest good over time necessitates the use of economic and social analysis in determining management of the national forest system.
- **FSH 1909.15—National Environmental Policy Act Handbook Chapter 10—Environmental Analysis** (USFS 2011a): When social or economic impacts are important to a reasoned decision, follow the direction in FSM 1970 and FSH 1909.17.
- **FSM 1900—Planning Chapter 1970—Economic and Social Evaluation:** FSM 1970 directs that economic and social analyses be conducted to aid decision making (FSM 2008d):
  - **Section 1972—Economic Impact Evaluation:** Economic impact evaluations must identify the geographic area of concern, timeframe, and the affected industries within the scope of the plan, project, or program. Impacts in the affected economy may be indicated by one or more of the following measures: (1) employment, (2) income, and (3) revenues contributed to state and local governments.
  - **Section 1973—Social Analysis:** Mandates social impact analysis if potential social effects of agency policies or actions are important to the decision. Social impact analysis must identify the geographic area of concern, timeframe, and the affected population or communities within the scope of the plan, project, or program. The range of appropriate information methods for social analysis information collection and analysis includes: (1) information inquiry and/or formal scoping of public attitudes, beliefs, and values; (2) synthesis of media reports and other secondary data; (3) primary data collection.
- **FSH 1909.17—Economic and Social Analysis Handbook:** Discusses how the policies and guidelines set forth in *FSM 1970 Economic and Social Analysis* should be used in the evaluation of the economic and social effects of policies, programs, plans, and projects. Directs the agency to initiate social impact analysis when preliminary scoping determines that important

social effects could result. The analysis should describe (1) the variety and intensity of possible social effects, (2) the location of affected populations, (3) the interrelationships between social and other factors, and (4) whether it is possible to mitigate adverse effects that could occur (USFS n.d.b).

Methodology for Analyzing Impacts

The methodology for determining impacts on socioeconomics is based on the guidance above. The geographic area of concern and the affected industries, population, or communities are identified in chapter 3, "Affected Environment." This analysis involves identifying and assessing both economic and social impacts:

- economic impacts
  - causal relationships between the proposed actions and economic environments
  - changes to employment, income, and revenues that may be contributed to state and local governments
- social impacts
  - changes to social systems/organizations; public attitudes, beliefs, and values; lifestyle; and demographics

Alternative 1: No Action

Summary

Effect	Context	Impact Type	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Economic	Short/long term: negligible
		Social	Short/long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Economic	Short/long term: minor to moderate and adverse
		Social	Short/long term: moderate and adverse
Cumulative	Actions listed in table 4-1	Economic/social	Beneficial

The removal of the staging areas and elimination of interim recreation programs and activities under alternative 1 would have minimal social or economic impacts.

Direct/Indirect Impacts

Implementation Level

Alternative 1 would result in the removal of the Valle Grande and Banco Bonito Staging Areas and the elimination of the interim recreation programs and activities. No additional structures or facilities would be built to accommodate visitors, resulting in no short-term construction impacts. Negligible impacts on the local economy or social settings would result from the removal of the staging areas compared to existing conditions.

Programmatic Level

Visitation under alternative 1 would decrease compared to existing conditions, resulting in fewer tourist revenues and related jobs for the local community.

The VCT would phase out current access through the staging areas, as well as interim programs and activities. Visitation would decrease considerably under this alternative compared to existing conditions. The result would be an adverse impact on local economies, including state and local governments, from decreased visitor spending on food, lodging, and other services in the area. Impacts would be measurable but would not be expected to alter employment or income in the area. Overall short- and long-term impacts on the local economy would be minor and adverse.

The preserve would experience decreased revenue generation from a drastic reduction in visitation. Economic impacts on the preserve would be measurable and would influence its capacity for revenue generation. Short- and long-term impacts on the preserve's economy would be moderate and adverse.

Public attitudes and beliefs that access to the preserve is too restricted would be intensified under the no-action alternative.

As mentioned in chapter 3, the public holds strong attitudes, beliefs, and values toward the preserve, particularly regarding access. Slightly more than half (52.2 percent) of survey respondents believe that public access to the preserve is neither adequate nor satisfactory. Approximately 77 percent and 41 percent of respondents believe that limited access and limited activities, respectively, have prevented them from participating in activities in the preserve. Public attitudes and beliefs that access to the preserve is too restricted would be intensified under the no-action alternative. Such lack of access may galvanize social organizations to expand and further push for management changes to the preserve. The lifestyle of current and prospective visitors would not change, but they would not be able to experience the preserve. Therefore, changes to social systems or organizations, and public attitudes and beliefs, would occur. Short- and long-term social impacts would be moderate and adverse because changes would be measurable and would influence social conditions associated with the preserve. No changes to demographics are expected.

Access for grazing or other land management activities would continue, consistent with the decisions and environmental documents guiding those specific actions. No measurable economic or social change would be expected as a result of the continuance of these programs compared to existing conditions.

Cumulative Impacts

Actions and activities that would affect this resource include those listed in table 4-1 for socioeconomics. Commercial activities that occurred on the preserve and/or adjacent USFS lands include oil and gas leasing and timber harvesting, which may have economically benefited local and state economies through direct employment, tax revenue, and sales of resources. Oil and gas leasing and timber sales continue to occur, and will occur into the future, on USFS lands in the area. A slight economic benefit has been and will continue to be provided to local ranchers who graze cattle on preserve lands. According to the VCT, grazing on preserve lands has social as well as economic impacts, in that it may increase the local cattle ranchers' traditional values and connections to the land (VCT 2009b).

The Las Conchas fire that burned much of Bandelier National Monument and the eastern third of the preserve during the summer of 2011 resulted in both areas being temporarily closed to visitors. Although both have reopened, it is possible that visitors may avoid the region for some time if they believe that the damage would degrade their experience. As time passes, more visitors would be expected to return.

Past, present, and future actions to enhance or improve recreational facilities and increase tourism have brought, and will continue to bring, more visitors to the area, with associated spending on food, lodging, and other local services. Local actions to develop industrial and commercial businesses in the area would beneficially affect local economies as well. Population increases and anticipated future growth and development would add another economic benefit.

Overall, other past, present, and future actions in the preserve and the surrounding area would be measurable, with beneficial impacts that have influenced and would continue to influence local and, to a lesser extent, state economies and social systems.

When the negligible economic and minor to moderate social impacts expected under the no-action alternative are combined with the overall beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would remain beneficial. The impacts of the no-action alternative would not substantially alter the combined effects of the other actions, primarily the planned future actions to develop business and tourism in the local area.

Alternative 2: Banco Bonito Visitor Contact Station

Summary

Effect	Context	Impact Type	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Economic/social	Short/long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Economic/social	Short/long term: beneficial
Cumulative	Actions listed in table 4-1	Economic/social	Beneficial

Direct/Indirect Impacts

Implementation Level

Under alternative 2, the existing Banco Bonito Staging Area would be removed and new development would occur. A small-scale visitor contact station would be developed (up to 5,000 square feet), with associated day-use facilities, a small parking area, and roads to provide access to the preserve for personal vehicles and/or shuttles, which would be used on high-use days to accommodate increased visitation. Nonmotorized access from the visitor contact station to the existing network of trails in the area would be generally open and unlimited. Short-term deconstruction and construction impacts may result in the purchase of local goods and employment of local workers. This beneficial impact would be slight.

Alternative 2 would bring approximately twice as many visitors to the preserve as existing conditions. Additional employees may be needed, resulting in local economic benefits.

The new visitor contact station and associated day-use facilities, such as picnic and group staging areas, would draw considerably more visitors to the preserve, and thus to the general area. The presence of these facilities would increase visitation, with associated spending locally on food, lodging, and other services (more detail is provided under "Programmatic Level" for this alternative). The VCT may need to hire additional employees to operate and maintain the visitor contact station, which would have a slight beneficial economic impact.

The presence of the visitor contact station and associated facilities proposed as part of the implementation-level actions would improve public attitudes and beliefs regarding access to the preserve, which would constitute a beneficial social impact. During public scoping for this EIS, many people expressed a desire for small-scale development on the preserve. Alternative 2 is a response to that request, and would beneficially affect public values through the small scale and the sustainable design concepts incorporated into the visitor contact station to protect and make wise use of resources. The small scale of alternative 2 would also minimize long-term commitments in operational and maintenance costs associated with larger facilities and infrastructure. Therefore, changes to social systems or organizations and public attitudes and beliefs would occur. Short- and long-term impacts would be beneficial. No measurable impacts on demographics would be expected.

Programmatic Level

Programmatic-level actions proposed under alternative 2 would increase visitation substantially over existing conditions by providing increased access and recreational opportunities throughout the preserve. The development of Level 4 roads, improvements to existing Level 3 roads, and the implementation of a shuttle system on high-use days would greatly facilitate access throughout the preserve compared to existing conditions.

Recreational facilities would be developed to include fishing access, trailheads, overlooks, and picnic areas. The trail system would be enhanced preserve-wide. Based on demand, pedestrian, equestrian, camping, and mountain biking access would be managed in space and time to reduce conflicts while minimizing controls and restrictions. Visitors would be able to access the preserve on upgraded roads using personal vehicles, and shuttles would be used when visitation is high to continue to provide access. As a result, approximately 50,000 visitors would be expected annually under this alternative.

Local economic benefits would include increased spending on food, lodging, and other services.

As noted in chapter 3, the average total trip spending per party at Santa Fe National Forest is $320 (more than half are day trips). An increase to 50,000 visitors in the area would beneficially affect local economies, particularly in the long term, through spending on food, lodging, and other services. The preserve would continue to provide group lodging at Casa de Baca Lodge and the bunkhouse as under existing conditions, but no additional room rental or lodging would be provided. Local and state governments would benefit from increased revenue generated from sales taxes. Employment could increase somewhat if new hires are added to existing establishments, and/or if new goods and services providers move to the area as a result of increased visitation. The VCT would need to purchase or lease shuttle

vehicles or hire a company to provide that service, which could have a slight beneficial economic impact. Income levels are not likely to rise because these types of jobs are not typically high paying.

The preserve would benefit economically in the short and long term from increased visitation through entrance fees and fees for special programs, if and when offered. As noted in chapter 3, 66 percent of survey respondents prefer quality recreational experiences over quantity, and 67.6 percent are willing to pay an increased fee for such experiences in the preserve. Commercial uses of the preserve, such as filming and photography activities, would not likely change.

Expanding access would support the public's interest in participating in recreational activities in the preserve, with limits to protect the preserve's resources.

As mentioned above, the public holds strong attitudes, beliefs, and values toward the preserve, particularly regarding access. Alternative 2 would increase access substantially compared to existing conditions. Limited access would no longer be a factor preventing people from participating in recreational activities in the preserve. Survey respondents also value resource protection; 80 percent indicate that recreational access should be limited, and 52.8 percent disagree that increased access is more important than possible negative environmental effects associated with it. Alternative 2 would beneficially affect these public values through seasonal access restrictions incorporated to protect resources. The lifestyle of current and prospective visitors would not change, but they would be able to experience the preserve to a much greater extent. Changes to social systems or organizations and public attitudes and beliefs would occur. Short- and long-term impacts would be beneficial. No measurable impacts on demographics would be expected.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 2 as well. When the beneficial impacts expected under alternative 2 are combined with the beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be beneficial.

Alternative 3A: Entrada del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Impact Type	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Economic/social	Short/long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Economic/social	Short/long term: beneficial
Cumulative	Actions listed in table 4-1	Economic/social	Beneficial

Direct/Indirect Impacts

Implementation Level

Development of the full-service visitor center under alternative 3A would provide greatly expanded opportunities for access, interpretation, and enjoyment of the preserve. Jobs would be generated to support these services.

The central feature of alternative 3A is the development of a full-service visitor center. A wide variety of visitor services and amenities would be offered from the visitor center, including a theater, exhibit halls, classroom space, retail and food service space, and indoor and outdoor observation decks. Associated day-use facilities would include access to the East Fork of the Jemez River and South Mountain for hiking and fishing, as well as group staging and picnic areas. The visitor center would be up to 10,000 square feet, accommodating substantially more visitors than the existing Valle Grande Staging Area, which would be removed. Short-term deconstruction and construction impacts may result in the purchase of local goods and employment of local workers. This beneficial impact would be slight.

The visitor center and associated day-use facilities could become a destination in itself due to the extent of its offerings, drawing people to the site even if they explore the preserve no further. These facilities would also appeal to people with limited mobility or time constraints by providing educational and interpretive opportunities in one easily accessible location. The VCT would need to hire additional employees or concessionaires for the visitor center, which would have a beneficial economic impact.

The presence of the visitor center and associated day-use facilities would improve public attitudes and beliefs regarding access to the preserve, which would constitute a beneficial social impact. The extent of the services provided by the visitor center, such as a theater, exhibit halls, and classrooms, would provide educational value. The sustainable design concepts incorporated into the site would enhance public attitudes towards conservation and wise use of resources. Therefore, changes to social systems or organizations and public attitudes and beliefs would occur. Short- and long-term impacts would be beneficial because changes would be measurable and would influence social conditions associated with the preserve. Slight changes to demographics could occur if new employees and concessionaires hired under this alternative relocate to the area, but these changes would not likely be measurable.

Programmatic Level

Like under alternative 2, programmatic-level actions proposed under alternative 3A would increase visitation substantially over existing conditions by providing increased access and recreational opportunities throughout the preserve. Primary visitor access would be via shuttle bus, with limited personal vehicle access through a permit system. Visitors would be able to bike into the preserve along a dedicated bike path and drive personal vehicles to the Banco Bonito Staging Area for horseback riding and special events. The trail system would be enhanced preserve-wide, and new interpretive facilities and programs would be provided. Because of these improvements, approximately 120,000 visitors would be expected annually under this alternative.

Up to 120,000 visitors would be expected each year, benefiting local economies through spending on food, lodging, and other services.

An increase to 120,000 visitors to the area would beneficially affect local economies, particularly in the long term, through spending on food, lodging, and other services. The preserve would continue to provide group lodging at Casa de Baca Lodge and the bunkhouse as under existing conditions, but no additional room rental or lodging would be provided. Local and state governments would benefit from increased revenue generated from sales taxes. Existing establishments may need to hire new employees, and new goods and services providers may move to the area as a result of increased visitation. The VCT would need to eventually purchase or lease electric shuttle vehicles or hire a company to provide that service, resulting in a slight beneficial economic impact. Income levels are not likely to rise because these types of jobs are not typically high paying.

The preserve would benefit economically in the short and long term from increased visitation through entrance fees and fees for special programs, if and when offered. Commercial uses of the preserve, such as filming and photography activities, would not likely change.

The lifestyle of current and prospective visitors would not change, but they would be able to experience the preserve to a much greater extent. Limited access would no longer be a factor preventing people from participating in recreational activities in the preserve. However, some visitors may not want to access the preserve via shuttle bus, preferring the spontaneity of using their own personal vehicles. Those visitors may continue to view the preserve as restricted. Conversely, access via shuttle bus would appeal to visitors who value conservation and resource protection or who do not like to drive. As noted in chapter 3, 80 percent of survey respondents indicate that recreational access should be limited, and 52.8 percent disagree that increased access is more important than possible negative environmental effects associated with it. These differences in values would not change the overall beneficial impact of increased access on public attitudes, beliefs, and values. At the programmatic level, changes to social systems or organizations and public attitudes and beliefs would occur. Short- and long-term impacts would be beneficial. No measurable changes to demographics would be expected.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3A as well. When the beneficial impacts expected under alternative 3A are combined with the beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be beneficial.

Alternative 3B: Entrada del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Impact Type	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Economic/social	Short/long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Economic/social	Short/long term: beneficial
Cumulative	Actions listed in table 4-1	Economic/social	Beneficial

Direct/Indirect Impacts

Implementation Level

Alternative 3B would differ from alternative 3A in that visitors would access the preserve using personal vehicles rather than shuttle buses, discussed under "Programmatic Level" for this alternative. Implementation-level impacts on socioeconomics would be the same as those under alternative 3A: beneficial.

Programmatic Level

Impacts would be similar to alternative 3A, except that local gas stations may experience more business due to increased gasoline use by personal vehicles.

Impacts would be similar to those under alternative 3A, with the exception that local gas stations may experience more business because people would access the preserve's interior using personal vehicles and may purchase more gasoline. This would have a slight beneficial impact on the local economy.

Public attitudes, beliefs, and values would be enhanced due to increased access as described for alternative 3A, resulting in a beneficial impact. As mentioned under alternative 3A, some visitors may not want to access the preserve via shuttle bus, preferring the spontaneity of using their own personal vehicles. Those visitors may view the preserve as fully accessible under alternative 3B. Conversely, visitors who value conservation and resource protection may view unlimited personal vehicle access as environmentally damaging. As noted in chapter 3, 80 percent of survey respondents indicate that recreational access should be limited, and 52.8 percent disagree that increased access is more important than possible negative environmental effects associated with it. However, these differences in values would not change the overall beneficial impact of increased access on public attitudes, beliefs, and values.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3B as well. When the beneficial impacts expected under alternative 3B are combined with the beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be beneficial.

Alternative 4A: Vista del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Impact Type	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Economic/social	Short/long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Economic/social	Short/long term: beneficial
Cumulative	Actions listed in table 4-1		Beneficial

Direct/Indirect Impacts

Implementation Level

Implementation and programmatic level impacts under alternative 4A would be similar to alternative 3A.

Like alternative 3A, the central feature of alternative 4A is the development of a full-service visitor center, with similar amenities and facilities. Alternative 4A would focus on views of the Valle Grande, interpretation of geology, and proximity to the adjacent day-use areas at Bandelier National Monument. Although the location of this visitor center may make it slightly more accessible from NM-4, there would be no measurable socioeconomic differences between alternatives 3A and 4A at the implementation level. Impacts would be beneficial in the short and long term for the same reasons described for alternative 3A.

Programmatic Level

Approximately 120,000 visitors would be expected annually under this alternative, as with alternative 3A. Although recreational amenities offered at the programmatic level would differ very slightly from alternative 3A, there would be no measurable socioeconomic differences between alternatives 3A and 4A at the programmatic level. Impacts would be beneficial in the short and long term for the same reasons described for alternative 3A.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 4A as well. When the beneficial impacts expected under alternative 4A are combined with the beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be beneficial.

Alternative 4B: Vista del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Impact Type	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Economic/social	Short/long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Economic/social	Short/long term: beneficial
Cumulative	Actions listed in table 4-1	Economic/social	Beneficial

Direct/Indirect Impacts

Implementation Level

Implementation-level impacts under alternative 4B would be similar to alternative 4A. Programmatic-level impacts would be similar to alternative 3B.

Like alternative 3B compared to alternative 3A, alternative 4B would differ from alternative 4A in that visitors would access the preserve using personal vehicles rather than shuttle buses. Implementation-level impacts under this alternative would be beneficial.

Programmatic Level

Short- and long-term impacts would be beneficial, as described for alternative 3B.

Cumulative Impacts

Cumulative impacts would be beneficial, as described for alternative 3B.

Environmental Justice

Guiding Regulations and Policies

The following regulations and policies provide guidance for analyzing environmental justice impacts.

Title VI of the Civil Rights Act of 1964 prohibits discrimination based on race, color, national origin, and sex in the provision of benefits and services under any program or activity receiving federal financial assistance.

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority and Low-income Populations," was signed by the president on February 11, 1994, and requires that federal agencies administer and implement their programs, policies, and activities that affect human health or the environment to identify and avoid "disproportionately high and adverse" effects on minority and low-income populations. The executive order ensures that agency actions do not have disproportionately high and adverse effects on environmental justice populations, or otherwise have the effect of

- excluding persons (including populations) from participation
- denying persons (including populations) from benefits
- subjecting persons (including populations) to discrimination because of their race, color, or national origin

Executive Order 12898 requires that each federal agency develop an agency-wide environmental justice strategy that

- promotes enforcement of all health and environmental statutes in areas with minority and low-income populations
- ensures greater public participation
- identifies differential patterns of consumption of natural resources among minority and low-income populations

Regarding public participation, Section 5-5 of Executive Order 12898 states that each agency, whenever practicable and appropriate, shall translate crucial public documents, notices, and hearings relating to human health or the environment for limited English-speaking populations. Section 6-606 states that Executive Order 12898 shall apply equally to Native American programs.

The CEQ has issued guidance on how to implement Executive Order 12898 and conduct an environmental justice analysis (CEQ 1997b), as has the USDA (1997).

The presidential memorandum that accompanied Executive Order 12898 specifically recognized the importance of procedures under NEPA for identifying and addressing environmental justice issues. Goals defining the purposes and policies of NEPA are consistent with the attainment of environmental justice (CEQ 1997b), as follows:

- to ensure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings
- to attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences
- to preserve important historic, cultural, and natural aspects of our natural heritage, and to maintain, wherever possible, an environment that supports diversity and variety of individual choice
- to achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities

Executive Order 12898 requires that, in complying with NEPA, agencies shall

- Analyze the environmental effects of proposed Federal actions, including human health, economic, and social effects on minority and low-income populations.
- Whenever feasible, identify mitigation measures that reduce significant and adverse environmental effects of proposed Federal actions on minority and low-income populations.
- Provide opportunities for community input in the NEPA process (see chapter 5 for more information about public involvement).

Departmental Regulation 5600-2 (USDA 1997) states that the USFS will analyze the environmental effects, including human health, economic, and social effects, of federal actions on minority and low-income communities when such analysis is required by NEPA.

Per 5600-2, in determining whether

- an effect on a minority and/or a low-income population is disproportionately high and adverse, agencies should consider whether the adverse effect is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population and/or non-low-income population.
- there are disproportionately high and adverse environmental or human health effects, including social and economic effects, on an identifiable low-income or minority population, agencies should consider, as appropriate, such effects as …destruction or disruption of man-made or natural resources; destruction or diminution of aesthetic values; destruction or disruption of community cohesion or a community's economic vitality (USDA 1997).

Executive Order 13166, "Improving Access to Services for Persons with Limited English Proficiency," is intended to improve access to federal programs and activities for persons who, as a result of national origin, are limited in their English proficiency. Executive Order 13166 requires Federal agencies to examine the services they provide, identify any need for services to those with limited English proficiency, and develop and implement a system to provide those services so limited English proficiency persons can have meaningful access to them. The Department of Justice *Federal Agency LEP Guidance and Language Access Plan* is currently pending (DOJ n.d.). However, the "Language Access Assessment and Planning Tool for Federally Conducted and Federally Assisted Programs," published by the Department of Justice in May 2011, offers guidance on identifying limited English proficiency communities (DOJ 2011).

Valles Caldera Preservation Act restricts access to Redondo Peak within the preserve, as follows:

Section 105(g) REDONDO PEAK.— (1) IN GENERAL.—For the purposes of preserving the natural, cultural, religious, and historic resources on Redondo Peak upon acquisition of the Baca ranch under section 104(a), except as provided in paragraph (2), within the area of Redondo Peak above 10,000 feet in elevation— (A) no roads, structures, or facilities shall be constructed; and (B) no motorized access shall be allowed. (2) EXCEPTIONS.—Nothing in this subsection shall preclude— (A) the use and maintenance of roads and trails existing as of the date of enactment of this Act; (B) the construction, use and maintenance of new trails, and the relocation of existing roads, if located to avoid Native American religious and cultural sites; and (C) motorized access necessary to administer the area by the Trust (including measures required in emergencies involving the health or safety of persons within the area).

Valles Caldera Preserve Authorization assigned to Santa Clara Pueblo the right to purchase 5,046 acres at the headwaters of Santa Clara Creek in the northeast corner of the preserve. Santa Clara completed this transaction on July 25. Santa Clara and the United States also subsequently carried out a reciprocal exchange of conservation easements along their common boundary at the northeast corner of the preserve. These easements guarantee that no inappropriate development will occur along the part of the caldera rim that defines the boundary (VCT 2005i).

Valles Caldera National Preserve, *Framework and Strategic Guidance for Comprehensive Management* (2005) presents the framework for decision-making that the VCT proposes to use as it develops programs and policies for the management and use of the preserve. Page 107, "Visitor Programs and Guidelines," states, "activities must not conflict with religious and cultural priorities and uses" (VCT 2005i).

Methodology for Analyzing Impacts

The methodology for determining impacts on environmental justice is based on the guidance above. The geographic area of concern and the affected populations are identified in chapter 3, "Affected Environment."

CEQ guidance on environmental justice acknowledges that "there is no standard formula for how environmental justice issues should be identified or addressed." However, the CEQ provides principles as general guidance, and Departmental Regulation 5600-2 (USDA 1997) provides methodology for analyzing impacts on environmental justice. These documents were used to develop the following methodology for analyzing impacts:

1. Identify the minority and low-income populations and Indian Tribes in the affected area that might be disproportionately affected (described in chapter 3).
2. Identify cultural, social, occupational, historical, or economic factors that may amplify the natural and physical environmental effects of the alternatives, such as sensitivity of the community or population to particular impacts, the effects of disruption on community structure, and the nature and degree of the impact on the physical and social structure of the community.
3. Analyze potential impacts on the economic and social factors identified in step 2 above, as well as to subsistence consumption and human health related to such consumption, for each alternative. Determine differences in rates and patterns of subsistence consumption as compared to rates and patterns of the general population.

None of the alternatives are expected to have a disproportionately high impact on environmental justice populations.

4. Determine whether the proposed alternatives would have a disproportionately high and adverse effect on human health or the environment, including socioeconomic effects, of minority, low-income, or tribal populations. Consider destruction or disruption of human-made or natural resources, destruction or diminution of aesthetic values, and destruction or disruption of community cohesion or a community's economic vitality. As recommended by the CEQ, to determine disproportionately high and adverse environmental effects, this methodology considers the following (CEQ 1997):
   - whether the impacts meet the definition of significant under NEPA. Relevant NEPA significance criteria include:
     - effects on public health and safety
     - unique characteristics of the geographic area
     - precedent-setting effects for future actions
     - cumulative effects
     - loss or destruction of significant scientific, cultural, or historic resources
   - whether the impacts are significant (as defined by NEPA, above) and appreciably exceed or are likely to appreciably exceed those on the general population
5. Determine impacts on populations and/or individuals with limited English proficiency based on the number or proportion of persons with limited English proficiency likely to be affected by the alternatives.

Alternative 1: No Action

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: none Long term: negligible and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: negligible and adverse
Cumulative	Actions listed in table 4-1	Beneficial

Direct/Indirect Impacts

Implementation Level

Alternative 1 would result in negligible impacts due to the reduction in services and access to low-income, minority, and Native American visitors.

This alternative would result in the removal of the Valle Grande and Banco Bonito Staging Areas and the elimination of the interim recreation programs and activities. No additional structures or facilities would be built to accommodate visitors. There would be no measurable short-term impacts at the implementation level. Low-income, minority, and Native American visitors to the preserve would be adversely affected in the long term by a reduction in visitor services, as described in the

"Visitor Experience" section. However, these impacts would be negligible and adverse and would not be disproportionately high compared to the general population.

The removal of the staging areas would not measurably affect persons with limited English proficiency. The preserve would notify the public of the effects of this alternative in English as well as in the most frequently encountered languages in the area.

Programmatic Level

The VCT would phase out current access through the staging areas, as well as interim programs and activities. Visitation would decrease considerably under this alternative compared to existing conditions. The result would be an adverse impact on local economies, as described in the "Socioeconomics" section, which would also affect low-income, minority, and Native American populations that rely on tourism income. These impacts would not be expected to disproportionately affect environmental justice populations, and there would be no impact on an environmental justice community's economic vitality. Overall short- and long-term impacts related to tourism spending would be negligible and adverse.

Phasing out current access and interim programs and activities, with associated decreased visitation, would not affect community cohesion for any environmental justice populations in the study area.

As noted in chapter 3, the preserve is an important agricultural resource for many minority residents. Access for grazing or other land management activities would continue, consistent with the decisions and environmental documents guiding those specific actions. No impact on the affected populations would be expected compared to existing conditions because access for grazing would continue to be provided.

Under alternative 1 would not change the landscape features that are important to the local Pueblos. Native American groups would continue to be allowed access for game hunting, plant gathering, mineral collecting, and ceremonial pilgrimage as under existing conditions.

Also as noted in chapter 3, the preserve is a sacred place to Native Americans. Under this alternative, there would be no changes to landscape features that serve as focal points for physical and metaphysical interaction for local Pueblos. The removal of the staging areas may improve certain landscape features, such as the Valle Grande. Although general visitation would be curtailed under this alternative, Native American groups would still be permitted periodic on-site visits for game hunting, plant gathering, mineral collecting, and ceremonial pilgrimage as under existing conditions. Such access would continue to maintain and affirm cultural identities while also providing for subsistence consumption, with no related adverse health effects. Therefore, there would be no adverse impact or disproportionately high adverse impact on Native Americans seeking access to and traditional use of the preserve.

There would be no measurable change to persons with limited English proficiency from the reduction in visitor services. The preserve would notify the public of the effects of this alternative in English as well as in the most frequently encountered languages in the area.

Overall, there would be no disproportionately high adverse impacts on environmental justice populations under alternative 1. There would be little change from existing conditions. Any adverse impacts would be related to decreased tourism revenue and would be negligible.

Cumulative Impacts

Actions and activities that would affect this resource include those listed in table 4-1 under "environmental justice." The 1993 Jemez National Recreation Area Act resulted in a beneficial impact on Native Americans by allowing the temporary closure of portions of the Jemez National Recreation Area to protect traditional and customary uses by local Tribes. This law currently benefits and will continue to benefit Tribes in the future. Actions described in the "Socioeconomics" section would also affect all environmental justice populations through employment opportunities. When these beneficial impacts are combined with the overall negligible adverse impacts from the no-action alternative, cumulative impacts would be beneficial because the effects of alternative 1 would not be substantial.

Alternative 2: Banco Bonito Visitor Contact Station

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short/long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Short/long term: beneficial
Cumulative	Actions listed in table 4-1	Beneficial

Direct/Indirect Impacts

Implementation Level

Increased visitation under alternative 2 would increase tourism spending, and generate jobs for construction and visitor services, potentially benefiting environmental justice populations. Bilingual staff may be needed to serve visitors.

Under alternative 2, the existing Banco Bonito Staging Area would be removed and a small-scale visitor contact station would be developed (up to 5,000 square feet), with associated day-use facilities, a small parking area, and roads to provide access to the preserve for personal vehicles and/or shuttles. Nonmotorized access from the visitor contact station to the existing network of trails in the area would be generally open and unlimited. As described under the "Socioeconomics" section, short-term deconstruction and construction impacts may result in the purchase of local goods and employment of local workers, including environmental justice populations. This beneficial impact would be slight.

The new visitor contact station and associated day-use facilities would draw considerably more visitors to the preserve, and thus to the general area, with increased spending locally on food, lodging, and other services (more detail is provided under "Programmatic Level" for this alternative). The VCT may need to hire additional employees to operate and maintain the visitor contact station. As noted in chapter 3, a substantial proportion of the local population is Hispanic or Latino, with 24 percent speaking Spanish. Department of Justice guidance notes that "the greater the number or proportion of limited English proficiency persons in an

area, the more likely language services are needed," and recommends hiring bilingual staff for public contact positions (DOJ 2002). In addition, the VCT would also investigate the possibility of employing "Cultural Guides" from the local Tribes and Pueblos to provide educational services at the visitor contact station and vicinity. This would result in a slight beneficial impact on local environmental justice populations.

The Pueblo of Jemez has identified a sacred pilgrimage trail from the village of Walatowa to Redondo Peak, the Pueblo's most important landmark in the preserve, which passes through the area of the proposed visitor contact station. The VCT would work with the Pueblo during final design to help identify a site for the visitor contact station and associated facilities that would avoid this trail and minimize impacts to it and its use by the Pueblo. The VCT would also work with the Pueblo to avoid and protect important plant procurement areas the Pueblo has identified in the vicinity.

Programmatic Level

Programmatic-level actions proposed under alternative 2 would increase visitation substantially over existing conditions by providing increased access and recreational opportunities throughout the preserve. Approximately 50,000 visitors would be expected annually, which would beneficially affect local economies through spending on food, lodging, and other services. These benefits would affect environmental justice populations employed in these sectors in both the short term and the long term.

As noted in chapter 3, a fairly high percentage of minority populations in the area live below the poverty level. Increased tourism to the area is expected to result in the need for additional services, potentially providing the opportunity for new business development and the need to hire employees. Increased tourism may also generate a desire for locally made crafts and interest in indigenous customs, also potentially creating job opportunities that support existing skills, knowledge, and expertise. As noted on the preserve's web site, "The Valles Caldera National Preserve has long attracted people who wish to study and learn about a wide range of topics, such as … cultural history … In the years to come, the VCT will be exploring options to create meaningful programs on the preserve that offer lasting, long-term benefits to the area's local communities, the state of New Mexico and the world beyond." This commitment to education is reflected in the *Strategic Management Plan for the Valles Caldera National Preserve, Fiscal Years 2012-2018*, which calls for the establishment of "permanent and formal education programs for all ages" (VCT 2012). The VCT recognizes the educational value that minority populations in the area can provide to visitors, and will work with these populations to integrate them into high-quality educational programs. For example, the VCT would investigate the possibility of employing "Cultural Guides" from the local Tribes and Pueblos to provide educational programs within the preserve. These new opportunities would be designed to help address local populations living at and below poverty levels.

The development of the visitor contact station and associated increased visitation would not affect community cohesion for any environmental justice populations in the study area.

Access for grazing or other land management activities would continue. The preserve would continue to be an important agricultural resource for many minority residents. No impact on the affected populations would be expected compared to existing conditions because these programs would continue to be provided.

Under this alternative, improvement and increased use of preserve roads, increased recreational amenities (such as campgrounds), and the presence of substantially more visitors could change landscape aesthetics and features that are important to local Pueblos. However, the removal of the staging areas may improve certain landscape features, such as the Valle Grande.

Under alternative 2, shuttles and private vehicles would have access only to Level 3 and Level 4 roads, as shown in chapter 2. None of the preserve's Level 1 or Level 2 roads from the Valle Toledo to the Santa Clara Indian Reservation would be open to shuttle or private vehicle use. Therefore, no access to the Santa Clara Reservation or the easement would be permitted.

VCT staff would work with local Tribes and Pueblos to identify methods of sustaining on-site visits for cultural and religious practices without interference from increased public visitation, as well as identify and protect areas where Tribes and Pueblos gather important medicinal plants, herbs, and other resources. Native American groups would still be permitted periodic on-site visits for cultural and religious practices and to hunt and gather natural resources, as under existing conditions. Therefore, there would be no adverse impact or disproportionately high adverse impact on Native Americans seeking access to and traditional use of the preserve.

Increased visitation may result in a need to hire additional employees and an opportunity to comply with limited English proficiency guidance by hiring bilingual individuals. This would result in a slight beneficial impact on local environmental justice populations.

Overall, there would be no disproportionately high adverse impacts on environmental justice populations under alternative 2. Slight beneficial impacts would be expected primarily from increased local spending by visitors, which would affect environmental justice populations as well as general populations.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 2 as well. When the beneficial impacts expected under alternative 2 are combined with the overall beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be beneficial.

Alternative 3A: Entrada del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short/long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Short/long term: beneficial
Cumulative	Actions listed in table 4-1	Beneficial

Direct/Indirect Impacts

Implementation Level

The same benefits expected under alternative 2 to environmental justice populations would occur, but to a greater degree due to higher visitation levels. Bilingual staff may be needed to serve visitors.

As mentioned in the "Socioeconomics" section, the central feature of alternative 3A is the development of a full-service visitor center that would offer a wide variety of visitor services and amenities, as well as associated day-use facilities. Short-term deconstruction and construction impacts may result in the purchase of local goods and employment of local workers, which could include environmental justice populations. This beneficial impact would be slight.

The visitor center and associated day-use facilities could become a destination in itself due to the extent of its offerings. The VCT would need to hire additional employees or concessionaires for the visitor center, providing an opportunity to comply with limited English proficiency guidance by hiring bilingual individuals. The VCT would also investigate the possibility of employing "Cultural Guides" from the local Tribes and Pueblos to provide educational services at the visitor center and vicinity. This would result in a slight beneficial impact on local environmental justice populations in the short and long term.

The VCT would work with local Tribes and Pueblos during final design to help identify a site for the visitor contact center and associated facilities to protect important plant procurement areas and archeology.

Programmatic Level

The VCT would work with local Pueblos to identify methods of protecting culturally important features of the preserve.

Alternative 3A would result in an increase to 120,000 visitors to the area, which would beneficially affect local economies, including environmental justice populations, through local spending on food, lodging, and other services. New employment opportunities as described under alternative 2 (such as hiring "Cultural Guides") would also apply to this alternative, and would be designed to help address local populations living at and below poverty levels.

Increased visitation would not affect community cohesion for any environmental justice populations in the study area.

Access for grazing or other land management activities would continue as described under alternative 2. No impact would be expected compared to existing conditions because these programs would continue to be provided.

Alternative 3A could result in a change to landscape aesthetics and features that are important to local Pueblos, as described for alternative 2. Similarly, the preserve would work with local Tribes to identify methods of protecting these features, as well as areas where Tribes and Pueblos gather important medicinal plants, herbs, and other resources. VCT staff would also work with local Tribes to identify methods of sustaining on-site visits for cultural and religious practices without interference from increased public visitation. Therefore, there would be no adverse or disproportionately high impact on Native Americans who value and use the preserve.

Under alternative 3A, shuttle access would be restricted to only Level 4 roads as shown in chapter 2. None of the preserve's Level 1 or Level 2 roads from the Valle Toledo to the Santa Clara Indian Reservation would be open to shuttle or private vehicle use. Therefore, no access to the Santa Clara Reservation or the easement would be permitted.

Like under alternative 2, increased visitation may result in a need to hire additional bilingual employees, such as shuttle bus drivers or resource interpreters, resulting in a slight beneficial impact on local environmental justice populations.

Overall, there would be no disproportionately high adverse impacts on environmental justice populations under alternative 3A. Beneficial impacts would be expected primarily from increased local spending by visitors, which would affect environmental justice populations as well as general populations.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3A as well. When the beneficial impacts expected under alternative 3A are combined with the primarily beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be beneficial.

Alternative 3B: Entrada del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short/long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Short/long term: beneficial
Cumulative	Actions listed in table 4-1	Beneficial

Direct/Indirect Impacts

Implementation Level

Alternative 3B would differ from alternative 3A in that visitors would access the preserve using personal vehicles rather than shuttle buses, discussed under "Programmatic Level" for this alternative. Implementation-level impacts would be the same as those under alternative 3A: beneficial.

Programmatic Level

Increased access under alternative 3B could affect landscapes that are important to local Tribes, and the use of the preserve for cultural and religious practices. VCT staff would work with Tribes to mitigate this possibility.

Impacts would be similar to those under alternative 3A. However, visitors would have more direct access to areas of the preserve, which could affect landscape aesthetics and features that are important to local Tribes, as well as affecting the use of the preserve for cultural and religious practices. Under alternative 3B, private vehicle access would be restricted to only Level 4 roads as shown in chapter 2. None of the preserve's Level 1 or Level 2 roads from the Valle Toledo to the Santa Clara Indian Reservation would be open to private vehicle use. Therefore, no access to the Santa Clara Reservation or the easement would be permitted.

Like under alternative 3A, the preserve would work with local Tribes to identify methods of protecting important cultural features, as well as areas where Tribes and Pueblos gather important medicinal plants, herbs, and other resources. VCT staff would also work with local Tribes to identify methods of sustaining on-site visits for cultural and religious practices without interference from increased public visitation. Programmatic-level impacts would therefore be beneficial, as described for alternative 3A.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3B as well. When the beneficial impacts expected under alternative 3B are combined with the primarily beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be beneficial.

Alternative 4A: Vista del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short/long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Short/long term: beneficial
Cumulative	Actions listed in table 4-1	Beneficial

Direct/Indirect Impacts

Implementation Level

Implementation and programmatic level impacts under alternative 4A would be similar to alternative 3A.

Like alternative 3A, the central feature of alternative 4A is the development of a full-service visitor center, with similar amenities and facilities. The VCT would work with local Tribes and Pueblos during final design to help identify a site for the visitor contact center and associated facilities to protect important plant procurement areas and archeology. Implementation-level impacts to local economies, which would include environmental justice populations, would be beneficial in the short and long term for the same reasons described for alternative 3A.

Programmatic Level

Alternative 4A would result in an increase to 120,000 visitors to the area, with the same beneficial economic impacts on environmental justice populations as described for alternative 3A. Other impacts on environmental justice populations at the programmatic level would be the same as those under alternative 3A, because the difference in the location of the visitor center and the amenities provided under alternative 4A would not create measurably different effects compared to alternative 3A.

Overall, there would be no disproportionately high adverse impacts on environmental justice populations under alternative 4A. Beneficial impacts would be expected primarily from increased local spending by visitors, which would affect environmental justice populations as well as general populations.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 4A as well. When the beneficial impacts expected under alternative 4A are combined with the primarily beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be beneficial.

Alternative 4B: Vista del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short/long term: beneficial
Programmatic level: direct/indirect	Within the bounds of the study area	Short/long term: beneficial
Cumulative	Actions listed in table 4-1	Beneficial

Direct/Indirect Impacts

Implementation Level

Implementation-level impacts under alternative 4B would be similar to alternative 4A. Programmatic-level impacts would be similar to alternative 3B.

Alternative 4B would differ from alternative 4A in that visitors would access the preserve using personal vehicles rather than shuttle buses, discussed under "Programmatic Level" for this alternative. Implementation-level impacts would be the same as those under alternative 4A: beneficial.

Programmatic Level

Impacts would be similar to those under alternative 3B regarding more direct visitor access to the preserve. Programmatic-level impacts would therefore be beneficial, as described for alternative 3B.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 4B as well. When the beneficial impacts expected under alternative 4B are combined with the primarily beneficial impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be beneficial.

Carbon Footprint and Air Quality

Guiding Regulations and Policies

Executive Order 13514, "Federal Leadership in Environmental, Energy, and Economic Performance," requires all federal agencies to submit a comprehensive GHG inventory and establish a percentage reduction target. Executive Order 13423, "Strengthening Federal Environmental, Energy, and Transportation Management," identifies six areas for reducing the environmental footprint. GHG reporting will help agencies understand their emission profile and improve environmental performance in the following six environmental footprint areas (the scopes described in chapter 3 are added to each):

- Energy (Scopes 1 and 2)
  - Improve energy efficiency and reduce GHG emissions through the reduction of energy.
  - Shift toward renewable energy such as solar power and biomass.
- Water (Scopes 1 and 2)
  - Reduce water consumption in buildings, grounds, and related facilities.[13]

[13] Water typically requires treatment prior to use and prior to return to the environment, and it is pumped and pressurized to reach consumers. These activities require energy, resulting in GHG emissions.

- Green purchasing (Scope 3)
  - Increase the sustainability performance of purchased goods and services and the performance of suppliers, contractors, and partners.
  - Increase the number of buildings that are LEED certified.
- Fleet and transportation (Scope 1)
  - Improve transportation and travel practices, which in turn will reduce harmful emissions, increase operational and fuel efficiency, and reduce the use of nonrenewable fuel.
- Waste prevention and recycling (Scope 3)
  - Minimize waste generation and reduce landfill use. Reduce, reuse, and recycle materials.
- Sustainability leadership
  - Make strong efforts to meet or exceed the requirements of executive orders and policies related to sustainable operations.
  - Leadership and management have a commitment to communicate the agency's vision for sustainable operations (USFS 2010c).

As mentioned in chapter 3, the Clean Air Act has defined national air quality standards that set allowable concentration and exposure limits for six pollutants considered harmful to human health. These standards are applied and administered at the state level. Areas that do not comply with NAAQS are known as "nonattainment" and must comply with a number of special requirements.

Methodology for Analyzing Impacts

Changes to GHG emissions (which ultimately affects climate change) and air quality can result in regional and/or global effects. This analysis considers the impacts of those changes at the regional level. The methodology for determining impacts on the preserve's carbon footprint uses a qualitative approach based on how the alternatives address the six areas for reducing the environmental footprint described in the guidance above. The context for assessing direct impacts is the preserve itself, and areas under its direct influence. The context for indirect impacts extends outside the preserve to varying degrees to account for visitor miles traveled, transportation of purchased goods and generated waste, etc.

Air quality is evaluated in a dynamic setting of space and time, and relates to the production of PM and its dispersion. The methodology for determining impacts to air quality uses a qualitative approach based on how the alternatives could affect criteria pollutant emissions and nearby Class I areas through increased visitation to the preserve (implementation level) and within the preserve (programmatic level).

Alternative 1: No Action

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short/long term: beneficial to negligible and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short/long term: beneficial
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

Energy consumption would decrease under alternative 1, but there would be no opportunity to communicate the VCT's vision for sustainable operations.

This alternative would result in the removal of the Valle Grande and Banco Bonito Staging Areas and the elimination of the interim recreation programs and activities. Energy consumption would be reduced and waste generation slightly reduced through the removal of the staging areas, although the change to the amount of CO_2 emitted from stationary combustion sources or electricity usage would be slight. No change related to fugitive emissions would occur. There would be no change to water consumption because the staging areas do not use surface water or groundwater. There would be no measurable change regarding how the VCT purchases goods and services. No LEED-certified buildings would exist at the preserve. There would be limited opportunity to communicate the VCT's vision for sustainable operations. For these reasons, carbon footprint impacts at the implementation level would range from beneficial to negligible and adverse in the short and long term compared to existing conditions.

Approximately 25,000 people participated in public programs at the preserve in 2010. Assuming no change in visitation under the no-action alternative, 25,000 fewer people would drive to the preserve to recreate. Some people may still drive to the preserve to hike the two free trails near Rabbit Mountain. It is expected that many of these visitors would be local or passing through on the way to other destinations, representing a small number of visitors and a negligible adverse indirect impact on carbon footprint and air quality.

Programmatic Level

The visitor services currently provided by the existing temporary facilities would not be replaced. Reducing the amount of tours available would slightly reduce harmful emissions from vans, increase operational and fuel efficiency, and reduce the use of nonrenewable fuel. The amount of emissions from mobile combustion sources would decrease due to fewer tours and fewer visitors driving to and in the preserve. Under the no-action alternative, the number of miles driven within the preserve is expected to be reduced from approximately 75,000-100,000 to approximately 30,000-50,000 annually (Rodriguez, pers. comm. 2012c). As a result, short- and long-term impacts would be beneficial at the programmatic level.

Cumulative Impacts

Actions and activities that would affect visitors include those listed in table 4-1 for carbon footprint and air quality. GHG and criteria pollutant emissions increased in the past from roadway development on nearby USFS lands, which allowed for more vehicle emissions, including emissions from logging trucks. Logging and clearing trees for roads also reduced the area's capacity to offset GHGs locally. The 1987 *Santa Fe National Forest Land and Resource Management Plan* (USFS 1987) increased old-growth management areas, eliminated unneeded roads, and decreased sawtimber sales, which would have helped offset past GHG impacts. In the preserve, forest cover has returned to previously disturbed areas, and all unplanned fires are suppressed. The presence of more trees will help sequester CO_2 and offset GHG emissions. Similarly, the Collaborative Forest Landscape Restoration project (USFS and VCT 2010) will restore sustainable ecological forest conditions on 210,000 acres in the Jemez Mountains.

Increased tourism and transportation improvements have drawn visitors to the area, whose vehicles contribute to GHG and criteria pollutant emissions. Plans to increase tourism (e.g., by adding scenic byways) and improve the local economy would continue that impact. Planned public transportation services and bike routes would help offset some emissions from personal vehicles.

Oil and gas production on USFS land and in Rio Arriba County has contributed, and will continue to contribute, to GHG and criteria pollutant emissions through the provision of fossil fuels for consumption. Recent wildfires contributed greatly to GHG and PM emissions through the burning of wood. As the forests recover, trees will return to the area to sequester GHG emissions. The implementation of the *Santa Fe National Forest Land and Resource Management Plan* (USFS 1987) will allow for natural recovery from wildfire. The plan also permits timber harvesting for commercial purposes.

The actions described above have had and will continue to have both adverse and beneficial effects on GHG and criteria pollutant emissions. In general, these actions increased emissions in the area, with oil and gas production having a broader impact. The result would be a minor adverse effect at the regional level. The slight beneficial effects expected under the no-action alternative would not affect the overall impacts from these other actions. Therefore, cumulative impacts would remain the same: minor and adverse.

Alternative 2: Banco Bonito Visitor Contact Station

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: negligible and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: negligible and adverse
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

Carbon and criteria pollutant emissions would increase due to the development of the visitor contact station, activities associated with the increased number of guests, and increased services (shuttles, programs) under alternative 2 compared to existing conditions.

Under alternative 2, the existing Banco Bonito Staging Area would be removed and a small-scale visitor contact station would be developed (up to 5,000 square feet), with associated day-use facilities, a small parking area, and roads to provide access to the preserve for personal vehicles and/or shuttles, which would be used on high-use days to accommodate increased visitation.

The visitor contact station would be LEED certified and would incorporate recycled materials. The building would be located in a previously disturbed area. Therefore, no trees, which sequester CO_2, would be removed. As described in chapter 2, the building would use renewable energy sources and incorporate several energy efficiency concepts, such as passive and active solar power, Trombe walls, and a GHP to reduce heating requirements. Passive and active solar power would produce electricity, with the potential to return electricity to the grid. The use of daylighting and low-energy appliances would reduce electrical demand. Therefore, the use of stationary combustion sources would be minimal.

Securing a water source at this location would be difficult. Rainwater harvesting would be used if appropriate, and potable water would be used only for hand washing and drinking. The preserve would use graywater in toilets or composting toilets. These actions would reduce or eliminate the amount of potable water that would need to be brought to the site. If water did need to be pumped to the site, solar energy would provide the pumping power and the energy needed to do so. Purchased electricity would be used if solar was not sufficient, in which case GHG emissions would increase slightly where electricity is generated, depending on the source (e.g., coal vs. renewable).

Waste generated at the visitor contact station would be minimized and recycled to the extent practicable. The VCT would purchase local goods and use local services when feasible to help control the amount of GHGs emitted regionally. The visitor contact station would provide an opportunity for the VCT to communicate sustainable design concepts in operation and to demonstrate nature and technology working together. The LEED design and other sustainable practices would provide educational opportunities for the public.

Annual visitation, which was approximately 25,000 in 2010, would increase to an estimated 50,000, representing an approximate doubling of visitors. This would result in an increase of mobile combustion sources from visitors driving to and from the visitor contact station. It is assumed that the percentage of New Mexico visitors to the preserve would remain high, at approximately 84 percent, with the majority coming from the preserve's region. It is also assumed that the majority of visitors from other states would include the preserve as part of a larger northern New Mexico itinerary, resulting in a small proportion of GHGs emitted to visit the preserve. Although this increased level of visitation would represent a considerable increase in vehicles traveling to the preserve, the magnitude of change would not be measurable in the regional context. Long-term impacts would be negligible.

Negligible, localized adverse short-term impacts at the implementation level would occur due to emissions from construction vehicles. Some long-term beneficial impacts would occur if the VCT returns electricity to the grid. Beneficial impacts would also result from educational opportunities provided by the LEED building and other practices. This alternative would represent the VCT's commitment to meet or exceed the requirements of the sustainability executive orders.

Although implementing sustainable building concepts at the visitor contact station would limit stationary combustion sources as much as possible, GHG emissions would still increase over existing conditions because no visitor contact station or visitor center currently exists. Visitors driving to the preserve would nearly double, increasing indirect GHG emissions. No shuttle or personal vehicle access would be permitted beyond the visitor contact station into the preserve during winter when inversions and associated poor ventilation typically occur. Because the visitor contact station is not expected to function as a primary standalone destination, few visitors are expected there during winter.

Under alternative 2, increased visitation to the preserve, coupled with increasing improvements, is not expected to exceed the NAAQS.

As noted in the "Transportation" section, the LOS for this alternative would remain at B or better, where traffic would operate at a reasonable free-flow rate (i.e., idling and stop-and-go traffic that contributes to carbon monoxide would be infrequent). Criteria pollutant emissions at the state level have decreased in the past five years, with PM emissions below the NAAQS for Sandoval County. As mentioned in chapter 3, the USEPA states that substantial progress made by motor vehicle emission control is expected to continue into the future. Increased visitation to the preserve, coupled with increasing improvements, is not expected to exceed the NAAQS. Similarly, increased emissions resulting from more visitors driving to the preserve are not expected to measurably affect the Class I areas at Bandelier or San Pedro Parks. Overall, long-term implementation-level impacts would not be measurable. Therefore, long-term impacts would be negligible at a regional level.

Programmatic Level

As noted in chapter 3, the total carbon footprint from transporting visitors within the preserve is estimated at approximately 33 tons of CO_2 emissions per year, which would be 66 when doubled (i.e., from visitation increasing from approximately 25,000 in 2010 to approximately 50,000). Under this alternative, visitors would have more vehicular access farther into the preserve than under existing conditions, increasing the amount of mobile combustion sources and associated GHG and criteria pollutant emissions in the preserve. Shuttles would be used on high-use days as warranted and for special events and tours. It is not known precisely how often shuttles would operate, so it is not possible to predict the amount of GHGs and criteria pollutants they would emit. Because vans are currently used to provide tours, which would continue under this alternative, it is assumed that shuttle use to handle peak demand would represent additional mobile combustion sources compared to existing conditions. Therefore, emissions from shuttle use would likely be higher compared to existing conditions. Over the years, the VCT would phase in more fuel-efficient shuttle vehicles, helping to reduce the amount of GHGs and criteria pollutants they emit. In addition, the preserve's peak

visitation occurs during summer when the highest number of good to excellent ventilation days occur, which would help offset air quality impacts. During winter when weather inversions occur and ventilation can be poor, visitation is low, with corresponding fewer impacts on air quality. Overall, increased driving by visitors throughout the preserve when roads are open to personal vehicles in spring, summer, and fall, coupled with increasing motor vehicle emission control improvements, is not expected to exceed NAAQS or measurably affect the Class I areas at Bandelier or San Pedro Parks.

No new roads would be built; the VCT would upgrade existing roads for vehicular use. Driving on unpaved roads can reduce fuel economy (USDOE 2012). Upgraded roads may improve fuel efficiency, but likely not enough to offset increased vehicular use.

Negligible, localized adverse short-term impacts would occur from construction crews improving the preserve's roads and creating related facilities, such as parking lots. Although the number of vehicles driving within the preserve would increase substantially, changes to GHG and criteria pollutant emissions would not be measurable at the regional level. Long-term impacts would be negligible.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 2 as well. When the long-term negligible adverse impacts expected under alternative 2 are combined with the minor adverse impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would remain minor and adverse.

Alternative 3A: Entrada del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: negligible and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: negligible and adverse
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

Emissions would increase under alternative 3A due to the development of the visitor center, activities associated with the increased number of guests, and increased services (shuttles, programs).

The central feature of alternative 3A is development of a full-service visitor center, with associated day-use and parking facilities. The visitor center would be up to 10,000 square feet, accommodating substantially more visitors than the existing Valle Grande Staging Area, which would be removed. Like under alternative 2, the visitor center would be LEED certified and would incorporate recycled materials. The building would use renewable energy sources and employ several energy efficiency concepts, as described in chapter 2. Passive and active solar power would produce electricity, with the potential to return electricity to the grid. The use of daylighting and low-energy appliances would reduce electrical demand. Therefore, the use of stationary combustion sources would be minimal.

The building would be located in a previously undisturbed area. Some trees, which sequester CO_2, would be removed to accommodate the new facilities (see the "Vegetation" section). This amount would be negligible in the context of the preserve's forested landscape.

The highly developed visitor center and associated day-use facilities could become a destination in itself due to the extent of its offerings, drawing people to the site who may not explore the preserve further. Recreational uses concentrated at the visitor center would reduce the amount of vehicle trips farther into the preserve for those people who are satisfied with the visitor center's offerings.

This alternative would greatly increase visitation. It is expected that approximately 120,000 guests would visit the visitor center each year, compared to approximately 25,000 visitors who participated in public programs in 2010. Such a change would increase regional mobile combustion sources from people traveling to the preserve.

The site for alternative 3A has good water sources, which would require minimal transportation. Conservation actions would reduce or eliminate the amount of potable water that would need to be brought to the site, as described for alternative 2. If water did need to be pumped to the site, solar energy would provide the pumping power. Purchased electricity would be used if solar was not sufficient, in which case GHG emissions would increase slightly where electricity is generated, depending on the source (e.g., coal vs. renewable).

Like under alternative 2, waste generated at the visitor center would be minimized and recycled, and the VCT would purchase local goods and use local services when feasible. The visitor center would provide an opportunity to communicate sustainable design concepts, and the LEED design would provide educational opportunities for the public. This alternative would represent the VCT's commitment to meet or exceed the requirements of the sustainability executive orders.

Negligible, localized adverse short-term impacts would occur due to emissions from construction vehicles. Some long-term beneficial impacts would occur if the VCT

returns electricity to the grid. Beneficial impacts would also result from educational opportunities provided by the LEED building and other practices.

Although implementing sustainable building concepts at the visitor center would limit stationary combustion sources as much as possible, GHG emissions would still increase over existing conditions because no visitor center currently exists. As noted in the "Transportation" section, the LOS for this alternative would remain at B or better, where traffic would operate at a reasonable free-flow rate. Highway performance could change to LOS C, which is a stable transportation flow, during peak hours. Due to improvements in transportation emissions technology, the increased number of vehicles traveling to the preserve is not expected to measurably affect mobile source GHG emissions at a regional level. Continued improvements to motor vehicle emission controls would help keep emissions below NAAQS, despite a substantial increase in motor vehicles being driven to the preserve. Increased emissions from more visitors driving to the preserve are not expected to measurably affect nearby Class I areas.

Overall, long-term implementation-level impacts would substantially increase GHG emissions from existing conditions at the preserve, but would not measurably affect GHG emissions or air quality at the regional level. Therefore, impacts would be negligible.

Programmatic Level

Alternative 3A seeks to reduce emissions through the use of shuttles in lieu of personal vehicles.

Like alternative 2, programmatic level actions proposed under alternative 3A would provide increased access and recreational opportunities throughout the preserve. Alternative 3A seeks to reduce emissions through the use of shuttles in lieu of personal vehicles. These alternatives could create a demand for connecting existing bus routes in Los Alamos and Jemez Springs to the preserve[14]. Primary visitor access would be via shuttle bus during peak season, with limited personal vehicle access through a permit system. Use of a shuttle system would limit the number of mobile combustion sources within the preserve; however, GHG and criteria pollutant emissions would be higher compared to existing conditions due to substantially increased visitation. As the VCT phases in fuel-efficient electric vehicles, emissions may be reduced somewhat, but would still occur where the purchased electricity is generated, depending on the source (e.g., coal or renewable resources).

Use of shuttles within the preserve would minimize impacts to air quality by limiting the number of vehicles emitting pollutants. No shuttle or personal vehicle access would be permitted beyond the visitor center into the preserve during winter when inversions and associated poor ventilation typically occur. People may still visit the visitor center and recreate using the facilities there, although visitation would be low. No measurable change to air quality is expected during winter months. No NAAQS exceedances and no measurable impacts to nearby Class I areas are expected from increased motor vehicle use within the preserve.

[14] While this hypothesis is reasonable, no market research has been undertaken to support it.

Visitors would be able to bike into the preserve along a dedicated bike path, which would also help limit the number of motor vehicles entering the preserve. Personal vehicles would be allowed to access the Banco Bonito Staging Area for horseback riding and special events, and hunters would continue to drive to their destinations, with associated emissions. It is not known how many visitors would drive their vehicles to Banco Bonito Staging Area or hunting destinations, so an increase or decrease in emissions from mobile combustion sources compared to existing conditions cannot be determined.

Slight beneficial impacts would result from carpooling programs for administrative staff and from providing nonmotorized access to the preserve from its perimeter. Indirect beneficial impacts would result from proposed environmental and ecotourism activities that could focus on how visitors can reduce GHG and criteria pollutant emissions.

No new roads would be built; the VCT would upgrade existing roads for vehicular use. Upgraded roads would improve fuel efficiency, but not likely enough to offset increased vehicular use.

Negligible, localized short-term impacts would occur from improving the preserve's roads and constructing related facilities, such as parking lots. In the long term, programmatic level impacts would substantially increase GHG emissions from existing conditions at the preserve, but would not measurably affect GHG emissions or air quality at the regional level. Therefore, impacts would be negligible.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3A as well. In addition, as noted under "Transportation" in table 4-1, MRCOG may provide public transportation services to areas along NM-4 as well as new biking facilities, providing alternatives to driving to the preserve. These facilities would combine with the preserve's shuttle system to help reduce the reliance on personal vehicles to experience the preserve, which would constitute a beneficial impact. However, these actions would not be sufficient to change the overall cumulative impacts on the area's emissions. When the negligible adverse impacts expected under alternative 3A are combined with the minor adverse impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would remain minor and adverse.

Alternative 3B: Entrada del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: negligible and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: negligible and adverse
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

Alternative 3B would differ from alternative 3A in that visitors would access the preserve using personal vehicles rather than shuttle buses, discussed under "Programmatic Level" for this alternative. At the implementation level, there would be little measurable difference between the alternatives. Therefore, impacts would be the same as those under alternative 3A: negligible and adverse in the short and long term.

Programmatic Level

GHG emissions would increase from personal vehicle use in the preserve. It is anticipated that 120,000 people would visit the preserve annually, almost five times the number of visitors in 2010. It is estimated that GHG emissions from transportation of visitors within the preserve is currently 33 tons of CO_2 per year. This would potentially increase to approximately 165 tons of CO_2 annually based on current travel patterns within the preserve, representing a substantial increase over the preserve's existing carbon footprint and resulting in a major adverse long-term impact.

Air quality would be affected by a large increase in motor vehicles driving within the preserve. These impacts would be more prevalent during summer, when ventilation is typically good to excellent, which would reduce impacts. During winter, no shuttle or personal vehicle access would be permitted beyond the visitor center into the preserve when poor ventilation typically occurs. People may still visit the visitor center and recreate using the facilities there, although winter visitation would be low. No measurable change to air quality is expected during winter months. Short-term impacts would be the same as those described for alternative 3A, negligible and adverse. Overall, no NAAQS exceedances and no measurable impacts to nearby Class I areas are expected from increased motor vehicle use within the preserve when roads are open to personal vehicles in spring, summer, and fall.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3B as well. When the long-term negligible adverse impacts expected under alternative 3B are combined with the minor adverse impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be minor and adverse.

Alternative 4A: Vista del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: negligible and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: negligible and adverse
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

Alternative 4A would have obstacles to providing water to the visitor center, and existing electrical power is almost two miles away. VCT would likely have to expand utilities to serve the visitor center.

Like alternative 3A, the central feature of alternative 4A is the development of a full-service visitor center, with similar amenities and facilities. The primary difference is that the alternative 4A site presents many obstacles to securing a viable water source, and electrical power is almost 2 miles away. Although renewable energy sources would be used as much as practical, they may not be sufficient to provide necessary utilities. Obtaining utilities at this location could require additional energy sources. However, this difference between alternatives 3A and 4A would not be substantial, and impacts would be the same for the reasons described for alternative 3A: negligible adverse short-term impacts would occur due to emissions from construction vehicles, and overall negligible long-term impacts would result at the regional level.

Programmatic Level

There would be no measurable difference between alternatives 3A and 4A at the programmatic level; therefore, negligible adverse short- and long-term impacts.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 3A would apply to alternative 4A as well. When the long-term negligible adverse impacts expected under alternative 4A are combined with the minor adverse impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be minor and adverse.

Alternative 4B: Vista del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: negligible and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: negligible and adverse
Cumulative	Actions listed in table 4-1	Minor and adverse

Direct/Indirect Impacts

Implementation Level

Implementation-level impacts under alternative 4B would be similar to alternative 4A. Programmatic-level impacts would be similar to alternative 3B.

Alternative 4B would differ from alternative 4A in that visitors would access the preserve using personal vehicles rather than shuttle buses. Implementation-level impacts would be the same as those under alternative 3A: negligible and adverse in the short and long term.

Programmatic Level

Short- and long-term impacts would be negligible and adverse as described for alternative 3B, because only slight differences would exist between alternatives 3B and 4B.

Cumulative Impacts

Cumulative impacts would be major and adverse, as described for alternative 3B.

Preserve Management and Operations

Guiding Regulations and Policies

Although FSM direction does not apply to the VCT, the following applicable objectives and policies may be applied as appropriate:

FSM 6400— Property Management Chapter 6440 addresses real property management. Section 6443.2 focuses on operation and maintenance. Policies that may apply to this analysis include the following:

- Operation of government-owned buildings: Provide services and utilities necessary to make space usable for ordinary purposes.
- Protection: Furnish normal safety, fire, and guard protection to visitors and occupants of the buildings, maintain order, and protect the government's interest in the property.
- Repairs and initial space alterations: Make alterations, improvements, and repairs to buildings and facilities to protect the investment of the government within available funds (USFS 2002b).

FSM 5300—Law Enforcement Chapter—Zero Code would be applied to issues raised by the increased visitation that would result under the action alternatives, which may require additional law enforcement capabilities. Specific law enforcement objectives may apply:

1. Protect the public, employees, natural resources, and other property.
2. Investigate and enforce applicable laws and regulations.
3. Prevent criminal violations through informing and educating visitors and users of applicable laws and regulations (USFS 2008b).

FSM 2300—Recreation, Wilderness, and Related Resource Management Chapter 2330—Section 2332.1 addresses the measures that VCT staff would also have to take to provide for public safety:

- To the extent practicable, eliminate safety hazards from developed recreation sites. Inspect each public recreation site annually before the beginning of the managed-use season. Maintain a record of the inspections and corrective actions taken with a copy of the operation and maintenance plan.
- Immediately correct high-priority hazards that develop or are identified during the operating season or close the site (USFS 2006).

FSM 2300—Recreation, Wilderness, and Related Resource Management Chapter 2390 provides direction for providing visitor and interpretive services:

- Assist in managing visitor capacity and influencing on-site behavior such as reducing user conflicts, protecting the resource, and enabling visitors to make accurate risk assessments and take appropriate safety precautions.
- Achieve strategic communication on a variety of resource issues and management practices through interpretive planning, using the best available science, contemporary media, and interdisciplinary collaboration.
- Provide lifelong learning and a variety of fully accessible opportunities for all age groups, on site, off site, and virtually, resulting in repeat visits, volunteerism, and increased understanding of nation's heritage and conservation legacy (USFS 2011b).

FSM 7700—Travel Management Chapter 7730 addresses road operation and maintenance. Under the action alternatives, preserve roads would be upgraded to accommodate more traffic. These roads would require operations and maintenance activities. The following activities may apply:

- Actively seek the cooperation of state and local law enforcement officials in enforcing state traffic law on National Forest System roads.
- Actively cooperate to the extent practicable with state and local law enforcement agencies in enforcing state traffic law, investigating traffic accidents, and prosecuting criminal offenses committed on National Forest System roads.
- Prevent damage to roadways.
- Abate unsafe traffic conditions.
- Control the use of vehicles that exceed the design capacity of a road.
- Employ traffic management strategies on preserve roads where appropriate to control traffic.
- Maintain preserve roads to accommodate their intended use safely and in accordance with maintenance criteria (USFS 2008c).

Methodology for Analyzing Impacts

The methodology for determining impacts on preserve management and operations is based on the guidance above. The geographic area of concern is the preserve. This analysis involves qualitatively identifying and assessing how the following elements would affect preserve management and operations:

1. operation and maintenance of the visitor contact station / visitor center
2. law enforcement provisions
3. public safety provisions
4. visitor and interpretive services
5. operation and maintenance of preserve roads

Alternative 1: No Action

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short/long term: none
Programmatic level: direct/indirect	Within the bounds of the study area	Short/long term: none
Cumulative	Actions listed in table 4-1	None

Direct/Indirect Impacts

Implementation Level

Alternative 1 would result in a reduction of administrative support for the preserve due to reduced visitor use. There would be no public benefit under this alternative.

This alternative would result in the removal of the Valle Grande and Banco Bonito Staging Areas and the elimination of the interim recreation programs and activities. Information provided to visitors about the preserve would be limited to the website and the Jemez Springs administrative facility. The existing staging areas are temporary facilities that do not require substantial operations or maintenance. Therefore, administrative support in support of public access and use would be reduced with the closing of the Valle Grande Staging Area. However, there would be no benefit for the public.

Programmatic Level

Although the VCT would provide no recreational services except the two free trails on Rabbit Mountain under the no-action alternative, there would be no measurable impact on the preserve's operation and maintenance activities at the programmatic level.

Cumulative Impacts

Actions and activities that would affect visitors include those listed in table 4-1 for preserve management and operations. Past actions will help reduce future workload by maintaining the conditions of the preserve's roads and facilities, preventing them from falling into expensive disrepair. However, there is currently a $1.2 million backlog for maintenance of the buildings in the headquarters area, where the water system also requires ongoing maintenance. Current and future actions, such as fire management activities, noxious weed eradication, and restoration programs, occupy VCT staff time and budgets, and will continue to do so in the future. The implementation of the *Santa Fe National Forest Land and Resource Management Plan* and the *Southwest Jemez Mountains Collaborative Forest Landscape Restoration Proposal* (USFS 1987; USFS and VCT 2010) will add to the staff's workload. These actions will have beneficial impacts in that preventive measures will offset expensive repair or restoration activities in the future. Adverse impacts will result if staffing and/or funding levels become insufficient to address these tasks, as demonstrated by the current maintenance backlog. For these reasons, the impacts of these actions are expected to be moderate and adverse.

Because no measurable impacts would be expected under the no-action alternative, there would be nothing to add to the other past, present, and reasonably foreseeable future activities discussed above. Therefore, there would be no cumulative impacts.

Alternative 2: Banco Bonito Visitor Contact Station

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: moderate and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: moderate and adverse
Cumulative	Actions listed in table 4-1	Moderate and adverse

Direct/Indirect Impacts

Implementation Level

Under alternative 2, the visitor contact station and increased numbers of visitors would require expanded operations and maintenance activities.

Under alternative 2, the existing Banco Bonito Staging Area would be removed and new development would occur. A small-scale visitor contact station would be developed (up to 5,000 square feet), with associated day-use facilities, a small parking area, and roads to provide access to the preserve for personal vehicles and/or shuttles, which would be used on high-use days to accommodate increased visitation. Nonmotorized access from the visitor contact station to the existing network of trails in the area would be generally open and unlimited.

The size of the visitor contact station compared to the existing staging areas would represent a considerable increase in space requiring operations and maintenance activities. VCT staff members would take on additional tasks to operate the visitor

contact station and make any necessary alterations, improvements, and repairs to it. These activities would also require the purchase of materials as needed. Although renewable energy would be used to provide heat and electricity for the visitor contact station, these utilities may have to be purchased to a certain extent, as would telephone service.

The visitor contact station would have to be staffed by personnel to greet visitors, answer questions, and possibly provide interpretive services. Janitorial services would also need to be provided for cleaning the facilities. Landscape maintenance services, such as tree trimming, may also be required.

This alternative would greatly increase visitation. It is expected that over 50,000 guests would visit the visitor contact station each year, compared to the approximately 25,000 visitors who participated in public programs in 2010. As a result, the VCT would have to provide more law enforcement services and public education regarding applicable laws and regulations. VCT staff members would have to regularly inspect the visitor contact station and surrounding facilities to correct any safety hazards. Additional interpretive services would also need to be provided for the increased number of visitors.

The increase in management, maintenance, and operations requirements would fluctuate seasonally, with the highest need occurring during peak season. Therefore, seasonal staff, including volunteers, could be used to help offset costs associated with long-term employment.

Funding would need to be obtained to develop the visitor contact station and associated day-use facilities. Funds would also be required to pay salaries associated with operating and maintaining these facilities. See chapter 2 for an estimate of development costs. Although adverse impacts to the VCT would result regarding overall costs of management and operations, a substantial public benefit would result. Not only would broad public access be provided, which would enhance the visitor experience, VCT staff would provide additional public safety and resource protection under this alternative.

In the short term, VCT staff would need to oversee construction activities during the deconstruction of the Banco Bonito Staging Area, the construction of the visitor contact station and associated parking and day-use facilities, and modifications to NM-4. All these activities associated with the development of the visitor contact station would place additional financial and human resource requirements on the VCT; however, short-term impacts related to deconstruction and construction would be negligible and adverse. Long-term impacts related to these activities would be measurable and would influence the VCT's maintenance and operations capabilities. Therefore, long-term impacts to the VCT would be moderate and adverse, but public benefits would result.

Programmatic Level

The operation of shuttles within the preserve on high-use days under alternative 2 would require staff to operate the shuttles, and the development of maintenance and storage facilities.

The road from Banco Bonito to the headquarters area would be upgraded to a Level 4 road. Visitors would be able to drive Level 3 roads, which would be improved, from that point farther into the preserve. On high-use days, a shuttle system would be implemented, with associated picnic areas, overlooks, and other visitor amenities developed along the route. As mentioned under "Implementation Level" for this alternative, visitation is expected to increase under alternative 2 compared to existing conditions. Currently, visitor use of preserve roads is mostly restricted. Opening the roads to approximately 50,000 visitors would result in increased road maintenance, as well as maintenance of the new visitor amenities, compared to existing conditions.

Maintenance and storage facilities and personnel would be required for the shuttles. Staff or a concessionaire would need to be hired to drive the shuttles, possibly to provide interpretive services on the shuttle, and to maintain and fuel the shuttles. Materials would need to be purchased for road and shuttle repairs and maintenance, such as oil, spare tires, etc. Shuttle vehicles would have to be purchased, and individual vehicles would need to be replaced as needed. Shuttles would be used during peak season and during high demand, which would limit the amount of operations and maintenance required for shuttle use.

Under alternative 2, the VCT would have to enforce state traffic law, investigate traffic accidents, and prosecute criminal offenses committed on the preserve's roads.

The VCT would have to enforce state traffic law, investigate traffic accidents, and prosecute criminal offenses committed on the preserve's roads. As per the Valles Caldera Preservation Act, law enforcement services are provided to the VCT by the Secretary of Agriculture on a reimbursable basis. Significant increase in visitation would require the VCT to supplement USFS Law Enforcement Officers. Staff members would be required to inspect and repair roads to prevent damage to them and to abate unsafe traffic conditions. Staff members would also need to control the use of vehicles that exceed the design capacity of a road, employ traffic management strategies to control traffic, and maintain roads to accommodate their intended use. In addition, materials would need to be purchased for road repairs.

Additional staff would be required to provide interpretive services and equestrian and other visitor programs throughout the preserve. With increased visitation, VCT staff members would need to assist in managing visitor capacity and influencing on-site behavior, such as reducing user conflicts, protecting the resources, and enabling visitors to make accurate risk assessments and take appropriate safety precautions. Staff members would also be required to provide the minimal education and ecotourism services proposed under this alternative and to maintain these facilities to provide life-long learning.

As described above, seasonal staff, including volunteers, could be used to help offset costs associated with long-term employment needed to provide programmatic-level services in the preserve.

Funding would need to be obtained to improve the roads, purchase shuttles, and pay salaries associated with operating and maintaining these facilities and services. See chapter 2 for an estimate of costs.

In the short term, VCT staff would need to oversee road improvement and upgrade activities and the construction of facilities along the shuttle routes. Short-term impacts related to upgrades and construction would be negligible and adverse. Programmatic-level activities would be measurable and would influence the VCT's maintenance and operations capabilities. Therefore, long-term impacts to the VCT would be moderate and adverse, but public benefits would result.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 2 as well. The operations and maintenance activities required under alternative 2 would be a considerable addition to the activities that VCT staff members already undertake and are expected to undertake in the future. When the long-term moderate adverse impacts expected under alternative 2 are combined with the moderate adverse impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be moderate and adverse.

Alternative 3A: Entrada del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: major and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: major and adverse
Cumulative	Actions listed in table 4-1	Major and adverse

Direct/Indirect Impacts

Implementation Level

Alternative 3 would require additional management and operations activities due to the creation of a full-sized visitor center and expected increase in visitors.

The central feature of alternative 3A is the development of a full-service visitor center. A wide variety of visitor services and amenities would be offered from the visitor center, including a theater, exhibit halls, classroom space, retail and food service space, and indoor and outdoor observation decks. Associated day-use facilities would include access to the East Fork of the Jemez River and South Mountain for hiking and fishing, as well as group staging and picnic areas. The visitor center would be up to 10,000 square feet, accommodating considerably more visitors than the existing Valle Grande Staging Area, which would be removed.

The same operations and maintenance activities described for alternative 2 would apply to alternative 3A as well, but in a greater capacity. Substantially more visitor services would be provided at this visitor center, requiring personnel to staff and operate the theater, maintain and update the exhibit halls, develop and teach classes, and staff and manage the retail and food services. Coordinating all these services and activities would require considerable management time. A full-time visitor center manager may need to be hired.

The visitor center would include administrative space and offices for interpretive staff, volunteers, and law enforcement, as well as a break room. A storage area, access for deliveries, and a work area for building maintenance would also be accommodated. These facilities would concentrate management, operations, and maintenance staff in one location where the majority of work would likely be required. A central location for staff would also foster communication among employees and enable quick response when issues arise.

As mentioned under alternative 2, seasonal staff and volunteers could be used to provide some of the services required under alternative 3A, in conjunction with peak visitor seasons. This would help alleviate some of the work assigned to permanent staff and help contain costs.

Funding would need to be obtained to develop the visitor center and associated day-use facilities. See chapter 2 for an estimate of development costs. Funds would also be required to pay salaries associated with managing, operating, and maintaining these facilities. If concessionaires and/or volunteers are used to provide some of the services in the visitor center, such as operating the food and retail services, impacts on the VCT would be more financial than personnel related. VCT staff members would be able to concentrate more on providing the services they already offer, such as conducting tours.

In the short term, VCT staff would need to oversee construction activities during the deconstruction of the Valle Grande Staging Area, the construction of the visitor center and associated parking and day-use facilities, and modifications to NM-4. Short-term impacts related to deconstruction and construction would be minor and adverse. The activities associated with the development of the visitor center would place additional financial and human resource requirements on the VCT in the long term. Such impacts would be measurable and would alter the structure, composition, or function of the VCT's maintenance and operations staff and funds. Therefore, long-term impacts to the VCT would be major and adverse, although having a central location for management, operations, and maintenance staff in the visitor center would constitute a beneficial impact. Like alternative 2, although adverse impacts to the VCT would result from increased costs, substantial public benefits would result.

Programmatic Level

Several roads in the preserve would be upgraded to Level 4, and a new access road to the visitor center would be required. With the exception of accessing the Banco Bonito Staging Area, which would remain, visitors would not be able to drive personal vehicles in the preserve (although hunters would be able to drive to their destinations). Access in the preserve would be provided by shuttle. Similar to alternative 2, VCT staff members would drive the shuttles or a concessionaire would need to be hired to drive the shuttles, possibly to provide interpretive services on the shuttles, and to maintain and fuel the shuttles; however, under this alternative it would be on a much larger scale due to higher visitor demand. Materials would need to be purchased for road and shuttle repairs and maintenance. A fleet of shuttle vehicles would have to be purchased, and individual vehicles would

need to be replaced as needed. Roads and a bicycle path paralleling the shuttle loop road would need to be inspected and repaired from increased vehicular and bicycle use.

The shuttle system would not operate during winter, which would save on operations costs. Maintenance activities may still occur during winter while shuttles are in storage.

The new facilities throughout the preserve would require inspection, maintenance, and law enforcement activities. VCT would also provide interpretive services and other visitor programs. Additional staff would be required to support these services.

New facilities and infrastructure for visitors would be developed in the preserve, including fishing access sites, trailheads, overlooks, campgrounds, and picnic areas. These areas would require inspection and maintenance and additional law enforcement and other activities to help ensure visitor safety. The substantial increase in visitation expected under this alternative would result in the potential for visitor conflicts and unlawful activities, requiring more law enforcement. Additional staff would be needed to protect the public, employees, natural resources, and other VCT property; to investigate and enforce applicable laws and regulations; and to prevent criminal violations by informing and educating visitors and users of applicable laws and regulations.

Additional staff would also be required to provide interpretive services and equestrian and other visitor programs throughout the preserve. Staff would also be required to operate the environmental and ecotourism programs proposed under this alternative, which would provide lifelong learning and a variety of fully accessible opportunities for all age groups, on site, off site, and virtually. Several new facilities would be developed for these programs, which would also require maintenance.

Funding would need to be obtained to improve the roads, purchase shuttles, provide more visitor amenities and educational programs, and pay salaries associated with operating and maintaining these facilities and services. See chapter 2 for an estimate of costs.

In the short term, VCT staff would need to oversee road improvement and upgrade activities and the construction of facilities along the shuttle routes. Short-term impacts related to upgrades and construction would be negligible and adverse. Programmatic-level activities would be measurable and would alter the structure, composition, or function of the VCT's maintenance and operations staff and funds. Therefore, long-term impacts to the VCT would be major and adverse, but substantial public benefits would result.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 1 would apply to alternative 3A as well. The operations and maintenance activities required under alternative 3A would be a substantial addition to the activities VCT staff members already undertake and are expected to undertake in the future. When the long-term major adverse impacts expected under alternative 3A are combined with the moderate adverse impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be major and adverse.

Alternative 3B: Entrada del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: major and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: major and adverse
Cumulative	Actions listed in table 4-1	Major and adverse

Direct/Indirect Impacts

Implementation Level

Alternative 3B would differ from alternative 3A in that visitors would access the preserve using personal vehicles rather than shuttle buses, discussed under "Programmatic Level" for this alternative. Implementation-level impacts would be the same as those for alternative 3A: minor and adverse in the short term and major and adverse in the long term, with substantial public benefits.

Programmatic Level

The use of personal vehicles instead of shuttles under alternative 3B for visitors traveling throughout the preserve would increase traffic safety and law enforcement issues and staff requirements.

Personal vehicles would travel in the preserve, following the same loop route described for shuttle vehicles under alternative 3A. Shuttles would be used for tours and group events, or to reduce congestion on high-use days. Roads would be improved to accommodate the mix of shuttles and personal vehicles. Parking lots would be developed at trailheads, fishing access sites, picnic areas, and overlooks to accommodate the increased number of personal vehicles.

Allowing personal vehicle access in the preserve would present traffic safety and law enforcement issues. Additional law enforcement staff would be required to enforce state traffic law, investigate traffic accidents, and prosecute criminal offenses committed on preserve roads. Personal vehicle access in the preserve may allow visitors to poach or vandalize protected resources, requiring more law enforcement presence. Safety issues could arise from visitors driving too fast to reach their destinations, combined with visitors driving too slow or stopping to view wildlife. Safety issues could also arise from a mix of vehicle types using the roads, such as slower-moving RVs with faster-moving cars or motorcycles, as well as cyclists using the bike path that would parallel the loop road.

VCT staff would be required to control the use of vehicles that exceed the design capacity of a road, and to employ traffic management strategies where appropriate to control traffic, particularly on high-use days. Personal vehicles may break down or get stuck while in the preserve, requiring assistance. This would be particularly true if visitors try to drive vehicles on road levels unsuitable for their vehicle type. Substantially more vehicles would use the roads, requiring ongoing inspection and maintenance activities to repair damage and ensure safety.

Because shuttles would be used for tours and group events, or to reduce congestion on high-use days, operations and maintenance of a shuttle program would be required. Staff or a concessionaire would need to be hired to operate the shuttles during peak season, and shuttles would need to be maintained as described for alternative 3A, but to a lesser degree. This would result in increased costs and personnel compared to existing conditions.

In the short term, VCT staff members would need to oversee road improvement and upgrade activities and the construction of facilities along the roads. Short-term impacts related to upgrades and construction would be negligible and adverse. Allowing substantially more personal vehicle use in the preserve, as well as providing limited shuttle service, would alter the structure, composition, or function of the VCT's maintenance and operations staff and funds. Therefore, long-term impacts to the VCT would be major and adverse, but substantial public benefits would result.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 3A would apply to alternative 3B as well. When the long-term major adverse impacts expected under alternative 3B are combined with the moderate adverse impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be major and adverse.

Alternative 4A: Vista del Valle Visitor Center—Primary Access via Shuttle System

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: major and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: major and adverse
Cumulative	Actions listed in table 4-1	Major and adverse

Direct/Indirect Impacts

Impacts associated with alternative 4A would be similar to those described for 3A, though there could be additional challenges in securing a viable water source and electricity for the visitor center, resulting in potentially higher costs for these amenities.

Implementation Level

Like alternative 3A, the central feature of alternative 4A is development of a full-service visitor center, with similar amenities and facilities. The location of the visitor center under alternative 4A poses potential complications in securing a viable water source and electricity. As noted in chapter 2, it would be costly to create the systems and infrastructure to supply water to the site, as well as electrical power. This would result in additional direct expenses, and possibly more long-term operations and maintenance of these utilities. In other respects, there would be no measurable difference between alternatives 3A and 4A from a management and operations standpoint: short-term impacts to the VCT would be minor and adverse and long-term impacts would be major and adverse, with substantial benefits to the public.

Programmatic Level

Access in the preserve would be provided primarily by shuttle, as described for alternative 3A. From a management and operations standpoint, there would be no measurable difference between alternatives 3A and 4A: short-term impacts to the VCT at the programmatic level would be negligible and adverse and long-term impacts would be major and adverse, with substantial benefits to the public.

Cumulative Impacts

The other past, present, and reasonably foreseeable future actions described for alternative 3A would apply to alternative 4A as well. When the long-term major adverse impacts expected under alternative 4A are combined with the moderate adverse impacts of other past, present, and reasonably foreseeable future activities, cumulative impacts would be major and adverse.

Alternative 4B: Vista del Valle Visitor Center—Primary Access via Personal Vehicle

Summary

Effect	Context	Intensity
Implementation level: direct/indirect	Within the bounds of the study area	Short term: minor and adverse Long term: major and adverse
Programmatic level: direct/indirect	Within the bounds of the study area	Short term: negligible and adverse Long term: major and adverse
Cumulative	Actions listed in table 4-1	Major and adverse

Direct/Indirect Impacts

Implementation Level

Implementation-level impacts under alternative 4B would be similar to alternative 4A. Programmatic-level impacts would be similar to alternative 3B.

Alternative 4B would differ from alternative 4A in that visitors would access the preserve using personal vehicles rather than shuttle buses. Implementation-level impacts would be the same as those under alternative 4A: minor and adverse in the short term and major and adverse in the long term, with substantial public benefits.

Programmatic Level

Short-term impacts would be negligible and adverse and long-term impacts to the VCT would be major and adverse with substantial public benefits, as described for alternative 3B.

Cumulative Impacts

Cumulative impacts would be major and adverse, as described for alternative 3B.

Unavoidable Adverse Impacts

The VCT is required to consider whether the alternative actions would result in impacts that could not be fully mitigated or avoided (NEPA Section 102[c][ii]).

Alternative 1: No Action

Under alternative 1, unavoidable adverse impacts on visitor experience would occur because access to the preserve would be severely restricted.

- The no-action alternative would result in the removal of the Valle Grande Staging Area and Banco Bonito Staging Area facilities and the elimination of the interim recreation program.
- No visitor facilities or new infrastructure would be located in the preserve.
- Visitors would still be able to hike the trails located at Rabbit Mountain without a permit or fee. However, spontaneous access to the majority of the preserve would be restricted.

Alternative 2: Banco Bonito Visitor Contact Station

Unavoidable adverse impacts would occur to the following resources:

- Visual Resources: More visitors and personal vehicles would be visible within the preserve.
- Transportation: Increased traffic would occur on NM-4, with a potential for congestion and accidents.
- Vegetation: Construction would result in permanent impacts on approximately 3.0 acres of grassland and forest habitat.
- Fish and Wildlife, Special-status Species: Increased visitor use may result in habitat fragmentation, may adversely affect habitat use and migration patterns by some wildlife species, and may increase the risk of animal/vehicle collisions, resulting in direct mortality to elk and other species. Conversely, some wildlife may be attracted to human presence and new sources of food. An increase in the number of anglers could impact special-status fish through direct mortality, and could disturb special-status species that inhabit wetlands and aquatic areas. Increased visitation may also adversely affect elk calving through disturbance or disruption.
- Geology and Soils: Soil compaction and an increased potential for erosion would occur.
- Water: Alternative 2 would require approximately 2 million gallons of water per year.
- Natural Sounds: Noise levels would be increased substantially over existing conditions.
- Cultural Resources: Cultural resources may be impacted by construction, as well as by trampling, vandalism, unauthorized collection, or visual intrusion. Appropriate mitigation would be developed through the Section 106 process.

- Carbon Footprint and Air Quality: Additional visitation would result in an increase of mobile combustion sources from visitors driving to and from the visitor contact station.
- Preserve Management and Operations: Unavoidable adverse impacts on operations and management would occur due to the demands on staff to provide more visitor services and maintenance.

Alternative 3A: Entrada del Valle Visitor Center—Primary Access via Shuttle System

Unavoidable adverse impacts would be similar to those under alternative 2, but would occur to a greater extent given the considerable increase in visitation. Additional primary differences include the disturbance of previously undisturbed ground and a larger construction footprint for the visitor center. Unavoidable adverse impacts would occur to the following resources:

- Visual Resources: impacts would occur due to the presence of new human-made facilities.
- Vegetation: The construction of new facilities would impact between 5 and 10 acres of previously undisturbed habitat, including some that is considered rare. Up to 7.8 acres of wetlands would be directly affected by the construction of the access road and other facilities. Construction of new trails along the East Fork of the Jemez River may have unavoidable adverse impacts on riparian habitat.
- Fish and Wildlife, Special-status Species: A variety of wildlife and several special-status species may use some portion of the visitor center area as breeding habitat, foraging habitat, or cover during daily movements.
- Geology and Soils: Unavoidable adverse impacts on soils would occur from disturbing an undisturbed site, with compaction occurring as described for alternative 2, but in a much larger area.
- Water: Up to 1,379 feet at two stream crossings potentially could be affected by the construction of the access road and facilities. Additional parking facilities, pullouts, trailheads, and hiking trails could have unavoidable adverse impacts on water resources if their footprints encompass wetlands, streams, or floodplains. This alternative would require approximately 4.4 million gallons of water annually.
- Natural Sounds: Noise would increase near the visitor center from increased, concentrated visitation at that location, as well as from shuttle bus use throughout the preserve, with adverse effects on visitors and wildlife.
- Cultural Resources: Ten of the 11 archeological sites that are on or near the proposed visitor center site have been determined to be eligible for or recommended as eligible for listing in the NRHP. Unavoidable adverse impacts on cultural resources would be likely. Appropriate mitigation would be developed through the Section 106 process.

Alternative 3B: Entrada del Valle Visitor Center—Primary Access via Personal Vehicle

Impacts related to the proposed visitor center and associated facilities would be the same as those under alternative 3A. Differences would be based on personal vehicle use vs. shuttle use throughout the preserve, as described below.

- Transportation: There would be increased potential for motor vehicle accidents.
- Fish and Wildlife, Special-status Species: The use of personal vehicles would create more frequent, widespread disturbance to terrestrial wildlife than a shuttle system, and would likely result in more collisions with wildlife, including special-status species. More unlimited access via personal vehicle could result in potential illegal collection of special-status plants or hunting.
- Cultural Resources: Unavoidable adverse impacts on cultural resources would be likely from trampling, vandalism, unauthorized collection, or visual intrusion.
- Natural Sounds, Carbon Footprint and Air Quality: Noise and carbon footprint impacts would increase due to an increase in motor vehicle use, to a greater degree than would be caused by shuttle use because more vehicles would travel through the preserve and a wide variety of engine types would result in a mixture of noise levels and emissions.
- Preserve Management and Operations: Allowing personal vehicle access in the preserve would require hiring more safety and law enforcement staff in addition to those currently employed.

Alternative 4A: Vista del Valle Visitor Center—Primary Access via Shuttle System

Unavoidable adverse impacts at the programmatic level would be similar to those under alternative 3A. Locating the proposed visitor center near Rabbit Mountain would result in the following differences.

- Visual Resources: Like under alternative 3A, unavoidable adverse visual impacts would occur due to the presence of new human-made facilities. Additional unavoidable adverse visual impacts would result from views of the new facility from across the Valle Grande.
- Vegetation: The proposed visitor center site is previously undisturbed; construction would primarily affect grasslands, and some trees would be removed to make way for development. Up to 1.8 acres of wetlands would be directly affected by the construction of the access road and facilities.
- Fish and Wildlife, Special-status Species: Unavoidable adverse impacts from potential wildlife habituation and conditioning to human food at the visitor center would be as described for alternative 3A. The presence of a large visitor center and a substantial increase in human presence could affect mountain lion migration from Bandelier National Monument. Site-specific

development is likely to have less of an impact on mountain lions than the overall increase in human presence preserve-wide. Several historic Jemez Mountains salamander locations exist within 1 mile of the proposed visitor center. The footprint of the visitor center and parking lots would eliminate underground habitat for the salamander. Cliffs in the vicinity of the visitor center present marginal potential for American peregrine falcon nesting, which could be adversely affected by increased human activity in this area.

- Water: Up to 504 feet at one stream crossing potentially could be affected by the construction of the access road and facilities.
- Cultural Resources: All 11 archeological sites on or near the proposed visitor center site have been determined to be eligible for or recommended as eligible for listing in the NRHP. Unavoidable adverse impacts on cultural resources would be likely. Appropriate mitigation would be developed through the Section 106 process.

Alternative 4B: Vista del Valle Visitor Center—Primary Access via Personal Vehicle

Unavoidable adverse impacts under alternative 4B would be similar to those under alternative 4A, but with the additional impacts associated with personal vehicle use instead of shuttles, as described under alternative 3B.

Short-term Uses and Long-term Productivity

In accordance with NEPA Section 102(c)(iv), "the relationship between local short-term uses of [the] environment and the maintenance and enhancement of long-term productivity" must be considered for each alternative. This means determining how short-term uses of the environment, such as those that would occur during construction activities, would impact the long-term sustainability of the affected resources. For example, construction activities may disturb soils and generate dust in the short term. If sufficient soil resources exist to offset this effect, then the productivity of the soils would be maintained in the long term, helping to ensure the sustainability of the resource. These relationships are described below for each alternative.

Alternative 1: No Action

Short-term uses of environmental resources would be associated with the deconstruction and removal of the existing staging areas. However, such uses would be negligible and would not affect the long-term sustainability of the preserve's resources. Grazing and other approved land use programs would continue under alternative 1, with ongoing impacts similar to existing conditions. The long-term sustainability of environmental resources would be enhanced under alternative 1 because human activity would be considerably reduced, allowing the preserve to revert to a more natural state.

Alternative 2: Banco Bonito Visitor Contact Station

Short-term uses of the preserve's environment would occur through deconstruction of the staging areas, construction of the visitor contact station and associated facilities, campgrounds, parking areas, and other recreational amenities throughout the preserve, and upgrades to existing roads. These impacts would be mitigated to the extent possible as described in chapter 2.

- Implementation of a stormwater pollution prevention plan would address potential impacts from stormwater flowing over construction sites, resulting in no change to the long-term sustainability of the preserve's water resources from construction-related activities.
- Soil disturbance and dust generation during construction and during the removal of the existing facilities would occur. These impacts would not affect the long-term sustainability of the preserve's soils given the localized extent of construction activities, and the stormwater pollution prevention plan would also address mitigation for sedimentation and erosion.
- Surveys for golden eagle nests would be conducted prior to short-term deconstruction and construction activities. The VCT would allow a 660-foot buffer between the nest or key use areas and the use of heavy equipment or land clearing. Therefore, short-term uses of the environment for deconstruction and construction activities would not affect the long-term sustainability of golden eagles.
- The construction of the visitor contact station would result in permanent impacts on approximately 3.0 acres of grassland and forest habitat, which would displace a variety of wildlife. Mitigation measures described in chapter 2 would be implemented to minimize impacts to wildlife, including elk, and special-status species to the extent possible.
- Natural sounds would be affected by short-term construction noise. Upon completion of construction, natural sounds would return. Although the presence of an increased amount of visitors to the visitor contact station would occur, the majority of the preserve would remain dominated by natural sounds that would continue in the long term.
- Cultural resources are basically nonrenewable resources, and damage to or destruction of cultural resource sites is generally permanent. Therefore, short-term uses of the environment for construction activities could affect the sustainability of the preserve's cultural resources in the long term. An APE for the proposed visitor contact station, parking lots, picnic areas, and road improvements would be identified and the Section 106 process completed to assess the effects of the construction and use of the new visitor facilities and removal of the staging areas. The VCT would seek to avoid, reduce, or minimize adverse effects on historic properties and areas important to Native Americans.

Alternative 3A: Entrada del Valle Visitor Center—Primary Access via Shuttle System

Under alternative 3A, the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity would be similar to that under alternative 2. Although short-term construction impacts would involve a larger footprint under alternative 3A, impacts would be localized, and sufficient natural resources exist throughout the preserve to maintain and enhance their long-term sustainability.

As described above, cultural resources are basically nonrenewable. Short-term uses of the environment for construction activities could affect the sustainability of the preserve's cultural resources in the long term. To address this issue, the VCT would implement the Section 106 process and mitigation measures described for alternative 2.

Alternative 3B: Entrada del Valle Visitor Center—Primary Access via Personal Vehicle

The use of personal vehicles rather than shuttle buses to access the preserve would not change the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity as described for alternative 3A.

Alternative 4A: Vista del Valle Visitor Center—Primary Access via Shuttle System

The relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity would be the same as described for alternative 3A.

Alternative 4B: Vista del Valle Visitor Center—Primary Access via Personal Vehicle

The use of personal vehicles rather than shuttle buses to access the preserve would not change the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity as described for alternative 4A.

Irreversible or Irretrievable Commitments of Resources

The preserve must consider whether the effects of the alternatives cannot be changed or are permanent (that is, the impacts are irreversible). The preserve must also consider whether the impacts on resources would mean that once gone, the resource could not be replaced; in other words, the resource could not be restored, replaced, or otherwise retrieved (NEPA Section 102[c][v]). The analysis of irreversible commitments of resources applies primarily to the effects of the use of nonrenewable resources, such as cultural resources, or to factors such as soil productivity that are renewable only over long periods of time. The analysis of irretrievable commitments of resources applies to loss of production, harvest, and use of natural resources.

Alternative 1: No Action

No potential for irreversible or irretrievable commitments of resources would be expected under this alternative. Human activity would be considerably reduced, allowing the preserve to revert to a more natural state and reducing the possibility of permanent (irreversible) impacts. The Valles Caldera Preservation Act specifically authorizes the use of the preserve by Native Americans for religious and cultural purposes, therefore allowing continued harvest and use of resources by Native Americans.

Alternative 2: Banco Bonito Visitor Contact Station

Direct mortality would occur to individuals of some wildlife and special-status species. Cultural resources are basically nonrenewable resources, and damage to or destruction of cultural resource sites is generally permanent (irreversible). Such damage would occur from construction activities and potential theft and vandalism from increased visitation. An APE for the proposed visitor contact station, parking lots, picnic areas, and road improvements would be identified and the Section 106 process completed to assess the effects of the construction and use of the new visitor facilities and removal of the staging areas. The VCT would seek to avoid, reduce, or minimize adverse effects on historic properties and areas important to Native American communities and Tribes. However, the potential for some irreversible and irretrievable impacts on cultural resources would be expected. Irreversible impacts would occur because cultural resources are nonrenewable. Irretrievable impacts would occur from loss of use of cultural resources by Native Americans if such resources are damaged or stolen.

Alternative 3A: Entrada del Valle Visitor Center—Primary Access via Shuttle System

The potential for some irreversible and irretrievable impacts on cultural resources and wildlife/special-status species would be expected, as described for alternative 2. The extent of the impacts would be greater under alternative 3A due to a larger construction footprint for the visitor center and associated facilities, and substantially increased visitation, which could result in more theft or vandalism.

Alternative 3B: Entrada del Valle Visitor Center—Primary Access via Personal Vehicle

The potential for some irreversible and irretrievable impacts on cultural resources and wildlife/special-status species would be expected, as described for alternative 3A. However, the use of personal vehicles to access the preserve could result in more theft or vandalism, as visitors would have wider access to more remote areas of the preserve.

Alternative 4A: Vista del Valle Visitor Center—Primary Access via Shuttle System

The potential for some irretrievable and irreversible impacts on cultural resources and wildlife/special-status species would be expected, as described for alternative 3A.

Alternative 4B: Vista del Valle Visitor Center—Primary Access via Personal Vehicle

The potential for some irretrievable and irreversible on to cultural resources and wildlife/special-status species would be expected, as described for alternative 3B.