United States
Department of
Agriculture

Forest Service

Pacific
Northwest
Region

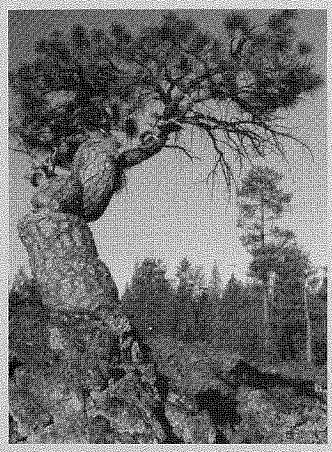
**Deschutes
National Forest**

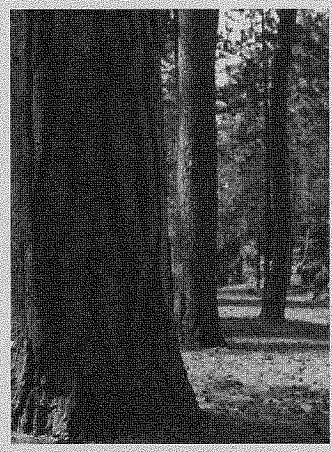
August 1994

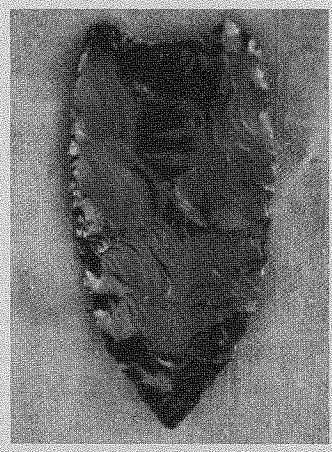
Newberry National Volcanic Monument Comprehensive Management Plan

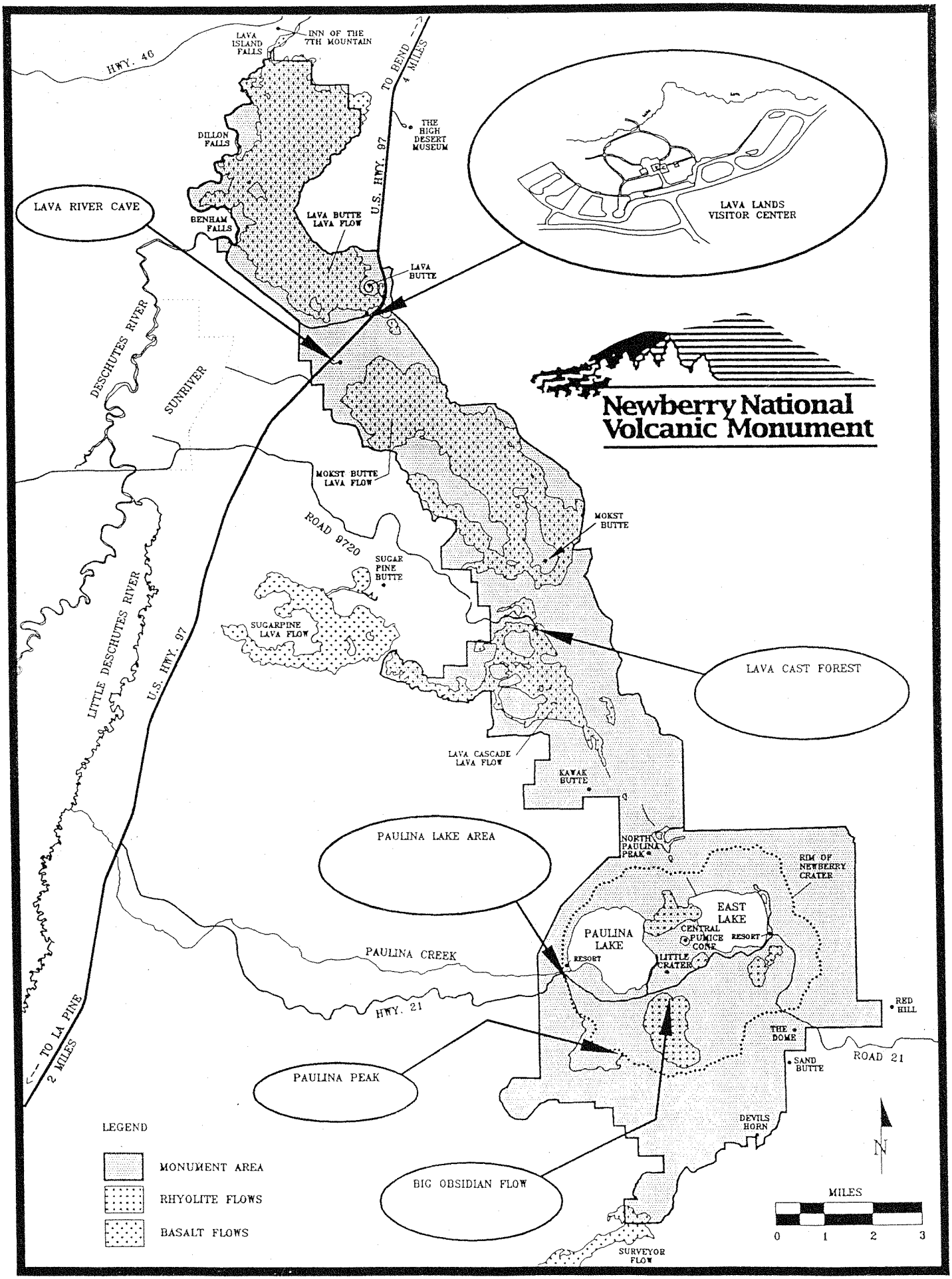
Summary of Final Environmental Impact Statement

Deschutes National Forest








HWY. 46
LAVA ISLAND FALLS
INN OF THE 7TH MOUNTAIN
TO BEND 4 MILES
U.S. HWY. 97
THE HIGH DESERT MUSEUM
DILLON FALLS
LAVA LANDS VISITOR CENTER
LAVA RIVER CAVE
BENHAM FALLS
LAVA BUTTE LAVA FLOW
LAVA BUTTE
DESCHUTES RIVER
SUNRIVER
Newberry National Volcanic Monument
MOKST BUTTE LAVA FLOW
ROAD 9720
MOKST BUTTE
SUGAR PINE BUTTE
SUGARPINE LAVA FLOW
LITTLE DESCHUTES RIVER
U.S. HWY. 97
LAVA CAST FOREST
LAVA CASCADE LAVA FLOW
KAVAK BUTTE
PAULINA LAKE AREA
NORTH PAULINA PEAK
RIM OF NEWBERRY CRATER
EAST LAKE
PAULINA LAKE
CENTRAL PUMICE CONE
RESORT
RESORT
LITTLE CRATER
PAULINA CREEK
HWY. 21
RED HILL
THE DOME
SAND BUTTE
ROAD 21
TO LA PINE 2 MILES
PAULINA PEAK
DEVILS HORN
LEGEND
MONUMENT AREA
RHYOLITE FLOWS
BASALT FLOWS
BIG OBSIDIAN FLOW
SURVEYOR FLOW
N
MILES
0 1 2 3

ENVIRONMENTAL IMPACT STATEMENT
FOR
NEWBERRY NATIONAL VOLCANIC MONUMENT
MANAGEMENT PLAN

Deschutes National Forest
Deschutes County, Oregon
August 1994

Lead Agency: USDA Forest Service
Responsible Official:
John Lowe, Regional Forester
USDA Forest Service
333 SW 1st Street
Portland, OR 97204

For More Information, Contact:
Carolyn Wisdom, Special Projects
Fort Rock Ranger District
1230 NE Third, Suite A262
Bend, OR 97701 (503) 383-4702

Abstract

This final environmental impact statement describes five alternatives for managing the Newberry National Volcanic Monument and adjacent special areas south of Bend, Oregon. Each alternative responds differently to the major issues and concerns identified in the planning process. The final EIS and management plan for the Monument will be incorporated into the Deschutes National Forest Land and Resource Management Plan at the next regularly scheduled revision.

Alternative A protects the special values of Newberry Monument, while emphasizing developed recreation and maximum access. It provides for the highest number of visitors and has the most roads, trails, and facilities.

Alternative B emphasizes solitude, dispersed recreation, wildlife enhancement, and resource protection. It accommodates the fewest number of visitors, and has the fewest roads, trails, and facilities.

Alternative C focuses on interpretation, education, and ecosystems. Principal interpretive topics are the unique archaeology and geology of the Newberry area. Prescribed fire is a major management tool to restore open, park-like stands of old-growth ponderosa pine historically present in Central Oregon. Recreational development is moderate, with an increased emphasis on day-use opportunities.

Alternative C-Modified was developed in response to public comments after the publication of the Draft EIS. It has the same emphasis on education, interpretation, and ecosystems as Alternative C. However, it proposes less vegetation management and includes the Monument trail. Alternative C-Modified is the Forest Service preferred alternative.

Alternative D is the No Action Alternative.

Summary

Environmental

Impact

Statement

Introduction

The United States Congress, recognizing the remarkable qualities of the Newberry Volcano area south of Bend, Oregon, created Newberry National Volcanic Monument on November 5, 1990. The first section of the legislation establishing the Monument sets out the purpose for designating this area a national treasure:

> **"There is hereby established the Newberry National Volcanic Monument in the State of Oregon as a component of the National Forest system in order to preserve and protect for present and future generations Newberry's remarkable geologic landforms -- and to provide for the conservation, protection, interpretation, and enhancement of its ecological, botanical, scientific, scenic, recreational, cultural, and fish and wildlife resources."**
> (Public Law 101-522)

The initiative for a national monument grew out of local concerns about the possibility of geothermal development in and around Newberry Crater. In the late 1980's a small group of Central Oregon citizens came to the Forest Service with a proposal to make the area a national monument. Recognizing the many interests at stake, the group invited to the table anglers, campers, hikers, geothermal interests, timber companies, environmentalists, community leaders, skiers and snowmobilers, local government representatives, mountain bikers, and horseback riders. This expanded group became known as the Monument Citizens' Committee.

After extensive collaborative negotiations, all interests on the Committee came to agreement on a proposal for a 50,000-acre national monument, to be managed by the Deschutes National Forest. This proposal also recognized the high potential for geothermal resources and the interests of geothermal leaseholders. The proposal specified a geothermal lease exchange process as a means of compensating leaseholders for the loss of their lease rights within Monument boundaries. It also established four other "special areas" adjacent to the Monument where geothermal exploration and development would be allowed, subject to certain restrictions. With the support and encouragement of the Oregon Congressional delegation, the group took their proposal to Washington, D.C., where they eventually convinced both Congress and the President of the special qualities of this national treasure. The result was the designation of Newberry National Volcanic Monument.

Location and General Description

Newberry National Volcanic Monument (NNVM) occupies some 50,000 acres of cinder cones, lava flows, and predominantly pine forests, in Deschutes County, between the communities of La Pine and Bend in Central Oregon. The Monument is about 25 miles long and varies in width between two and ten miles. Two mountain lakes full of trout and land-locked salmon (kokanee) are nestled in the caldera of massive Newberry Volcano. The caldera is also a wildlife refuge, home to bald eagles, bear, deer and elk. The highest point on the rim of the caldera is 7,985-foot Paulina Peak, offering spectacular views of the Oregon Cascades and across the high desert. The Big Obsidian Flow includes large chunks of black obsidian glass, and is easily accessible by car and trail. Scientists from all over the world come to study the features and learn about the forces that have shaped the landscape here, and to discover the legacy of more than half a million years of volcanic eruptions. The area is also rich in cultural history; archaeologists have found human camps in the caldera dating back about 10,000 years, making Newberry one of the oldest known archaeological sites in the Pacific Northwest.

Outside the caldera, much of the rest of the Monument is a mosaic of tall trees and lava flows. The Monument also includes Lava River Cave and Lava Cast Forest, unique features created by past volcanic action. The northwest part of the Monument borders the Deschutes River, a National Wild and Scenic River.

The interpretive hub of the Monument is Lava Lands Visitor Information Center, located just off Highway 97, eleven miles south of Bend. Lava Butte, an ancient cinder cone, rises 500 feet above the visitor center. A lookout tower at the top of the butte is open to the public. Visitors can enjoy the view and learn about the tools that fire lookouts use to scan the horizon for puffs of smoke.

The Monument lies in the middle of a booming recreational area. The clear sky, invigorating climate, and rugged scenery of the Central Oregon high desert draws visitors from all over the country. People come to ski at nearby Mt. Bachelor, canoe the high Cascades lakes, test their skills at over a dozen golf courses, or relax at first-class destination resorts. The area's popularity as a recreation destination has translated into a boom in resident population growth, with Deschutes County growing at a rate almost twice that of the State of Oregon in the past five years.

Purpose and Need

The **purpose** of the proposed action is to meet the requirement of the Monument legislation to develop a management plan for the Monument and adjacent special areas. The underlying **need** for the proposed action is to give the Forest Service clear direction on how to fulfill its mandate to "conserve, protect, interpret, and enhance" this special place, while providing enjoyment and learning opportunities for many thousands of visitors. By designating the Newberry area a national treasure, Congress intended to guarantee that future generations would be able to enjoy the recreational, scenic and other values of this remarkable landscape. In addition, both Congress and Central Oregon citizens felt that strong protection for the land would ensure that the unique geology, ecology, and cultural heritage of the area would be preserved. The legislation (and the management plan) is a promise to the people of Central Oregon and the nation that this national treasure will receive the care, attention, and respect it deserves.

Issues Summary

The issues addressed in plan came from a variety of sources. Public Law 101-522 establishing the Monument directed the Forest Service to consider a number of issues (Section 6b). They are all included here. Public comments and concerns led the agency to consider a number of other issues. Internal review further emphasized the need for protection of heritage (archaeological) resources and a sound interpretive program.

The following list of issues are addressed in this plan:

Recreation* (key)	Monitoring*
Roads and Facilities* (key)	Air Quality
Vegetation* (key)	Water Quality
Fire and Fuels* (key)	Scenic Quality
Fish and Wildlife* (key)	Law Enforcement*
Interpretation (key)	Local Communities
Heritage/Geology	American Indian Tribes
Science and Research*	Special Uses

*** Specific issue mandated by the Monument legislation**

The **key** issues are the issues that come up most frequently in public comment and over which there were the widely differing opinions. The alternatives were designed to respond in different ways to these issues. The other issues are also important, but did not drive differences in the design of the alternatives. They are addressed by provisions that would be applied in each of the alternatives.

Issue 1 - Recreation

What types and mix of recreation opportunities should the Monument provide?

Issue 2 - Roads and Facilities

What road access and what kinds of facilities should be provided?

Issue 3 - Vegetation

How should old growth ponderosa pine systems be restored? And how should biodiversity and healthy ecosystems be maintained?

Issue 4 - Fire and Fuels

How should we use fire to promote healthy ecosystems?

Issue 5 - Fish and Wildlife

What changes, if any, should we make in our present wildlife management approach? How can we minimize conflicts between visitors and wildlife?

Issue 6 - Interpretation

What type and level of interpretation will be provided?

Issue 7 - Heritage/Geology

How should we protect heritage (archaeological) resources and sensitive geologic features?

Issue 8 - Science and Research

What research should be allowed in the Monument?

Issue 9 - Monitoring

What elements and resources in NNVM should be monitored?

Issue 10 - Air Quality

What measures should be taken to protect air quality?

Issue 11 - Water Quality

What measures should be taken to protect water quality?

Issue 12 - Scenic Quality

How will management activities "conserve, protect, and enhance" the scenic qualities of the Monument?

Issue 13 - Law Enforcement

How will the Forest Service maintain an effective law enforcement presence to reduce conflicts and vandalism?

Issue 14 - Local Communities

How will management of NNVM affect local communities?

Issue 15 - American Indian Involvement

How can the American Indians' experience at Newberry be accurately presented?

Issue 16 - Lands and Special Uses

How will summer homes, resorts, and special use permits be managed in the Monument?

Features Common To All Action Alternatives

All action alternatives, in varying ways, meet the intent and purpose of the legislation establishing the Monument. That law states:

> **"There is hereby established the Newberry National Volcanic Monument in the State of Oregon as a component of the National Forest System in order to preserve and protect for present and future generations its remarkable geologic landforms and for the purposes of providing for the conservation, protection, interpretation, and enhancement of its ecological, botanical, scientific, scenic, recreational, cultural, and fish and wildlife resources."**

All the action alternatives (A, B, C, & C-Modified) share the following goals, and desired future conditions. Key opportunities that occur under all alternatives are also listed here. This section is divided by resources and issues, corresponding to the outline of issues in Chapter 1.

Overall Goals for NNVM

- Manage the Monument so that the values and resources for which it was designated are protected, enhanced, and interpreted.
- Keep the Monument a beautiful place, where people enjoy playing, exploring, and learning about nature.
- Sustain or restore ecosystems and ensure ecosystem resiliency within the Monument and Special Management Area.
- Protect the health and safety of visitors to the Monument.
- Provide for scientific research consistent with the purposes for which the Monument was established.
- Ensure that tree diseases, insect infestations, fire hazards, and fires within the Monument and Special Management Area do not seriously threaten resources outside the Monument and Special Management Area boundaries.
- Manage the surface of Newberry Special Management Area and of the Transferal Area Adjacent as part of the Monument, while allowing appropriate subsurface exploration for, and development of geothermal resources.
- Manage the Transferal Area and Transferal Corridor, to the extent practicable and consistent with the Geothermal Steam Act of 1970 and existing rights under geothermal leases, in a way that preserves the natural values which would qualify this area for designation as a national monument.
- Provide equal opportunity for all people to enjoy the Monument.

Desired Future Condition and Key Opportunities

Recreation

Desired Future Condition

Visitors enjoy many recreational opportunities. Many types of high quality settings provide for developed recreation, dispersed recreation, and opportunities for solitude. People coming to the Monument continue to recreate in "traditional" ways that were taking place at the time of Monument legislation (1990). Among these are: horseback riding, hiking, picnicking, camping, mountain biking, exploring, snowmobiling, cross-country skiing and fishing.

The Monument provides some recreational settings that are peaceful and quiet and others that are busier. Visitors feel that campgrounds, trails and other facilities are well-designed and not over-crowded. The current 10-mph speed limit on East Lake and Paulina Lake is maintained to promote a low-speed, low-key recreation experience, with emphasis on fishing. Campgrounds provide quality overnight experiences. Visitors feel safe, protected and secure in Forest Service campgrounds. Visitors using Monument trails experience minimal conflict with other trail users, and trails are planned and managed to reduce or prevent conflicting uses. Recreational activities do not disturb sensitive plants, animals' habitats, geologic features or heritage (cultural) resources.

Recreationists in all seasons discover new trails, experiences, and places to explore. Both nordic skiing and snowmobiling opportunities are enhanced by additional trails and warming shelters in the caldera. All people, including mobility and sight-impaired individuals, can find ways to enjoy the Monument and its many features. New facilities comply with regional accessibility standards.

All the alternatives would provide for a range of recreation opportunities and settings. The mix of these opportunities would differ according to the recreation objectives under each alternative, and in each zone.

NOTE: The Recreation Opportunity Spectrum (ROS) is a system used by many federal and state land management agencies to categorize different outdoor recreational settings. A brief description of some classes used in NNVM follows. They are listed from the most "developed" to the least.

Rural generally means that there are facilities for human use in an area (shelters, buildings, roads, campgrounds, parking lots), and you are likely to encounter lots of other visitors. Parts of the landscape have been modified, and the sights and sounds of other people will be readily evident.

Roaded Natural means the landscape appears natural, but roads and trails access the area, and some facilities are present. You can expect less interaction with other people. There is evidence of the human hand on the landscape, but these modifications generally harmonize with the environment.

Semi-primitive motorized means the area is characterized by a predominantly natural appearance, with little evidence of human use or change. Motorized use is permitted. There are very few controls or restrictions, and you would not be likely to encounter many people in these areas.

Semi-primitive non-motorized means the area is predominantly natural. Motorized use is prohibited, and the area remains mostly unaltered by human presence. You would not be likely to encounter many other visitors in these areas.

The mix of these ROS classes varies by alternative. ROS maps appear in the section later in this chapter called "Alternatives At A Glance." See also Chapter IV, Recreation.

Key Opportunities

- Increase the miles of trail, and provide new trails for a variety of users. New trails are proposed in every action alternative that reflect the character and goals of the Alternative.
- Improve signing on trails
- No new trail development in the riparian areas of the River Zone.
- Improve access for the physically challenged with improved surface trails. Offer varying degrees of challenge on trail system (easy - hard).
- Protect the Dome area by modifying or eliminating the Dome Trail.
- Consider new trails from Benham Falls to Lava Lands Visitor Center, and between Paulina and East Lakes.
- Move Benham Falls day use up to the bench above the river.
- Parts of the Monument provide opportunities for solitude.

Roads and Facilities

Desired Future Condition

Roads are safe, efficient, and maintained to a standard appropriate for the setting they traverse. The road system provides access to developed recreation sites and is minimal elsewhere. Unneeded roads are obliterated or closed, as appropriate.

Facilities are attractive, in character with natural surroundings, neat, clean, and meet visitors' needs. They support and enhance experiences in the Monument. Federal, state and county standards for public safety and welfare are met.

Key Opportunities

- Improve Paulina Peak Road to graveled, one-lane road.
- Reroute entrance to Lava Lands, Lava River Cave, and Lava Cast Forest by using Cottonwood Road interchange. This would improve safety and visibility for visitors.
- Replace, renovate, or expand Lava Lands Visitor Center (size would vary by alternatives).
- Build a new greeting/portal center in the vicinity of Road 21 and 2121, near the west entrance to the caldera. The size and function of this facility would vary among the alternatives, but would provide orientation for visitors to the area. In three alternatives (A, C & C-Modified), it would also serve as a winter sno-park.
- Lava River Cave remains open for some use.
- Renovate Lava Butte lookout
- Build warming shelters for winter recreation in the caldera and possibly flanks.
- Upgrade day-use areas

Vegetation, Fire & Fuels

Desired Future Condition

Vegetation restoration activities have served to sustain or enhance ecosystems. Plant communities within the Monument contribute to biological diversity at a landscape and regional scale. Stands of old-growth ponderosa pine are visible in the Monument primarily in the River, Lava Butte, and Transition Zones. These stands include some of the "historic" park-like stands that were present before EuroAmerican settlement; and some fire-excluded ecologically diverse old growth typical of today's forest. This diversity of stands offers scenic views, ecological health and diversity, and wildlife habitat. (See Vegetation section of Chapter 3 for complete definitions of old growth.)

Landscape patterns across some parts of the lodgepole pine forests resemble the "mosaics" of young, mature, and older stands prevalent before EuroAmerican settlement. Unique vegetative communities within NNVM (mountain hemlock, edges of lava flows, *Botrychium pumicola* (pumice grape fern), riparian, etc) are present and healthy. Biodiversity of plant communities is evident in the landscape. Vegetative management has been used only where needed to reestablish fire as an agent in vegetative succession, to improve wildlife habitat, or to reduce serious threats to resources outside the Monument to acceptable levels. Fire is an appropriate part of long-term management, and fire suppression activities continue to some extent. Livestock grazing has been eliminated in the Monument. The Monument's ecosystems are functioning well, and missing elements (such as fire) have been re-incorporated into natural processes. Fire, insects and diseases all play their natural roles as agents of change in vegetation communities, at levels that can be sustained by the ecosystems within the Monument.

Key Opportunities

- Manage vegetation around campgrounds and facilities for scenic quality, privacy, and safety.
- Use thinning, fire, and other silvicultural practices to alter vegetation and improve wildlife habitat and where necessary reduce serious wildfire and insect infestation threats (resources outside the Monument) to acceptable levels.
- Protect all threatened, endangered, and sensitive plants.
- Incorporate the Forest's strategy to preserve *Botrychium pumicola.*
- Make the old-growth ponderosa pine stand on Highway 97 a high priority for re-creating "historic" conditions.
- Protect riparian areas, meadows and unique vegetation communities.
- Reduce population of undesirable exotic plants.
- Keep roadless areas intact as ecological systems.

Fish and Wildlife

Desired Future Condition

Diversity and abundance of wildlife species continues and where feasible, increases. Visitors are able to enjoy wildlife watching opportunities. The Monument provides some relatively scarce habitats (for example, riparian areas and fire-based ponderosa pine old-growth). Deer continue to migrate through the Monument. Where allowed (outside caldera), hunting continues. Threatened, endangered, and sensitive species continue to live within the Monument. Habitats are managed to contribute toward their recovery. Some wildlife habitat improvement

projects have taken place, and conflicts between people and wildlife have been reduced. Wildlife interpretation is part of Monument's educational programs, and people enjoy opportunities to see many kinds of wildlife. The North and South Paulina Roadless Areas within the Monument remain essentially undisturbed by roads and provide solitude for species that are sensitive to human disturbance, as well as a natural appearing landscape.

Fish populations continue to play an important role in the ecosystem (food for eagles, osprey, otters). Non-game fish populations remain at levels that do not compete with game fish.

The primary purpose of the River Zone is to protect wildlife. Osprey, bald eagles, waterfowl, elk, deer, otter, and other species continue to live in this special area relatively undisturbed by people.

Key Opportunities

- Provide at least one Bald Eagle Management Area (the Forest Plan BEMA on East Lake).
- Maintain caldera wildlife refuge.
- Provide a quality fishing experience on East and Paulina Lakes. This includes opportunities to find solitude on the lakes, to catch trout and kokanee, and to enjoy the experience of fishing without undue conflicts or crowding.
- Protect caves to preserve bat habitat; offer interpretive programs on bats.
- Provide habitat to prevent declines of neotropical migratory birds (links and connections to the rest of the Western Hemisphere).
- Increase understanding of wildlife habitats and relationships through interpretation, education, and research.
- Avoid road or facility development in sensitive wildlife habitats.

Interpretation

Desired Future Condition

Effective, engaging, accurate interpretation is provided to inspire visitors' curiosities and encourage resource protection. Strong partnerships between the Forest Service and local, state and national organizations allow for a wide range of experiences, such as: guided walks, demonstrations, interactive media, self-directed discovery, and hands-on participation in research and other projects. Expanded opportunities, especially in the Lava Butte and Transition Zones, support longer visitor stays than at present. Students of all ages come and learn not only about the Monument, but about how it fits within the local, regional, and even global context of geology, ecology, and human history.

Key topics of interpretation are geology, archaeology, ecosystems, and the roles of the Forest Service and natural resource management, and interpretive themes for the Monument are clearly identified.

Interpretive facilities are designed to "facilitate" a visitor's interaction with NNVM's natural and cultural resources, rather than serving as attractions in themselves. They provide information on the Monument's special features, activities, and ideas for exploration of the area. They are clean, functional, accessible, appealing, and designed to be consistent with the Monument's architectural theme.

Visitors enjoy and learn from their visit. They leave with a good impression, and a sense of stewardship for the land. They do not litter, damage NNVM's features, or remove resources.

Key Opportunities

- Highlight the links between Central Oregon and the surrounding area, with respect to volcanology, human history and ecosystems.
- Provide some level of interpretation for all management zones.
- Increase and improve signing on trails, at key features, and in campgrounds.
- Use interpretation as a tool to address resource management concerns (e.g., removal of obsidian).
- Design facilities and programs so that people get out of their cars and experience the Monument up-close.
- Form partnerships with local American Indians for cultural interpretation of NNVM.
- Restore (or adaptively reuse) Paulina Guard Station (CCC Building) in caldera to its historic condition; operate it as a "living museum."
- Develop space for classes, workshops, and research seminars.
- Support field trips and activity programs for all ages.
- Provide guided walks and talks on the Lava Butte flow, in the pine forests, through Lava River Cave, and to interesting features in the caldera.
- Encourage learning independently (self-discovery). "Discovery packs" are available to be checked out at the visitor center. These contain such supplies as topographic maps, wildlife and plant identification guides, compass, and magnifying glass.
- Provide roving interpreters on the trails or in the visitor center.
- Build 24-hour kiosks with orientation maps and interpretive displays.
- Provide books, pamphlets, magazines, etc.
- Participate in or observe living history presentations that make Monument history and stories come alive.
- Develop and environmental education support program in partnership with local schools.

Heritage/Geology

Desired Future Condition

Archaeology and geology are primary interpretive themes for NNVM. Information on geology and archaeology is accurate and up-to-date. Visitors know and respect the unique American heritage and geologic history of Newberry Volcano. Protection of geologic and archaeological resources is enhanced by law enforcement, interpretation, education, inventories, and monitoring.

Caves within the Monument are protected for their historical and ecological significance (bats, etc) and unique geology.

Key Opportunities

- Locate and design all roads and facilities to minimize impacts on important geologic and archaeological features.
- Protect obsidian and other geologic and archaeological resources with a specific strategy and standards & guidelines, especially in high-use areas like the caldera.
- Rehabilitate and restore significant sites and historic properties. Focus on the caldera and the two sites on the National Register of Historic Places.
- Complete archaeological inventory. Prioritize sites for evaluation; evaluate them; then nominate sites to the National Register.
- Interpret, protect, and preserve the Paulina Lake site.

- Develop partnerships with American Indians, scientific and educational organizations, individuals and corporations to study, protect and interpret resources.
- Evaluate the area between the two lakes before encouraging or discouraging use.
- Develop world class heritage displays. Focus on the Paleo-Indian period and how these people interacted with the environment.
- Complete the analysis of data recovery projects already undertaken.
- Preserve and interpret the Big Obsidian Flow, Newberry caldera, Northwest Rift Zone, Lava Butte, Benham Falls, the lakes, and other special geologic features.
- Develop a strategy to interpret the unique geology of Newberry to the public.
- Complete an inventory and evaluation of the geologic features within the Monument.
- Complete agreement documents for the treatment and management of significant cultural resources.

Science and Research

Desired Future Condition

Appropriate research is encouraged and supported in the Monument, based on standards and guidelines and evaluation criteria. Some of these criteria may include: minimal environmental damage, opportunities for public participation, and the availability of research information to the public.

Research projects are compatible with recreational use, and in general, do not displace recreational activities. (Allow for exceptions: bat research may displace cavers, hot springs research may displace bathers, etc.).

Science and research projects aid in the public's understanding of the Monument's ecosystems and how natural processes work.

Key Opportunities for Science and Research Projects

- Demonstration areas highlighting ecosystems management.
- How people lived 10,000 years ago.
- The effects of nearby geothermal development.
- Underwater archaeology in the caldera lakes.
- How Newberry is connected to the Pacific Ring of Fire.
- The effects of fire on various tree and plant communities.
- Wildlife ecosystems and species interactions.
- Fish dynamics and the best way to promote a healthy fishery in the lakes.
- Bat ecology and bats' role in the ecosystem.
- Radiometric dating of geologic features in NNVM.
- Studies of tephra deposits in the Northwest Rift Zone as geologic time markers.
- Studies of the formation of obsidian flows and volcanic eruptions.
- Paleo-Indian campsites in the Monument.
- Lithic technology and how it has evolved over time.
- Distribution of Newberry obsidian outside the caldera.
- American Indians use of traditional plants from NNVM.
- Distinguishing the different chemical signatures of the caldera flows.
- Complete inventory and evaluation of the area between the two lakes.
- Other opportunities that increase knowledge and are compatible with Monument values.

- Study of fungus flora.
- Cultural chronology and affiliation of prehistoric sites.
- Effects of volcanic activity on biotic productivity.

Monitoring

Desired Future Condition

A monitoring program for key Monument values has been established. The program is accurately determining and evaluating trends in the resiliency of Monument ecosystems, visitor satisfaction, and the effectiveness of management direction in meeting the intent of Monument legislation. Some key resource values to be monitored include: geological, ecological, botanical, scientific, scenic, recreational, cultural, and fish and wildlife. The monitoring program also assesses the impacts of geothermal activities on these values. See the Monument Plan for complete monitoring program.

Key Opportunities

- Monitor the recreational carrying capacity, and have appropriate corrective measures in place if carrying capacity is exceeded.
- Recognize that monitoring will continue with site-specific projects.
- Establish both short-term and long-term monitoring.

Air Quality

Desired Future Condition

Air quality in the Monument remains good or improves. It does not endanger human health. Visitors are satisfied with the air quality, including visibility and odor. Emissions from motor vehicles, wood burning (campfire, woodstove, and forest-fire smoke), and any geothermal or other commercial developments near the Monument do not degrade the special values for which NNVM was created. All federal and state requirements and standards for air quality are met. See the Monument Plan for complete monitoring program.

Key Opportunities

- Monitor weather conditions at several locations with the Monument.
- Collect background air quality data for at least one year prior to the operation of any geothermal power plant(s) on Newberry Volcano.
- Monitor air quality on an on-going basis for fine particulates (PM_{10}) and visibility, as well as other pollutants that may be produced by traffic, fires, or nearby geothermal developments.

Water Quality

Desired Future Condition

Groundwater quality remains excellent in the Monument. All drinking water is safe for human consumption and meets or exceeds state and federal drinking water standards. Public drinking water systems have been upgraded, where needed, to provide reliably uncontaminated (bacteria-free) water. Wastewater treatment and disposal is adequate to protect both ground and surface water from degradation.

Surface water in Paulina Creek, Paulina Lake, and East Lake is of good quality and supports beneficial uses such as fisheries and other aquatic life, aesthetics, and water-contact recreation. Water clarity has been stable or improved since monitoring by the U.S. Geological Survey began in the caldera in 1991. Activities in the Monument do not adversely affect the quality of water entering and leaving NNVM in the ponds along the Deschutes River.

Water sources necessary to meet program objectives have been found and developed. Water conservation programs are in place in the Monument.

The natural fluctuation of hot springs and fumarole activity is well understood and is not adversely affected by human activities.

Key Opportunities

- Replace and upgrade the holding tank for drinking water in the Paulina Lake water system.
- Monitor water quality in wells on an on-going basis for state ground-water standards and primary and secondary drinking- water standards.
- Conduct a thorough investigation and evaluation of the effectiveness of current waste disposal facilities (e.g., septic systems) in the caldera. Change, upgrade, or repair systems as necessary.
- Use "Best Management Practices" (BMP's) to protect water quality, tailoring them for site-specific projects and conditions in NNVM. (See Appendix H of the Deschutes National Forest Land and Resource Management FEIS for a complete discussion of BMP's. Also, see standards and guidelines in the Management Plan for BMP requirements.) See the Management Plan for the monitoring program.

Scenic Quality

Desired Future Condition

Overall, the landscape of the Monument appears scenic and natural to the average visitor. It reflects the diversity, beauty, and ecology of the High Lava Plains of Central Oregon. Outside of developed areas, evidence of human alternations or management is generally not evident to the casual observer or is subordinate to the landscape character. Natural disturbance patterns are part of the landscape structure within the Monument.

Some landscapes have been enhanced by opening views to distant peaks, unique rock forms, unusual vegetation, or other features of interest. Landscapes containing negative visual elements, such as skid roads, activity residue, or cable corridors have been rehabilitated.

Buildings and signs reflect the character of the Monument.

Key opportunities

- Create or enhance vistas and views of interesting landscape features.
- Enhance screening of negative visual elements.
- Provide visual buffers in campgrounds and other recreation areas.
- Shape or grade the land to provide screening or improve vistas.
- Bury powerlines in order to eliminate linear breaks in the forest canopy.
- Upgrade and/or restore recreation facilities to provide high quality recreation settings.
- Provide architectural and signing standards that will result in a long-term transition toward complementary forms, colors, and materials used for structural development in the Monument (currently being developed).
- Remove stumps in recreation areas.
- Rehabilitate existing vegetative openings that do not complement or blend with the surrounding landscape.
- Highlight viewing in areas of unique vegetative, archaeological, zoological, or geological interest.

Law Enforcement

Desired Future Condition

An effective Forest Service presence reduces vandalism, resource destruction, and disturbances to other visitors.

Key Opportunities

- Consider increasing law enforcement patrols if necessary.
- Stress education and resource protection in interpretive programs to cut down on vandalism. Use roving interpreters to provide a "presence" that is relatively benign, and friendly, but still delivers the message of ethical behavior in the Monument.

Local Communities

Desired Future Condition

Visitation to the Monument contributes to economic diversity in the local communities. The quality of the recreational experience in the Monument draws new and return visitors. The Forest Service and other agencies work together to support a responsible level of tourism and visitation to the Monument.

American Indian Involvement

Desired Future Condition

Local American Indian tribes are involved in developing cultural interpretive programs, identifying continuing religious practices and current traditional uses, and monitoring projects in the Monument. Tribes are consulted concerning projects that have the potential to affect cultural resources. American Indian Tribes are consulted concerning traditional cultural properties, sacred sites, and Tribal religious practices. Effective working relationships with local American Indian Tribes are promoted.

Lands and Special Uses

Desired Future Condition

Appropriate special uses such as railroad and electric power corridor right-of-ways, summer homes, horse endurance rides, and other recreation events support and contribute to the values for which the Monument was created. Two well maintained resorts (East Lake and Paulina Lake Resorts) provide a high quality experience while maintaining their traditional rustic character. The present summer homes on Paulina Lake remain.

The Mokst Butte Research Natural Area (RNA) continues to provide baseline ecological research opportunities as part of the National Research Natural Area Program. The recommendation made by the Regional Forester in the 1990 Forest Plan was to establish Mokst Butte as an RNA. Final establishment would by approved by the Chief of the Forest Service.

Special areas outside the Monument designated by Monument legislation are managed to meet the intent of the legislation. Where so designated by the legislation, these areas are managed as part of the Monument, with their values preserved and protected, subject to valid existing geothermal lease rights.

In the Newberry Special Management Area and the Transferal Area Adjacent, these rights involve sub-surface drilling only. No surface occupancy is allowed. In the Transferal Area, geothermal rights include opportunities for exploration and development. The Transferal Corridor is land designated to provide a corridor across the Monument in the event of geothermal development.

Key Opportunities

- Evaluate any requests for additional special use permits to determine if they are consistent with Monument legislation and goals.

Alternatives at a Glance

Alternative A — At A Glance

This alternative would protect the special values identified in the Monument legislation, while emphasizing developed recreation opportunities. It would accommodate the highest number of visitors to the Monument. This alternative provides access to many areas within the Monument, and has the most roads, trails, and facilities. Many different kinds of "controls" could be used to direct recreational activities in ways that protect other resources. This is the most people-oriented alternative, designed to provide large numbers of visitors a quality experience in NNVM.

Some of the most popular places in the Monument would be busy, bustling, and humming with life and activity under this alternative. A wide variety of safe, directed activities would guide and inform visitors about unique opportunities.

Interpretation would be state-of-the-art, and often high-tech. For example, at Lava Lands Visitor Center, children and adults might use interactive video displays that show volcanoes erupting or American Indians hunting within the Monument 10,000 years ago. The Monument offers information and activities for people of all ages and interests.

Key Features

A new **Monument Road** would be proposed under this alternative, running the length of the Monument from Benham Falls to Road 21 near the caldera. This new road would provide increased access to areas of NNVM and provide a scenic loop for motorized visitors. The new road would link existing roads as much as possible, but some additional road construction would be required. New roads in selected other areas (Transition Zone, Flanks) would increase access and provide recreational opportunities.

Campground capacity in the caldera would increase by 20-40 percent over present levels to provide for more visitors to NNVM. A new developed campground would be built in the Transition Zone. Up to three additional hike-in campgrounds would also be developed in the Flanks and Caldera.

A new **Monument Trail** would run the length of the Monument, providing access to a series of loop trails, linking the zones together, and providing a high-quality recreational experience for hikers, mountain bikers, and horseback riders. Major new trail developments are also proposed for the Transition Zone and in the caldera from the lakes up to the rim.

ATV access is provided to East Lake Resort, and an ATV "pass-through" corridor would be provided in the Transition Zone. Street legal ATV's may use existing roads in the Monument.

Lava Lands Interpretive Center would be expanded and upgraded to serve a large number of visitors in an efficient and engaging way. Emphasis is on providing the "short stop" visitor with a taste of what the Monument has to offer.

Lava River Cave remains open all year.

One **Bald Eagle Management Area** exists in the caldera.

The focus of **Vegetation Management** is around campgrounds, day-use areas, and other popular facilities. Most of the rest of NNVM is left alone, allowing ecological succession to take place. Where feasible, some areas would be managed for movement toward the old-growth ponderosa pine ecosystem.

A **New Portal Facility** on Road 21 outside the caldera provides information and orientation. This portal facility also serves as a sno-park in the winter, enhancing snowmobiling and cross-country skiing.

Alternative A at a Glance

Description	Projected
Change in number of campsites in caldera	+ 20 - 40%
New campgrounds outside the caldera	2 - 4
Change in miles of summer trails	+ 60~70 miles
Miles of interpretive trails	19
Change in capacity of interpretive facilities	+ 120 - 210%
Miles of road	67
Percent of NNVM in semi-primitive ROS classes	53%
Percent of NNVM in roaded natural ROS class	46%
First decade restoration of ecological processes in lodgepole pine (acres)	1,000
First decade restoration of old-growth ponderosa pine (acres)	1,000
Long-term (50+ years) total acres restoration of ecological processes in lodgepole pine	6,200
Long-term (50+ years) total acres restoration of old-growth ponderosa pine	1,000
Number of Bald Eagle Management Areas (BEMA's)	1

Alternative B — At a Glance

This alternative would increase opportunities for self-guided exploration and discovery of the Monument's many special features. It emphasizes opportunities for solitude, and consequently accommodates the smallest number of visitors. Roads, trails and facilities would be designed to provide for dispersed recreation outside the caldera and developed recreation within the caldera.

This would be a quieter, slower-paced Monument. People have more opportunities to be alone and discover things on their own. There are not as many signs or guidelines. There would be more risk. More measures would be in place to enhance wildlife habitat, and this may limit human access in some areas.

At the Interpretive Center, visitors could check out discovery packs that may include binoculars, field guides, and maps directing them to more remote destinations. More areas of the Monument remain undisturbed. Interpretive programs rely mainly on roving interpreters who offer low-key information, and if needed, aid.

Key Features

No new Monument Road or other road development. Existing roads are maintained as necessary for public safety, fire prevention, or vegetation management.

Campground capacity in the caldera would decrease by 10 - 20 % compared to present levels. Some sites in the caldera would be rehabilitated or removed to enhance the feeling of privacy while camping. The primitive boat-in campgrounds on Paulina Lake would be removed. No new campgrounds would be built.

There is **some new trail development**, especially in the Transition Zone. The focus of trail development would be to provide quality dispersed recreation experiences.

No special **ATV access** is provided. Street legal ATV's may enter NNVM only on existing roads.

Lava Lands Interpretive Center would provide interpretive programs and information. The center would be renovated or if needed, slightly expanded, to provide services and information. Interpretive programs would emphasize self-guided activities and roving interpreters.

Lava River Cave is closed in the winter to enhance bat recovery. In the summer, it is not open to the general public, but guided group tours are offered that feature bat education.

Two additional **Bald Eagle Management Areas** are created in the caldera, bringing the total to two on East Lake and one on Paulina Lake.

Seasonal closures in the River Zone would aid wildlife. These could include closure to protect waterfowl nesting and elk calving at certain times of the year.

The focus of **vegetation management** is to provide more habitat diversity for wildlife

species. Mechanical treatments (thinning, cutting, etc.,) would be the primary method for enhancing wildlife habitat.

A small **new portal facility** on Road 21 outside the caldera provides information and orientation. In Alternative B, this portal facility would be for summer visitors, and is not expected to serve as a sno-park.

Alternative B at a Glance

Description	Projected
Change in number of campsites in caldera	- 10 - 20%
New campgrounds outside the caldera	0
Change in miles of summer trails	+10-20 miles
Miles of interpretive trails	11
Change in capacity of interpretive facilities	+ 0 - 45%
Miles of road	56
Percent of NNVM in semi-primitive ROS classes	81%
Percent of NNVM in roaded natural ROS class	19%
First decade restoration of ecological processes in lodgepole pine (acres)	1,350
First decade restoration of old-growth ponderosa pine (acres)	1,000
Long-term (50+ years) total acres restoration of ecological processes in lodgepole pine	16,000
Long-term (50+ years) total acres restoration of old-growth ponderosa pine	7,000
Number of Bald Eagle Management Areas (BEMA's)	3

Alternative C — At a Glance

This alternative would showcase the unique geologic and archaeological resources of Newberry Monument. It would highlight the long and rich history of the earth -- and how people, plants and animals have adapted to living in the shadow of Newberry Volcano. This alternative would emphasize education, interpretation, and ecosystems. Alternative C provides a variety of learning experiences at many levels, including self-guided tours, classes, research opportunities, and hands-on projects designed to engage visitors. Another primary emphasis of the alternative is the use of prescribed fire in the Monument's ecosystem, with the goal of recreating the large, open, park-like stands of ponderosa pine that were present before EuroAmericans arrived in Central Oregon.

Overnight use in the caldera would be moderate, accommodating about the same number of visitors as today. The Monument would provide for more day-use visitors. A visitor center and educational complex in the Lava Butte Zone would be the interpretive hub of the Monument. Visitors could choose from a wide diversity of available experiences, from one hour to one day; from a casual stroll on a lava field to an in-depth, university-sponsored archaeological project.

Key Features

The number of campsites in the caldera would increase slightly in order to spread people out and provide a more pleasant overnight experience. A campground for research or educational groups would be provided in the Transition Zone. The boat-in campgrounds on Paulina Lake would be relocated to reduce damage to sensitive resources.

A series of interpretive trails in the Transition Zone would enhance opportunities for day-use visitors. The focus of any new trail development would be for interpretation. New trails would be built in the Flanks and Caldera Zone as well.

No special **ATV access** is provided. Street legal ATV's would be permitted to enter the Monument on existing roads.

Lava Lands Interpretive Center would provide a comprehensive, theme-driven interpretive program, featuring the geology, archaeology, and ecology of the Central Cascades area and how these resources relate to the larger context around NNVM. An appropriate combination of delivery techniques would be used. Some examples are: guided hikes, displays, interactive media, interpretive brochures, "discovery packs," and interpretive kiosks. The center would be renovated or expanded as needed to support a wide array of interpretive, educational and information services. A key goal would be to integrate interpretation and education as part of any new recreational developments or programs.

Lava River Cave would be closed in the winter, and open for both private individuals and guided tours in the summer. Bats and their role in the ecosystem is a primary interpretive focus of the cave tours.

Two **Bald Eagle Management Area** exist in the caldera, adding an additional BEMA to the one present now.

The focus of **vegetation management** is the re-introduction of fire as an integral part of the ponderosa pine and lodgepole pine ecosystems. This alternative proposes the most extensive use of fire as a vegetation management strategy. Some areas of the Monument (primarily in the Transition Zone) would move toward the open, old-growth ponderosa pine stands that were present before EuroAmerican settlers arrived here. Mechanical treatments would be used in conjunction with fire to achieve reductions in fuel loads and move toward ecological health and biodiversity in the forest.

A **new portal facility** on Road 21 outside the caldera provides information and orientation. This portal facility also serves as a sno-park in the winter, enhancing snowmobiling and cross-country skiing recreation.

A new **Road** that links Lava Lands Visitor Center with Lava Cast Forest through the Transition Zone is possible under this Alternative, and its effects are analyzed in Chapter 4. The road would be less extensive than the Monument Road in Alternative A, but would provide a short driving loop from Lava Lands. The new road would provide access to a number of interpretive trails and day-use facilities near Lava Cast Forest. This road is a low priority, and unless demand for this kind of use in the Transition Zone increases significantly, it will not be built in the next 10 years.

Alternative C at a Glance

Description	Projected
Change in number of campsites in caldera	+ 5 - 10%
New campgrounds outside the caldera	1
Change in miles of summer trails	+30-40 miles
Miles of interpretive trails	27
Change in capacity of interpretive facilities	+ 135 - 220%
Miles of road	63
Percent of NNVM in semi-primitive ROS classes	72%
Percent of NNVM in roaded natural ROS class	28%
First decade restoration of ecological processes in lodgepole pine (acres)	2,700
First decade restoration of old-growth ponderosa pine (acres)	2,500
Long-term (50+ years) total acres restoration of ecological processes in lodgepole pine	20,000
Long-term (50+ years) total acres restoration of old-growth ponderosa pine	8,000
Number of Bald Eagle Management Areas (BEMA's)	2

ALTERNATIVE C-Modified -- At A Glance

This alternative was developed after the Draft Environmental Impact Statement (DEIS) was published. Alternative C-modified is an attempt to incorporate and respond to public comment and Advisory Council recommendations. It is similar in many respects to Alternative C, with emphasis on education and interpretation, and moderate recreational development. But there are significant differences between C and C-modified. They are outlined as follows:

Vegetation. Alternative C-modified has a different approach to vegetation management, based on the public comments we heard. This alternative would allow existing ecological succession of vegetation (with less human intervention) to a much greater extent, while still treating some areas to protect and restore existing old growth or to reduce high fire risk. Prescribed fire would be emphasized as a way to re-establish fire as a part of the ecological processes within the Monument. (See Vegetation Section in this chapter for more details).

Monument Trail. The Monument Trail is included in Alternative C-modified, in response to public comments.

Roadless Areas. Vegetation management in the roadless areas would be very limited and would be undertaken only if needed to improve wildlife habitat or to reduce a serious threat from fire, insects, or disease to outside resources. Any treatments would avoid the construction of roads, if at all possible.

Loop Road to Transition Zone. No new loop road from Lava Lands Visitor Center to Lava Cast Forest in the Transition Zone is planned. Existing roads 9720 and 9710, which together already provide a loop drive, would be upgraded with rock surfacing to provide a more comfortable drive.

In many other ways, this alternative is identical to Alternative C.

Alternative C-modified would showcase the unique geologic and archaeological resources of Newberry Monument. It would highlight the long and rich history of the earth -- and how people, plants and animals have adapted to living in the shadow of Newberry Volcano. This alternative would emphasize education, interpretation, and ecosystems. Alternative C-Modified provides a variety of learning experiences at many levels, including self-guided tours, classes, research opportunities, and hands-on projects designed to engage visitors. Another primary emphasis of the alternative is the use of prescribed fire in the Monument's ecosystem, with the goal of re-creating the large, open, park-like stands of ponderosa pine that were present before EuroAmericans arrived in Central Oregon.

Overnight use in the caldera would be moderate, accommodating about the same number of people as today. The Monument would provide for more day-use visitors. A visitor center and educational complex in the Lava Butte Zone would be the interpretive hub of the Monument. Visitors could choose from a wide diversity of available experiences, from one hour to one day; from a casual stroll on a lava field to an in-depth, university-sponsored archaeological project.

Key Features

The number of campsites in the caldera would increase slightly in order to spread people out and provide a more pleasant overnight experience. A campground for research or educational groups could eventually be provided in the Transition Zone, if supported by demand.

The boat-in campgrounds on Paulina Lake could be relocated in the future to reduce damage to sensitive resources, if alternative sites were available and the relocations were needed.

The Monument Trail, linking all five management zones, would eventually be provided. The Monument Trail would be open to non-motorized use. A series of interpretive trails in the Transition Zone would enhance opportunities for day use visitors. The focus of new trail development would be for interpretation. New trails would also be built in the Flanks and Caldera Zone.

ATV access and use would be excluded from the Monument.

Lava Lands Interpretive Center would provide a comprehensive, theme-driven interpretive program, featuring the geology, archaeology, and ecology of the Central Cascades area and how these resources relate to the larger context around NNVM. An appropriate combination of delivery techniques would be used. Some examples are: guided hikes, displays, interactive media, interpretive brochures, "discovery packs," and interpretive kiosks. The center would be renovated or expanded as needed to support a wide array of interpretive, educational and information services. A key goal would be to integrate interpretation and education as part of any new recreational developments or programs.

Lava River Cave would be open by appointment and guided tour in the winter, and open for both private individuals and guided tours in the summer. Bats and their role in the ecosystem is a primary interpretive focus of the cave tours.

Two **Bald Eagle Management Area** would exist in the caldera, adding an additional BEMA to the one present now.

Vegetation management would feature the re-introduction of fire as an integral part of the Monument's ecosystems. The North and South Paulina Roadless Areas surrounding the caldera would remain roadless, with minimal, if any vegetative treatments. Fire suppression and prescribed natural fire (within predetermined parameters established by a fire management action strategy) would be used within the roadless areas. The ponderosa pine communities would move toward the open, park-like stands of old growth trees present before EuroAmerican settlement. Some mechanical treatment (primarily thinning) and prescribed fire would be done in small, selected areas, for the following reasons:

- To protect existing old-growth trees and provide conditions that encourage their reseeding.

- To promote ecological health and biological diversity in the forest communities.

- To enhance the sustainability of the old growth ponderosa pine forests.

- To reduce high fuels loads in areas identified as having a high fire risk.

- To ensure safety in camping, day use, and other developed recreation areas.

- To enhance wildlife habitat.

- To establish small experimental plots to accurately measure the effects of fire, thinning, and other treatments on ecosystem health in various environments.

A **portal facility** on Road 21 outside the caldera would provide information and orientation. This facility could also serve as a sno-park in the winter, enhancing cross-country skiing and snowmobiling recreation.

Roads in the Transition Zone (9720 and 9710 to Lava Cast Forest) would be upgraded to improve visitor safety and comfort.

Alternative C-Modified at a Glance

Description	Projected
Change in number of campsites in caldera	+ 5 - 10%
New campgrounds outside the caldera	1
Change in miles of summer trails	+35-45 miles
Miles of interpretive trails	27
Change in capacity of interpretive facilities	+ 135 - 220%
Miles of road	60
Percent of NNVM in semi-primitive ROS classes	74%
Percent of NNVM in roaded natural ROS class	26%
Acres of Roaded Natural recreation	14,860
First decade restoration of ecological processes in lodgepole pine (acres) *	170~760
First decade restoration of old-growth ponderosa pine (acres)*	70~300
Long-term (50+ years) total acres restoration of old-growth lodgepole pine	12,900
Long-term (50+ years) total acres restoration of old-growth ponderosa pine	3,760
Number of Bald Eagle Management Areas (BEMA's)	2

* Vegetation treatments in the first decade of this plan focus on protecting or restoring existing old-growth, reducing fire hazard, safety and scenic improvements around developed sites, and enhancing wildlife habitat. We estimate five to eight projects in the first decade, each ranging from 50 to 200 acres in size. Please see the Vegetation section of Chapter 4 for more details.

Alternative D — At a Glance

This alternative would continue management of Newberry National Volcanic Monument according to direction provided under the 1990 Deschutes National Forest Land and Resource Management Plan (Forest Plan). This is the "No Action" Alternative required by the Council on Environmental Quality [40 CFR 1502.14 (d)] and National Forest Management Act [36 CFR 219.12 (f) (7)] regulations.

Currently, the Forest is managing the Monument to comply with direction in the 1990 Forest Plan (where such direction does not conflict with Monument values). Determining whether or not Forest Plan direction and resulting projects are consistent with Monument legislation is often a complex task. For some activities, such as scheduled timber harvest, the legislation is fairly specific in its direction. (No scheduled timber harvests are allowed, but trees may be removed if needed to achieve the purposes of the Act, and to protect health and safety).

The legislation is much less specific about other activities, such as whether to develop new trails for mountain biking, add new campgrounds, permit new resorts, or allow research on geothermal resources. The need to make such determinations for each individual project, without integrated direction and an overall vision for the Monument, would be time-consuming and fragmented. In addition, this piece-meal approach would require frequent legal counsel, be confusing to the public, and would likely result in conflicts and inconsistencies with both the Forest Plan and the intent of the Monument Legislation.

Some direction in the Forest Plan, such as allowing scheduled timber harvest, conflicts with the Monument legislation (Public Law 101-522). Adopting Alternative D would require either changing the general forest and scenic views allocations within the Monument boundaries to preclude scheduled timber harvests, or changing the Monument legislation to allow scheduled timber harvests. Alternative D would not meet the underlying need (discussed in Chapter 1) to develop a comprehensive management plan for this special area.

In this alternative Monument lands would be allocated into nine different management areas, each of which had its own theme, goals, and objectives. There would be no integrated, overall vision for the Monument. Management emphasis would vary from providing intensive and dispersed recreation opportunities to maximizing production of wood fiber (this emphasis could not be implemented without a change to the Monument legislation).

Under Alternative D, some parts of the Monument would continue to function much as they do today. Newberry Crater would continue to provide intensive and dispersed recreation activities, including day uses and overnight camping. Lava Lands Visitor Center would remain open and continue its current season of use (open about 230 days a year). North and west of the Visitor Center, to the Monument's boundary at the Deschutes River would remain undeveloped and used mostly by wildlife and river recreationists. Some small areas within the Monument would be managed for old growth.

Key Features

General-use **campground capacity** in the caldera would increase by about 37 percent over present levels with the expansion of Cinder Hill and Paulina campgrounds. No new campgrounds would be developed.

No new roads would be developed within the Monument, with the exception of those needed for vegetation management purposes.

Trail systems would remain about the same as present. Some minor reconstruction and rerouting of trails would take place to correct or prevent soil erosion or other resource damage.

Lava Lands Visitor Center would stay the same, with no renovations or expansions planned. Interpretive programs and season of operation also remain the same.

Lava River Cave would be open during the summer and an additional 1/2 mile of interpretive trail inside the cave would be planned.

The **Bald Eagle Management Area** presently along the north edge of East Lake would remain.

Vegetation Management to increase wood fiber production could occur in Management Area 9, general forest allocation (in the area known under other Alternatives as the Transition Zone). Such management would be very limited, however.

Current summer closure orders for **ATV's** on trails inside Newberry Crater would remain in effect. ATV's could use Monument lands outside the Crater as long as they stayed off trail.

Present **interpretive facilities** would remain. No additional interpretive or other facilities would be planned, beyond the reconstruction of the Big Obsidian Flow trailhead and parking lot.

No new snow shelters or additional trails would be developed in the caldera.

Alternative D (NO ACTION) at a Glance

Description	Projected
Change in number of campsites in caldera	+ 34%*
New campgrounds outside the caldera	0
Change in miles of summer trails	0
Miles of interpretive trails	4
Change in capacity of interpretive facilities	0
Miles of road	97
Percent of NNVM in semi-primitive ROS classes	56%
Percent of NNVM in roaded natural ROS class	26%
First decade restoration of ecological processes in lodgepole pine (acres)	minimal
First decade restoration of old-growth ponderosa pine (acres)	minimal
Long-term (50+ years) total acres restoration of old-growth lodgepole pine	minimal
Long-term (50+ years) total acres restoration of old-growth ponderosa pine	minimal
Number of Bald Eagle Management Areas (BEMA's)	1

* Current number of campsites in caldera is 328. Under Forest Plan direction, and Capital Investment Project planning, 110 new campsites would be added in the next ten years.

Table 2-11

COMPARISONS BY ISSUE

	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE C-MODIFIED	NO ACTION ALTERNATIVE D
THEME → ISSUE ↓	Increase recreational opportunities and access. Accommodate highest number of visitors. Many roads, trails and facilities.	Maximize preservation and protection of all resources, especially wildlife. Limits access in some areas. Emphasizes dispersed recreation, self-discovery, opportunities for solitude.	Focus on education, interpretation, science and research. Emphasize unique geology, archaeology and ecosystems of NNVM and re-introduction of fire.	Same as Alternative C.	Follow guidelines in legislation and Forest Plan; No change from present management.
RECREATION					
Camping	Increase capacity; expand caldera campgrounds and add RV hook-ups; add 1 car-accessible campground and a few small hike-in campgrounds in Transition Zone, plus a few semi-primitive camp sites in Flanks Zone.	Decrease capacity. Focus on quality camping experience for fewer people. Eliminate hike-in/boat-in campgrounds on Paulina Lake.	Increase capacity slightly in caldera to better accommodate existing use levels. New group camp for educational groups in Transition Zone. Relocate hike-in/boat-in campgrounds on Paulina Lake.	Same as Alternative C.	Maintain current camp-grounds. Add sites at Paulina Lake and Cinder Hill.
Trails	Build many new trails, including Monument Trail (River to Caldera). Emphasize accommodating a range of uses for general recreation and sightseeing.	Some new trails to improve dispersed recreation opportunities. Most are semi-primitive.	Focus on interpreting unique geology, archaeology and ecosystems. Some existing trails are enhanced for interpretation.	Same as Alternative C, but add Monument Trail.	Keep current trail system
Day Use	Expand and improve current day-use areas. New day-use facilities in Transition, Caldera, and Lava Butte Zones.	Relocate Paulina Lake day use to provide more natural entrance view of caldera. Improve but do not expand other day-use areas in caldera. New semi-primitive day use in Transition Zone.	New day-use areas enhance education opportunities. Expand interpretive day use in Caldera, Transition and Lava Butte Zone.	Same as Alternative C.	Expand some day-use areas slightly.
ATV Use	Provide one corridor through Transition Zone and access to East Lake Resort. No off-trail use allowed.	No ATV access or use provided, except for licensed use on roads open to public.	Same as Alternative B.	Same as Alternative B.	No ATV trails provided.
Winter Recreation	Build two warming shelters in caldera, one in Flanks. Develop new sno-park 2 miles west of caldera at new greeting/portal facility); Design new nordic and snowmobile trails. Provide more snowplay areas.	Enhance non-motorized nordic use while continuing snowmobile use. Build new nordic trails. One warming shelter proposed in caldera.	Enhance winter interpretive opportunities with snowshoe walks, ski and snowmobile tours. Design new nordic and snowmobile trails. Develop new sno-park west of caldera (at new portal facility) for better access.	Same as Alternative C.	Heavy snowmobile use in caldera, some nordic skiing.

Table 2-11 COMPARISONS BY ISSUE (continued)

	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE C-MODIFIED	NO ACTION ALTERNATIVE D
ROADS AND FACILITIES	New roads and facilities provide for more visitors. Build new Monument Road using mostly existing routes to link the Lava Butte Zone to the Caldera Zone. Short new road may enter Flanks Zone (NE of caldera) to access geothermal development and new trails. Build new portal (interpretive) facility on Road 21 west of the caldera. Expand or build new visitor center in Lava Butte Zone.	Minimal road and facility development. Obliterate some roads to protect wildlife. Portal/greeting facility near caldera is small -- probably a drive-through kiosk only. No new campgrounds. Improve Lava Cast Forest Road. Keep or improve CCC building in caldera for visitor information and interpretation.	New roads and facilities support interpretive programs. Develop loop road from Lava Butte Zone to Transition Zone (Lava Cast Forest). Field station/campground in Transition Zone provides overnight facilities for school groups and researchers. Build new portal facility on Road 21 west of caldera. Renovate education/visitor facility in Lava Butte Zone.	Same as Alternative C, except no new loop road from Lava Lands to Lava Cast Forest.	Keep all roads and non-recreational facilities as they are. Expand campgrounds in the caldera.
VEGETATION	Focus on scenic views around high use areas. Create some "historic" open, park-like stands of ponderosa pine by a variety of treatments. Most areas left untouched. High accumulations of fuels due to fire exclusion.	Vegetative treatments focus on mechanical means (thinning) with limited use of fire. Goal is wildlife habitat improvement and promoting healthy, diverse ecosystems. Large areas are treated to promote multi-storied "ecological" old-growth conditions, with the exclusion of fire.	Emphasize restoring natural patterns, including the re-introduction of fire as a major part of the Monument ecosystem. Gradual development of "historic" old-growth ponderosa pine stands. Research projects on vegetative treatments and their outcomes.	Reduce number of acres treated. Emphasize natural processes in ponderosa pine and lodgepole pine.	"Allow natural ecological succession to the maximum extent practical." Continue to exclude fire, allowing high fuel accumulations.
FISH AND WILDLIFE	Increased development and access for people may disturb eagles, bats and other species. Lava River Cave remains accessible to people year-round. Provide more wildlife viewing opportunities.	Enhance wildlife habitat through vegetative treatments and restricting human access. Dispersed recreation may disturb some species. Close Lava River Cave in winter and allow only guided tours in summer to protect bats. Create two additional areas for bald eagles in caldera. Protect River Zone by seasonal closures. Highest biodiversity.	Focus on wildlife study and ecosystems interpretation for visitors. Close Lava River Cave in winter to protect bats. Create one new BEMA in caldera. Leave some areas less accessible to humans.	Same as Alternative C.	Protecting endangered plants and animals. Providing habitat for deer, elk and other species. Lava River Cave remains accessible to people year-round, potentially disturbing bat populations.
INTERPRETATION	Expand/Relocate current visitor center, and make Lava Butte Zone the interpretive hub for NNVM. Feature shuttles running to all parts of Monument. Accessible, high-tech interpretation, relying heavily on facilities to serve many people. Many guided tours.	Minor improvements and expansion of current visitor center in Lava Butte Zone. Interpretive focus includes wildlife and habitat management. Roving interpreters offer more person-to-person interactions. De-emphasize facilities & buildings. "Discovery packs" offer opportunities for families to learn on their own.	Renovate current visitor center in Lava Butte Zone to enhance science education and "hands-on" interpretation. Emphasis includes ecosystem dynamics, role of fire, and links NNVM to global context. Wide range of learning opportunities.	Same as Alternative C.	Continue present level of interpretation. Focus at Lava Lands; some programs in caldera and at Lava Cast Forest.

Table 2-13

SUMMARY OF QUANTITATIVE PROJECTIONS*

NNVM COMPONENT	ALTERNATIVE				
	A	B	C	C-Modified	D*** No Action
Miles of road**	67	56	62	60	97
Number of campsites	+15~30%	-10~20%	+5~10%	+5~10%	328
Miles of new trail Summer Winter	 +60 mi. +30 mi.	 +15 mi. +20 mi.	 +40 mi. +20 mi.	 +45 mi. +20 mi.	 0 mi. 0 mi.
First decade restoration of ecological processes in lodgepole pine (acres)	1,000	1,350	2,700	170~760	minimal
First decade restoration of old-growth ponderosa pine (acres)	1,000	1,000	2,500	70~400	minimal
Long-term (50+ years) total acres - lodgepole pine restoration of ecological processes	6,200	16,000	20,000	13,000	minimal
Long-term (50+ years) total acres - restoration of old-growth ponderosa pine	1,000	7,000	8,000	3,760	minimal
Size of Lava Lands (square feet)	6~9,000	3~6,000	9~12,000	9~12,000	3,100
Bald Eagle Management Areas	1	3	2	2	1

* The Monument interdisciplinary team made some assumptions to analyze the effects of the alternatives. These assumptions are shown here -- and developed fully in Chapter 4.

** All action alternatives reduce miles of road by closing some roads. All reroute the entrance to Lava Lands and improve Paulina Peak Road.

*** Alternative D, the "No Action" Alternative, represents current management direction as provided in the Forest Plan. The activity schedule for the Forest Plan identifies several campground expansion projects in Newberry caldera. The campsite number shown in this column would be expected to increase by 110 (for a total of 438 sites) in the first decade of the Forest Plan. The other numbers shown in this column would be expected to remain the same.

NNVM Environment

Overview

Newberry National Volcanic Monument is located south of Bend, Oregon and includes a number of remarkable geologic features associated with Newberry Volcano. The nearest communities are Bend, La Pine, and Sunriver. The Monument rests at the confluence of three broad geographic provinces: the Cascade mountains, the Columbia River plateau, and the Great Basin. Much of the Deschutes National Forest land surrounding the Monument is General Forest. The Monument is to be managed in accord with the Congressional legislation for this special area, passed in 1990.

Recreation

Newberry National Volcanic Monument provides more than 300,000 recreation visitor days annually, with most use occurring in Newberry Caldera and at Lava Lands Visitor Center. Recreational activities in the Monument include camping, hiking, biking, sightseeing, horseback riding, boating, fishing, cross-country skiing and snowmobiling. Some hunting and all-terrain vehicle (ATV) riding also occur outside the caldera rim boundary. Demand for recreation in the area is expected to increase rapidly for the next five to ten years with the potential for increases in social conflicts and adverse impacts to natural and cultural resources.

Roads and Facilities

Principal access to the Monument is provided by U.S. Highway 97 and County Road 21. Highway 97 has high traffic volumes, high speeds, and adverse weather in the winter, often creating hazardous driving conditions. County Road 21 has been undergoing staged reconstruction by Deschutes County and the Federal Highway Administration with completion expected in 1994. The road to Paulina Peak is popular but is inadequately signed, variable in width, and presents maintenance problems. Recreational traffic has been increasing and the demand for roads, parking areas and camping facilities is also expected to increase.

Vegetation

The forested portions of the Monument are dominated by mountain hemlock communities on subalpine sites, ponderosa pine communities at the lower elevations, and lodgepole pine communities at mid-elevations. The mountain hemlock forests are most likely to resemble historic old growth conditions. Existing old-growth ponderosa and lodgepole pine forests on the Monument most closely meet the definition of "ecological old growth," climax forest conditions where fire has been excluded. Mountain pine beetle plays an important role in lodgepole pine ecosystems. The pumice grapefern, *Botrychium pumicola*, is the only sensitive plant species known to exist on the Monument; however, potential habitat exists for an additional 12 sensitive plant species.

Fire and Fuels

Fire has played a significant role in the ecosystems of Central Oregon. Historically, fire swept through this area every eight to twelve years, cleaning out the understory, and leaving large, open, park-like stands of ponderosa pines. The recent suppression of fires, and the mountain pine beetle epidemic have caused unnatural fuel build-ups, increasing the possibility of more frequent, larger and more destructive fires in some areas.

Fish and Wildlife

A wide variety of wildlife typical of Central Oregon forests is found in NNVM. Mule deer and elk populations are managed by the Oregon Department of Fish and Wildlife (ODFW). Birds of particular interest to visitors include bald eagles, osprey, tundra swans and many songbirds which migrate through and nest in Central Oregon. Several threatened, endangered, and sensitive (TES) animal species live or could live in the Monument, including bald eagles, peregrine falcons, Townsend's big-eared bats and Preble's shrews. Human impacts on wildlife populations are hard to predict, and vary with species tolerance for disturbance, and population dynamics outside the Monument. East Lake and Paulina Lake are both productive fisheries stocked annually by ODFW with trout and kokanee. Close coordination with ODFW would continue to assure a quality fishing experience.

Interpretation

Interpretation in what is now NNVM began in 1962 with a single interpreter on Lava Butte. In the years since, Lava Lands Visitor Center opened (1974), Lava River Cave was transferred to the Forest Service (early 1980's), a program for volunteer interpreters began (1982), and summer interpretive programs started in the caldera (1985). In 1992, visitorship to Lava Lands Visitor Center was approximately 110,000, and the interpretive staff had grown to ten employees (including seasonal employees) and over 20 volunteers. The demand for interpretive programs has increased since the Monument's designation and is expected to continue to grow.

Heritage

Recent archaeological excavations reveal that the Newberry area was inhabited 10,000 years ago. A 1992 data recovery project at Paulina Lake uncovered artifacts and a possible structure that vastly increased our knowledge of ancient peoples in Central Oregon. This site is now considered one of the oldest known human camps in North America. The caldera was a major source of obsidian for making tools. Sites are found throughout the Monument, but the densest sites seem to be within the caldera, associated with obsidian and water sources. Only two sites have had sufficient information collected to be evaluated for significance and inclusion in the National Register of Historic Places. Illegal collecting and artifact theft are major concerns.

Geology

Newberry Volcano is one of the largest Quaternary volcanoes in the contiguous United States and has a long and varied volcanic history with both violent silicic eruptions and relatively gentle mafic eruptions. Geophysical surveys suggest the presence of a small magma body at a depth of about three kilometers. Vandalism and theft of small scale geologic features is a concern.

Geothermal Energy

Exploration for geothermal energy at Newberry Volcano began in 1970. The creation of the Monument settled the issue of where exploration and development should be allowed. No drilling is allowed in the Monument. Two proposals for drilling on the west flank of the volcano outside the Monument have been submitted to the Forest Service.

Soils

Soils (or their lack) within the Monument are entirely the result of recent volcanic action. Condition of soils is good with the exception of compacted areas near recreation sites, and past timber activities.

Science and Research

Newberry Volcano has long been of interest to geologists, with studies beginning in the early 1900's. Archaeological inventories in the 1980's revealed how rich the Newberry area was in pre-history. The Monument is now considered a major source of knowledge for pre-Mazama Indian history in the Pacific Northwest. The rebuilding of Road 21 in 1991 - 1993 funded an important archaeological study of the area. Geology and archaeology continue to provide opportunities for researchers and scientists from all over the world.

Monitoring

Monitoring at this time includes: geodetic monitoring for changes in the shape of the volcano, water quality, hydrothermal activity, and pumice grapefern populations.

Air and Water Quality

Air quality appears to be excellent; however, no data have been collected within the Monument. Impacts to air quality can be expected to increase with increasing visitation. Surface water is confined to Paulina Creek, Paulina Lake, East Lake, Lost Lake, and ponds in the caldera and near the Deschutes River. Paulina Lake and East Lake have experienced a noticeable decrease in water transparency in the last 50 years. Paulina Creek is being studied for possible nomination for Wild and Scenic River status. Twelve water wells are currently in use. Water quality is generally good; however, the water system serving the Paulina campground has an aging wooden tank, and may need to be replaced if demands on the system continue to increase.

Scenic Resources

The Monument is located within a landscape of dynamic and diverse scenic beauty that includes: distinct geologic landforms, a turbulent river, blue lakes, green forests, and dark, rough lava flows. Some areas have been damaged from heavy recreational use. Insect infestations have affected both ponderosa and lodgepole pine stands. Natural disturbance patterns are likely to become more visually evident in the future.

Law Enforcement

A Forest Service officer and Deschutes County deputy currently have authority for maintaining order and reducing conflicts in the Monument. Conflicts have been rare. Roving interpreters reduce the potential for conflicts.

Special Uses

Special uses include right-of-ways for utilities, railroad, and Highway 97; weather monitoring stations; irrigation water rights; resorts, outfitter and guide services; and summer residences. Requests for special use permits in the Monument are increasing.

Environmental Effects

Recreation

Under all alternatives, recreational use is expected to increase. Alternative A would emphasize developed recreation with both day and overnight expected to increase. Alternative B would emphasize dispersed recreation with an expected increase in day use and decrease in overnight use. In Alternatives C and C-Modified, day use would increase with the increase in interpretive programs. Overnight use would be approximately the same as present; however, more concentrated activities would be emphasized around Paulina Lake, while lower-key opportunities would occur at East Lake. In Alternative D (no Action), overnight use is expected to increase.

Roads

In Alternative D (no action), access to and within the Monument would be by existing roads in their current condition. In all action alternatives (A, B, C and C-Modified), Lava Lands Visitor Center and Lava River Cave would be accessed by the Cottonwood Road Interchange, and the Paulina Peak road would be reconstructed. Alternative A would improve access in the Monument by linking all zones together with a Monument Scenic Drive, which would join Road 21 at the Road 2121 junction and require a bridge over Paulina Creek. Alternative B would decrease overall access to the Monument with closure of some low standard roads. In Alternative C, access to the Monument would increase, but not as much as in Alternative A. A modified Monument Scenic Drive would be a loop road to Lava Cast Forest, but it is not expected to be built in the next ten years. In Alternative C-Modified, Road 9720 to Lava Cast Forest and Road 9710 could be upgraded to enhance interpretation in the Transition Zone.

Vegetation, Fire and Fuels

The extent of effects depends on size, location and timing of vegetation management activities prescribed for each alternative and is expected to be proportional to the number of acres treated. In Alternative A the general focus of vegetation management is to create and maintain high visual quality around popular recreation areas. We anticipate treating about 1,000 acres of ponderosa pine over the next ten years. About 25 % of the lodgepole stands would eventually be treated, with the goal of reducing fuel loads in these stands. In much of the rest of the Monument, natural ecological processes would continue. The long term fire risk is moderate.

In Alternative B, the focus is on enhancing wildlife habitat. To meet this objective, large parts of the Monument would be managed for ecological (fire-suppressed) old growth. This creates a variety of habitats and encourages biodiversity. Some ponderosa pine stands would be managed for the open, park-like appearance common before EuroAmerican settlement (The Alternative B total in the first decade is about the same as Alternative A: 1,000 acres). Over time, about 70% of the lodgepole stands would be treated to produce mosaics -- different ages of trees -- that favor wildlife diversity. Riparian areas would also receive special attention. The long term fire risk is moderate.

The focus of Alternative C is re-creating the historic (fire-based) old-growth ponderosa pine stands present before EuroAmerican settlement. Prescribed fire would be an important tool in returning stands to this condition. Mechanical treatments such as crushing and thinning would

also be used. In the first decade, about 2500 acres of ponderosa pine would be treated. An aggressive fuels treatment program would eventually treat 90% of the lodgepole pine. The long term fire risk would be low.

Alternative C-Modified was developed in response to public comment after the Draft EIS was published. It includes a more selective approach to vegetation management. The Monument ID team used a resource synthesis (see Management Plan) to specifically identify areas where old-growth ponderosa pine exists and where fuel hazard is extremely high. Based on this analysis, Alternative C-Modified proposes five to eight vegetation projects in the first decade, ranging in size from 50 to 200 acres. The emphasis is on encouraging the ecological health and long-term sustainability of the existing ponderosa pine stands. Long-term treatments (in the next 50 years) would depend on what is learned in the first decade. This alternative proposes to stay out of the North and south Paulina Roadless Areas unless absolutely necessary. Fire risk over the long term is moderate.

Under Alternative D (no action), the use of vegetative activities would be very limited, so little effect is expected form vegetation management. Fuels would continue to build up with fire suppression; stands would become more crowded and susceptible to insect attack; and shade-tolerant species would slowly become the dominant species in mixed stands. With no action, the long term fire risk would be high.

Fish

Under Alternative A, increased use of trails along the river would increase soil entering the river. Risk of wildfire and resulting soil erosion would be similar to that in the No Action Alternative. Increased fishing pressure on the lakes would cause a reduction in the quality of angler experience.

In Alternative B, fishing pressure might increase slightly. Removal of boat-in/hike-in campgrounds would reduce trampling of lakeside vegetation. Risk of wildfire and subsequent soil erosion would be reduced by vegetation management activities. Small acreages of vegetation management activities would improve riparian vegetation condition.

In Alternative C and C-Modified, increased riverside trail use would increase soil entering the river. Fishing pressure would increase on Paulina Lake with more day use areas and launch facilities designed to accommodate large boats. Fishing pressure would remain similar to present levels on East Lake. Riparian vegetation projects would occur as in Alternative B.

Alternative D would continue present management.

Wildlife

The two main variables in the alternatives that affect wildlife and their habitats are changes in vegetation, and human presence and activities. A single vegetation change may be positive for one species and negative for another. The effects of human presence and activities depend on many variables, including species and time of year. Increased recreational use in Alternatives A, C, C-Modified and D would increase the potential for wildlife disturbance. Increased levels of vegetation management in Alternatives B and C would make habitat more evenly available over time, and provide a mosaic of forest conditions. Alternatives with less vegetation management (A, C-Modified and D) will have a "boom and bust" cycle of habitat availability, depending on fire and insect outbreaks.

Interpretation

Interpretation would be geared to serve the most people in Alternatives A, C and C-Modified. Alternative B would provide lower-key interpretive programs with opportunities for self-directed discovery and exploration. Alternative D would provide the lowest level of interpretation using current facilities. Alternatives C and C-Modified would encourage the most research activities in the Monument and would make these projects accessible to visitors.

Heritage

All alternatives have the same standards for protection of cultural resources. Alternatives that emphasize more recreational development and other improvements (A, C and C-Modified) have more potential to affect cultural resources. At the same time, those alternatives offer opportunities to discover more sites through cultural resource inventories. Alternatives C and C-Modified would emphasize non-project cultural site evaluations.

Geology

Alternatives with higher levels of development and use (A, C and C-Modified) would have higher potential to affect the geologic resource. However, those alternatives also offer a gain in geologic knowledge from the new exposures created during excavation for projects. Alternatives with access to geologic features (especially smaller-scale features) and lower levels of visitation (B and D) have the most potential for vandalism.

Soils

Alternatives with higher levels of vegetation management activities, land disturbing projects and visitation have greater potential to affect soil productivity. Alternatives B, C-Modified, and D would have the least effect.

Science and Research

Science and research projects have the potential for a wide range and level of effects dependent on the type and location of proposed research activities. For the action alternatives, the potential level of science and research activities is lowest under Alternative A and highest under Alternatives C and C-Modified.

Air quality

The air pollutant of major concern in Central Oregon is particulate matter (PM_{10}). The main source of particulate in NNVM is wood smoke. Considering both prescribed fire and predicted wildfire risk, in the first ten years smoke emissions in the Monument would be highest under Alternatives A and C-Modified, lower in D, still lower in B, and lowest in C. In the long term, smoke emissions in the Monument would be highest under Alternative D and lowest under B, C and C-Modified. In any alternative, emissions from wildfire would have more prominent effects than those from prescribed fire.

Water quality

Alternatives with high levels of recreational use near water have the highest potential to affect water quality through ground disturbance and soil movement, spills of petroleum products from motorized vehicles, and strain on septic systems. These effects would be highest in Alternative A and lowest in Alternative B. Wildfire may also increase sedimentation. In the long term, expected effects on water quality by wildfire would be greatest in Alternatives A and D, less in B and C-Modified, and least in Alternative C.

Scenic

Scenic quality, especially around high use recreation areas, would improve under Alternative A. Alternative B would have similar effects, although more acreage would be treated for fuels reduction and wildlife habitat. Alternative C would create the largest, most extensive stands of old-growth ponderosa pine, which are visually appealing. The vegetation management of Alternative C, which includes prescribed fire and thinning, could be unattractive to some people. Alternative C-Modified would emphasize treatment in ponderosa pine stands and around recreation sites. There would be little management in lodgepole pine stands.

Local communities

Estimated total employment and income generated in the area of influence by NNVM will increase over time for all alternatives, except Alternative B. The greatest increases are associated with Alternative A. Changes for all alternatives are expected to be minimal. Alternatives that increase recreation capacity (A, C and C-Modified) may lead to increased traffic and congestion, and increased pressures on community infrastructure and services.

American Indians

Historically, American Indians have used some parts of the lands within the Monument for at least 10,000 years. Consultation with the Confederated Tribes of the Warm Springs Reservation, the Burns Paiute Tribe, and the Klamath Tribes are on-going. The cultural resource inventory has not identified any continuing religious practices or current traditional uses within Newberry National Volcanic Monument, though the inventory has thus far concentrated on historical and archaeological properties. If any sites important for religious purposes are discovered, their setting and location may be protected from disturbance, consistent with the NHPA and AIRFA and other federal laws.

Special uses

Effects on most special uses would be minimal under all alternatives. The resorts may have a higher level of occupancy under alternatives that have higher recreational usage of the Monument.

Please see the Monument Management Plan for how these issues are addressed in Standards and Guidelines.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1994 - 589-113 / 00202 REGION NO. 10