



United States
Department of
Agriculture

Forest Service

Pacific
Northwest
Region

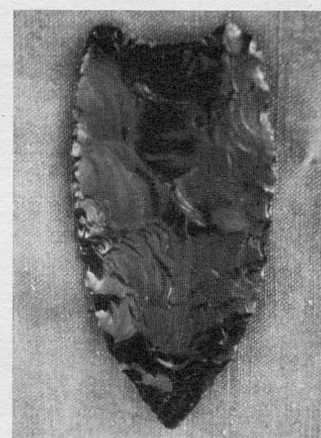
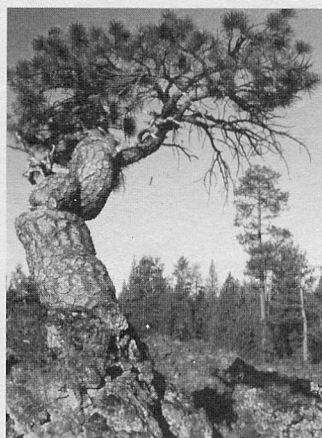
Deschutes
National Forest

August 1994



Newberry National Volcanic Monument Comprehensive Management Plan

Deschutes National Forest



OUR VISION

The Forest Service held an internal vision retreat as part of the scoping process for the Monument. From that effort came a statement of principles -- a guiding light as we accept the responsibility for managing this special place:

- ▶ This national monument is a magical place, alive with the spirit of the past.

- ▶ The Monument is a crossroads that connects us in time and space. It breathes the past into the present and future.

- ▶ From it, we learn of peoples, of plants and animals, of the living rock. It is a museum of life — a place where individuals and families can touch, explore, and imagine.

- ▶ The Monument offers the gifts of solitude, discovery, and understanding to all.

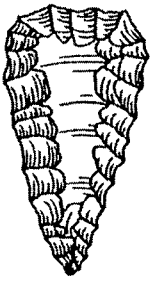
- ▶ We use our imagination and our creativity to be responsible stewards. With respect, we preserve and protect its unique treasures and spirit.

- ▶ It has been a special place for the past 10,000 years. We intend to keep the spirit alive for the next 10,000 years.

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INTRODUCTION

INTRODUCTION

Newberry National Volcanic Monument

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 LaPine and Bend in Central Oregon. The Monument lies within Deschutes National Forest, is about 25 miles long and varies in width between two and ten miles. The first section of the legislation establishing the Monument (enacted into law November 5, 1990) 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)

Purpose of the Monument Plan

This comprehensive management plan for Newberry National Volcanic Monument establishes programmatic management direction for the Monument for the next decade. It has been developed to comply with the mandate in Section 6 of the Monument legislation and embodies the provisions of that legislation.

The Monument Plan guides all management and restoration activities within the Monument. It establishes management goals and objectives for the Monument, and describes desired future conditions. It defines five management zones for the Monument and sets standards and guidelines for activities within these zones as well as for the Monument as a whole. It outlines a monitoring program and identifies and prioritizes research opportunities. The goals, land use allocations, and standard and guidelines are a statement of the Plan's management direction; however the projected activities and rates of implementation are estimates and depend on the annual budgeting process.

This Plan also provides direction for surface lands and resources within the Newberry Special Management Area, Transferal Area Adjacent, Transferal Area, and Transferal Corridor, consistent with the Monument legislation and subject to the provisions of the 1970 Geothermal Steam Act and valid existing geothermal lease rights. The map on the following page displays the boundaries of the Monument and these additional four designations.

The Monument Plan will ordinarily be revised on a 10-year cycle. It will be incorporated into the Forest Plan for the Deschutes National Forest (LRMP) during the next regularly scheduled revision of that Forest Plan. It may also be updated, amended or revised whenever the Forest Supervisor determines that new environmental conditions or information require changes in Monument Plan direction.

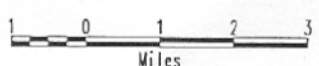
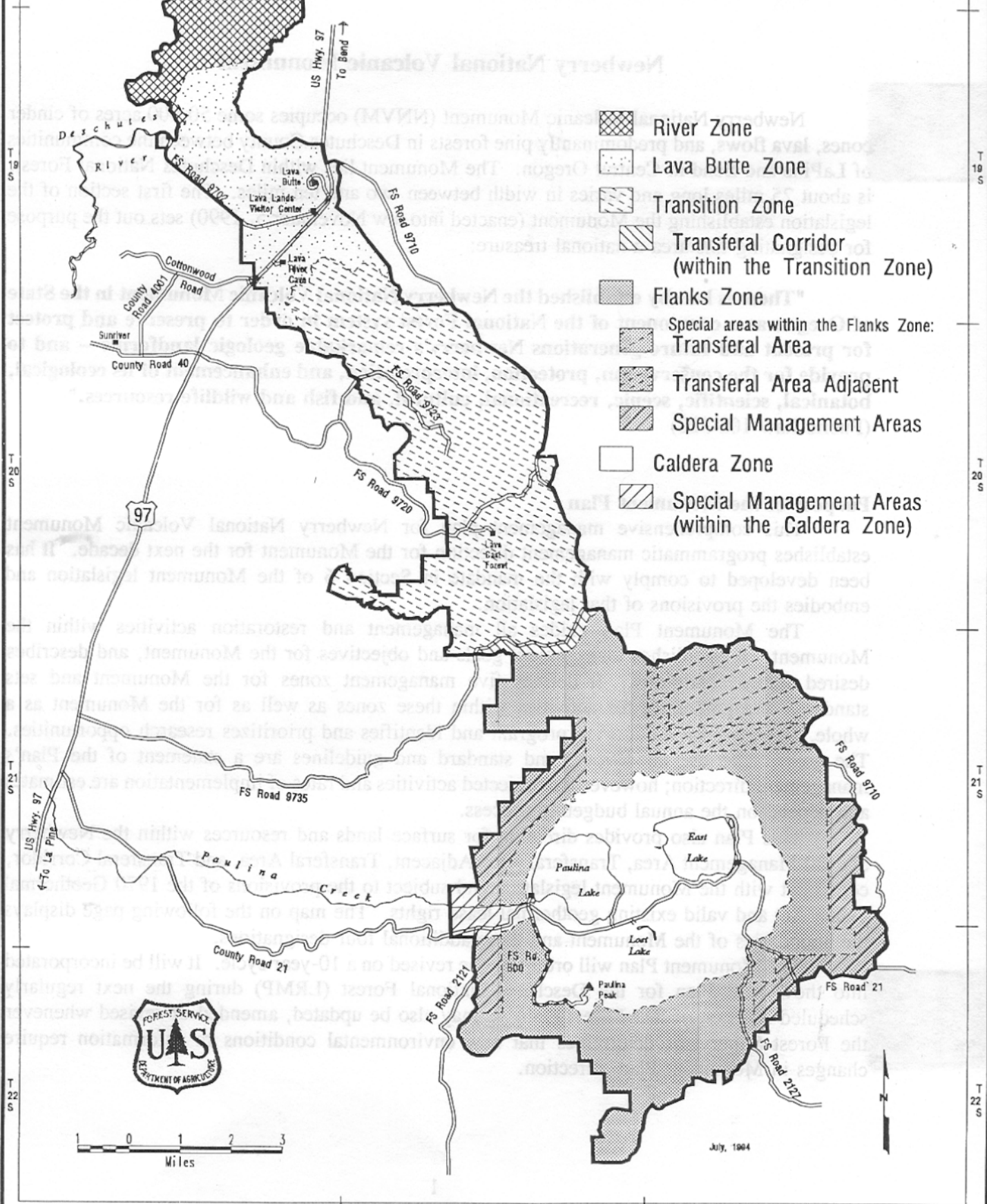
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Management Zones

Newberry National Volcanic Monument



July, 1994

R 11 E

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How this Monument Plan is Organized

The first section of this document introduces the reader to the Monument's location, describes the purpose of the Monument Plan and what it contains, and discusses the Monument Plan's relationship to other documents and planning guidance.

Management direction in the Monument Plan is included in the second and third sections:

- Goals, Desired Future Conditions, and Objectives
- Standards and Guidelines

The fourth section presents integrated resource information to be used in the first steps of planning site-specific projects, and is titled:

- Areas of Concern and Opportunity, with Project Planning Criteria

The fifth section, which is also management direction, includes the Monitoring Program and Criteria for Science and Research Projects.

The sixth section of the Monument Plan includes a schedule of activities intended to accomplish the goals and objectives of the plan.

The seventh section contains the text of the Monument legislation (Public Law 101-522).

The eighth section includes a list of wildlife species found in the Monument.

The ninth and last section provides a list of the references used in this plan.

Relationship to the Final Environmental Impact Statement and Record of Decision

The direction in this Monument Plan results from the extensive analysis and considerations documented in the accompanying Final Environmental Impact Statement (FEIS). This plan is based on Alternative C-Modified, described in the FEIS. The FEIS also describes other alternatives considered in the planning process. The planning process and the analysis procedures that were used to develop the Monument Plan are described or referenced in the FEIS. Detailed documentation of planning processes, data, working maps and analysis methods is contained in the planning record for the Monument Plan, located at the offices of the Fort Rock Ranger District.

The Monument Plan Record of Decision (ROD) documents the Regional Forester's reasons for selecting this plan to govern management activities in Newberry National Volcanic Monument. It also documents any changes the Regional Forester decided to make to the preferred alternative (Alternative C-Modified) on which this plan is based.

Site-specific analysis will be done for projects proposed within the Monument and/or the Special Management Area, Transferal Area, Transferal Area Adjacent, and Transferal Corridor. Site-specific analyses will be tiered to the FEIS for the Monument Plan.

All proposed projects must be tested for consistency with the Monument Plan during the site-specific analysis. If a proposed project is found to be inconsistent, one of three choices must be made: change the project, drop the project, or amend the Monument Plan.

Relationship to the Forest Plan

The Monument legislation specifies that Newberry National Volcanic Monument is to be managed in accordance with the laws, rules, and regulations pertaining to the National Forest System and the Deschutes National Forest, **to the extent that** such laws and regulations are consistent with the Monument legislation. The National Forest Management Act of 1976 required the preparation of Forest Plans to direct management of each National Forest. The Monument legislation, which was passed after the Forest Plan for the Deschutes National Forest was adopted, supersedes any Forest Plan direction that is inconsistent with the purposes for which the Monument was established.

Because the Monument legislation supersedes the Forest Plan, the direction provided in this Monument Plan will take precedence over the Forest Plan. The only time Forest Plan direction will apply to the Monument is when the Monument Plan does not speak to a particular issue and Forest Plan direction on that issue is consistent with the intent of the Monument legislation. During the next regularly scheduled Forest Plan revision, the Monument Plan will be incorporated into the Forest Plan.

Relationship to Special Area Plans

Other planning documents required by law will be developed to give additional and more specific guidance to three areas within or next to the Monument. These include:

- Mokst Butte Research Natural Area, entirely within Monument boundaries
- The upper Deschutes River, a segment of which forms part of the northernmost Monument boundary; and
- Paulina Creek, a segment of which is located within the Monument.

Mokst Butte was recommended as a Research Natural Area in the 1990 Forest Plan. The Monument Plan continues that recommendation. At the time an establishment report is finalized for Mokst Butte RNA, any direction provided by that report will be incorporated into the Monument Plan.

The upper Deschutes River was designated as part of the National Wild and Scenic Rivers System in 1988. A management plan is being prepared for the upper Deschutes River, including the portion (classified as scenic) that bounds the northernmost part of the Monument. The two planning efforts for the Monument and the Deschutes Wild and Scenic River have been coordinated for consistency of intent and direction. Along this segment of the river, Monument Plan direction governs for all lands within the Monument and above the high water mark of the upper Deschutes River's eastern bank.

Paulina Creek, about two miles of which lie within the Monument, has been determined to be eligible for inclusion in the National Wild and Scenic Rivers System as a recreational river. The Deschutes National Forest will be undertaking a suitability study for this creek. In the interim, the outstandingly remarkable values of the creek segment within the Monument will be protected under this plan. In the event that the creek is designated as part of the National Wild and Scenic Rivers System, the Monument Plan may be modified as necessary to incorporate provisions of the management plan for Paulina Creek.

Relationship to the Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation

The Monument Plan incorporates the Pacific Northwest Region's FEIS for Managing Competing and Unwanted Vegetation. In implementing the Monument Plan through project activities, the Forest will comply with the Record of Decision issued by the Regional Forester dated December 8, 1988, and the Mediated Agreement of August, 1989. Emphasis must be on prevention and early treatment of unwanted vegetation and full public involvement in all aspects of project planning and implementation. Information about the vegetation management FEIS, ROD, and Mediated Agreement are available at the Forest Supervisor's Office.

Consistency with Other Instruments

This Monument Plan serves as the single land management plan for Newberry National Volcanic Monument. Subject to valid existing rights, all outstanding and future permits, contracts, cooperative agreements, and other instruments for occupancy and use of lands included in the Monument, Newberry Special Management Area, Transferal Area, Transferal Area Adjacent, and Transferal Corridor will be consistent with the direction established in this Monument Plan. Adjustments of existing instruments under Forest control will be accomplished within three years of the time the Monument Plan is implemented. Items under Regional control will have four years. Renewable permits will be changed at the time of renewal or sooner if the permittee agrees.

Amendment and Revision

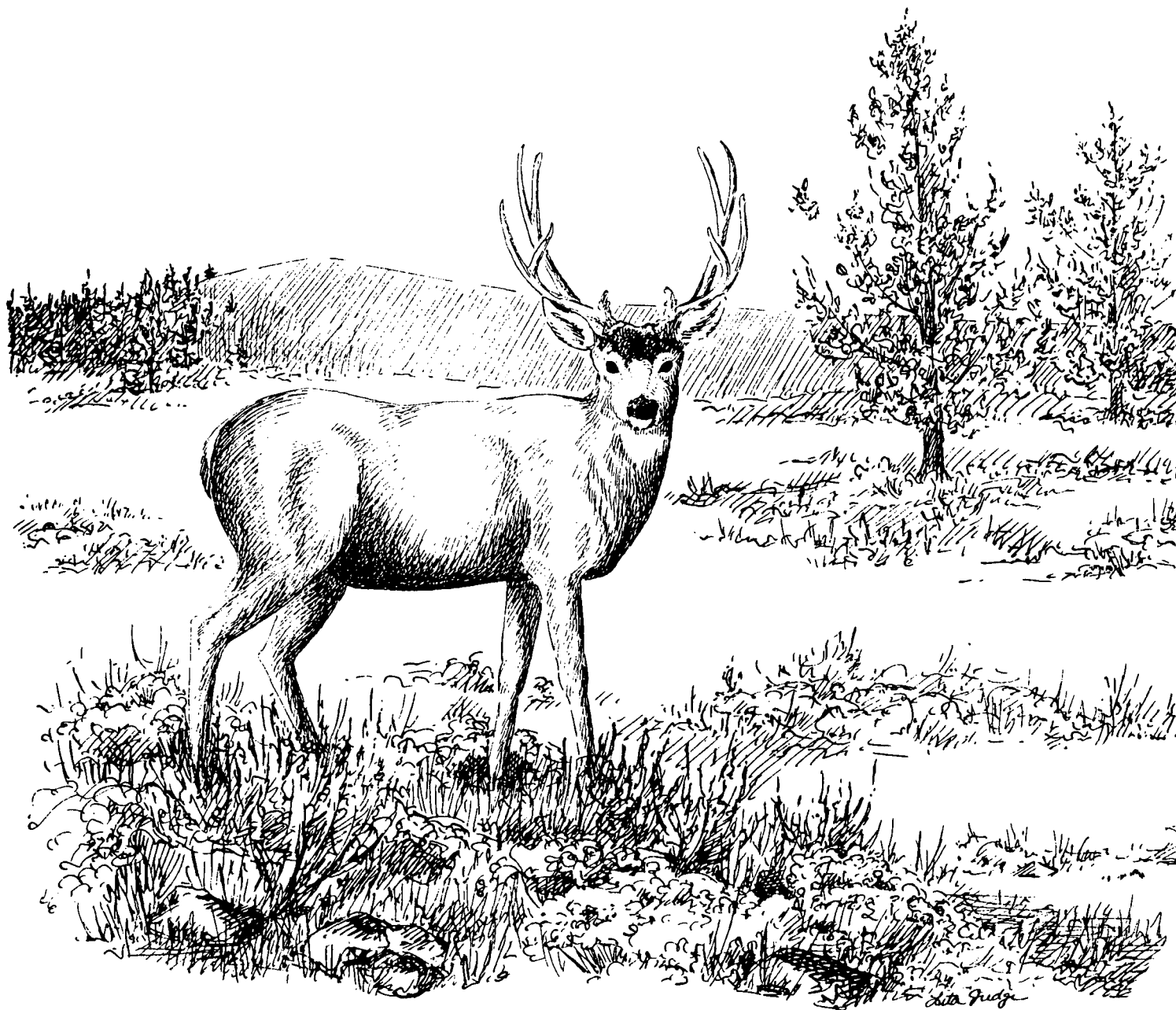
The Monument Plan incorporates legal mandates, professional judgement and the public's stated concerns into a future vision for the Monument. It charts a path for reaching this vision by developing management goals and objectives and translating them into management direction in the form of standards and guidelines.

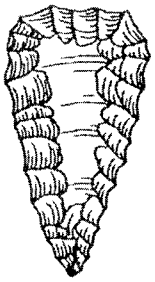
Ecological processes, environmental conditions, and public preferences are inherently dynamic. The Monument Plan can and should be changed if new circumstances or information regarding these processes, conditions, or preferences warrants a change. As management direction is applied on the ground or as new information is learned about resources, the Monument Plan's goals and objectives, or activities the goals generate, may no longer be appropriate. In such instances activities may be changed to fit the needs, or planning objectives as stated in the Plan may be amended.

The Forest Supervisor may update, amend or revise the Monument Plan. Based on monitoring and evaluation, and analysis of the objectives, standards, and other contents of the Monument Plan, the Forest Supervisor will determine if an update, amendment or revision is necessary. The Forest Supervisor may implement the update, amendment or revision following appropriate public notification and satisfactory completion of the NEPA procedures.

The Monument Plan will be incorporated into the Deschutes National Forest Land and Resources Management Plan (LRMP) at the next regularly scheduled revision of the LRMP. At that time, the Forest Supervisor will review the conditions of the land covered by the Monument Plan (as part of the LRMP revision process) to determine whether conditions or demands of the public with respect to Newberry National Volcanic Monument have changed significantly. If so, the Monument Plan could be revised.

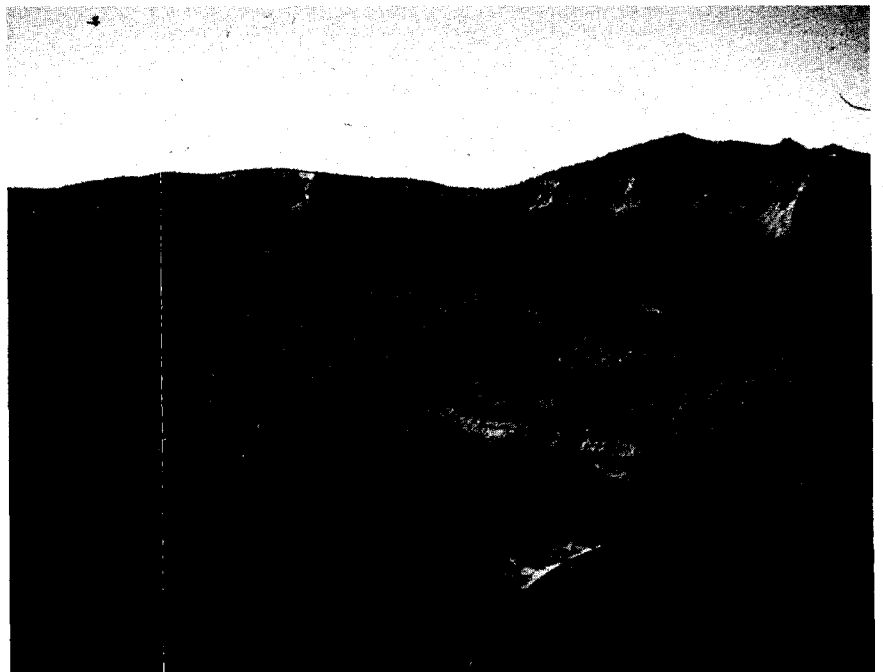
The next two sections provide the direction for managing Newberry National Volcanic Monument and are the heart of this plan. To best understand the intent of the third section, titled "Areas of Concern and Opportunity," readers should also refer to the map of the same title in the accompanying map packet.





MANAGEMENT DIRECTION

**GOALS
AND
DESIRED
FUTURE
CONDITION
OBJECTIVES**



Monument Management Goals

These goals reflect the Monument Legislation and other applicable laws, rules and regulations of the National Forest System, as well as the key issues identified during scoping for the development of this plan (refer to Chapter I of the Final Environmental Impact Statement for a description of the key issues).

- Ensure that the values and resources for which Newberry National Volcanic Monument was designated are protected, conserved, enhance and interpreted.
- Sustain or restore ecosystems and ensure ecosystem resiliency within the Monument and Special Management Area, while providing for natural ecological succession of vegetation to the maximum extent practical.
- Protect the health and safety of visitors to the Monument.
- Provide for scientific research consistent with the purposes for which the Monument was established.
- Keep the Monument a beautiful place, where people enjoy playing, exploring and learning about nature.
- Provide a diversity of high-quality recreational experiences while significantly increasing opportunities for interpretation and education, including participating in research activities where appropriate.
- 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.
- 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.

Desired Future Conditions For Newberry National Volcanic Monument

Natural ecological processes are operating to the maximum extent practical within the Monument, Newberry Special Management Area, Transferal Area, Transferal Area Adjacent, and Transferal Corridor. Evidence of these processes, including openings created by fire and insects, and mosaics of different age stands of trees, can be seen in different parts of the Monument. Visitors recognize and understand the value of these processes in perpetuating sustainable and resilient ecosystems for the long term.

In cases where it is not practical to allow natural ecological processes to operate without human intervention, the effect of intervention has been to preserve, restore or increase ecosystem resiliency or biodiversity, and/or provide for public health and safety.

Biophysical Ecosystem Components

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 found within the Monument, including some of the fire-based, park-like stands that were present before EuroAmerican settlement. Fire-excluded, more ecologically diverse old-growth is also found in many parts of the Monument. Fire (prescribed and prescribed natural) plays a key role in ecological processes within the Monument. Fire suppression is also used where needed to protect Monument resources and values. Domestic livestock grazing no longer occurs within the Monument and plant communities no longer show the effects of past grazing.

Landscape patterns across some parts of the lodgepole pine forests resemble the mosaics of young, mature, and older stands prevalent before EuroAmerican settlement, as a result of the influence of fire, insects, and disease. Unique vegetative communities within the Monument (for example, mountain hemlock, deciduous vegetation along lava flows, and pumice grape fern) are present and healthy.

Sensitive **geologic features** are protected from vandalism or other inappropriate human activities. Visitors know and respect the geologic history of the Newberry area and have come to understand the importance of geology to ecology, archaeology, and the landscape. Interpretive materials related to geology feature up-to-date and accurate information. The location, characteristics, and sensitivity of geologic features within the Monument are well understood and documented.

Diversity and abundance of **wildlife** continues, and where feasible, increases. Visitors are able to enjoy wildlife watching opportunities. Deer continue to migrate through the Monument. Hunting continues where allowed (outside the caldera). Threatened, endangered and/or sensitive species continue to be found within the Monument, and habitats are managed to contribute to their recovery. The Monument provides some relatively scarce habitats (for

example, riparian areas and fire-based ponderosa pine old-growth). 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.

Wildlife habitat improvement projects have taken place and conflicts between wildlife and people have been reduced. Wildlife interpretation is part of the Monument's educational programs, and people enjoy opportunities to see many kinds of wildlife. Fish populations continue to play an important role in the ecosystem (for example as food for eagles, osprey, and otters, as well as fun for people). Non-game fish populations remain at levels that do not compete with game fish.

Water quality (both surface and groundwater) remains excellent in the Monument. All drinking water is safe for human consumptions and meets or exceeds state and federal drinking water standards.

Surface water in East Lake, Paulina Lake, and Paulina Creek is of good quality and supports beneficial uses such as fisheries and other aquatic life, aesthetics, and water-based recreation. The natural fluctuation of hot springs and fumarole activity is well understood and is not adversely affected by human activities. Activities in the Monument have not adversely affected water quality in the ponds along the Deschutes River, or the river itself.

Water sources needed for program objectives have been found and developed. Water conservation programs are in place in the Monument.

Air quality in the Monument remains good or improves, and does not endanger human health. Visitors are satisfied with the air quality, including visibility and odor. Emissions from motor vehicles, wood burning (campfires, woodstoves, and forest-fire smoke) and geothermal or other commercial activities near the Monument have not degraded the special values for which the Monument was designated. All federal and state requirements and standards for air quality are met.

Human/Social Ecosystem Components

Protection of **archaeological resources** has been enhanced by law enforcement, interpretation, education, and monitoring. Visitors know and respect the unique American Indian heritage and EuroAmerican settlement history of the Newberry Volcano area.

American Indian tribes are involved in developing interpretive programs for the Monument. Tribes are consulted concerning archaeological research and exploration, traditional cultural properties, sacred sites, tribal religious practices, and projects that affect cultural resources. Effective working relationships with local American Indian Tribes are promoted.

Effective, engaging **interpretation** is provided to inspire visitor curiosity and encourage resource protection. 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 Monument features, or remove resources.

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. Interpretive themes for the Monument are clearly articulated, and key topics of interpretation include geology, archaeology, ecosystems, and the roles of the Forest Service in natural resource management.

Strong partnerships between the Forest Service and local, state, and national organizations support a wide range of experiences, such as guided walks, demonstrations, self-directed discovery, and hands-on participation in research projects. Expanded opportunities, especially in the Lava Butte and Transition Zones, support longer visitor stays than at present.

Interpretive facilities are designed to support the active and extensive interpretation program. Buildings, trails, and other structures function to "facilitate" visitor interactions with the Monument's natural and cultural resources, rather than serving as attractions in themselves.

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. To the casual observer, results of activities are not evident or are visually subordinate to the landscape. Natural disturbance patterns are part of the landscape structure within the Monument.

In some places 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 complement the visual character of the Monument.

Visitors enjoy many **recreational** opportunities. High quality settings are available for both developed and dispersed recreation. The Monument provides some recreational settings that are peaceful and quiet and others that are busier. Solitude and challenge can still be found in many areas of the Monument--the **North and South Paulina Roadless Areas** have maintained their unroaded character and provide opportunities for solitude. The Monument continues to provide for the common and popular recreational activities taking place on the Forest lands that eventually became part of the Monument. These activities, referred to as "traditional," include horseback riding, hiking, picnicking, camping, mountain biking, exploring, snowmobiling, nordic skiing, fishing, and boating.

Visitors feel that campgrounds, trails and other facilities are well-designed and not over-crowded. A 10-mph speed limit for boats on East Lake and Paulina Lake contributes to high-quality recreation and fishing experiences in a relaxed and peaceful setting. Campgrounds provide high-quality overnight experiences. Visitors feel safe, protected and secure in Forest Service campgrounds. Trail use conflicts are minimal. Visitors enjoy recreational activities and settings without adversely affecting sensitive plants, wildlife habitats, geologic features or 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. New facilities meet regional accessibility standards, and barrier-free access to some parts of the Monument facilitates enjoyment of the Monument and its features for all.

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 have been obliterated or closed. Conflicts between Forest and Monument traffic are minimal. **Facilities** are attractive, in character with natural surroundings, and meet visitors' needs. They support and enhance experiences in the Monument. Federal, state and county standard for public safety and welfare are met.

Appropriate **special uses** such as railroad and electric power corridor rights-of-way, summer homes, and recreational events support and contribute to the values for which the Monument was created. Two well-maintained resorts (East Lake and Paulina) provide a high quality experience while retaining the traditional rustic character popular with the Monument's many visitors.

Mokst Butte Research Natural Area (RNA) continues to provide baseline ecological research opportunities as part of the National Research Natural Area Program.

Special areas designated in the Monument legislation to address geothermal development adjacent to the Monument are managed to meet the intent of the legislation. These areas are managed as part of the Monument, with their natural values preserved, 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, with no surface occupancy allowed. In the Transferal Area, geothermal exploration and development may be approved, dependent on site-specific environmental analysis. The Transferal Corridor provides for a utility corridor across the Monument in the event of geothermal development.

Appropriate **research** is encouraged and supported in the Monument. Research projects are compatible with recreational use, and do not in general displace recreational activities. Science and research projects aid in the public's understanding of the Monument's ecosystems and how natural processes work. A **monitoring program** for key Monument values has been established and is accurately determining and evaluating trends in the resiliency of Monument ecosystems, the satisfaction of visitors, and the effectiveness of management direction in meeting the intent of the Monument legislation.

An effective Forest Service **law enforcement** presence has reduced vandalism, resource destruction, and disturbances to other visitors. Visitation to the Monument contributes to economic diversity in **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.

NOTE: Readers should also consult the "List of Key Opportunities Common to All Alternatives" found in Chapter 2 of the Monument Plan FEIS for more background on ways and opportunities identified to help more toward desired future conditions. Most, although not all, of these opportunities are reflected in management objectives, standards and guidelines, the monitoring program, or other sections of this Plan.

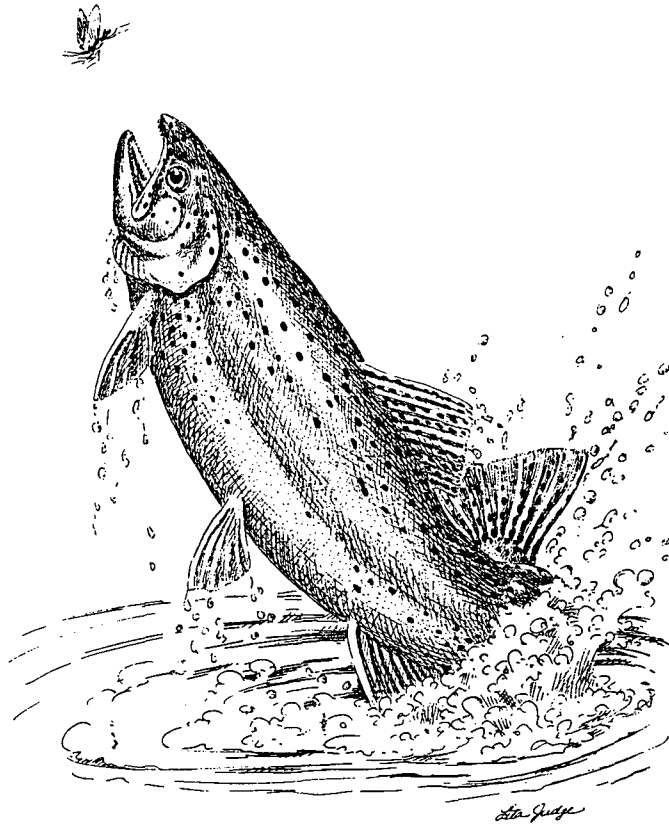
Management Zones

Newberry Natural Volcanic Monument is divided into five Management Zones. Each Management Zone contains lands that share broad similarities in their mix of vegetation communities, wildlife species, geologic features, and human uses.

The Management Zones govern what types of human developments and activities (especially recreational developments and activities) may take place and where they may take place. Each Management Zone has a general goal and objectives, as well as standards and guidelines specific to that Zone. The five Management Zones include:

- the River Zone,
- the Lava Butte Zone,
- the Transition Zone,
- the Flanks Zone,
- the Caldera Zone.

Their boundaries are shown on the map in the introduction section of this Plan. Each Management Zone's set of goals and objectives is described in the subsections on Management Zone Standard and Guidelines.



Management Objectives

Management objectives are the kinds and amounts of activities and services we expect to provide in order to fulfill the management goals and move toward desired future conditions for the Monument. This section is about how much and when.

These levels of activities and services are based on assumptions. These include assumptions about demand for different kinds of recreation experiences, and interpretive activities, and about the effectiveness of ecosystem protection, restoration, and enhancement measures. The levels of activity and services provided could be significantly affected by the level of funding the Forest Service receives from Congress.

The projected activity and service levels may not always be accomplished in any given year. In addition to budgets, personnel ceilings could affect accomplishment of activities. Should appropriated budgets or personnel ceilings vary significantly from the planned needs, this Plan may need to be amended.



Table 1. Summary of expected levels of conditions, activities, and services

Condition, Activity or Service	Measure	Decade 1	Long-term
Human/Social Components			
Developed Recreation Use	RVD/year		
Day Use		138,900-149,600	227,700-293,100
Overnight		266,500	287,000-295,000
ROS categories provided	acres		
SPNM		42,760	same
SPM (winter)		37,420	same
Roaded natural		14,860	same
Rural		470	same
Trail Construction or Rehab	miles		
Summer		13	35-45
Winter		5	15-25
Road Improvements/Construction	miles	7	9
Road Closures/Obliterations	miles	11	41
Capacity of Key Developed Sites	PAOTs		
Lava Lands Visitors Center and Lava Butte Lookout		500	980-1310
Benham Falls day use		42	88
Lava River Cave		200	same
Caldera general-use campground		1625	same
Horse-rider campgrounds		225	same
Boat-in campgrounds		55	same
Lakeside day-use areas		662	709-755
Interpretive day-use areas		250	315-512
Portal facility		10-20	112-224
Cultural Site Evaluation	#/year	10	> 300 total
Biophysical Components			
Actions to restore "historic" fire-based ponderosa pine old-growth	acres/year	7-30	135
Actions to maintain fire-excluded, "ecological" characteristics in ponderosa and lodgepole pine	acres/year	5-10	55

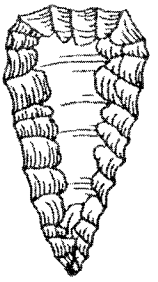
Table 1. Summary of expected levels of conditions, activities, and services

Condition, Activity or Service	Measure	Decade 1	Long-term
Actions to restore fire to lodgepole pine ecosystem ²	acres/year	17-76	40 ¹
Actions to restore ponderosa pine in mixed-species forests dominated by white fir ³ insect/disease threats to areas outside NNVM	acres/year	3-5	13
Watchable wildlife habitat improvement	number of structures	2	5
Sensitive plants habitat improvement	acres	7	same
Bald Eagle nesting habitat management	acres	50	200
Goshawk nesting habitat present	acres	5,200-12,600	same
Mule Deer			
Hiding cover on winter range	acres	1,400	2,200
Hiding cover on summer range	acres	32,800	26,700
Expected costs of NNVM management			
• Capital investment costs	M \$	14,574	not available
• Operation/maintenance costs	M \$/year	1,746	1,790

1/ Acreage does not include use of prescribed natural fire.

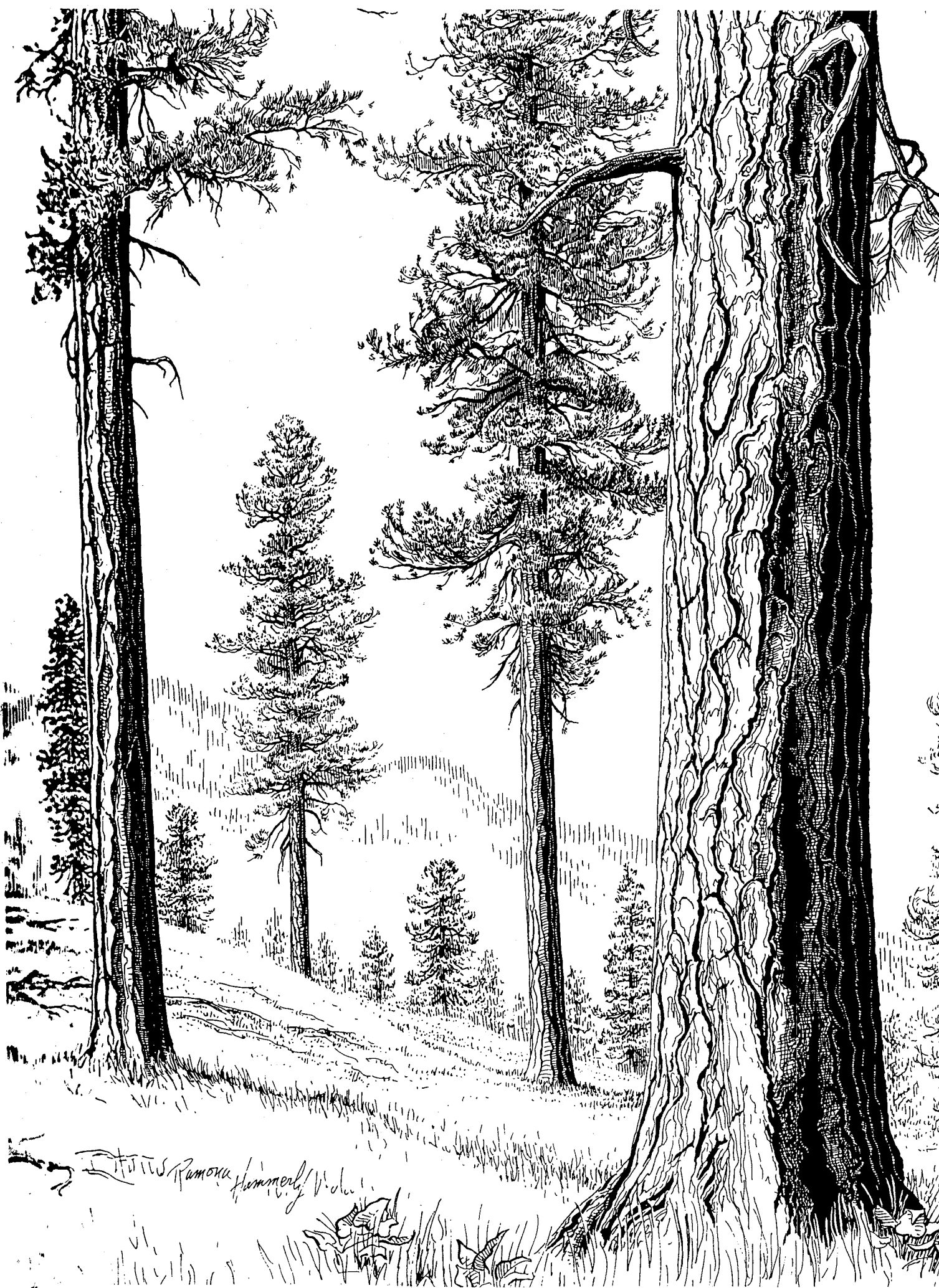
2/ Short-term focus includes reduction of fuels in areas of high hazard/risk.

3/ Where this serves to meet wildlife habitat enhancement objectives.



MANAGEMENT DIRECTION

**STANDARDS
AND
GUIDELINES**



THE PINE RAMONA Hammered by V. J. ...

Standards and Guidelines

Introduction

This section describes the standards and guidelines that will be used in planning and managing activities within the Monument and the special areas (Newberry Special Management Area, Transferal Area, Transferal Area Adjacent, and Transferal Corridor). The overall intent of these standards and guidelines is to ensure that projects and activities within the Monument and special areas will contribute to the long-term sustainability or restoration of ecosystems, while meeting the intent of the Monument legislation. Standards and guidelines provide overall direction reflecting the goals, management objectives and desired future conditions established for the Monument and the special areas. Often, existing conditions do not match desired conditions. Another intent of these standards and guidelines is to help design and carry out management activities that, over time, will result in desired future conditions and ecological processes.

Management activities and projects planned within the Monument require site-specific environmental analysis before any decision to proceed. Interdisciplinary teams conducting site-specific analysis of project proposals within the Monument should provide the mix of skills and disciplines appropriate to the nature of the proposal. Input from ecologists, geologists, wildlife biologists, archaeologists, interpretive/recreation specialists, silviculturists, and landscape architects will typically be needed during environmental analysis and often into project implementation and monitoring as well. Input from other disciplines may also be needed, depending on the nature of the proposal. As projects and activities are planned, they will be coordinated with other appropriate federal, state, and local agencies and American Indian Tribes.

This section is organized in two parts: Monument-wide standards and guidelines and Management Zone standards and guidelines. Standards and guidelines for the Newberry Special Management area, Transferal Area, Transferal Area Adjacent, and Transferal Corridor, appear in the subsection for the Transition Zone and Flanks Zone. *All standards and guidelines appear in italic typeface, like this sentence.* Supplemental information which accompanies the standards and guidelines appears in regular typeface.

Newberry National Volcanic Monument is to be managed "in accordance with the laws, rules, and regulations pertaining to the National Forest System and this Act (Public Law 101-522) as part of the Deschutes National Forest." These standards and guidelines reflect applicable laws, rules, and regulations. Forest Service personnel using this plan may find it especially helpful to be familiar with the following laws and executive orders as background in applying Monument Plan direction:

- Public Law 101-522, Newberry National Volcanic Monument
- Clean Water Act

- Clean Air Act
- National Environmental Policy Act
- National Trails System Act
- Geothermal Steam Act of 1970
- Endangered Species Act of 1973
- Federal Cave Resources Protection Act of 1988
- National Environmental Education Act
- National Forest Management Act of 1976
- Antiquities Act of 1906
- National Historic Preservation Act of 1966, as amended 1992
- Archaeological Resources Protection Act of 1979
- Executive Order 11593
- American Indian Religious Freedom Act
- Native American Graves Protection and Repatriation Act
- Archaeological and Historic Preservation Act of 1974
- Department of Transportation Act of 1966
- Federal-Aid Highway Act
- Historic Sites Act of 1935
- Public Buildings Cooperative Use Act of 1976

For a complete list of laws applicable to National Forest System Lands, readers should consult "The Principal Laws Relating to Forest Service Activities," prepared by the United State Department of Agriculture. Forest Service Manuals and Handbooks also contain direction and policy applicable to management of Newberry National Volcanic Monument, and these standards and guidelines reflect that direction as well.

Some standards and guidelines from the 1990 Forest Plan for Deschutes National Forest will also be used to manage the Monument. A list of these standards and guidelines appears at the end of this section. Readers should consult the 1990 Forest Plan for the text of these standards and guidelines.

Monument-Wide Standards and Guidelines

Introduction

These standards and guidelines apply throughout the Monument. The standards are designated by italics, and the numbering prefix of M- represents their Monument-wide applicability.

M-1 Land management activities should allow natural ecological succession¹ of vegetation to continue to the maximum extent practical. Where natural ecological succession is not practical, analysis of projects and activities should explain why it is necessary to intervene and how this intervention is consistent with the purposes and provisions of the Monument legislation (P.L. 101-522). Site-specific planning efforts will use the section of this plan titled "Areas of Concern and Opportunity" for information and preliminary issues that should be considered when planning site-specific management activities.

NOTE: Current resource opportunities and concerns within the Monument Management Zones have been summarized and integrated in the section of this Plan titled "Areas of Concern and Opportunity, with Project Planning Criteria." These Areas of Concern and Opportunity are also displayed on the map of the same title in the accompanying map packet. This section is intended as an informational and prioritizing tool to alert land managers to integrated resource considerations when locating or designing projects or activities. It does not necessarily preclude or require specific projects in specific areas. The areas displayed on the map reflect ecological conditions such as plant communities, forest mortality, or wildlife migration corridors that may shift over time and that are commonly gradational, though shown relatively precisely on the map. These areas generally have "fuzzy", integrated edges (where resource characteristics and concerns may change) rather than sharp demarcations. This should be taken into account when planning projects or activities. As resource conditions change and shift over time, the information in this section may need to be updated.

¹ Natural ecological succession refers to the successive changes in the structure and composition of plant and animal communities that occur when natural ecological processes are allowed to evolve without human intervention. In Central Oregon, wildfires are a disturbance cycle associated with these processes. It is not feasible to allow wildfires to burn at random within the Monument, due to issues of human safety and protection of public property. Thus, completely natural ecological succession is not, practically speaking, possible within the constraints imposed by concerns for public safety and property.

Within the Monument, the closest we can come to allowing for "natural ecological succession" is in areas where we can use a prescribed natural fire management strategy.

The remaining Monument-wide standards and guidelines address biophysical and human/social components of the ecosystem. A brief introduction precedes the set of standards for each ecosystem component.

Biophysical Components of Ecosystems

This section begins with the ground, and consideration of the geologic features and soils that have formed and support the Monument's biophysical character. The geologic features of the Monument offer outstanding scenic, interpretive, and research opportunities. They are also irreplaceable and in many cases quite vulnerable to human-caused damage.

M-2 A public education program will increase understanding of the value of these irreplaceable features. Geologic resources may be developed for educational, scientific, or recreational purposes to the extent the integrity of the resource is maintained. The nonrenewable (or at least long time span for renewability) nature of geologic resources will be recognized and managed for the greatest scientific and public good.

M-3 An inventory of geologic features will be started and developed over time. It should include coordination for inventory and mapping of the location of features, research and monitoring programs, and when necessary, a cleanup or restoration program. The inventory program should be aimed at both a Monument-wide level and specific projects. From this data base, a geologic overview that summarizes and compiles known geologic information may be developed.

M-4 Measures for the protection of geologic features will be incorporated into project plans as needed for any activity which could adversely affect the features. Access will be determined by the capacity of sites to withstand the impacts of visitation and management prescriptions will be developed on a site by site basis. The location of unique geologic features will be kept confidential when needed to protect the features. The public will be directed to geologic features along designated roads and trails and at developed sites only. There will be vigorous enforcement of laws to protect features from collectors and vandalism.

During site-specific NEPA analysis, all projects within the Monument will be evaluated for their potential to add to the geologic knowledge of the Monument. If needed, project planning will include methods for recovering information. In preparing contracts for projects within the Monument, consider including a stop-work clause if significant geologic exposures or deposits are likely to be encountered.

M-5 Until a significant cave list is completed, all caves will be protected as follows: Trees will not be removed (except for safety) in a 200 foot radius around cave entrances and infeeder drainages with slopes of less than 30 degrees. There will be no ground disturbing activities on slopes steeper than 30 degrees adjacent to cave entrances. Similar buffers will be maintained around direct drainages into caves. This includes sinkholes, cave collapse areas known to open into a cave's drainage system, and perennial, intermittent or ephemeral streams flowing into caves. Any interim guidelines adopted by the Deschutes National Forest to provide protection for caves pending nomination for significance will also apply to caves with the Monument and special areas.

M-6 Due to low-quality material and potential scenic quality impacts, all existing pits and quarries within the Monument are considered closed unless opened through site-specific NEPA project analysis and approval. This includes Rift rock Quarry, Rift Cinder Pit, Lava Butte Cinder Pit, Lava Cast Cinder Pit, The Dome Cinder Pit, and East Draw Pumice Pits.

M-7 Project planning shall include measures to protect and where desirable enhance soil productivity, and to mitigate disturbance to the soil resource. The intent is to retain the land's capability to support natural plant establishment and growth. Within recreational developments, administrative sites and trails, some decrease in soil productivity is unavoidable. Where feasible, accelerated loss of surface soils due to visitor use should be corrected, using native materials and vegetation when possible. New trails will be located, and existing trails may be relocated, to avoid sensitive and wet-soil areas, such as in meadows, lake shorelines, and riparian areas. In prescribed burning activities, where feasible, avoid burn piles or burning high concentrations of fuels on sensitive soils and/or steep slopes.

Vegetation communities play a critical role in the ecosystems that cross the Monument. Their long-term extent, structure, diversity, and health greatly influence wildlife habitats, soil productivity, water quality, scenery, and recreation opportunities. During the time this plan has been developed, land management efforts on other lands (federal, state and private) have begun to recognize that ecosystems and their management should be considered at scales that often transcend administrative boundaries. For instance, various recent (1992-1996) ecosystem planning or analyses have considered spatial scales ranging from regional (10,000 to 20,000 square miles, i.e., the Pacific Northwest) to provinces/river basins (1,000-10,000 square miles) to watersheds (10-200 square miles) to site-specific (20-100's of acres).

This Plan for Newberry National Volcanic Monument used a landscape approach to planning, a scale larger than site-specific planning, smaller than the typically very large watersheds found in Central Oregon. When planning site-specific vegetation activities in the Monument it is important to consider resource conditions and issues at a larger scale so that 1) the value of Monument lands in the larger ecological context is recognized; and 2) possible adverse cumulative effects can be identified and mitigated. Planners should refer to the watershed analyses relevant to the Monument area as a tool for considering larger scales when planning activities in the Monument.

M-8 Intent: Overall, any projects to alter existing vegetation should respond to one or more of the following needs:

- 1) protect existing large, old trees and provide for the perpetuation of the genetic heritage they represent,*
- 2) reestablish conditions that allow natural ecological succession of vegetation to the maximum extent practical,*
- 3) protect public health and safety (including removal of hazard trees),*
- 4) enhance wildlife or sensitive plant habitat, scenic quality, or recreational values,*
- 5) reduce serious threats from insects, fire, or disease to resources outside the Monument,*
- 6) accommodate appropriate facility, trail, or road construction or reconstruction consistent with this Plan.*

M-9 Eliminate domestic livestock grazing allotments within the Monument. Follow appropriate procedures for termination of permits.

M-10 Maintenance of Habitat Diversity: Overall, restoration activities should provide for habitat diversity, including horizontal, vertical, and vegetative species diversity. Vegetation projects should contribute to habitat diversity at the stand level and/or landscape levels.

Ensure that restoration activities provide for the enhancement and long-term maintenance of unique plant communities, including meadows, riparian vegetation, and vegetation at the edges of lava flows.

M-11 Planting of Vegetation: The use of natural regeneration is preferred over planting. If planting is done, it should be done with species that are ecologically adapted to the site. Non-native species will not be planted unless there are no other feasible options for meeting management objectives.

M-12 Integrated Insect/Disease Management: It is recognized that insects and disease play an important role in ecosystem function. However, in some cases, the level of insect and disease activity or the location of such activity could preclude the accomplishment of important goals of the Monument legislation. Treatment to reduce or prevent insect or disease effects should be a result of integrated resource analysis that has identified quantifiable land management objectives, based on the intent of the Monument legislation. Treatment on an isolated stand-by-stand basis is not recommended, but may be required to meet a particular resource objective.

M-13 Where feasible and practical, favor manual methods for vegetation restoration activities. If mechanized equipment must be used, choose equipment and methods that avoid or reduce undesirable impacts to soils and damage to vegetation intended to remain on the site. The following guidelines are some ways to avoid or reduce undesirable impacts when heavy machinery is used:

- *Consider aerial or cable systems on slopes sensitive to soil displacement.*
- *Use designated travel routes for heavy equipment.*
- *Limit machinery operations to times when soils are least likely to be disturbed or compacted, such as when they're dry, frozen, or covered with snow.*

M-14 Machine piling of slash during fuels treatment should be used only when no other method can accomplish objectives, and should generally be avoided on slopes over 30 percent. Minimize impacts of machine piling by piling no more than needed to break up fuel continuity.

Ponderosa Pine Communities

The intent of this Plan is to, over the long term, reestablish some of the open, park-like stands of large old-growth ponderosa pine that were prevalent in Central Oregon before EuroAmerican settlement, through the reintroduction of fire (primarily in the form of prescribed fire) as an agent of ecological change. This Plan uses the term "historic" ponderosa pine old growth when referring to this kind of ponderosa pine stand. Fire exclusion, timber harvesting, and other management activities have all contributed to changing the more open stands of large ponderosa pines to today's denser, multiple-storied, brushy stands of smaller trees (often with other species such as lodgepole pine, having grown in). Fire exclusion has been the most significant of these activities in changing the character of these stands.

M-15 Where practical in light of other resource objectives, reestablish "historic" ponderosa pine old growth (over time) on a substantial portion of the ponderosa pine sites. The intent is to create (over time) fuel conditions that allow stands to be maintained and perpetuated solely with prescribed fire (or where appropriate, prescribed natural fire) rather than through mechanical treatments. While prescribed fire or natural prescribed fire is the preferred treatment method, some mechanical treatments may be needed before fire can be used safely. The choice of which sites to manage for this condition should be integrated with other resource objectives such as wildlife habitat, scenic quality, and recreation.

NOTE: The following descriptions of historic fire-based ponderosa pine old growth are provided as a useful reference in considering management options and tools, and what conditions to approximate. They are not standards.

Discussion of Old Growth Definitions:

There is no clear separation between ponderosa pine old growth as it occurred in pre-EuroAmerican times (called here "historical old growth") and the Region 6 definitions provided for old growth ponderosa pine (called here "ecological old growth"). "Historical" old growth characteristics fall fully within the range of characteristics provided for in the "ecological" definition. The distinction between "ecologic" and "historic" old growth is made here to point to the fact that today's forests, which have been influenced by decades of fire exclusion, may encompass the "historic" range of variability on any given acre but do not resemble "historic" conditions, given the extent of these conditions over the landscape.

Conditions that Result in "Historic" Ponderosa Pine Old Growth (fire-based):

As defined here, "historic" old growth reflects the characteristics of fire-based ponderosa pine ecosystems that occurred prior to the arrival of EuroAmericans. Low intensity fires burn through them at frequent and regular intervals (8-35 years). The attainment of the old-growth characteristics typical of these stands is generally associated with low-intensity fire. The repeated fires have reduced understory vegetation, fine fuels and large woody material on the forest floor. Fire has the effect of thinning stands from below, creating scattered snags, more open conditions, and leaving a residual forest stand made up of larger diameter trees. The characteristic open and "park like" stands gradually develop over time. While this condition is common over the landscape, the ponderosa pine forests do not lack diversity. Unburned islands of regeneration are scattered over the landscape and mid- and mid-late successional stages are evident.

Characteristics of "Historic" Ponderosa Pine Old Growth (fire-based):

Site Productivity - The presence and amount of old-growth characteristics (including understory vegetation, size of trees, trees per acre and dead woody material) will vary by the productivity of a given site. Sites are broken into two broad categories: low productivity and moderate-high productivity. A variation in conditions will also occur based on specific management objectives for a given area.

Tree Size and Number of Trees - The number and size of trees present will generally fall within the "typical range" for this characteristic as defined in the Region 6 - Interim Old Growth Definitions and should always exceed the number defined as minimally acceptable to qualify as old growth. There are two broad conditions that can occur: mid- to late-seral (decadent) conditions where dominant trees are greater than 21" dbh and at least 150 years of age; and late- to very late-seral conditions where dominant trees are greater than 31" dbh and at least 200 years in age.

Snags - Snag numbers are variable across the landscape but in old-growth stands should generally meet the minimum of three snags per acre that are at least 14" in diameter as described in the Region 6 - Interim Old Growth Definitions. Late- to very late-seral conditions will generally have snag levels as described in the previous sentence and/or 10% of the stand with spire (dead) tops.

Downed Wood - The amount of downed woody material will vary across the landscape. Numbers of downed logs will generally fall at or below the low end of the "typical range" of 3-6, eight foot pieces (12" or larger at the large end) as defined in the Region 6 - Interim Old Growth Definition, except where mitigation measures are applied. Logs larger than eight feet in length are counted as more than one piece. For example, a 24-foot log (at least 12" in diameter, eight feet from the small end) will represent three logs or pieces. The attribute is also a function of site productivity, age, and relative degree of decadence of each stand. Late- to very late-seral stands that have not experienced a recent fire (or have had down wood protected by mitigation) will exhibit larger volumes of down material than mid- to late-seral stands.

Canopy Layers - Canopy layers below that occupied by the large trees (21" and greater) will frequently be absent. Some stands may have a second canopy layer of smaller-sized trees that have recently regenerated and have escaped or been protected from burning. On better sites the regeneration may appear as a true layer and on poorer sites the regeneration may occur as scattered individuals. Gaps or openings may also be occupied by smaller-sized trees.

Understory Vegetation - Understory vegetation will vary across the landscape depending on how recently fires have burned, if mitigation measures have been applied or because of variations in burn intensity or frequency. Grassy understories will be common and shrubs generally less common or young in age. The combination of understory vegetation will fall generally at the low end of the "typical range" for percent understory canopy cover as defined in the Region 6 - Interim Old Growth Definitions.

Stand Size - Old-growth stands will generally fall within the "typical range" of 40-100 acres as defined in Region 6 - Interim Old Growth Definitions. Ten acres is the minimum acceptable size in order for a stand of old-growth trees to be considered as providing old-growth habitat. Some stands smaller than 40 acres may occur, as well as some stands greater than 100 acres depending on surrounding vegetation. **NOTE:** This is the old growth portion of an old growth area. The acreage does not include earlier successional stages required for old growth replacement.

Gaps - Small gaps of 1/2 acre to several acres (with the norm about 1/2 acre) may occur within a given old-growth condition as defined in Region 6 - Interim Old Growth Definitions. Gaps may have been created by human activity to meet management objectives or may exist as a function of insect activity, or root disease, etc. Gaps may contain grasses, shrubs, or successional forest conditions that are earlier in the succession process than required for old growth.

Presence of Early- to Mid-Successional Stages - The degree and arrangement of various successional stages found within a given old-growth area is of great ecological importance. Identified "stands" within an old-growth area should support vegetation representing early, mid-, mid- to late, late, and very late successional stages. The mosaic of seral conditions should mimic historic stands, at least in part, and provide for increased bio-diversity (increased horizontal diversity and edges) in addition to providing the ability to sustain old growth in a given area over time. The extent of a given old-growth area should be mappable and is the basis for providing the range of successional stages.

**Table 2. Ponderosa Pine
Desired Amount of Various Successional Stages**

Stages	Early	Mid	Mid to Late	Late to Very Late
Percent Desired <u>1/</u>	25%	15%	15%	45%
Average Age <u>2/</u>	0-90	91-150	151-200	201-350+

1/ Assumes ponderosa pine stands begin to break up at ages between 300 and 400 years.

2/ Average ages in years associated with successional stages.

M-16 On ponderosa pine sites where it is not desirable because of other resource objectives to manage for historic ponderosa pine old growth, attain and perpetuate ponderosa pine old growth that meets the Region 6 - Interim Old Growth Definitions for "ecological old growth." This generally will mean exclusion of fire from these stands. The choice of which sites to manage for ecological old growth should be integrated with other resource objectives such as wildlife habitat or fire safety (see section titled "Areas of Concern and Opportunity" for more information on potential locations). The intent is to provide (over time) stands that provide for additional visual and biological diversity. The exclusion of fire will require periodic use of mechanical treatments such as thinning or uneven-aged regeneration to attain and perpetuate the desired characteristics for this type of old growth.

NOTE: The following descriptions of ecological (fire-excluded) ponderosa pine old growth are provided as a useful reference in considering management options and tools, and what conditions to approximate. They are not standards.

Conditions that Result in "Ecological" Ponderosa Pine Old Growth (fire-excluded):

As defined here, "ecological" old growth reflects the characteristics that generally occur within the "typical range" of characteristics for old-growth ponderosa pine as described in the Region 6 - Interim Old Growth Definitions. The attainment of desired old-growth characteristics is generally dependent on the exclusion of fire. Exclusion should be applied where ponderosa pine is the climax species under these circumstances. The exclusion of fire will frequently require the use of mechanical treatments such as thinning or uneven-aged regeneration harvest to allow for the attainment and perpetuation of the desired conditions for this type of old growth. Unlike old growth developed to resemble "historic" conditions this type of old growth is distinguished by its multi-level canopy that is generally contiguous across the landscape. While this condition is common over the landscape, some diversity is provided by small gaps in the forest where the objective is to create stands comprised of small even-aged groups which are generally less than 1/2 acre in size (group selection method of regeneration).

Characteristics of "Ecological" Ponderosa Pine Old Growth (fire-excluded):

Site Productivity - The presence and amount of old-growth characteristics (including understory vegetation, size of trees, trees per acre and dead woody material) will vary by the productivity of a given site. Sites are broken into two broad categories: low productivity and moderate-high productivity. Variability is also expected within these broad categories. Consult the "Plant associations used in the analysis process to determine characteristics of old-growth ponderosa pine ecosystems" in Region 6 - Interim Old Growth Definitions (June, 1993 or most recent revision) for a list of plant associations by productivity group. A variation in conditions will also occur based on specific management objectives for a given area.

Tree Size and Number of Trees - The number and size of trees present will generally fall within the "typical range" for this characteristic as defined in the Region 6 - Interim Old Growth Definitions. There are two broad conditions that can occur: mid- to late-seral where dominant trees are greater than 21" dbh and at least 150 years of age; and late- to very late-seral (decadent) conditions where dominant trees are greater than 31" dbh and at least 200 years in age. In providing diversity of age classes within the stand the number of large trees may be limited to the lower end of the typical range but should always exceed the minimum acceptable number to be considered old growth.

Snags - Snag numbers will be variable across the landscape but in old-growth stands should generally meet the minimum of three snags per acre that are at least 14" in diameter as described in the Region 6 - Interim Old Growth Definitions. As stands approach "late- to very late-seral conditions," they may contain trees with spire tops but not generally enough to substitute for snags.

Downed Wood - The amount of downed woody material will vary across the landscape. Numbers of downed logs will generally fall with the "typical range" of 3-6, eight foot pieces (12" or larger at the large end) as defined in the Region 6 - Interim Old Growth Definition. Logs larger than eight feet in length are counted as more than one piece. For example, a 24-foot log (at least 12" in diameter, eight feet from the small end) will represent three logs or

pieces. The attribute is also a function of site productivity, age, and relative degree of decadence of each stand. Late- to very late-seral stands will exhibit larger volumes of down material than mid- to late-seral stands.

Canopy Layers - Multiple canopy layers will be present, with 2-3 levels (including the level with trees 21" and greater) being typical. Gaps or openings may also occur, occupied by trees with a single canopy layer.

Understory Vegetation - Understory vegetation will vary across the landscape. The understory may frequently be occupied by older shrubby vegetation unless treated to stimulate new growth. The combination of understory vegetation will fall generally at the low end of the "typical range" for percent understory canopy cover as defined in the Region 6 - Interim Old Growth Definitions.

Stand Size - Old-growth stands will generally fall within the upper end of the "typical range" of 40-100 acres as defined in Region 6 - Interim Old Growth Definitions. The perpetuation of uneven-aged management over time will lead to the creation of large stands with limited variability over the landscape but high within stand diversity. The minimum acceptable size is 10 acres. Some stands smaller than 40 acres may occur, as well as numerous stands greater than 100 acres depending on surrounding vegetation.

Gaps - Small gaps greater than 1/2 acre in size may occur within a given old-growth condition as defined in Region 6 - Interim Old Growth Definitions. Gaps may have been created by human activity to meet management objectives or may exist as a function of insect or disease activity, etc. Gaps may contain grasses, shrubs, or successional forest conditions that are earlier in the succession process than required for old growth.

Presence of Early- to Mid-Successional Stages - Identified "stands" within an old-growth area should support multiple canopy layers with various age classes present to perpetuate the stand over time. The uneven-aged nature of the stands will generally make them resemble late to very late successional conditions over time but will contain young and middle-aged trees. This will contribute to bio-diversity (vertical structural diversity). The extent of a given old-growth area should be mappable and is the basis for determining age distribution.

M-17 Where regeneration is needed, even- or uneven-aged regeneration methods may be used to meet resource objectives. In ponderosa pine community types where climatic conditions allow for the establishment, survival and growth of ponderosa pine and where lodgepole pine is a common associated species, activities should emphasize the establishment and maintenance of ponderosa pine to the extent necessary to avoid converting stands to those dominated by lodgepole pine.

A variety of wildlife species make use of ponderosa pine ecosystems. The intent of this plan is to provide for a range of the habitats typically associated with ponderosa pine in its different seral stages. As prescribed burning creates the characteristic of historic old-growth pine, in some areas of the Monument habitat components will shift to favor those species associated with large, open, old-growth ponderosa pine stands.

M-18 In ponderosa pine old-growth habitats, the intent is to provide habitat components, such as snags and down woody debris, used by wildlife species associated with old-growth ponderosa pine ecosystems. In ponderosa pine communities intended to provide fire-excluded ponderosa pine old-growth (refer to M-16), manage for an average of 4 or more snags per acre, 14 inches or greater in diameter. Snags may be grouped or scattered across the landscape. In ponderosa pine communities where the intent is to reestablish fire-based ponderosa pine old growth, where feasible and practical, in light of objectives for reintroduction of fire, provide for snags as described in the discussion on characteristics of fire-based ponderosa pine communities (following M-15). The basis for estimating snag levels may vary between 10 to 300 acres, in order to allow for landscapes with patterns of natural variation, such as stand replacement fires. Where feasible and practical, provide desired snag levels on every 10 acres. Snag creation, nest-box placement, pulling fuels away from snags before prescribed burning, or other management techniques may be used if needed to help provide for this habitat component.

In historic (fire-based) old-growth ponderosa pine stands, downed woody debris will be relatively scarce compared to 1994 levels. When treating ponderosa pine stands to move towards historic conditions, where feasible, use mitigation measures to maintain some of the larger pieces of downed woody debris within the project area.

Lodgepole Pine Communities

With respect to lodgepole pine communities, the intent of this Plan is to allow fire, diseases, and insects to play out their natural roles as agents of disturbance, to the extent this can be done while providing for public safety, and avoiding serious threats to resources outside the Monument, as well as unacceptably large losses of wildlife habitat or other values within the Monument.

A management objective is to (where practical and consistent with other objectives of this Plan) reintroduce fire as an agent of disturbance in lodgepole pine plant associations. This may be done by preparation of prescribed fire strategies that allow for natural ignitions within approved prescriptions (specific environmental conditions) or it may entail the use of prescribed burning. In some cases, mechanical treatments such as thinning or crushing may be needed to reduce fuels to levels that allow for prescribed burning. In other cases, wildfires themselves may create desirable habitat components of fuel breaks and reduce the need for human intervention. When they occur, vegetation project proposals in the vicinity should be reevaluated to see whether the wildfire has accomplished habitat or fuels reduction objectives, and to determine whether the project is still needed.

Over time, the activity of insects, fire, and disease (as well as human activity in some areas) is expected to create a more diverse mosaic of lodgepole pine stand conditions and ages than is presently found. The distributions shown in the following table approximate proportions of

successional stages which mimic historic stands (at least in part) and provide for increased biodiversity (more horizontal diversity and more edge), in addition to providing the ability to sustain old-growth lodgepole pine in a given area over time.

**Table 3. Lodgepole Pine
Desired Amount of Various Successional Stages**

Stages	Early	Mid	Mid to Very Late
Percent Desired <u>1/</u>	35%	40%	25%
Average Age <u>2/</u>	0-50	51-110	111-150+

1/ Assumes oldest stand age is 150 years.

2/ Average ages in years associated with successional stages.

M-19 Where feasible, practical and consistent with other objectives of this Plan, re-introduce fire as an agent of disturbance.

M-20 Many of the lodgepole pine communities are found within the North and South Paulina Roadless Areas. If, in these Areas action is needed to reduce serious threats from fire, insects, or disease to resources outside the Monument, or to protect, conserve, or enhance Monument values such as wildlife habitat, give first preference to methods that avoid the need for roads and heavy mechanical equipment. Consider roads only as a last resort, when other options are not feasible. If roads must be used, they are to be temporary for the life of that project only, and must be obliterated and rehabilitated once the project is complete.

M-21 Due to the short lifespan of lodgepole pine old growth stands, provide for a continuum of old growth over time by encouraging the development of a mosaic of age classes. To be classified as old growth, stands should exceed the minimum levels for old growth characteristics as outlined in the R-6, Interim Old Growth Definitions (1993 or later) for the lodgepole pine series. Thinning may be used if needed to encourage the development and perpetuation of large lodgepole pine trees where this is needed to enhance wildlife habitat, scenic quality, or other Monument resources.

M-22 The degree and arrangement of various successional stages found within a given area of lodgepole pine old growth is of great ecological importance. Identified "stands" within an old growth area should support vegetation representing early, mid, mid-to-late, late and very late successional stages. This mosaic of seral conditions should resemble historic stand conditions and provide for increased biological diversity, in addition to providing for the perpetuation of lodgepole pine old growth in a given area over time. The extent of a given old growth area should be mappable and is the basis for providing the range of successional stages.

M-23 Vegetation activities in lodgepole pine communities should be designed and located so that habitat components of special importance to American marten, neotropical migrants, deer, elk, black bear and cougar remain sufficient throughout the lodgepole pine forests as a whole to support viable populations of these species. These habitat components include standing snags, dead and down woody material, hiding cover, and solitude.

Locate and design any vegetation management activities in lodgepole pine communities to retain snag habitat where feasible. Where this is not feasible, compensate for snag deficiencies resulting from the activity by providing for higher snag levels (if needed) within adjacent stands, and/or at a landscape level. Artificial snag creation or nest boxes may be used to accomplish this objective, if needed.

NOTE: Consult the Deschutes National Forest Wildlife Tree Implementation Guide for useful information on management techniques for retaining and perpetuating snags.

Mixed Conifer Communities

Mixed conifer communities add valuable habitat diversity to lands within the Monument. The intent of this Plan is to protect and sustain these communities over the long term. Within-stand tree species diversity, an adequate range of successional stages, and the continuation or reestablishment of natural agents of disturbance are important factors in meeting this intent. When fires are suppressed, the balance of pines to true firs changes in these communities, with decreases in pine and loss of habitat diversity. Maintaining fire frequencies of 25-100 years (or mechanical treatments) helps to maintain pine species within the mixed conifer communities.

M-24 Existing Old Growth: Protect existing stands of large old growth trees in the mixed conifer community to the maximum extent practical, and ensure that conditions will allow for the continuation of old growth characteristics over time. Some areas within these communities should provide conditions encouraging the re-establishment of early seral species, such as pines. Other areas should exhibit multiple canopy levels, more snags and downed wood, and more understory vegetation. The intent is that these communities provide diversity across the landscape and also retain the mix of successional stages that will allow for continual replacement of present-day old growth as it matures and dies.

M-25 Where appropriate, reintroduce fire (prescribed natural or prescribed) as an agent of disturbance. Where prescribed fire is not feasible to achieve objectives, mechanical treatment may be used (for instance where the objective is to sustain high components of both pine and smaller, fire-sensitive true fir in mid-successional stands).

M-26 Where regeneration is needed, use even or uneven-aged regeneration methods, depending on the objectives for the area. Even-aged methods and group selection will encourage establishment of early seral species. Uneven-aged methods will favor shade-tolerant fir and other change agents such as root diseases, stem diseases, and dwarf mistletoe.

M-27 Any vegetation activities in mixed conifer communities should be designed and located so that habitat components of special importance to American marten, neotropical migrant birds, deer, elk, black bear and cougar remain sufficient throughout the mixed conifer communities to contribute to viable populations of these species. These habitat components include standing snags, dead and down woody material, hiding cover, shrubby understories, and solitude.

Locate and design any vegetation management activities in mixed conifer communities to retain snag habitat where feasible. Where this is not feasible, compensate for snag deficiencies resulting from the activity by providing higher snag levels in adjacent stands (if needed) and/or at a landscape level in that vegetation community type. Snag creation, nest boxes, or other techniques may be used to help meet this objective.

NOTE: Consult the Deschutes National Forest Wildlife Tree Implementation Guide for useful information on techniques for retaining and perpetuating snag habitat.

NOTE: The following descriptions of mixed conifer old growth are provided as a useful reference in considering management options and tools, and what conditions to approximate. They are not standards.

To be classified as old growth, stands should exceed the minimum levels for old growth characteristics as outlined in the R-6, Interim Old Growth Definitions (1993 or later) for the grand fir/white fir series. The definition is based on the exclusion of fire or other moderate to heavy disturbances. Where fire has been employed to emulate historical occurrence in pine associated stands, the definition for the ponderosa pine series may be more appropriate.

Presence of Early to Mid-Successional Stages: The degree and arrangement of various successional stages found within a given area of old growth is of great ecological importance. Identified "stands" within an old growth area should support vegetation representing early, mid, mid- to late, late and very late successional stages. The mosaic of seral conditions will mimic historic stands (in part) and provide for increased biological diversity, as well as sustaining old growth in a given area over time. The extent of a given old growth area should be mappable and is the basis for providing the range of successional stages.

The distributions shown in the following table approximate proportions of successional stages desired to provide for habitat diversity and renewal of mixed conifer communities over the long term. Uneven-aged stands will generally resemble late to very late structural conditions over time, but will also contain young, and middle-aged trees. They will contribute to biodiversity by providing increased vertical structural diversity.

**Table 4. Mixed Conifer
Desired Amount of Various Successional Stages**

Stages	Early	Mid	Mid to Very Late
Percent Desired <u>1/</u>	30%	20%	50%
Average Age <u>2/</u>	0-90	91-150	151-300+

1/ Assumes oldest stand age is 300 years.

2/ Average ages in years associated with successional stages.

Mountain Hemlock Communities

How mountain hemlock communities regenerate and perpetuate themselves is not well understood. Fire regimes in this community are considered to be high-severity (more than 100 years between fires, with stand replacement fires being the norm). Caution should be used when applying any regeneration treatments in these forest types, if the objective is to perpetuate mountain hemlock.

M-28 Monitor mountain hemlock plant associations to assess successional trends, insect and disease activity, fuel loads, and hazard trees (near high-use areas). Allow natural processes to continue uninterrupted where possible. Any activities should mimic natural processes. Generally, the intent is to minimize human disturbance in mountain hemlock plant associations to allow transition to late successional stages.

Riparian Vegetation

Riparian vegetation is a relatively scarce habitat component within the Monument, and as such, has great value. The intent of this Plan is to protect, and where possible, enhance riparian vegetation.

M-29 In general, avoid new trail or facility developments that direct human use into riparian vegetation, unless such developments would increase protection of riparian values. Limit or prohibit concentrated dispersed camping in riparian areas. Where practical and appropriate, redesign existing trails or facilities to allow enjoyment and interpretation of riparian areas while minimizing adverse impacts (for example, routing human use along the edge of, rather than into an area, through boardwalks, interpretive signs, or other means).

M-30 Where feasible, restore past damage to riparian vegetation (especially in areas where the damage may be having undesirable effects on wildlife or other resources) and maintain conditions that encourage perpetuation of riparian communities. In some cases this may require human intervention (for example, where vegetation has died out to the point that it can no longer reseed or regenerate).

M-31 When prescribed burning is used near riparian areas, protect riparian vegetation by leaving an unburned buffer, unless burning is part of the prescribed treatment to improve the riparian condition.

Threatened, Endangered and/or Sensitive Plant Species

The intent of this Plan is to protect known populations of threatened, endangered, or sensitive plants, to survey areas where populations may occur, and to contribute to the recovery of these populations.

M-32 Manage habitat for the perpetuation of plants which are listed as Threatened, Endangered, or Sensitive. Provide interpretation about these plant species to the public. Where interpretation involves on-site visits, provide interpretive guides to help monitor access to these populations.

Locate new facilities and trail routes that may encourage high levels of visitation away from known populations. Evaluate existing developments near known populations to determine if risks posed to these species are within acceptable limits. Take measures to mitigate unacceptable risks posed by existing developments or uses.

Undesirable Exotic Plant Species

M-33 Take action to eliminate or control existing populations of undesirable exotic plant species within the Monument. Where feasible and effective, choose methods that mimic natural processes (such as prescribed fire). Other treatments that may be used where appropriate include mechanical and herbicide treatments. Establish priorities for treatment based on rate of spread, threats to native populations, etc. In some cases, the re-establishment of native species through natural regeneration methods, seeding or planting may be appropriate to reduce further encroachment by undesirable, exotic plants. The collection of certain plants by American Indian Tribes and/or individuals will be reviewed on a case-by-case basis.

Gathering of Miscellaneous Forest Products and Fuelwood

M-34 The gathering of these products (such as evergreen boughs, pinecones, mushrooms, fuelwood, etc.) is prohibited unless the activity contributes to the attainment of goals and objectives as outlined in this Plan. An example where this circumstance could exist is the removal of fuelwood in areas where high fuel loads pose a serious threat to wildlife habitat, old growth, or other Monument resources. The collection of certain plants by American Indian Tribes and/or individuals will be reviewed on a case-by-case basis.

Fish and wildlife species are abundant and diverse within the Monument, and their presence is highly valued by human visitors to the Monument. The intent of this Plan is to protect, conserve, and where feasible enhance wildlife habitats across the Monument as a whole, to support wildlife species and contribute to the maintenance of viable populations. Another intent is to reestablish some habitat components and natural processes (such as open, park-like old growth ponderosa pine, and fire) missing from these lands today. This will serve to increase biodiversity at landscape and regional scales.

This Plan recognizes that not all wildlife habitat components of importance will be provided in all areas of the Monument at the same levels. For instance, snags and down woody material will be less abundant in Ponderosa pine habitats where prescribed burning is used to return these forests to conditions and processes prevalent before EuroAmerican settlement. Conditions in these areas will eventually resemble the description of "historic" old growth ponderosa pine (fire-based) provided earlier, in the section discussing vegetation communities. These conditions favor the reestablishment of species associated with this habitat type, such as flammulated owls and white-headed woodpeckers. Animals which prefer shrub understories, or multiple canopies, such as deer and goshawks will be found less frequently in these settings.

Conversely, in some ponderosa pine or mixed pine communities in the Monument the objective will be to retain multiple canopies and shrub understory to provide for habitat diversity. This will likely require human intervention, such as fire suppression or mechanical treatments to maintain tree species diversity within stands. In these stands, deer and goshawks will be more frequent, and white-headed woodpeckers will be missing. The overall goal is

diversity in habitats and species across the landscape and in some areas, settings reflective of conditions and processes in place around the time of EuroAmerican settlement.

Standards and discussions addressing desirable habitat components within different vegetation communities are presented in the preceding sections on Ponderosa Pine Communities, Lodgepole Pine Communities, Mixed Conifer Communities, Mountain Hemlock Communities, and Riparian Vegetation. The following standards apply to individual species, species groups, or particular habitat components, and are not necessarily tied to specific vegetation communities.

M-35 For Northern goshawk: Manage at least 2,300 acres as suitable nesting habitat, distributed across the Monument in vegetation communities favored by this bird (primarily lodgepole pine, mixed pine and mixed conifer). Before implementing projects which have potential to affect nesting activity or habitat, survey nesting habitat to determine if goshawks are present and may be affected by the project. When doing surveys, if known nests do not appear to be active, survey alternate nest stands as well to see if the pair has moved.

Manage active nest sites to promote successful production of young through time. Aim for the following characteristics (these may be modified based on future research results):

--mean tree canopy cover of 60 percent or greater

--tree density of at least 195 trees per acre

--stand age of 60 years or more, with large (at least 12" diameter) trees present for nests

--stand size of at least 30 acres around nest tree, or 100 acres to include alternate nests.

--post-fledging area around each active nest.

M-36 For Other Raptors: Protect active nest sites from human disturbance during the nesting season. (See also standards for Bald Eagle Management Areas, described in the Management Zones section).

M-37 For Deer and Elk: Ensure clumps or screens of hiding cover along roads within the Monument, to reduce view distances into openings. In areas that deer or elk use as migration corridors, design vegetation management activities or recreation developments to provide for viable migration corridors in that general vicinity over time. In areas where activities are undertaken to reestablish historic fire-based ponderosa pine old growth it may not be feasible to maintain the entire corridor. In these areas, provide for pockets of higher-density tree clumps.

M-38 For Threatened, Endangered and/or Sensitive Wildlife Species: Protect habitat and populations of these species and where possible, promote their recovery.

NOTE: As of August 1994 these species included the following:

- Northern Bald Eagle** (status: designated "Threatened" by United States Fish and Wildlife Service (USFWS))
- Peregrine Falcon** (status: designated "Endangered" by USFWS)
- Preble's Shrew** (status: Category 2 Species--under review by USFWS for protection under the Endangered Species Act)
- Townsend's Big-Eared Bat** (status: Category 2 Species--under review by USFWS for protection under the Endangered Species Act)

M-39 For Bats: Protect bat populations from disturbance and promote recovery of Threatened, Endangered, and/or Sensitive bat species. Evaluate newly discovered caves for their potential as bat habitat. Provide information on bat habitat, populations, and their benefit to the ecosystem through interpretive programs. (The intent is to inform people about bats to reduce impacts to their habitat and populations.) Incorporate roosting areas for bats into appropriate structures as they are built or remodeled, where it is practical and will not conflict with human use of the structure.

M-40 For Black Bear, Cougars, and American Marten: Manage garbage disposal in recreation sites to avoid creating reliable and easily accessible food sources for these species.

M-41 For Fisheries: Ensure a level of water quality in the lakes adequate to sustain fisheries and the aquatic life on which they depend. Coordinate with the Oregon Department of Fish and Wildlife in support of management objectives for East and Paulina Lake fisheries.

Management of fire and fuels within the Monument is a key element in reestablishing fire's natural role in vegetative succession and other ecological processes. It is also important from the perspective of human health and safety, and impacts to other resources such as wildlife habitat, air quality, and scenery. The intent of these standards and guidelines is to provide a well managed fire protection and prescribed fire program that:

- Allows fire to play its ecological role to the greatest extent feasible through the use of appropriate management techniques.
- Protects human life, property and designated resources.
- Suppresses wildfires in a safe, cost effective, and environmentally sensitive manner commensurate with the values at risk.
- Maintains an active fire prevention program.
- Provides an interpretive and public information program that will educate the public on the ecological role of fire.

M-42 A successful annual fire prevention program will have less than 3 human caused fires inside the Monument (not including arson fires, because they are not preventable, or prescribed fires).

M-43 The burned acre objective for NNVM in all vegetation communities will be no more than 300-400 acres burned annually as a result of wildfire. This does not mean that fires will be allowed to burn to these sizes prior to suppression, but will allow fire managers to choose the appropriate suppression response.

M-44 Use of natural barriers (in exchange for more acres burned) is allowed as part of wildfire suppression strategies or prescribed natural fire strategy when no human life or property would be threatened by their use. Where practical and effective, suppression should emphasize low impact methods such as handline and use of water. Retardants, because they are fertilizers and may adversely affect research areas, nesting sites, riparian areas, and water quality should be evaluated when developing the suppression strategy, to determine whether their use is appropriate in that particular fire situation.

M-45 Unplanned ignition may be used as a prescribed natural fire if (1) the fire was ignited by natural means, usually lightning. (2) a prescribed fire plan for that area has been prepared and approved and (3) the fire is burning within prescription (specific environmental conditions). Prescribed natural fire objectives will be to perpetuate natural resources and associated processes. Normally, prescribed fire will be by planned ignition.

M-46 Fuel accumulations should be allowed to develop within levels that are natural to the vegetation community in question. Where fuel accumulations exceed natural levels, (i.e., pre-Euroamerican), prescribed fire or other fuel reduction means may be considered to reduce them to a level consistent with ecosystem restoration objectives (to enable safe reintroduction of fire as an agent of disturbance). In these cases, the intent is to reduce or rearrange fuel loadings in a way that eliminates the likelihood of high intensity fires while maintaining as natural-appearing a setting as possible. Fuels treatment methods should reflect this intent (see also scenic quality standards in the Human/Social Ecosystem Components section).

Air quality is an important element in providing for high quality experiences, human health and safety, and resource protection within the Monument and special areas. It is the intent of this Plan to maintain air quality consistent with the State of Oregon Ambient Air Quality Standards and "Prevention of Significant Deterioration, Maximum Allowable Increases," as defined in the Oregon Administrative Rules, Chapter 340, Division 31. The reintroduction of fire is an important aspect of this Plan, and smoke management in conformance with the Oregon State Smoke Management Plan will be a key part of site-specific planning for any projects involving prescribed burning or other use of fire.

M-47 Air quality should not significantly harm or endanger human health, ecosystem health, or human enjoyment of NNVM. Air quality shall be protected and, if needed, enhanced through restrictions on certain uses within the Monument (e.g., motorized boats, automobiles, campfires).

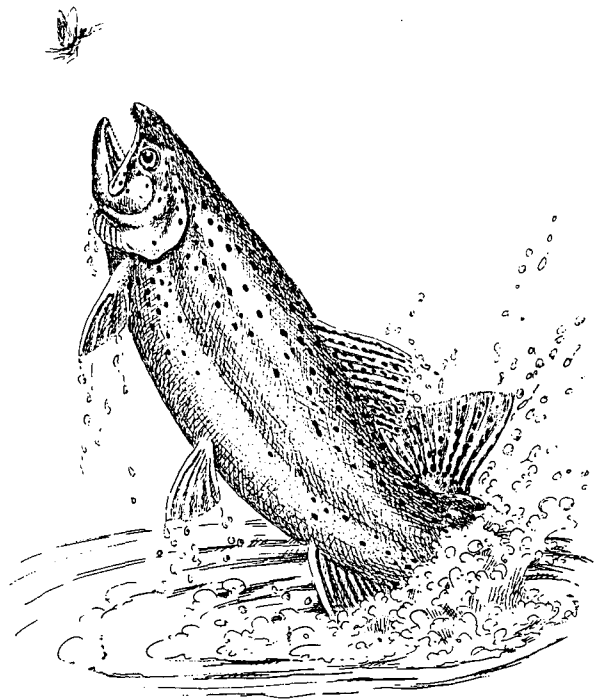
M-48 Air quality should be monitored on a periodic, on-going basis for fine particulates (e.g. PM10) and visibility, carbon monoxide, and other pollutants that may be of concern (e.g. H2S). Coordinate monitoring for air quality concerns related to geothermal development with the Bureau of Land Management (see Monument Legislation, Section 6 (b) (7)).

Good water quality is also essential to support many of the values and resources provided by the Monument. A variety of County, State, and Federal government entities have responsibilities and interests in the management of the surface water features within the Monument. Each entity has a unique area of expertise and authority and each can make a contribution to protecting these water systems. Working cooperatively with these organizations will be an essential part of the Forest Service management effort. The intent of this Plan is to manage water quality consistent with surface and ground water quality standards for the state of Oregon (Oregon Administrative Rules, Chapter 340, Divisions 40 and 41), as well as Oregon Health Division and EPA standards for drinking water.

M-49 Surface and ground water quality will be protected and/or enhanced. In providing for protection of water quality, use Best Management Practices (BMPs). For a more complete explanation of BMPs and the text of the other BMPs that apply to the Monument, refer to Appendix H in the FEIS for the 1990 Deschutes National Forest Land and Resource Management Plan.

M-50 The natural character of the hot springs and fumaroles shall be maintained.

M-51 Water quality in Paulina and East Lakes and Paulina Creek will be monitored for potential impacts from any geothermal developments. (See Monitoring Program section in this Plan).



Human/Social Components of Ecosystems

These components include settings, opportunities or conditions created by human interaction with ecosystems which continue to be valued by people. Interpretive programs, recreation settings, and opportunities, scenic quality, law enforcement, roads, trails and facilities; and archeological resources are all considered to be human social components of the Monument ecosystems.

Lands within the Monument have a long history of human use, and the Monument's cultural/heritage resources offer outstanding opportunities for learning about past cultures. The intent of this plan is to protect, interpret, conserve, and enhance cultural resources. An important facet of the cultural resources program is the eventual inventory of all lands within the Monument, to ensure the identification and preservation of significant cultural sites. Interpretation, supported by science and research, will be another major focus of the cultural resources program for the Monument. This program is intended to encourage diverse and visible archaeological research opportunities. Of particular interest is a better understanding of how the history of human uses within the Monument is linked to cultures, ecology and events of the Western Hemisphere.

Development of cultural resource treatment strategies should be emphasized as a way of improving flexibility and cost effectiveness in developing, maintaining and managing high use recreational areas while protecting fragile resources. This will be particularly valuable within the caldera, especially in the vicinity of the resorts, campgrounds and sites listed in the National Register of Historic Places.

M-52 Protect cultural resources through monitoring (see monitoring section), public education, and increasing the security of inventory and site location data. To increase public awareness, provide education, interpretation and scientific programs which are consistent with the protection of cultural resources, the public interest and management requirements.

M-53 When American Indian burials or associated funerary objects are observed: a) all work in the immediate area will cease; b) the Tribal Chair and Tribal archaeologist for the Burns Paiute Tribe, the Klamath Tribes, and the Confederated Tribes of the Warm Springs Reservation of Oregon will be immediately contacted; c) any further disturbance of the burial whether through archaeological excavation or construction activities will take place in consultation with of the appropriate Tribal elders; d) unless a compelling case can be made otherwise, and the consent of the affected Tribes is obtained, all remains and associated grave goods will be returned to Tribal representatives for reburial. (Refer also to the Native American Graves Protection and Repatriation Act for specific procedures).

M-54 Develop and maintain active testing and evaluation programs in order to identify significant cultural resources. Where appropriate and feasible, combine with interpretive opportunities. Ensure that significant cultural resources retain the values that make them eligible for listing in the National Register of Historic Places. Where feasible, develop strategies for cultural resource treatment where significant sites occur in high use recreational areas. Evaluation of the area between the two lakes (see planning record and cultural resource files) will occur prior to project proposals within the area, including trails.

M-55 Significant cultural resources should be prioritized for rehabilitation or restoration, where appropriate. The criteria to prioritize should include site significance, the potential for pre-mazama components, existing and/or potential disturbance, and resource protection. Generally, emphasis should be placed on sites located within the caldera, including the Paulina Guard Station and the Newberry IOOF Group Camp (sites listed in the National Register of Historic Places).

M-56 Ensure that the value of data recovery is maintained. Generally, analysis and reports of data recovery projects should be done within two years of completion of field work.

M-57 If undetected archaeological remains are exposed during an undertaking, project work in the immediate vicinity will cease until the find has been assessed by a professional archaeologist and a plan of action developed.

*M-58 Encourage partnerships for cultural resources.**

*** NOTE:** Some opportunities for partnerships could include the Confederated Tribes of the Warm Springs Reservation of Oregon, the Klamath Tribes, the Burns Paiute Tribe, the High Desert Museum, the Museum at Warm Springs, Oregon State University, the University of Oregon, the Oregon Historical Society, the Association of Oregon Archaeologists, the Archaeological Society of Central Oregon, the National Geographic Society, the Earthwatch Society, volunteers, businesses and corporations.

Consultation with American Indian Tribes is an important aspect of site-specific analysis for projects in the Monument and is required by law. The Burns Paiute Tribe, the Klamath Tribes, and the Confederated Tribes of the Warm Springs Reservation of Oregon are the three local American Indian Tribes who have an interest in the Monument. In addition to consultation on proposed projects and cultural resource issues, these tribes are an invaluable source of knowledge about the cultural history of the Monument and surrounding. Oral interviews with Tribal elders and "oldtimers" could add immeasurably to our fund of knowledge and understanding about Monument lands and their role in human history.

M-59 When consulting and coordinating with American Indian Tribes and individuals, seek opportunities for research, monitoring, and interpretation for enhancing the public's understanding of American Indian cultural history. Work to promote a positive and long-term working relationship with Tribes who have an interest in the Monument. (See also M-34.)

Interpretation and education programs are a key feature of this Plan. The intent of these programs is to provide a variety of high-quality interpretive and natural-resource education programs that keep abreast of visitors' interests, enhance their experiences, and increase their understanding of and respect for the natural processes and features within the Monument. These programs will highlight the historic and natural environment of which the Monument is a part, be it within local, regional, or global context. (Topics need not be restricted to addressing the Monument only.) In developing interpretive materials, consultation with and review by appropriate specialists (for example from the Deschutes National Forest or local American Indian Tribes) will play a key part in assuring the accuracy of information presented.

Interpretive facilities, services and programs within NNVM will be developed and operated under Forest Service oversight, and should reflect this association. Partnerships, grants, and support from other organizations, agencies, or individual will be encouraged and pursued. It is also desirable to develop a coordinated program of awareness training for employees, volunteers, and partners (including outfitter guides and other public-service permittees) to achieve and maintain high-quality service to Monument visitors.

M-60 Develop an interpretive strategy for NNVM to establish integrated Monument-wide, zone-specific, and site-specific educational goals, interpretive messages, and direction for programs and facilities, including trails. This strategy should be coordinated with other Forest Service and non-Forest Service interpretive programs in Central Oregon, and should provide for different programs tailored to specific audiences, such as children, seniors, tours, school groups, and people who don't traditionally participate in interpretive activities.

M-61 Provide interpretive and educational programs that increase awareness and understanding of how Newberry Volcano and its resources have interacted and continue to interact with human, plant, and animal life.

M-62 Ensure that interpretive activities/media are compatible with the carrying capacity and sensitivity of the resources being interpreted. They should also be consistent with the ROS class in which they occur. Interpretation should be "barrier-free" (language, cultural, physical, sensory), wherever practical.

M-63 Generally, trails that currently have interpretation as their primary function will remain interpretive trails. Develop new interpretive trails and improve present ones where necessary, and convert other trails to this use if appropriate.

M-64 Information and education efforts will be oriented toward enhancing visitors' experiences but will de-emphasize areas or attractions that are receiving use that may not be compatible with the experience and setting they desire. Visitors should be informed of alternate areas to visit that will satisfy their needs.

High-quality recreation is an important value provided by the Monument. The intent of this Plan is to provide for a range of recreation settings and opportunities consistent with the values for which the Monument was established.

M-65 The Monument shall provide for the following recreation opportunity Spectrum (ROS) classes: RURAL, ROADED NATURAL, SEMIPRIMITIVE NONMOTORIZED, and SEMIPRIMITIVE MOTORIZED (winter). See the 1986 USDA Forest Service ROS book and accompanying ROS Users Guide for direction on managing within these classes. The maps on the following pages display the location of the ROS classes across the Monument, for summer and winter.

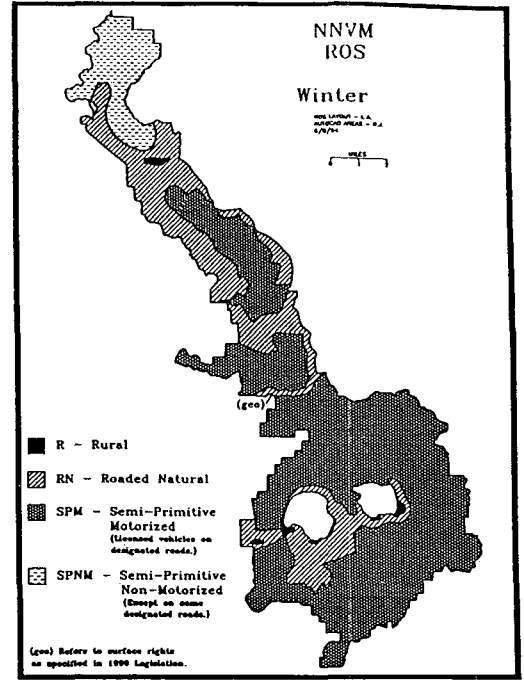
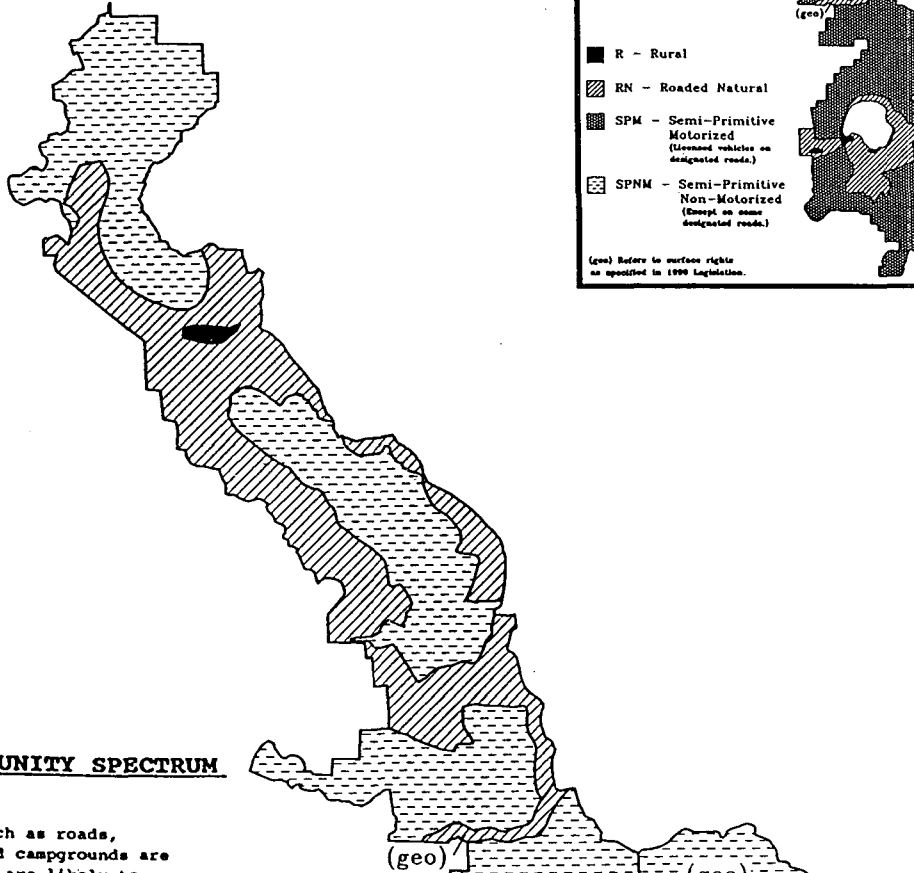
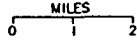
M-66 Design and manage facilities, structures, on-site controls, and signing within the Monument according to the guidance provided in the 1994 Deschutes National Forest Recreation Facilities Handbook. Provide for barrier-free access consistent with Regional standards for accessibility. This handbook contains a separate section on the Monument, including a complete description of the design theme (including architectural and signing guidelines) to be followed for Monument facilities and signing.

NOTE: The NNVM theme and supporting design guidelines provide a consistent and comprehensive approach to development and management of recreation facilities within the Monument. Based on a synthesis of biological, physical and social dynamics, the theme and guidelines strive to promote harmony in recreation facilities with the surrounding environment and to provide for user needs and preferences. Architectural style, detail refinement, Recreational Opportunity Spectrum setting, principles of universal access, materials and treatment of materials are addressed. Guidelines emphasize material, forms, pattern and colors that harmonize with the site and relate in scale to natural surroundings. Treatment of historical buildings, feature and standard architectural elements, and signage are discussed.

NNVM
ROS

Summer

ROS LAYOUT - L.A.
AUTOCAD AREAS - R.J.
6/8/94



RECREATIONAL OPPORTUNITY SPECTRUM

RURAL



R

Facilities such as roads, buildings, and campgrounds are present. You are likely to encounter lots of people.

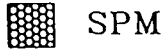
ROADED NATURAL



RN

Roads and trails provide access to a natural environment. Some people and some facilities could be present.

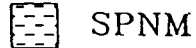
SEMI-PRIMITIVE MOTORIZED



SPM

Motorized use permitted in a undeveloped forested setting. Few People.

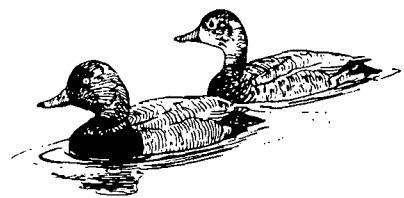
SEMI-PRIMITIVE NON-MOTORIZED



SPNM

Motorized use prohibited in a undeveloped forested setting. Few People.

(The key characteristics of the recreational opportunity spectrum classes are found on a table in chapter 3 recreation)



M-67 Manage developed campgrounds and day-use areas in Rural and Roaded Natural areas to provide high-quality settings and experiences suitable for families or small groups. The range of opportunities and settings may vary among developed sites (for example some sites may offer RV hook-ups, others will provide tent camping). Management of these sites should be oriented toward providing a predominantly natural appearing setting. Lava Lands Visitor Center, designated ROS Rural, will require a more substantially modified environment to meet current and expected visitor use levels. Facilities within the semi-primitive nonmotorized (SPNM) areas should be low key and limited to those needed to protect resources or public health and safety, and will be designed to complement the landscape.

M-68 The semiprimitive motorized (SPM) ROS category applies as shown on the ROS-winter map. Winter snowmobile use is provided for on all areas of the Monument that sustain adequate snow cover except the River Zone. The River Zone continues as an SPNM designation during winter to reduce potential impacts to wildlife habitats.

M-69 All summer trails within the Monument are closed to motorized use. All National Recreation Trails (NRT) within the Monument (Peter Skene Ogden NRT, Molten Land NRT, and Lava Cast Forest NRT) will continue to be managed consistent with goals and regulations for National Recreation Trails and with their current emphasis:

Peter Skene Ogden - emphasis is on horseback, hiking, and mountain biking (uphill only for mountain bikes).

Molten Lands - foot travel only, interpretive is primary emphasis.

Lava Cast Forest - foot travel only, interpretive is primary emphasis.

M-70 Design trails to provide a range of challenge and experiences. Seek opportunities for loop trail systems of varying lengths, designed for foot, mountain bike, or horse use (and where desirable, combinations of these uses). Design trail systems to minimize conflicts between different types of users. Trail types and difficulty levels should be consistent with the ROS category in which they lie, and with their purpose. Provide for some barrier-free trail segments in compliance with Regional Accessibility Standards. Trails within SPNM areas should be planned away from the outer 1/2 mile edge of the area where feasible, to ensure noise and visual buffers from adjacent lands.

M-71 Recreational use of Class I, II, and III All Terrain Vehicles within the Monument is not permitted.

The transportation system for the Monument should provide safe, efficient, and economical access to meet the goals and objectives of the Monument. The intent of this Plan is that any roads within the Monument will blend with the surrounding landscape and protect other resources, and will be built and maintained to meet design and traffic service level standards. Along Highway 97, access to Monument features on the north end should be centralized to improve traffic flow and safety. Conflicts between Forest and Monument traffic should be minimized.

M-72 Develop management zone transportation strategies for the Monument and Monument access roads, including road management objectives.

M-73 Roads should be at the lowest density feasible, which still meets management objectives. Block or obliterate unneeded roads, and rehabilitate the surface of obliterated roads where needed to facilitate ecosystem restoration. Design, construct, and maintain roads to the minimum standard needed to achieve objectives and goals of the area. Road locations and design should conform to ROS and VQO direction in this Plan. Non-system (temporary) roads may be constructed for short-term use where their use is the only practical option for achieving the objectives of a project, where resource impacts are predicted to be minor or can be mitigated, and where analysis has shown this approach is cost-effective. Obliterate and rehabilitate temporary roads when the project has been completed. Convert unneeded roads to trails where doing so can meet trail management objectives.

M-74 No permanent roads may be constructed in SPNM designations, except in the event of geothermal development in the Transferal Area within the Flanks Zone (see standards and guidelines for Flanks Zone). Avoid the use of temporary roads in SPNM areas; temporary roads should not be considered unless they are the only feasible and practical way to accomplish Monument objectives for these areas. Obliterate and rehabilitate temporary roads at the conclusion of the project or convert to trails if consistent with trail management objectives.

M-75 Use one or more of the following road management strategies for use to accomplish the management objectives for the area in question:

***Encourage** - The objective is to influence certain user groups in specific types of vehicles to use this road. This is done by use of information techniques such as maps or signing. The road should be actively maintained and operated at the standard appropriate to the use experienced. The roads should meet the requirements of the Highway Safety Act.*

***Accept** - The objective is to allow use but not to advertise or invite passage on a road that meets design and maintenance standards for full public use. Continued use is not encouraged and should be discouraged or eliminated if the road condition deteriorates or resource impacts develop. Use could be specified for one user group, i.e. four wheel drive vehicles or high clearance vehicles.*

Discourage - Passage appears feasible, but entrance information is designed to persuade some user groups or vehicle types not to use the road. Entrance management can be accomplished by using advisory or warning signs and/or barriers.

Eliminate - Intermittent use, on a ten year cycle or less, would call for a gate, a guard rail barrier, a log (and disguised entry), or an earth berm. Permanent closure would call for entrance obliteration and/or road obliteration.

Prohibit - Some user groups or all users are informed not to use this road and this is actively enforced under a regulatory order. There would be some need for this road for administrative or seasonal use to keep it on the system.

Scenic resources are named in the Monument legislation as one of the resources to be conserved, protected, interpreted and enhanced. In addition, the legislation direction is that "land management activities shall allow natural ecological succession of vegetation to continue to the maximum extent practical."

The terminology used to describe management concepts and assumptions can be interpreted in different ways. Therefore, in order to provide a common understanding for scenery management the following discussion explains what some specific terms mean in the context of this document.

Natural ecological succession refers to the successive changes in the structure and composition of plant and animal communities that occur when natural ecological processes are allowed to evolve without human intervention. In Central Oregon, wildfires are a disturbance cycle associated with these processes. It is not feasible to allow wildfires to burn at random within the Monument, due to issues of human safety and protection of public property. Thus, completely natural ecological succession is not, practically speaking, possible within the constraints imposed by concerns for public safety and property.

Within the Monument, the closest we can come to allowing for "natural ecological succession" is in areas where we can use a prescribed natural fire management strategy. From a visual quality standpoint, these areas, as well as areas where fire is suppressed, would result in **natural appearing** landscapes.

Prescribed natural fire refers to a management strategy which involves developing a fire management action plan for an area. In the event of an unplanned fire start, the fire is allowed to burn without human intervention, as long as it remains within the parameters defined by the strategy. No fire management action plans are yet in place for the Monument. However, the long term strategy for areas that currently have a "preservation" Visual Quality Objective (VQO) is to develop such plans and allow prescribed natural fire to act as a primary agent of disturbance in ecological succession, rather than human intervention in the form of mechanical treatments or prescribed fire. (See planning record for more discussion of long term intent for scenery.)

Human alteration refers to deliberate management activities (in a predetermined location) that result in a visible change in the scenic condition. This includes mechanical treatment, but is not being interpreted to include prescribed natural fire (PNF) or fire suppression (**NOTE:**

while PNF and fire suppression activities may be deliberate management actions, the location of the effects of these actions happens randomly, through the occurrence of unplanned fire starts).

Prescribed fire refers to a management strategy which involves deliberately setting a fire under controlled conditions. In terms of effect on scenery, prescribed fire activities are different from mechanical treatments. While they are deliberate management activities, visually they are often not perceived as distinguishable from naturally occurring processes. The intent of all prescribed fire activities in the Monument is to mimic natural fire patterns. However, if a project results in a pattern that appears human created (inconsistent form, line, color, texture, or scale) it would be considered a human alteration. Whether or not prescribed fire is considered and alteration depends on the resulting visual condition after treatment.

Scenic condition refers to the state of naturalness, or conversely, the state of disturbance, caused by human occupancy or human alteration. Condition is stated in degrees of deviation from the naturally evolved landscape character. Landscape condition classifications are correlated directly to visual quality objectives, or VQO's (VQO's are referred to as Scenic Quality Objectives in "Landscape Aesthetics - A Handbook for Scenery Management" [USFS 1993- Draft]).

Summary viewshed condition rating (SVCR) refers to standards for measuring cumulative impacts to scenery. It is based on change in scenic condition at one time and correlates with human alterations. Details of this rating system are in "Landscape Aesthetics a Handbook for Scenery Management" (USFS 1993 [draft]).

Summary fire character rating (SFCR) also refers to standards for measuring cumulative impacts to scenery within the Monument. However, it is based on change in landscape character at one time and correlates with prescribed fire activities. Details of this rating system are available in the planning record for this project (and on the Fort Rock District).

Visual Quality Objectives (VQO's) are the scenic quality standards that are applied to different areas of the Monument. They are mapped for the Monument as a whole (see maps in this section) and are also specified for particular recreation sites, and trail and road corridors, in the standards and guidelines presented on the following pages. VQO's are to be used as the standards for the minimum visual quality to be attained when planning and designing projects in particular locations. It is always considered desirable to provide for a higher level of scenic quality than specified by the VQO's, if this can be done in a way that also ensures all other resource management and ecosystem restoration objectives are met.

The VQO's described for the recreation sites, viewpoints, trail corridors and road travelways depict the overall intent for visual management of that particular viewpoint, site, or travel way. Where there appears to be an inconsistency between meeting these VQO's and those displayed on the map, the VQO's on the map are governing.

How VQO's, SVCR, and SFCR are related: The Summary Viewshed condition rating (SVCR) and Summary fire character rating (SFCR) provide standards which limit the cumulative impact of changes to scenery (including scenic condition and landscape character) as projects are implemented across the Monument landscape. They are tied to the different VQO's and sometimes to specific vegetation types within the area governed by a particular Visual Quality Objective.

For example, the Visual Quality Objective called "Retention" specifies that the Summary

Fire Character Rating (SFCR) should meet rating 2 for ponderosa pine and rating 1 in all other vegetation types. This means that for ponderosa pine communities within a viewshed that has a VQO of Retention, as much as 10 percent of the actually seen ponderosa pine could appear modified by prescribed fire at any one time. For all other vegetation types in that VQO-Retention viewshed, no more than 5 percent of those types (where actually seen) should appear modified by prescribed fire at any one time. The VQO for Retention also specifies that the Summary Viewshed Condition should meet the rating of "Natural Appearing" as described in the Handbook for Scenery Management (fully referenced earlier in this section). So, overall, the cumulative effects of management activities need to be consistent with both the SFCR system and the SVCR system.

Viewshed distance zones refer to the distance between viewer location and what is being seen. In the Monument the distance zones are interpreted to include:

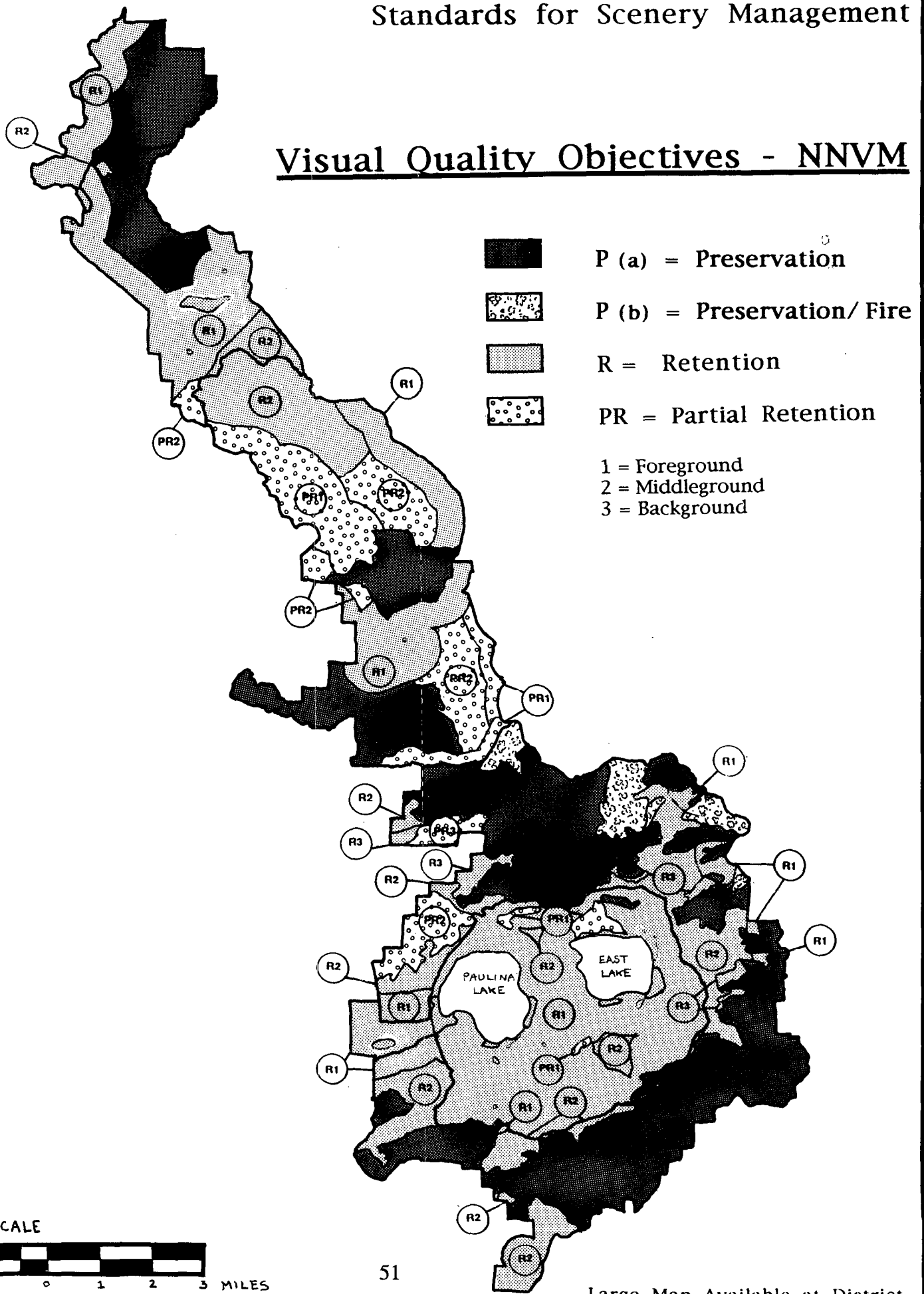
Immediate foreground(IM FG)=	0 - 300' from observer location
Foreground (FG)=	0 - 1/2 mile from observer location
Middleground (MG)=	1/2 - 4 miles from observer location
Background (BG)=	4 miles to horizon (from observer location)

The following Scenery standards are organized to describe short-term direction for scenery management. Short-term refers to planning direction provided for the first decade of this Plan, or until the first revision, expected within 10 - 15 years. The map depicting short-term direction is titled Visual Quality Objectives--NNVM. This map spatially illustrates planning direction for scenery management in the Monument.

Long-term intent for scenic conditions in the Monument has also been described and mapped, but is not considered direction because new information and learning about fire's role in ecologic conditions and scenery management is evolving rapidly, and public as well as agency understanding in this arena is expected to change significantly in the next ten years. Those interested in the current thinking about long-term Visual Quality Objectives for the Monument may consult the planning record for the map titled "Visual Quality Objectives, Long Term Intent - NNVM" and the accompanying explanation. These long-term Visual Quality Objectives were developed to recognize that the long-term intent is to reestablish fire in its historic role as a disturbance agent, and that over the long term this will change the present scenic character of the Monument to some extent. They are included in the planning record as background information for project planners and to capture ideas and approaches to scenery management that should be useful at the time of Monument Plan revision.

In general the mapped standards are self-explanatory. In the event of a discrepancy, misunderstanding, or a field verification of viewshed areas which causes unclear direction, a description of the intent of the VQO map in this document is also available in the planning record. This information also includes the intent for scenery along all of the travelway

Visual Quality Objectives - NNVM



corridors. The terminology used to describe scenery standards is generally consistent with the descriptions in the "Landscape Aesthetics- A Handbook for Scenery Management" (USFS 1993 [Draft]), and the Visual Management System (USFS 1974). These handbooks provide additional information and descriptions regarding visual quality objectives. Some adaptation of the visual management system has been made in this Plan with regard to the role of prescribed fire and prescribed natural fire. (These variations are described in the Visual Quality Objective definitions on the following pages.)

M-76 Design projects to be, at a minimum, consistent with the Visual Quality Objective that applies to the site where the project is located, as shown on the map titled "Visual Quality Objectives--NNVM." Comply with the following definitions when applying Visual Quality Objectives. Visual Quality Objectives shown for the Transferal Corridor and Transferal Area will apply, subject to valid geothermal lease rights.

PRESERVATION a (Pa)- (VQO-NNVM map) *A visual quality objective that provides for ecological change only. Management activities except for very low scenic-impact recreation facilities, are prohibited. Wildfires are managed by suppression. Efforts should be made to reduce any unintentional impact from human alteration as a result of fire suppression activities (e.g., dozer lines), and should focus on ecosystem restoration. Post-fire salvage cutting is not permitted.*

The RNA has this classification; however, the goals and management direction in the establishment report for the RNA supersede scenic quality concerns. Prescribed fire and other management activities consistent with the RNA goals supersede the VQO in this area.

PRESERVATION b (Pb)- (VQO-NNVM map) *A visual quality objective that provides for ecological change predominantly. Prescribed fire is permitted as necessary to reduce fuel levels should they seriously threaten resource values. All prescribed fires should be designed to mimic naturally occurring fire patterns. Mechanical pretreatment in lodgepole pine could be necessary in order to reduce high fuel areas prior to burning. Such activity should be consistent with Visual Quality Objectives for Partial Retention. If at all feasible, it should also avoid road development (see standards and guidelines for roads). Mechanical treatment should not be visually evident following treatment with prescribed fire. Wildfire is managed by suppression. Where a fire management action strategy has been developed, prescribed natural fire could be used. Efforts should be made to reduce any unintentional impact from human alteration as a result of fire suppression activities (e.g., dozer lines), and should focus on ecosystem restoration. Removal of burned wood or dead trees following treatment with prescribed fire is generally not permitted, unless identified fuel reduction objectives were not met through the original treatment. If additional fuels removal is needed, resultant conditions should mimic naturally occurring fire patterns and not exceed PR standards. SFCR should be managed at rating 2 in all vegetation types.*

NOTE ON VQO, PRESERVATION: This classification has been subdivided and adapted from the original Preservation Visual Quality Objective, to better address the reintroduction of fire into ecological processes. Preservation a is the original Preservation VQO classification. Preservation b includes prescribed fire activities and assumes some (light) mechanical pre-burn treatment (not to exceed Partial Retention standards) in lodgepole pine.

RETENTION (R) - A visual quality objective meaning human activities are not visually evident. In retention areas, activities may only repeat attributes of form, line, color and texture found in the naturally evolved landscape character. Mechanical treatments and prescribed burning are permitted. Wildfires are managed by suppression. Where a fire management action strategy has been developed, prescribed natural fire could be used. The evidence of light underburning may linger beyond 1 year; however, burning projects should be designed to be visually pleasing and to appear unaltered by human activity. All prescribed fires should be designed to mimic naturally occurring fire patterns.² Cumulatively they should not exceed the SFCR for each viewshed. Post-fire treatment could include scenery enhancement projects as appropriate. SFCR should be managed at rating 2 in ponderosa pine, and rating 1 in all other vegetation types. SVCR should be Natural Appearing.

PARTIAL RETENTION (PR) - A visual quality objective meaning human activities must remain visually subordinate to the attributes of the naturally evolved landscape character. Activities may repeat form, line, color or texture common to the landscape character but changes in their qualities of size, amount, intensity, direction, pattern and so on, must remain visually subordinate to the landscape character. Mechanical treatments and prescribed burns are permitted. Wildfires are managed by suppression. Where a fire management action strategy has been developed, prescribed natural fire could be used. The evidence of light underburning may linger beyond 2 years; however, burning projects should be designed to be visually pleasing and to appear unaltered (by human activity), and cumulatively they should not exceed the SFCR for each viewshed. Post-fire treatment could include scenery enhancement projects as appropriate.

² **NOTE:** Prescribed fire activities and effects should be designed to be consistent with the VQO standards. Light underburns are typically consistent in ponderosa pine Retention and Partial Retention areas. The effects appear as patches and mosaics. Viewed from a distance, the green forested canopy remains the dominant feature. Viewed up close, some of the ground vegetation may appear burned; however, projects are designed to regenerate quickly. Scorching of tree trunks is generally not visible above five or six feet.

In lodgepole pine, burning is generally not consistent in seen areas of Retention viewsheds. Carefully designed jackpot type burns could be consistent within Partial Retention areas if treatments are designed to be subordinate to the visual experience. Burns are typically screened or partially screened from the viewer. Partial stand replacement fires occur in VQO-"Preservation B" areas. They appear as naturally occurring fire patches.

SFCR should be managed at rating 3 in ponderosa pine, and rating 2 in all other vegetation types; SVCR should be Slightly Altered.

M-77 Use the following Summary Fire Character Rating System (SFCR) when assessing cumulative visual impacts of prescribed fire in a viewshed at one time. The SFCR is intended to be used in conjunction with project planning, monitoring, and interpretive opportunities. The percentages shown are the interim standards for cumulative limits to prescribed fire activities in a given viewshed at any one time. They are based on estimates of perceptual thresholds, and are intended to be refined over time in conjunction with research efforts, interpretation programs, and public input. For background information and details on the development and use of the SFCR, consult the white paper of the same name in the planning record.

RATING 1 A viewshed in which no more than 5% of the area actually seen appears modified by prescribed fire activities (not including prescribed natural fire). Applies to Retention in all vegetation types except ponderosa pine.

RATING 2 A viewshed in which no more than 10% of the area actually seen appears modified by prescribed fire activities (not including prescribed natural fire). Applies to Retention in ponderosa pine; Partial Retention, in all vegetation types except ponderosa pine; Preservation 2.

RATING 3 A viewshed in which no more than 15% of the area actually seen appears modified by prescribed fire activities (not including prescribed natural fire). Applies to Partial Retention in ponderosa pine.

M-78 In order to function well, developed recreational structures and facilities in the Monument may often need to be designed in a way that is not consistent with retention or partial retention VQO classifications. Design new or remodeled structures and facilities to be consistent with these classifications to the extent practical. They should also be consistent with the ROS designation for the area and with architectural themes and standards for the Monument. Limit contrast with the surrounding environment to what is necessary for the function of the facility. See "Landscape Aesthetics - A Handbook for Scenery Management" (USFS 1993 [draft]).

M-79 Within the Monument, any new road to a developed recreation area, or development/designation of a scenic loop road, or any new trail or viewpoint outside of a Preservation VQO area should have the standards FG=R, MG/BG=PR, SVCR= R, SFCR= 2 - ponderosa pine, 1 - all other vegetation types. Any new viewpoint or trail within a Preservation VQO area should have the standards; FG=P, MG/BG=PR, SFCR= 2.

VQO's for individual viewsheds are as follows:

#1 Viewsheds with Preservation (foreground) and Partial Retention (middleground/background) standards include:

Roads: Road 9710 south of 9735, Road 21 east of Road 700, and Road 2127

Trails: the caldera Rim trail, The Dome trail, and trail #61

Feature viewpoints: The Dome

#2 Viewsheds with Retention (foreground/middleground) and Partial Retention (background) standards include:

All developed recreation sites, except lava Butte and Paulina Peak

East Lake and Paulina Lake

#3 Viewsheds with Retention (foreground) and Partial Retention (middleground/background) standards include:

Roads: Highway 97, Roads 9702, 9700-100, 9710 (south to intersection with 9720), 9720-950, 21 (western edge east to 700 road), 2100-500, and 9720.

Trails: All existing summer trails except as noted in #1. (Winter trails correspond with Preservation or Retention on the VQO map, with a Partial Retention (background) standard.

#4 Viewsheds with Retention (foreground/middleground/background) standards include:

Feature viewpoint: Paulina Peak

#5 Viewsheds with Retention (foreground/middleground) and Partial Retention (background) standards include:

Feature viewpoint: Lava Butte

#6 Viewsheds with Partial Retention (foreground/middleground/background) standards include:

Roads: 9710 (south of 9720 to 9735), 9735 (subject to valid existing geothermal rights), and 9723.

M-80 Where feasible and practical in light of ecosystem restoration objectives, design projects to promote the desired scenic conditions as described for the 13 landscape subcharacter types on the following pages. One or more of these types may apply, depending on the project area. (Map available in the planning record.)

THE RIVER'S EDGE--Diverse, multiple storied plants form a dynamic edge to the water. Distinct color and textural differences contrast the linear form of the water and create visual interest. Riparian vegetation, lava flows, special water features, and potential wildlife viewing exist as interesting scenic and interpretive elements. It is possible to view into high diversity areas such as where forest, water, and lava meet. Unique examples of vegetation, water, and lava are highlighted.

Facilities may be evident in the immediate foreground within the developed recreation site;

however, they are not visible from the river. They complement the surrounding landscape in their design, materials and colors. The edge of the river does not appear impacted from people and there are no visible soil compaction or erosion problems. Trails in or near the river provide views of the water but do not detract from the visual experience of people viewing from the water.

PAULINA CREEK--Views of the waterfall and the unique exposed geological formation are highlighted. The edge of the creek has diverse vegetation with multiple stories of plants growing among the rocky creek banks. Distinct color and textural differences contrast the linear form of the water and create visual interest. Large trees are highlighted. Riparian vegetation, geologic forms, special water features, and potential wildlife viewing exist as interesting scenic and interpretive elements.

Facilities may be evident in the immediate foreground within the developed recreation site; however, they do not detract from the visual experience of viewing the waterfall and geologic formation. Facilities complement the surrounding landscape in their design, materials and colors. The edge of the creek does not appear impacted from people and there are no visible soil compaction or erosion problems in the area.

UNVEGETATED LAVA--The low choppy texture and open rocky form characterizes this area. Views of unique features in the lava such as kipukas, large and/or twisty old ponderosa pines, and pockets of unusual vegetation are highlighted. The lava appears to be in its original state, unaltered by human activities (not meant to include historic and prehistoric evidence of people).

Facilities are visible in the immediate foreground of developed facilities only. They complement and blend with the surrounding lava in their design, materials and colors. Facilities are either not present, visible, or are not visually dominant when viewing across these open areas. Trails blend with the dark, open character of these areas and are located to take advantage of the contrast between the choppy lava and the interesting vegetation.

FORESTED LAVA--Views of large and twisty old ponderosa pines growing in or adjacent to the lava and pockets of unusual vegetation are highlighted. The lava appears to be in its original state and unaltered by human activities (not meant to include historic and prehistoric evidence of people). The grey lava contrasts with the green canopies of the trees. Views towards open lava fields nearby are possible from within these areas. (See also UNVEGETATED LAVA.)

BUTTES--The buttes form strong vertical statements and reflect the volcanic origin of this landscape. Unforested areas of buttes appear undisturbed and undeveloped. There is little visible evidence of user trails (this is not meant to include Lava Butte). When viewed from middleground and background, all new trail or facility development in forested portions of the buttes is not visible.

LAKES AND LAKE EDGES--The lakes appear clear and blue, and provide visual contrast with the surrounding forest. The area surrounding the lake forms a natural appearing edge that complements views from the lakes towards the forest or lava. Views towards the lake are highlighted. The wetland areas around the lakes provide visual diversity and opportunities for wildlife viewing. Riparian vegetation is a focus of interest. Unique features across the water such as geologic formations and vegetation patterns, are viewing and interpretive opportunities.

Facilities and trails may be evident in the immediate foreground within the developed recreation site or on the trail; however, they are screened from the lake to the extent feasible and do not detract from the visual experience of people viewing from the water. They complement the surrounding landscape in their design, materials and colors. The edge of the lakes do not appear impacted from people and there are no visible soil compaction or erosion problems. Boats may be visible on the water; however, the amount of boats at any one time does not detract from the visual experience of the caldera and the geologic and forested setting in the area.

ROCKY OUTCROPS--Dramatic rocky forms characterize these areas and they can be seen from great distances. Views of these unique features are highlighted and their connection with the geologic and volcanic origins of this place is apparent. These rocky formations appear to be in their original state, unaltered by human activities (not meant to include historic and prehistoric evidence of people). Unvegetated rocky areas are undeveloped.

Facilities in nearby forested areas are visible in the immediate foreground of developed areas only. They complement and blend with the surrounding forest and nearby rocky character in their design, materials and colors. Facilities are either not present, visible, or are not visually dominant when viewing towards these rocky outcrops. Trails blend with the grey, open character of these areas and are located to take advantage of the contrast between the rocky formation and the interesting vegetation.

PONDEROSA PINE FORESTS--

Foreground--Park-like old-growth forests characterize these areas. Groves and pockets of large pines, with little or no understory, are apparent and broken up occasionally with clusters of multiple-storied middle-aged and young pine. Existing large pines have been maintained and are highlighted. Large pines are the primary vertical form and have deeply furrowed, yellow-bark characteristics. More yellow-bark pine are visible behind the immediate foreground (in the backdrop) creating a pleasant, all-aged forest appearance (with a predominance of open pine areas). It is more desirable to have small size groupings or groves of mature pine than evenly-spaced large pine scattered throughout the foreground. Groupings should relate in size and scale to the immediate area openings and tree sizes.

Shrubs and groundcover species are intermixed within the multiple-storied pine clusters and are a desirable visual component. Where biologically consistent, deciduous species with good fall color are emphasized or encouraged. Some standing dead trees and downed woody materials are visible. Canopy openings are small and natural appearing, often with young pine growing in clusters within them. Existing unnatural appearing openings have been rehabilitated, they blend into the surrounding forest and appear natural. Visitors traveling on roads and trails through these forests experience a pleasant, diverse, sequence of vegetative patterns. Depth into

and through the forest is variable and often highlights unique or outstanding landscape features in the distance.

FIRE: The evidence of fire is visible in some areas and appears light, as a result of low intensity fire. Fire patterns occur in small patches and mosaics. Some of the groundcovers, shrubs, and grasses may appear burned in the short term and some scorching of tree trunks (generally not above six feet) may be visible. Grasses and groundcovers quickly revegetate burned areas. Large charred standing dead trees (often with orange needles), exposed soils, and trees with trunks charred up to ten or fifteen feet are not often visible in these foreground areas. In some instances, areas where wildfires have burned across sensitive viewsheds have been rehabilitated and the resulting negative scenic impacts have been reduced or eliminated (consistent with other ecological considerations).

Middleground and Background--Ponderosa pine landscapes provide a strong textural element when viewed as middleground and background. Many of the middleground and backgrounds on the Monument are buttes that are viewed for long duration. They have a coarsely-textured almost continuous character that typifies areas comprised of many old trees. In some areas individual large trees with full crowns can be distinguished. Some multiple-storied clusters of vegetation form dense, darker appearing patterns in the canopy. Openings are small and appear as though fires or insects have created them; all human activities appear as if they were created through natural disturbances. If visible, openings create small pockets of contrasting color. All openings visible in middleground and background areas reflect the qualities of natural landscape character in size, color, texture, and form.

FIRE: Fire patches that have resulted from prescribed activities are small and do not appear to be a dominant feature of the canopy. Some orange needle coloration on scarred trunks may be visible as textural pockets within the canopy; however, the green forested canopy remains the dominant visual component.

LODGEPOLE PINE FORESTS--

Foregrounds--Interspersed within areas of similarly-aged trees are clusters of lighter textures and different sizes of vegetation that add visual diversity and provide some viewing depth into these foregrounds. Small openings may be visible and appear natural. Soft transitions occur between the different densities of vegetation patches (there are no 'walls' of trees next to open areas). Large, old ponderosa pines growing within the lodgepole pine have been highlighted. Some large, older lodgepole pine are visible but not common. In places where more light reaches the forest floor shrubs and grasses provide additional variety. Standing snags, down logs, and other woody debris are seen. Diversity in the sizes and spatial distribution of these areas evolves over time.

FIRE: In foregrounds there is little evidence of the effects of fire (other than wildfires) in this vegetation type. Visitors traveling roads or trails may encounter openings and charred trees from wildfires.

Middlegrounds and Backgrounds--These areas appear to be broad scale forest mosaics. Lodgepole pine viewed from the middleground and background provides a strong textural landscape element. Within retention areas, these forests appear as a constant green, somewhat uniform, healthy canopy. Some openings are visible and appear to have resulted from natural disturbance patterns (insects and wildfires). Textural variety occurs within the canopy and is relatively subtle. The forest mosaic consists of relatively uniform textures created by maintaining canopy closure and healthy trees. The forested canopy provides a scenic complement and enhances views of some of the unique features within the Monument (this description applies to VQO-Preservation (A) areas.

In VQO-Preservation B areas the forests appear to be a green forested mosaic interspersed with fire patches of various sizes. Variety is provided by the overall affect of the mosaic. Openings appear to have resulted from either a fire or insects and are natural appearing. Prescribed fire patches have been sensitively located so that they do not create soil contrasts that dominate the landscape when viewed from significant viewer locations.

MIXED PINE FORESTS--

These forests appear visually diverse with different ages, species and densities of vegetation. Some areas appear similar to ponderosa pine forests (previously described); however, in this case the groves of older large ponderosa pines occur within a matrix of multiple-stored forest where lodgepole pine forms a predominant understory component. The lodgepole pine creates textural and color variety and is typically young and healthy. Existing large ponderosa pines in these areas are highlighted and their orange trunks are visible and scattered throughout the foreground. Visitors traveling on roads and trails experience a pleasant sequence of vegetative patterns. Viewed from the middleground and background these forests have similar qualities and patterns as the mixed conifer forests (see Mixed Conifer Description). The FIRE discussion for ponderosa pine foregrounds, middlegrounds, and backgrounds applies in these areas.

MIXED CONIFER AND PINE/FIR FORESTS--

Foreground--Mixed conifer forests appear visually diverse and dense though not necessarily continuous. Large diameter old growth characteristics are an important visual component in these landscapes. Large ponderosa pines are visible and highlighted in some areas. Large trees of species other than pine are present and add large tree diversity. Both the species type and the sizes of trees and shrubs are diverse creating multiple textures (often coarse) and colors. Some groves or pockets of yellow barked old ponderosa pines (with little to no understory) may be visible within a multiple-storied, diverse forest matrix (these large trees are often mixed with lava flows and open flats of brush and grass). Existing unnatural appearing openings have been rehabilitated, they blend into the surrounding forest and appear natural. Visitors traveling roads and trails experience a pleasant sequence of vegetative patterns. Viewing depth into the forest has been improved in some areas in order to create or enhance visual diversity along travel routes. Any small openings that are present appear to be a result of natural disturbance cycles. The FIRE discussion under ponderosa pine foreground applies in these areas.

Middleground and Background--These areas appear as an essentially continuous forested canopy. The canopies are visually diverse in both color and texture. Small natural appearing

patches are visible as a result of natural disturbance cycles and reflect the characteristic landscape. From these viewing distances, full, dense areas mix with more coarser canopies and form a mosaic. Some scattered larger trees provide textural diversity and are sometimes discernable as individual forms on these landscapes and provide visual variety. All openings visible in middleground and background areas reflect the qualities of naturally evolved landscape character in size, color, texture and form. Young trees, groundcover vegetation, and large mature trees are all important elements in these forests. The FIRE discussion under ponderosa pine middleground/ background applies to these areas.

HEMLOCK FORESTS--

These forests appear visually diverse with various ages, densities and species mixes. The dense horizontal layering of older hemlocks provides textural contrast with adjacent stands and the dark green color contrasts with the other, more dominant greens of lodgepole and ponderosa pines. Opportunities for the viewing of unique landscape features may be enhanced in certain areas.

DEVELOPED AREAS--

Facilities may be evident in the immediate foreground within the developed recreation sites; however, they are not visible from nearby areas. They complement the surrounding landscape in their design, materials and colors. Vegetation within developed areas is used to visually screen people and facilities. It appears natural and unaltered, as if the development had originally evolved with the surrounding forest and no vegetation had been affected when the recreational sites were established (for example, no stumps or large scale openings). Vegetation is also used to direct use patterns and enhance views to and from the area. There are no visible soil compaction or erosion problems in the area. Areas around development containing negative visual elements such as skid roads, debris piles, stumps and compacted areas, have been rehabilitated and blend visually with the surrounding landscape type. When viewed from middleground and background facilities, and their supporting infrastructure (such as powerlines), meet the established visual quality objectives. Unnatural lines, colors, textures, and forms have been rehabilitated.

Within developed areas and along travelways, views of distant peaks, unusual rock, water, historic, or vegetation formations have been enhanced or created where appropriate. Along roads and trails visitors travel through a natural appearing forest interspersed with lava, small openings, and trees. Fire or the evidence of fire may be visible along these routes in some areas; however, effects are dispersed in small pockets or mosaics, and while scorching of trees trunks may be evident, it is generally not visible above six feet.

M-81 *Effects analysis for any proposed activity with potential to adversely affect scenic quality should include assessment of treatments or mitigations needed to meet scenic quality objectives and promote desired visual conditions; effectiveness of proposed clean-up activities; and the predicted visual condition following the activity, including consistency of created openings and prescribed fires with objectives for visual quality.*

M-82 *In Retention areas, slash or other visible results of mechanical vegetation removal activities should not be noticeable to the casual forest visitor one year after the work has been completed. In Partial Retention areas, slash or other visible results of mechanical vegetation removal activities should not be obvious to the casual forest visitor two years following the activity.*

M-83 *Specific opening sizes will be evaluated on a project by project, site-specific basis. The scale of human-created openings should be similar to naturally-occurring openings and consistent with Visual Quality Objectives. Mechanically-created openings should be within the normal size range of openings which occur naturally within that vegetation community and as small as feasible, given ecosystem restoration objectives. Openings should be designed to appear natural (see discussion in section on vegetation communities). Openings resulting from prescribed fire should result in patterns that are not perceivably different (to the casual forest visitor) from natural fire patches.*

NOTE: An **Opening** is visually in an "open" or un-treed condition until trees are an average of 10 feet tall on slopes less than 30 percent, and an average of 15 feet tall on slopes greater than 30 percent. The following sizes for mechanically created openings are provided for project planning purposes. They are not standards, nor all inclusive. They depict the general range of opening sizes that correspond with meeting VQO standards. The standard that must be met for a project is the VQO standard on the map VQO-NNVM.

Ponderosa Pine

Retention	FG= 1/4-2 acres	MG/BG= as small as feasible, should appear as naturally occurring
Partial Retention	FG= 1/4-5 acres	MG/BG= 1/4 - 20 acres, where visually appropriate

Lodgepole Pine

Retention	FG= 1/2-5 acres	MG= 5 acres or less, BG= 15 acres or less
Partial Retention	FG= 1/2-5 acres	MG/BG= 15 acres or less, or where visually appropriate, 3-40 acres

Mixed Conifer

Retention	FG= 1/4-2 acres	MG/BG= as small as feasible in light of ecosystem restoration objectives, should appear as naturally occurring
Partial Retention	FG= 1/4-5 acres	MG/BG= 1/4 - 20 acres in light of ecosystem restoration objectives, where visually appropriate

Utilities, resorts and summer homes are some of the special uses that occur in the Monument. In some cases they facilitate recreational experiences (such as the resorts) and in some instances they support other uses or needs (such as utility corridors).

***M-84 Utilities:** Any new utility lines permitted in the Monument should be buried, if feasible. Evaluation criteria to apply when considering issues of management or potential expansion of utility corridors paralleling Highway 97, as well as other utilities in places besides the Highway 97 corridor include:*

- Does the proposed use or expansion meet the intent of the Monument legislation?*
- Are feasible measures to mitigate any adverse effects on visual quality, wildlife or other resources of concern part of the proposed use or expansion?*
- Does the proposed use or expansion provide for public health and safety, or provide other substantial public benefits?*

***M-85 ODFW Fish weirs and dam:** Any changes to the present fish weir and dam at the outlet of Paulina Lake must be coordinated and approved by the District Ranger, Fort Rock Ranger District. Any changes must also be coordinated with ODFW and the Kellems and Taylor properties, which have water rights to Paulina Creek.*

***M-86 Resorts and Concessionaires** No new resorts may be built in the Monument. The resorts must maintain and preserve the rustic character of buildings in the Monument. Resorts may be operated year-round, and may be upgraded and expanded to accommodate more visitors. This may include some expansion of the permit area, if consistent with other resource management objectives. New buildings, additions, or facilities must conform to the architectural theme for the Monument. While implementation of the architectural theme is the long-term goal, an exception may be made where such conformance would not be feasible and an alternative solution acceptable to the Forest Service could be reached through dialogue with resort owners. Before any new construction can begin, there must be a master plan established for both resorts. Firewood cutting by resort owners will be coordinated with the Fort Rock District Office.*

Concessionaire operations within the Monument must be consistent with Monument values. Concessionaires should stress cleanliness, service, and respect for visitors.

***M-87 Recreation Residences (Summer Homes):** No new summer homes may be built in the Monument. Repairs and renovations to current summer homes are permitted, in accordance with the Forest Service Manual and Forest Service handbook including Regional Office supplements.*

M-88 Recreational and Other Outfitters or Guides: Authorize only those special use permits for outfitter/guides which provide a needed service and support the purposes for which the Monument was established (see Section 1 of the Monument legislation). Applications for outfitters/guides or any other special use permits must demonstrate how the proposal protects or enhances these Monument values. Where feasible, incorporate new requests into existing special use permits.

The Forest Service may place limits on outfitter/guides. These limits may include number of days of operation, number of people served, or other restrictions. The purpose of the limits is to preserve a quality recreational experience in NNVM.

M-89 Special Use Permits: Evaluate any changes to existing permits and any applications for new permits on a case-by-case basis. Any changes or new permits must be in keeping with the purposes of the Monument, and consistent with Monument legislation and this management plan. In general, Forest Service policy is to incorporate any new requests into existing special use permits where feasible.

M-90 Extractive Commercial Enterprises: Do not permit extractive commercial enterprises in the Monument unless they specifically contribute to the values and attainment of management objectives for the Monument (such as providing a recreational resort experience through the existing resorts, contracts for chub control in the lakes, or small-scale woodcutting that provides ecosystem benefits). As a general guideline, most commercial extractions of natural resources will not be compatible with the purposes of the Monument.

Law enforcement is also an important dimension of managing human interaction with both biophysical and human/social ecosystem components.

M-91 Provide adequate protection for visitors, public resources, personnel and property through appropriate law enforcement agencies and programs.

Standards and Guidelines Specific to Management Zones

This section of the Monument Plan presents the purposes and objectives for the five Management Zones within the Monument, and the standards and guidelines specific to each Management Zone. Management Zone standards and guidelines are intended to provide additional direction specifically related to the purposes and objectives of that Management Zone. They do not replace or supersede Monument-wide standards and guidelines, unless so stated in the standard.

The five Management Zones include:

- The River Zone
- The Lava Butte Zone
- The Transition Zone
- The Flanks Zone
- The Caldera Zone

Standards and guidelines within each Management Zone are divided into those for biophysical ecosystem components and those for human/social ecosystem components. If a particular component is not shown (such as vegetation communities), it means that there are no standards for that component unique to the particular Management Zone. In that case, please refer to the Monument-wide standards and guidelines for that component. Management Zone standards and guidelines are given an alphanumeric designation specific to the particular Management Zone:

- RZ means the standard applies to the River Zone
- LZ means the standard applies to the Lava Butte Zone
- TZ means the standard applies to the Transition Zone
- FZ means the standard applies to the Flanks Zone
- CZ means the standard applies to the Caldera Zone

A map of the Management Zones is included in the introduction of this Plan. Management Zone boundaries are also displayed on the "Areas of Concern and Opportunity" Map in the accompanying map packet.

The River Zone

Description: The River Zone is the area at the north end of the Monument that is bordered by the Deschutes River. It includes a mix of riparian vegetation along the river, some ponderosa pine, and extensive lava flows. It totals about 3,645 acres.

Purpose: The River Zone is intended primarily to provide high-quality wildlife habitat, and some opportunities for self-guided exploration.

Objectives: Manage the River Zone to minimize disturbance to wildlife habitats, while ensuring their long-term sustainability and diversity. Direct recreation use away from this Zone.

River Zone Standards and Guidelines

Biophysical Components

RZ-1 Increase waterfowl production where desirable, with appropriate habitat enhancement methods. These could include (but are not limited to) water level controls, nesting boxes, platforms, and restriction of off-trail travel in nesting areas. Ensure activities or structures are compatible with management direction for the Deschutes Wild and Scenic River.

RZ-2 Within the Ryan Ranch Key Elk Area, maintain and improve habitat for elk consistent with standards WL-42 through WL-51 in the 1990 Forest Plan for the Deschutes National Forest.

Human/Social Components

RZ-3 Do not planning new recreational developments, trails, or roads in this Zone.

(NOTE: The Benham Falls Day Use Area and associated trails and roads are part of the Lava Butte Zone.)

RZ-4 Guided interpretive activities and special uses such as group recreational events should be directed to areas other than the River Zone, unless they serve to enhance protection of the wildlife habitat values provided by the Zone. Inform visitors about the intent of the River Zone as a "special place" for wildlife solitude and protection.

The Lava Butte Zone

Description: The Lava Butte Zone lies south and east of the River Zone. It includes the Benham Falls Day Use Area, Lava Lands Visitor Center, the Lava Butte Lookout, the Highway 97 corridor, and a section east of Highway 97 that includes a utility corridor containing a natural gas pipeline and several electric lines. Vegetation communities are predominantly ponderosa pine, and a variety of volcanic geologic features occur in this Zone. The Lava Butte Zone totals about 5,883 acres.

Purpose: The Lava Butte Zone is intended to serve as the primary interpretive day-use and information hub for the Monument. Reintroduction of fire through prescribed burning and reestablishment of fire-based, historic ponderosa pine old growth is also a purpose in this Zone. This Zone is not intended to provide for public overnight use.

Objectives: Manage the Lava Butte Zone to serve a large number of day-use visitors (primarily at Lava Lands Visitor Center) with a variety of short-term, day oriented interpretive programs and recreation opportunities. Redesign access roads to Lava Lands Visitor Center and Lava River Cave to improve safety of access, and visitors' experiences when entering this part of the Monument. Manage (and if needed, redesign) facilities to support a comprehensive, theme-based interpretive program. Manage vegetation to provide high quality scenery, with emphasis on preserving and sustaining large, old-growth ponderosa pines, and to provide some habitat that allows for deer migration.

Lava Butte Zone Standards and Guidelines

Biophysical Components

LZ-1 Maintain some migration routes for deer through this Zone. Provide for some high-quality winter forage, hiding cover, and thermal cover where feasible within the context of objectives to reintroduce fire and foster development and preservation of historic, fire-based ponderosa pine old growth. Within transition/winter range, maintain hiding and thermal cover on at least 30% of suitable range in the Zone. Provide for 900 acres of bitterbrush within transition/winter range, preferably located away from roads and facilities.

LZ-2 Consider ways to reduce conflicts with deer migration corridors when locating, designing and managing new facilities, roads and trails. During winter (December 1 to April 30) close roads unneeded for visitor access, to reduce disturbance to migrating or wintering mule deer. Avoid special uses or events which would adversely affect deer migration or displace deer during the winter. Coordinate with Oregon Department of Wildlife and Oregon Department of Transportation to reduce hazards to motorists and deer along Highway 97 within the Zone during migration periods.

LZ-3 *Aggressively suppress wildfires within this Zone, except in low visibility areas in the lava near Lava Butte. Near Lava Butte and Lava River Cave, suppression entries should use low impact methods consistent with the purpose and objectives in this Zone.*

LZ-4 *In the winter, limit the use of Lava River Cave to guided tours of appropriate duration and extent (into the cave) to reduce disturbance to hibernating bats.*

NOTE: This limitation would generally be implemented between early November to mid-April.

Human/Social Ecosystem Components

LZ-5 *Manage recreation settings and opportunities for the ROS classes of SPNM, Roaded Natural, and Rural, as shown on the ROS map in Monument-wide Standards and Guidelines. Provide for day-use recreational opportunities in this Zone. When planning recreation opportunities and interpretive programs that entail crossing Highway 97, ensure that safety concerns are adequately addressed.*

LZ-6 *Provide information services that inform visitors of other recreational and interpretive opportunities available elsewhere in the Monument, as well as those provided in the Lava Butte Zone. Provide for a range of high-quality interpretive and recreational opportunities within this Zone that will support visitor stays of 3 to 6 hours.*

LZ-7 *Manage Lava Lands Visitor Center as the primary developed facility for Newberry National Volcanic Monument information services and interpretive programs, both for this Zone and for the Monument as a whole.*

LZ-8 *Develop and manage the segment of the Monument Trail within this Zone in a way that directs recreation use away from sensitive resources.*

The Transition Zone

Description: The Transition Zone stretches from the boundary of the Lava Butte Zone south toward the caldera and is bordered by Road 9735 on its southern edge. This is an area of diversity and transition, both for geologic features and vegetation communities. Lava flows are extensive. Ponderosa pine communities give way to mixed pine and pure lodgepole pine, as well as some mixed conifer communities. This Zone is presently largely undeveloped, with the exception of the Lava Cast Forest area. The Transition Zone totals about 14,652 acres.

Purpose: The Transition Zone is intended to provide a mix of recreation, scenic and interpretive opportunities (primarily for day use) as well as a variety of wildlife habitats. Reintroduction of fire through prescribed burning and reestablishment of fire-based, historic ponderosa pine old growth will be a key focus in this Zone.

Objectives: Manage the Transition Zone to serve visitors interested in day-use recreational and interpretive opportunities, with emphasis on trail opportunities, both recreational and interpretive. If sufficient demand is demonstrated, this Zone could include a group campground oriented to serve educational, interpretive, or research groups. Manage to provide visitor access to some of the scenic, geologic, and biological features of interest, where their protection can be ensured. In some areas, work to reduce fuel loads enough to allow safe reintroduction of fire (prescribed) without endangering large, old-growth ponderosa pines.

Transition Zone Standards and Guidelines:

Biophysical Components

***TZ-1** Manage Mokst Butte Research Natural Area (RNA) in accordance with provisions of the final Establishment Report and Designation Order for this RNA. Until the Establishment Report is adopted, the standards and guidelines for Management Area 2 in the 1990 Forest Plan for the Deschutes National Forest will provide management direction.*

***TZ-2** Near Lava Cast Forest and any new developed recreation sites, all fire suppression entries should use low impact methods consistent with Management Zone objectives. Lands in this area should receive aggressive suppression.*

***TZ-3** Maintain some migration routes for deer in this Zone. Provide for some high-quality winter forage, hiding cover, and thermal cover where feasible within the context of objectives to reintroduce fire and foster development and preservation of historic, fire-based ponderosa pine old growth. Consider ways to reduce conflicts with deer migration corridors when Locating, designing and managing new facilities, roads and trails. Avoid special uses or events which would adversely affect deer migration. Minor displacement of a few deer for a few days is allowed.*

Human/Social Ecosystem Components

TZ-4 Manage recreation and interpretive opportunities and settings consistent with the ROS classifications for this Zone (Roaded Natural, SPNM-summer, SPM-winter) as shown on the ROS maps in Monument-wide Standards and Guidelines. Where appropriate, day-use areas should focus on interpretation of special features. Avoid directing use into the Mokst Butte RNA. Recreation and interpretive facilities and opportunities should support a stay of approximately 4 to 6 hours. Dispersed camping is allowed. It could be regulated in the future if adverse effects to resources becomes a problem.

TZ-5 The Transferal Corridor, a special corridor designated in the Monument legislation, lies within this Zone. In the event of geothermal development in the Transferal Area (located in the Flanks Zone) this corridor shall be the only corridor across the Monument to be used for transmission lines associated with geothermal development. Manage this corridor as part of the Transition Zone. Subject to valid existing rights as provided under the Monument legislation, all relevant standards and guidelines apply.



The Flanks Zone

Description: The Flanks Zone surrounds the caldera of Newberry Volcano, and is undeveloped. It contains most of the North and South Paulina Roadless Areas. Vegetation is somewhat less diverse than in the Transition Zone, with most of the lodgepole pine forest found within this Zone, as well as mountain hemlock, mixed conifer, and some whitebark pine. The Transition Zone totals about 22,701 acres.

Purpose: The Flanks Zone is intended to provide opportunities for solitude and dispersed recreation in an undeveloped setting, largely free of evidence of human disturbance. The reestablishment of fire (prescribed natural fire) as a component in the ecological succession of mixed conifer and lodgepole pine communities is also a long-term goal in this Zone.

Objectives: Manage the Flanks Zone to retain its undeveloped and remote character. Provide for some trail opportunities (both winter and summer). Where feasible, develop fire management action strategies to allow for prescribed natural fires within the parameters established by the strategy. This may require some small-scale experimentation with prescribed burning (including manual reduction of fuel loads prior to burning) as a means of establishing defensible barriers to limit the extent of fires to within acceptable parameters.

Flanks Zone Standards and Guidelines:

Biophysical Ecosystem Components

FZ-1 Vegetation alteration to address public health and safety, to construct trails, to reintroduce fire into ecological processes, or to reduce serious threats to resources outside the Monument may take place in this Zone, dependent on the results of site-specific NEPA analysis. If at all feasible, any such activities should rely on low-impact manual methods (including prescribed fire) that do not require roads. Roads should be considered only as a last resort, and if used, should be temporary, and obliterated/rehabilitated at the conclusion of the project.

Human/Social Ecosystem Components

FZ-2 Manage this Zone consistent with the ROS classifications of SPNM-summer and SPM-winter, as shown on the ROS maps in the Monument-wide standards and guidelines. Motorized use is permitted in emergency situations such as search and rescue, wildfires, or other emergencies. One or two small warming shelters to provide for visitor safety during winter recreation use are appropriate in this Zone.

FZ-3 Avoid road development and structural facilities in this Zone, and obliterate existing roads or convert them (if appropriate) to nonmotorized trail use.

FZ-4 Where feasible, locate any new trails within this Zone 1/2 mile or further away from the Zone boundary, to reduce sights and sounds of activities on adjacent lands. Design trails to direct use away from sensitive features (for example, sensitive plants), and to minimize conflicts between different types of users, such as hikers, mountain bikers, horseback riders, nordic skiers, or snowmobilers. Direct dispersed camping away from sensitive areas, and generally 500 feet or more from trails. Future use could be regulated if resource damage becomes a problem.

FZ-5 Interpretive opportunities should be limited and low-key in this Zone, and consistent with the ROS classification. Use interpretive and information services to inform visitors about the "backcountry" nature of this Zone, and appropriate no-trace camping techniques.

FZ-6 Flanks Zone, Newberry Special Management Area, and Flanks Zone, Transferal Area Adjacent: Subsurface geothermal exploration and development are permitted within these areas. No surface occupancy of any geothermal facilities is permitted. (See Monument Legislation, Sections 2 and 4).

FZ-7 Flanks Zone, Transferal Area: Subject to valid existing rights as provided for by the Monument legislation, this area is to be managed as part of the Flanks Zone. When and if geothermal exploration or development takes place in this area, roads and other surface developments associated with geothermal activities are allowed, subject to site-specific NEPA analysis. If geothermal exploration and development occurs in this area, ROS direction within the proposed project area will change to Roaded Natural. (See Monument Legislation, Sections 2 and 4).



The Caldera Zone

Description: The Caldera Zone includes the interior of the caldera of Newberry Volcano, from the caldera rim inward, and is what most people know as "Newberry Crater." This is the most heavily used part of the Monument and includes numerous features and facilities, among them: Paulina and East lakes, Paulina Falls, the Big Obsidian Flow, two resorts, several general-use campgrounds, two boat-in campgrounds, one horseback riders' campground, several day-use areas and a network of recreational trails. In summer, fishing, picnicking, camping, hiking, bicycling, boating, and horseback riding are popular activities. In winter the area is heavily used by snowmobilers and to a lesser extent by nordic skiers. The Caldera Zone is a wildlife refuge, with no hunting permitted. Two Bald Eagle Management Areas (BEMA's) are also found within this Zone. The Caldera Zone totals about 12,741 acres.

Purpose: The Caldera Zone is intended to provide a wide variety of high-quality recreational and interpretive opportunities, including overnight use, in a highly scenic setting. This Zone serves as the primary hub for overnight stays in the Monument.





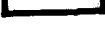

Objectives: Manage the Caldera Zone to provide a range of high-quality recreational and interpretive opportunities, from developed to undeveloped. Provide for high-quality overnight camping at 1993 levels of overnight visitor use. Increase day-use recreational and interpretive opportunities. Increase trail systems for a variety of users, including hikers, bicyclists, horseback riders, snowmobilers and nordic skiers. Rehabilitate and/or upgrade existing trails and facilities. Redesign the entrance to the caldera, including a Portal entrance station to better manage flow and dispersal of visitor use in the caldera. Maintain the high scenic quality within the Caldera Zone. **This Zone is divided into five recreation units, because of the diversity and complexity of settings and opportunities within the Caldera (see map on following page). They are intended to display where different uses in the Caldera are emphasized and directed. The five recreation units inside the Caldera include:**

- The Portal Unit:** functions as the main entrance to the caldera
- The Lakeside Units:** include the developed areas around the lake edges
- The Flow Unit:** is the main area for day use opportunities
- The Eagle Unit:** includes the Bald Eagle Management Areas (BEMA's)
- The Undeveloped Unit:** provides undeveloped, dispersed opportunities

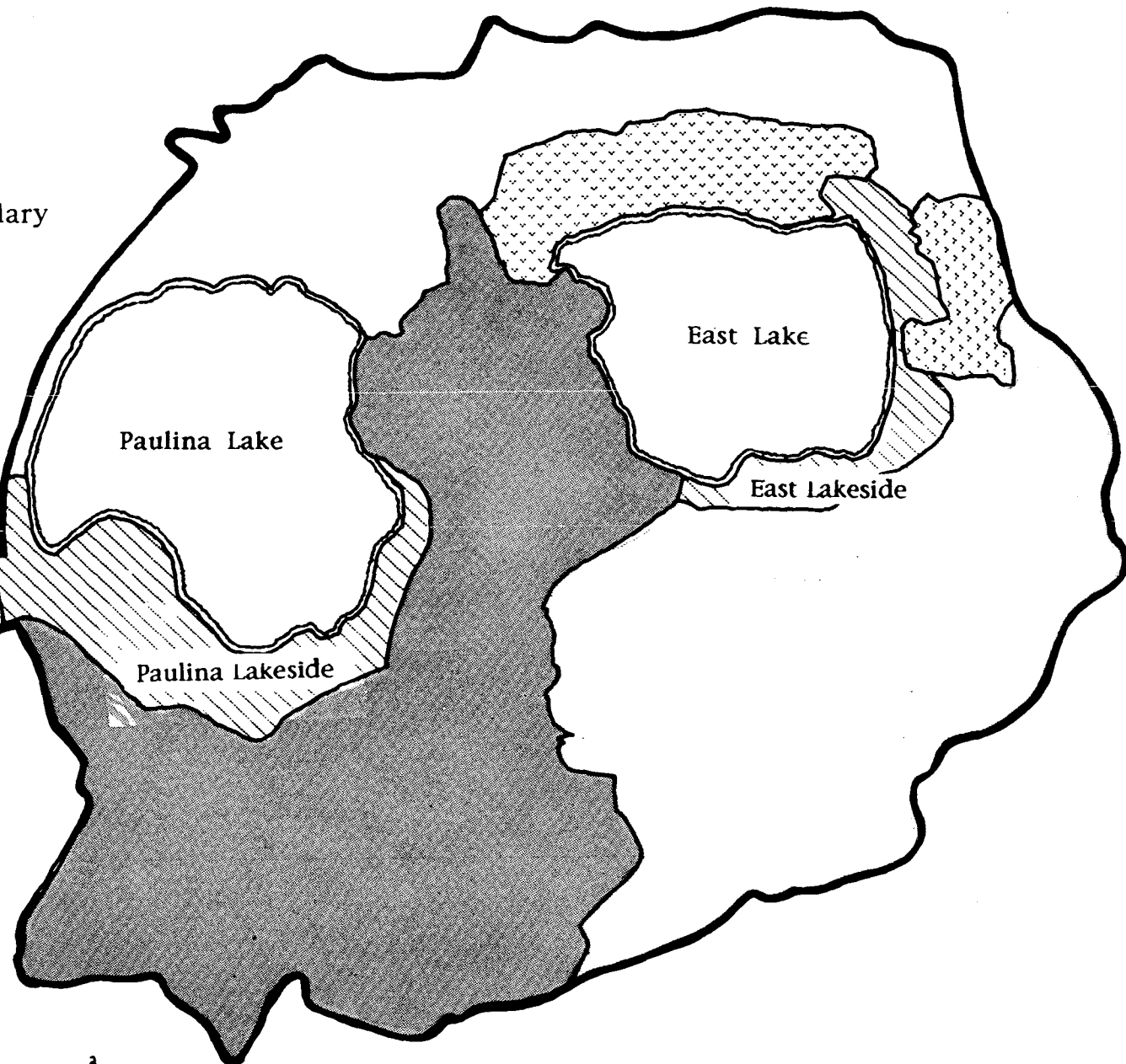
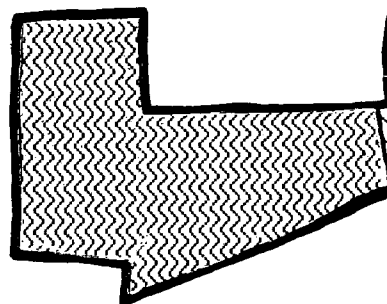
Caldera Zone Standards and Guidelines:

Some standards and guidelines apply to the Caldera Zone as a whole. These are presented below. Other standards and guidelines are specific to one of the five Recreation units, and follow a short discussion of the intent of the Recreation unit.

Caldera Recreation Units

-  Lakeside
-  Flow
-  Eagle
-  Portal
-  Undeveloped
-  Caldera Zone Boundary

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Newberry National Volcanic Monument

Biophysical Ecosystem Components

CZ-1 Aggressively suppress wildfires in visually sensitive areas within this Zone (see VQO discussion in Monument-wide standards). Suppression entries should use low impact methods consistent with the purpose and objectives in this Zone.

Human/Social Ecosystem Components

CZ-2 Manage this Zone to provide the ROS classifications as shown on the ROS map in Monument-wide standards and guidelines. The caldera provides R, RN, SPNM-summer and SPM-winter classifications. Locate, design and manage facilities to reduce conflicts between overnight visitors and shorter-stay, daytime visitors. Where feasible, facility renovations, expansions or new developments should include measures to buffer noise and visual impact of vehicles in the vicinity of developed sites and high use areas..

CZ-3 Monitor use levels and visitor preferences in this Zone to refine a carrying capacity for the Zone in terms of visitation. If visitation begins to unacceptably affect natural resources and the quality of recreation experiences within the caldera, implement appropriate measures to correct the problem. This could include a camping reservation system, permits, or other measures.

CZ-4 Manage winter motorized and nonmotorized recreation in a way that reduces potential for conflicts and accidents in high-use areas (for example, in the Lakeside and Portal recreation units), while providing high-quality opportunities for both snowmobiling and nordic skiing. A variety of measures may be used to accomplish this, including visitor education, separation of uses on trails, requesting users to stay on designated trails, posting of caution/slow signs, etc.

Portal Unit: This area serves as the main greeting and orientation area for visitors to the caldera. It is also the interpretive hub for the caldera. The entrance station to the caldera is located here. Information is given to visitors here, including information about camping availability, day use recreation opportunities, and interpretive programs. Day-use facilities, staging areas for shuttle buses, trail opportunities and sno-parks are also appropriate in this unit.

CZ-5 Recreation facilities in this Unit are limited to day-use facilities. Overnight camping is not intended in this Unit.

CZ-6 Manage the segment of Paulina Creek in this Unit in accordance with the 1990 Forest Plan standard and guideline M17-5 until determination of its suitability for inclusion in the National Wild and Scenic Rivers System has been made.

Lakeside Units: These Units, adjacent to both Paulina Lake and East Lake, serve as the primary overnight stay areas in the Monument. They provide a range of developed overnight opportunities, including general-use and specialized campgrounds and two resorts. They also provide for some day-use recreational opportunities, such as boat ramps, picnic and trails. Paulina Lakeside Unit is intended to accommodate more visitors at denser concentration, with more developed amenities. East Lakeside Unit is intended to provide a quieter, less developed campground setting, with more opportunities for privacy.

CZ-7 Provide for a range of high-quality overnight facilities and opportunities among the two Lakeside Units. Upgrade and/or expand existing campgrounds if necessary to provide a high quality experience. RV hook-ups may be provided in a portion of the developed camping areas designated as rural (R), if demand warrants. In the East Lakeside Unit, redesign campgrounds where appropriate to increase opportunities for privacy and low-key car camping. Camping outside of designated sites is not allowed in either of these Units.

CZ-8 Develop trail systems that emphasize short loop trails designed to originate in high use areas and disperse concentrations of visitors, and include barrier-free, accessible trail opportunities. Design and manage trails in congested areas to reduce potential for accidents and user conflicts.

CZ-9 In the Paulina Lakeside Unit, expand day-use fishing facilities, if demand warrants. In the East Lakeside Unit manage day-use fishing facilities to accommodate present (1993) use levels. When renovating these facilities, emphasize design features suitable for smaller-size boats, such as canoes or "car-toppers." Promote opportunities and attractions for non-motorized boating uses on East Lake.

CZ-10 Increase waterfowl production where desirable, with appropriate habitat enhancement methods. These could include (but are not limited to), nesting boxes, platforms, and restriction of off-trail travel in nesting areas.

Flow Recreation Unit: This Recreation Unit includes the Big Obsidian Flow and the Interlake Flow. The intent in this Unit is to provide a focus area for interpretive and day-use activities within the caldera. This unit should provide for a variety of interpretive/educational opportunities and settings. This area is not intended to provide dispersed camping.

CZ-11 Design interpretive facilities and opportunities in this Unit to support visitor stays of as much as six hours. Complete a cultural resource evaluation of the area between the two lakes prior to proposing projects within the area. Analyze potential for effects to bald eagle habitat on both lakes before approving projects in this area.

Eagle Unit: The intent of this Unit is to manage habitat for bald eagles. This Unit is comprised of the two Bald Eagle Management Areas (BEMA's) near the east and north shores of East Lake.

CZ-12 BEMA's may provide for limited dispersed recreation opportunities, such as hiking or bird-watching, that are compatible with maintaining desired numbers of bald eagles. The need for seasonal restrictions on recreational activities will be determined on a case-by-case basis. Direct other, more intensive recreation uses away from BEMA's. Dispersed camping within BEMA's is not permitted. Encourage visitors to remain on trails while traversing BEMA's. If needed, trail segments may be rerouted to avoid disturbance to nests or roosts.

CZ-13 Limit vegetation management in BEMA's to that needed to maintain large ponderosa pine and nest trees, and to reduce serious threats to nesting habitat from stand-replacement fires. Keep any vegetative management activities at least 1/4 mile away from active nests. Project activities should not be visible from the nest during the nesting season.

Undeveloped Recreation Unit: The intent of this Recreation Unit is to provide opportunities for solitude and exploration in undeveloped settings within the caldera. This area should be managed consistent with the SPNM-summer and SPM-winter ROS classifications, as shown on the ROS map in Monument-wide Standards and Guidelines.

CZ-14 Direct dispersed camping to locations that avoid sensitive habitats and resources. This could require establishing designated campsites and restricting dispersed camping to these sites, and/or permits for camping. Avoid encouraging recreational activities or developments along the north shore of Paulina Lake that would reduce its suitability as bald eagle nesting habitat.

CZ-15 Maintain Forest Service Road 21 east of East Lake at its present (1993) standard. Do not promote this road as an eastern entrance to the caldera.

CZ-16 Manage potential nesting habitat for peregrine falcons to preserve the characteristics which contribute to its suitability. In the event of reintroduction of peregrine falcons in the caldera, artificial treatments may be used to provide perches.

Applicable Forest Plan Standards

The following Forest-wide standards and guidelines from the 1990 Deschutes National Forest Land and Resource Management Plan will also apply throughout the Monument:

For Cultural Resources: CR-1 through CR-7; CR-9 through CR-11.

For Cave Management: CV-1 through CV-8.

For Trail Systems: TR-1 through TR-4; TR-10 through TR-12; TR-17; TR-18; TR-23 through TR-26; TR-29 through TR-33.

For Wildlife: WL-2 through WL-5; WL-10 through WL-12; WL-13; WL-17; WL-18 through WL-22; WL-25 through WL-29; WL-33; WL-34; WL-40 through WL-45; WL-49 through WL-52; WL-57; WL-59; WL 60; WL-64 through WL-71; WL-75.

For Threatened, Endangered, and/or Sensitive Plant Species: TE-1 through TE-7.

For Riparian Areas and Wetlands: RP-1 through RP-3; RP-5; RP-8 through RP-10; RP-12 through RP-29; RP-33 through RP-41; RP-43 through RP-47.

For Forest Vegetation and Forest Health: TM-2; TM-3; TM-5; TM-11; TM-12; TM-64; FH-2; FH-3; FH-5 through FH-8.

For Fisheries: FI-1 through FI-7; FI-11.

For Water - Best Management Practices: WT-1 through WT-7.

For Soils: SL-1 and SL-5.

For the Transportation System: TS-4 through TS-10.

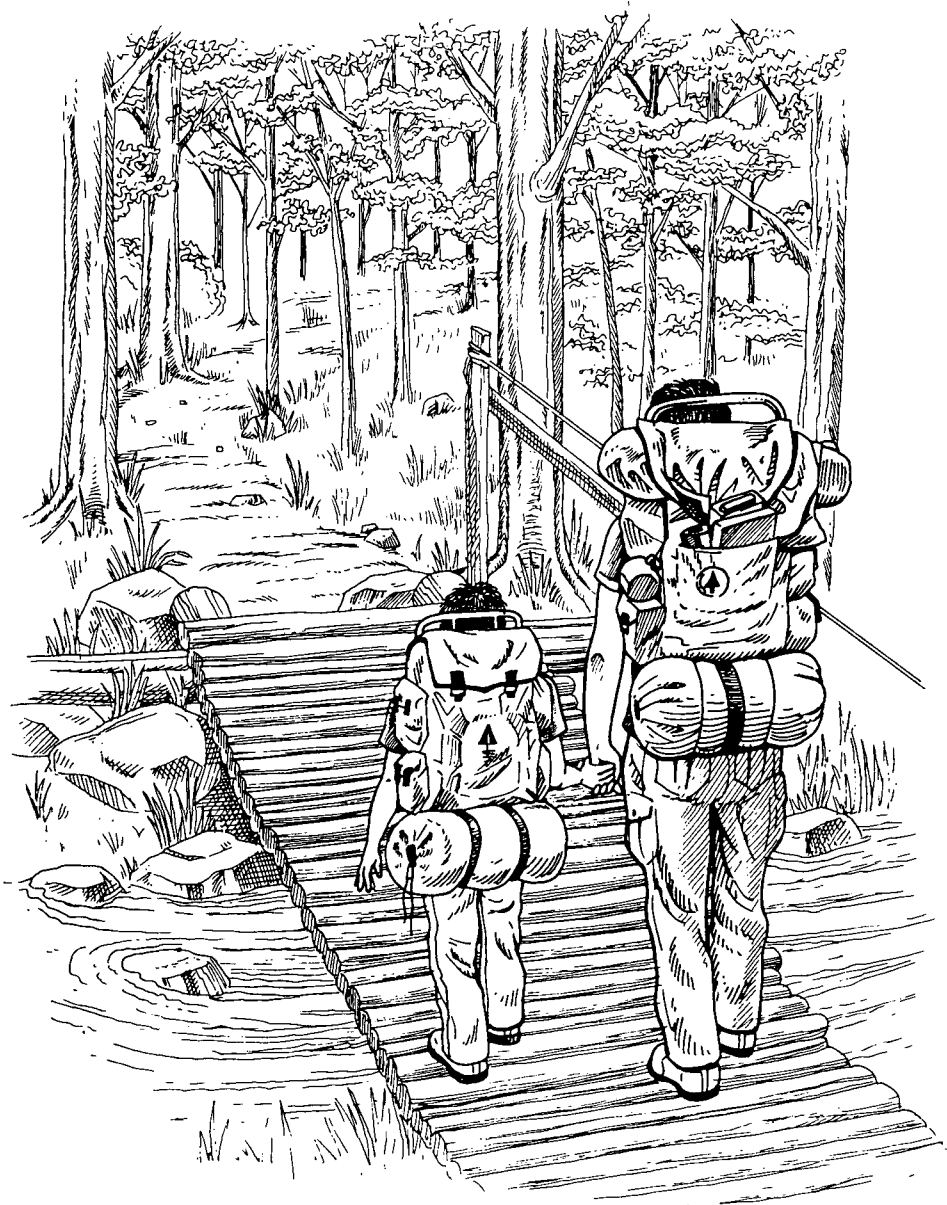
For Fire and Fuels Management: FF-1; FF-3 through FF-6; FF-8; FF-9.

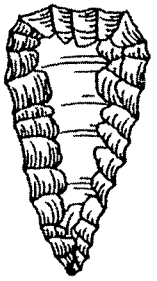
For Special Uses: SU-16 through SU-26; SU-32 through SU-34; SU-36 through SU-38; SU-40 through SU-46.

For Human Rights: HM-1 through HM-7.

For Law Enforcement: LE-1 through LE-9; LE-12 through LE-20.

Unless otherwise indicated in standards and guidelines direction for Management Zones, no other standards and guidelines from the 1990 Forest Plan apply to Newberry National Volcanic Monument or the Newberry Special Management Area, Transferal Area, Transferal Area Adjacent, and Transferal Corridor (hereafter referred to as the "adjacent special areas").





**AREAS OF
CONCERN AND
OPPORTUNITY**

**WITH
PROJECT
PLANNING
CRITERIA**

Areas of Concern & Opportunity

Introduction

What are Areas of Concern and Opportunity?

Areas of Concern and Opportunity are landscape areas with common resource and ecosystem characteristics. The Monument has been divided into 40 such Areas based on an integrated analysis of resource concerns and opportunities, completed in the spring of 1994. Available information pertaining to air quality, fire hazard and risk, fisheries, geology, heritage resources, recreation (including interpretation), scenery, soil, vegetation, water quality, and wildlife was all considered in the analysis.

These Areas were developed as a planning tool to help implement ecosystem management in NNVM. They provide an integrated, spatial perspective on the Monument's values, which is useful for planning future site-specific projects. The boundaries of each Area are intended to be approximate, rather than to display an exact location on the ground. This is because the resource characteristics on which the Areas are based tend to be gradational and dynamic, rather than distinct and static. For example, the edge of a goshawk habitat cannot be defined by a single line and may change from one year to the next. Areas of Concern and Opportunity are not allocations that restrict or prescribe specific activities.

To define the Areas, each of the Monument's five management Zones (River, Lava Butte, Transition, Flanks, Caldera) were considered separately. Locations of high concern and/or opportunity were mapped and overlaid for each resource, along with inventory information. Then, areas were delineated based on a spatial synthesis of resource values. The boundaries were gradually refined into forty separate Areas of Concern and Opportunity. (See planning record for complete record and description of this process.)

What are Drivers?

Resources designated as project "drivers" are those resources that would likely lead us to plan a project within a particular Area of Concern and Opportunity. For example an Area may be a high priority for treatment to address heavy fuel accumulations and high risk of a severe wildfire spreading outside of NNVM. In this case, fire hazard/risk would be listed as a "key driver."

In this example, other resource concerns would naturally come into play. For example, scenery and soils might be sensitive, or significant heritage resources might be present. The presence or sensitivity of these resources may either be known in advance or discovered during site-specific analysis. In any case, appropriate actions would be taken to protect these resources if the fuel-reduction project is implemented. Safeguards could include limiting, or even precluding, certain fuel-reduction activities on a site-specific basis. Resource concerns that are triggered in this way by some proposed action are considered responders, rather than drivers. Resources are only listed as drivers for an Area if they would be likely to instigate a project on their own--whether or not other activities were planned.

Drivers are not intended to indicate which resources are most important or sensitive in an Area. Information on sensitivity is included in the "planning issues" statements for each

Zone and Area. (Note: If all potentially triggered resource concerns were called drivers, their number would multiply to the point that the designation would be meaningless.)

Note also that the "driver" designations express priorities only for planning; they do not apply to operations or maintenance activities. Responding to urgent problems that arise--related to whatever resource--will continue without regard for planning drivers. For example, eliminating resource damage along a trail (an operations/maintenance priority) would have high priority even if recreation were not a key driver in an Area.

How to use Areas of Opportunity and Concern:

The Areas of Opportunity and Concern should be consulted as a first step when planning projects or programs within the Monument. The Planning Criteria for each Area are intended to provide concise, useful summaries of area-specific information and to indicate which resources are likely to be the focus of project planning within each Area. This information can also be used in watershed analysis. The following two sections, "Data Descriptions & Limitations" and "Criteria for Drivers," contain important background information for understanding preliminary planning issues and how drivers were determined. The last two sections, "Project Planning Criteria" and "Project Priority Areas by Resource" are to be used in conjunction with the Areas of Concern and Opportunity map (in map packet). Together, they display the results of the resource synthesis process and can be applied directly to project planning, as described below.

The "Project Planning Criteria" section is organized by Area number, starting with the River Zone in the north. If the general location of a potential project is already known, simply refer to the appropriate Area for a synopsis of the pertinent planning issues and drivers. This will alert the planner to the key opportunities and concerns that need to be considered in that Area. It will also show the key and secondary project-planning drivers there. Then, if proceeding with the project still seems desirable and feasible, more detailed and site-specific information can be obtained from the Monument Planning file and/or from appropriate District specialists. (Some information is confidential and not included in the published version of this section.)

The section called "Project Priority Areas by Resource" lists each resource type (e.g. scenery, wildlife, etc.), followed by a list of all the Areas in which that resource is a planning driver. This section is designed as a tool to help prioritize where within NNVM a particular type of project or activity would be most appropriate. For example, if funds were available to rehabilitate wildlife habitat, one could look under "Wildlife" for recommendations of what Areas to consider. The planner could then refer back to the "Project Planning Criteria" section to help determine which of these Areas might be the best candidates for a habitat restoration project.

Note that the Areas of Concern and Opportunity are meant to facilitate the early stages of project planning--not to control what can take place on a site or to predetermine where projects must be implemented. The Planning Criteria provide an overview of issues, opportunities, and concerns for each Area; they do not replace site-specific NEPA analysis. Ground surveys will always be necessary to determine current resource characteristics and conditions at each site, prior to analysis of potential effects to resources. Public involvement will always be needed to identify and address issues that may not have arisen in the resource synthesis process. In addition, the Monument legislation and all other laws and regulations applicable to resource protection must be met when planning and carrying out any activities in NNVM.

Data Descriptions and Limitations

This section describes the data used to develop the Resource Synthesis Areas and to identify planning issues and drivers for each one. Also included here are definitions of important terms used later in the "Project Planning Criteria."

Air Quality: No quantitative data are available for air quality within NNVM. Concerns and opportunities were based on limited field observations, Forest Service meteorological data, and professional judgement.

Fire Hazard/Risk: The level of fire hazard in an Area indicates potential wildfire severity. Hazard depends on the fuels (i.e. burnable material) present, for example dead pine needles, twigs, branches, logs, and brush. A hazard rating is assigned based on: (1) the type, volume, arrangement, condition, and location of the fuels; (2) the wildfire behavior and severity the fuels are expected to support; and/or (3) the predicted difficulty of suppressing the fire. Actual fire hazard can only be determined with ground surveys to assess fuel conditions. Throughout the "Project Planning Criteria" section, we refer to "fire hazard potential," which is the probable fire hazard in an Area, based on the information currently available.

In plant communities dominated by lodgepole pine, fire hazard potential was estimated from three factors: (1) the amount of tree mortality (proportion of dead trees), (2) the degree of slope, and (3) the aspect (direction of slope) in the area. Tree mortality was interpreted from high-altitude infrared photographs taken for inventory purposes in 1991. The mortality is primarily the result of a recent mountain-pine-beetle infestation. Additional mortality that has occurred since 1991 was not accounted for in this analysis. High mortality clearly relates to high fuel loads -- first as standing dead trees and later as logs on the ground. A medium-to-high mortality rating in the Planning Criteria indicates that 25% or more of the trees in a stand were interpreted to be dead. Slope is important because fire travels more rapidly up steeper slopes. Slopes with a grade greater than 30% were considered "steep." The moisture content of fuels is affected by the aspect. All other factors being equal, slopes that face south tend to be driest and therefore have the highest hazard potential, followed by slopes facing west, east, or north.

In ponderosa pine, mixed ponderosa and lodgepole pine, and mixed conifer communities, fire hazard potential was based on fuel characteristics, as estimated from "photo series" (USDA Forest Service 1976, 1980, 1981, 1987), field observations, and professional judgement. Factors contributing to hazard in the pine-type forests include needle castings, live and dead brush, and down logs.

Risk refers to the likelihood that significant fire damage would occur in an area. Risk is based on three factors: (1) the presence or absence of causative agents, such as lightning, campfires, or chainsaws; (2) the existing hazard; and (3) the value to be protected from fire. The first factor was evaluated based on records of historical lightning strikes and on the locations and estimated level of use of access roads, trails, and recreation sites where humans could provide ignition sources. Hazard potential is explained above. The values to be protected include human health and safety, ecosystem components, roads, facilities, and private property.

Geology and Soils: The main source for geologic information on the Monument is a geologic map by MacLeod and others (in press). Other sources include Jensen (1988), Linneman (1990), and MacLeod and Sherrod (1988). Information on tephra deposits and locations of geologic features comes largely from field observations by Deschutes National Forest geologists.

Tephra is a general term referring to particles that were ejected into the air from a volcanic vent. Examples found in NNVM are cinders, pumice, and ash. Cinders are chunks of basaltic, or mafic (iron-and magnesium-rich), rock that are dark-colored and may be reddish. Pumice is silicic (richer in silica) and generally light gray, white, or yellowish. Ash refers to fine (<2mm diameter) particles of cinder or pumice.

All tephra mentioned in the "Project Planning Criteria" section originated from activity of Newberry Volcano within the last 7,500 years. This includes the mafic material associated with the Northwest Rift Zone and the mostly silicic tephra erupted from within the caldera. This tephra is important both geologically and archaeologically for its well-preserved stratigraphic information. It also forms soils that are very sensitive to disturbance or compaction.

Where not composed of tephra or covered by lava from Newberry eruptions, topsoils in the Monument were formed from pumice and ash erupted by Mt. Mazama about 7,600 years ago. Although tephra soils in general are sensitive to disturbance or compaction, these Mazama soils are much less sensitive than the tephra erupted from Newberry Volcano.

All soil types are sensitive to disturbance, and in particular erosion, when they occur on steep slopes. Grades of 30% or more are described as "steep" in the Planning Criteria.

Heritage Resources: Heritage Resource information used in this analysis included: 1) the cultural resource database (SID) for NNVM; 2) existing inventory reports from NNVM and the Fort Rock District; 3) District site files; 4) the District's isolated find, tickler and unverified finds files; 5) historical records on file at the District, including homestead entries, stock driveways, land exchanges, potential railroad grades and timber harvest maps; 6) results of ongoing analysis for the Road 21 project in Newberry caldera; 7) the National Register of Historic Places; 8) the Cultural Resource Overview of the Deschutes National Forest (Goddard and Bryant 1979); 9) and the Interim Cultural Resource Overview update for the Fort Rock District (Matz 1991).

The terms "significant" and "inventory" have specific meanings when applied to heritage/cultural properties. Sites are significant if they meet one or more of the following criteria: 1) They are associated with events that have made a significant contribution to the broad patterns of our history. 2) They are associated with the lives of persons recognized as significant in our past. 3) They embody the distinct characteristics of a type, period or method of construction or the work of a master or possess high artistic values, or they represent a significant and distinguishable entity whose components may lack individual distinction. 4) They yield or are likely to yield information important in pre-history or history. In addition, the sites must have integrity and should not be overly redundant with regard to other site types or potential information. Significant sites are eligible for nomination to the National Register of Historic Places. A heritage/cultural inventory, as referred to in the "Project Planning Criteria," is a properly organized compilation of information on properties that have been evaluated for significance.

Some of the heritage resource information is sensitive because it is site specific. Information on the nature and locations of sites is generally withheld under the Freedom of Information Act, unless disclosure to the public would not harm the resource. In addition, any disclosure must further the purposes of the National Historic Preservation Act and the Archaeological Resources Protection Act. All sensitive information has been deleted from the published version of the Planning Criteria and is retained in the planning record. The complete document and more site-specific information are available to the appropriate planning specialist.

Recreation: Locations of existing designated recreation sites, roads, and trails represent the current Deschutes National Forest database, as entered into the Geographic Information System (GIS). "Developed" recreation facilities include all campgrounds, day-use areas, and visitor centers. Snow-play area locations were taken from the winter trail map (USDA Forest Service 1993). Trail and recreation site locations have not been verified by satellite (i.e. Global Positioning System). Locations of dispersed campsites and undesignated, user-created trails were not mapped.

ROS notations in the Planning Criteria refer to Forest Service's Recreation Opportunity Spectrum. Classifications present within NNVM are: rural, roaded natural and semi-primitive motorized and non-motorized. See Standards and Guidelines for ROS map and corresponding management direction in the different classes.

Scenery: Features and locations visible from different recreation sites were determined using site coordinates and digital elevation models in GIS. These calculated views represent "potentially-seen areas" and not necessarily the views a visitor would have from the sites today, because vegetation or structures may obstruct views. Potentially-seen areas are useful because vegetation and facilities can change. In an extreme example, wildfire may remove all visual screening, and then seen areas would be the same as potentially-seen areas. Views from travelways--including roads, trails, lakes, and river--were only analyzed in terms of their foreground views. These views were normally taken to include everything within a half-mile from the travelway. For both specific sites and travelways, these potential views, or "viewsheds," need to be verified on the ground when planning site-specific projects.

For area-specific scenery management direction, see the Visual Quality Objective (VQO) map and accompanying text in the Standards and Guidelines. Other mapped information available for NNVM includes: variety class, existing scenic condition, VQO inventories, and landscape character subtypes (see planning record).

Vegetation: Vegetation data reflects the 1984 Deschutes National Forest Stand Delineation and Inventory. This shows the existing (1984) vegetation and not the potential (climatic climax) communities, which in some cases are different. Mixed pine communities (with subequal abundance of ponderosa and lodgepole) in NNVM are mixed commonly because lodgepole pine has encroached into former ponderosa pine stands. This occurs because of fire suppression; the extent to which this has occurred does not appear to be natural. Where "recent vegetation management activities" are mentioned in the Planning Criteria, some mechanical treatments have occurred in the area since 1972. See Fire Hazard/Risk above for an explanation of mortality data.

In all Areas, on-the-ground surveys will be necessary to verify current conditions and plant communities. All old-growth ponderosa pine stands, for example, need to be located and their conditions assessed. Hazard trees are an ongoing concern in all Areas near trails, roads, and facilities; the Forest Service Manual and hazard tree policy should be used for guidance. Noxious weeds are also a concern Monument-wide, but they are only mentioned in the Planning Criteria where their specific locations are known.

"Old-growth ponderosa pine," as used in the "Criteria for Drivers" and "Project Planning Criteria" sections, refers to both "historic," fire-based and "ecological," fire-suppressed ecosystems. The appropriate or desirable type of old-growth character for a given stand needs to be determined based on wildlife needs, fire hazard/risk, scenic quality, recreation, and other site- or Area-specific issues.

Habitat for sensitive plant species is referred to in the Planning Criteria either as "known habitat," which supports confirmed populations, or as "potential habitat," which may be suitable but in which no sensitive plants have been documented. Known populations of sensitive plants (e.g. *Botrychium pumicola* -- BOPU for short) are located by Area in the Planning Criteria. However, specific locations within each Area are held confidential. This information may be released to appropriate planning personnel by the District ecologist/botanist.

Water Quality: Data used for Paulina and East Lakes included the Atlas of Oregon Lakes (Johnson et al. 1985), a report commissioned by DEQ (Aquatic Analysts 1990), Citizen Lake Watch reports (Daggett and Peterson 1993), and analyses by the US Geological Survey (Crumrine and Morgan in press). Ground-water quality data came from the USGS (Crumrine and Morgan in press) and Forest Service records of bacteriological and nitrate testing in drinking-water wells from the Fort Rock District.

Susceptibility to contamination was estimated based on: 1) proximity to surface-water bodies; 2) approximate depth to ground water (from State of Oregon well reports' static water levels in wells and the general regional trends described by Black (1983) and Chitwood (1985)); 3) general known locations of septic systems; and 4) current/expected level and type of use in and near water bodies.

Wildlife and Fish: Habitat determinations were made using the 1984 Deschutes National Forest Stand Delineation and Inventory, from limited field observations of vegetative conditions, and the District wildlife observation database. "Occupied habitat" is defined as an area where a species is known to occur either seasonally or year round. "Suitable habitat, occupancy unknown" is indicated in the Planning Criteria where all the necessary habitat components for a species appear to be present (5-25% of these areas have been field verified); however, no surveys have been conducted to determine whether or not the animal is present. "Unoccupied suitable habitat," on the other hand, contains adequate habitat components, but surveys have indicated that the species does not occur there.

The specific locations of habitat occupied by Threatened and Endangered (T&E) and Sensitive wildlife species are not described in detail in the Planning Criteria because they are confidential. Some of this information is included in the planning record copy of the "Areas of Concern and Opportunity." It and other confidential information may be released to appropriate planning personnel by the District wildlife biologist.

Mixed conifer stands are noted in the Planning Criteria as providing important habitat for many wildlife species in the Monument. These include American marten, goshawks, woodpeckers, and neotropical migrant birds. A major concern is maintaining the diversity of tree species in these stands. Ponderosa pine trees, in particular, are critical because they make good snags for cavity nesters.

Criteria for Drivers

This section lays out the criteria used to determine which resources were identified as planning drivers for each Area of Concern and Opportunity. If known resource conditions met the qualifications for "key" (high priority) drivers below, then that resource is listed as a "Key Driver" in the "Project Planning Criteria" section. If a resource did not qualify as a key driver, but did meet the conditions described for a "secondary" (medium priority) driver, then it is given as a "Secondary Driver" in the Planning Criteria.

Air Quality

key: The Area contains abundant pollutant sources, as well as potential for periodic accumulation and human health effects of pollutants (stagnant air).

secondary: Area has a high potential for accumulation and environmental effects of pollutants at times.

Fire Hazard/Risk

key: Half or more of the area has a high hazard potential, moderate or high risk of wildfire, and is located such that a wildfire would likely threaten human safety, areas outside the Monument, or compromise Monument resources.

secondary: Some portion of the area has a high hazard potential, moderate or high risk of wildfire, and is located such that a wildfire would likely threaten human safety, areas outside the Monument, or compromise Monument resources.

Geology

key: High potential for study and interpretation--
(a) Area contains pahoehoe, obsidian, spatter cones, or other sensitive features; or
(b) Area is all or mostly tephra from Lava Butte or Mokst Butte.

secondary: (a) Area is all or dominantly aa lava or tephra from Newberry eruptions;
or
(b) Area contains special features of interest (e.g. waterfalls, hot springs, lake terraces).

Heritage Resources

key: Significant sites occur, or potentially significant sites occur over a large portion of the area.

secondary: Area contains lava edges or other locations that have a high probability for significant sites, or potentially significant sites occur in a small portion of the area.

Recreation (reflects CIP priorities)

- key: Area is in the Lava Butte, Flanks, or Caldera Zone and:
- (a) Area contains an existing rec site (e.g. campsite, day-use area, interpretation site/trail, entrance station), or
 - (b) Over half of the area falls within summer trail corridors (i.e. within a quarter mile of a trail).
- secondary: (a) Area contains an existing rec site or trail in the Transition Zone,
or
(b) Area contains a potential/proposed rec site or trail in the Lava Butte or Transition Zone (excluding phase 2 of NNVM trail, south of Lava Cast Forest).

Scenery*

- key: (a) Area is all or mostly in foreground viewsheds of high-use recreation sites or major travelways (Highway 97, Roads 21, 9710, 9720, Benham Falls Road/9702, Paulina Peak Road, Lava Butte Road, Deschutes River, Paulina and East Lakes),
or
(b) Area is largely in foreground or middleground viewshed from a feature viewpoint, scenic quality is declining/threatened, and the viewshed is managed for retention (see VQO map).
- secondary: Area is partly in foreground of a high-use recreation site or a major travelway corridor, or Area is all or mostly middleground of long-duration recreation sites (e.g. overnight or fishing on lakes).

* These drivers do not apply to Areas where scenery enhancement projects are not feasible (e.g. on the lakes or on barren lava).

Soils

- key: (a) Area is all or mostly tephra from Lava Butte or Mokst Butte,
or
(b) Protection or restoration of riparian soils is needed.
- secondary: Area is all or dominantly tephra from Newberry eruptions.

Vegetation

- key: a) Protection of riparian vegetation or known populations of BOPU is needed near high-use areas or trails,
or
b) Opportunities are present for maintaining or enhancing existing old-growth ponderosa pine along a major travelway (road, trail, river or lake) or adjacent to a rec site, or

c) Area is within the Mokst Butte Research Natural Area, which was designated in large part for its special vegetative characteristics.

- secondary:
- a) Opportunities are present for allowing old-growth ponderosa pine to develop along a major travelway (road, trail, river or lake) or adjacent to rec site,
or
 - b) Opportunities exist for maintaining or enhancing existing old-growth ponderosa pine, but not adjacent to a major travelway corridor or adjacent to a rec site. (May be adjacent to a trail.)
or
 - c) Good opportunities exist for prescribed fire or prescribed natural fire to approximate natural processes,
or
 - d) Area contains a trail or rec site within potential BOPU habitat or talus/scree habitat.

Water Quality

key: Ground or surface water has a high potential for pollution due to existing conditions or activities within the Monument.

secondary: Ground or surface water is susceptible to pollution from conditions or activities outside NNVM and/or from increasing use or potential new facilities within NNVM.

Wildlife and Fish

- key:
- a) Protection of occupied or unoccupied suitable habitat of threatened, endangered, or sensitive wildlife species is needed near developments or in areas of high fire hazard/risk,
or
 - b) Opportunities are present for maintaining or enhancing mule-deer cover within seasonal migration areas, or for maintaining or enhancing mule-deer forage in winter ranges,
or
 - c) Protection of occupied raptor nesting habitat is needed in areas of high fire hazard/risk or near high-use areas or trails,
or
 - d) Protection or restoration of riparian habitats is needed near high-use areas or trails, or where undesirable vegetation occurs, or where maintenance of woody deciduous species is desirable,
or
 - e) Restoration of snags and fallen tree habitat is needed where it is lacking over large areas,
or
 - f) Protection or enhancement of mixed conifer habitats that contain ponderosa pine and white fir is needed where the fire hazard/risk is high,

or

g) Maintenance of fish habitat and populations is needed or desirable.

- secondary:
- a) Forested habitats with white fir component where the fire hazard/risk is moderate,
or
 - b) Protection of daily big-game movements to important water sources is needed,
or
 - c) Protection of unoccupied suitable goshawk nesting habitat where fire hazard/risk is medium to high,
or
 - d) Opportunities are present for enhancing forest vegetation for future goshawk nesting habitat in the vicinity of occupied habitat, below roughly 7,000 feet elevation,
or
 - e) Restoration of snags and fallen tree habitat is needed where it is lacking over small areas.

Project Planning Criteria - River Zone

Zone-wide Planning Issues:

Areas 1-2

Air Quality -- Air above barren lava is well heated on sunny summer days. Proximity to sources of woodstove smoke from the Deschutes River Woods residential development.

Fire Hazard/Risk -- Generally low hazard. Low to moderate risk due to human activity and lightning.

Geology -- The Lava Butte flow which is primarily aa lava with some inflated pahoehoe, comprises > 90% of the Zone. When it erupted, the lava temporarily blocked the Deschutes River and moved it westward to its present course.

Heritage Resources -- This Zone is largely unsurveyed, but has the potential for locating significant sites.

Recreation -- No developed recreation or designated trails in this Zone. Recreation should not be directed here. Dispersed use currently not restricted but should not be encouraged. ROS class is semi-primitive throughout.

Scenery -- West edge is foreground from Deschutes Wild and Scenic River corridor. South half is middleground from Lava Butte. North half is background from Lava Butte.

Soil -- See individual Areas.

Vegetation -- This Zone is predominantly unvegetated, except near the river. Overall goal is to reintroduce fire to the ecosystem.

Water Quality -- The high-water mark of the Deschutes River borders this Zone on the west. This Zone is all in the Kelsey Butte watershed.

Wildlife and Fish -- A primary purpose of this Zone is to provide undisturbed wildlife habitat along the river for riparian species, water fowl, raptors, and wintering elk.

Planning Criteria

Area 1

River Zone

Area description: This Area is mostly unvegetated or sparsely vegetated, blocky aa lava flow. It is adjacent to the Deschutes Wild and Scenic River. About 30% of the Area (i.e. near the river) is vegetated with a variety of plant communities. The Area also includes some seasonal ponds along the river. It is fairly flat, undeveloped and unroaded. Eighty acres in the northeast is outside of the Forest's Exchange boundary and is owned by the State of Oregon.

Key Drivers: Heritage Resources - Sites occur.

Scenery - Foreground viewing from Wild and Scenic River corridor.

Soils - Sensitive riparian soils.

Vegetation - Protect/restore riparian vegetation. Existing and potential old-growth ponderosa pine.

Wildlife - Protect/restore riparian habitat. Occupied osprey nesting habitat.

Secondary Drivers: Geology - Dominantly aa lava flow.

Water Quality - Susceptible to pollution, mainly due to influx of water from the Deschutes River, outside NNVM.

Planning Issues:

Air Quality -- Normally good air circulation along river. Riparian habitat is sensitive to pollutants.

Fire Hazard/Risk -- Low based on aspect, slope, and mortality; however, the vegetation mix of varied tree heights and the brush component will increase the chance that any fire occurring would climb into the crowns.

Geology -- Lava is part of the Lava Butte Flow, which is aa and inflated pahoehoe. Not an area of particularly high concern/sensitivity, but there are opportunities to study important evidence of interaction between the lava flow and the river near Benham and Dillon Falls.

Heritage Resources -- 5% is surveyed. Resources occur, with potential for locating more.

Recreation -- There are no designated trails, but some dispersed recreation occurs along the river's edge. Concern for potential impacts to riparian vegetation, wildlife, and water quality.

Scenery -- Southern tip may be viewshed from Benham Falls. Wild and Scenic River corridor, viewed from the river itself (rafting) and from the rec sites and trails on western bank (Bend District). Middleground and background from Lava Butte and background from Paulina Peak. Little or no visual absorption capacity in the lava and meadow portions.

Soil -- Wet, riparian soils (including meadows and ponds) adjacent to the river. Some steep slopes at Benham Falls and midway down the river, north of Dillon Falls along lava edge. About 75% of the Area is barren lava. The rest is Mazama or alluvial soils.

Vegetation -- 30 to 35% of the Area is vegetated, mostly along the west side. Types include ponderosa pine, mixed pine, meadow, and lesser amounts of lodgepole pine, sagebrush and riparian vegetation. Existing old-growth ponderosa pine and potential for more. Riparian habitat, including for the sensitive herbaceous artemisia (*Artemisia ludoviciana* ssp. *estesii*) in moist places along vegetated river's edge. Lava-edge ecotone between lava and river. Green-tinged paintbrush (*Castilleja chlorotica*) habitat in all vegetated parts except where very moist.

Water Quality -- Drainage is to the west to the Deschutes River. The river fills the ponds within NNVM during high water flows (i.e. in the irrigation season). Potential for siltation in ponds. Ground water is fairly shallow, so its potential for contamination is relatively high. The Area borders Benham Falls in the south, Dillon Falls in the middle and Lava Island Falls in the north.

Wildlife and Fish -- Deer, elk, bald-eagle perching, and osprey nesting along vegetated river's edge. Protect riparian wildlife (e.g. amphibians, waterfowl). Prebles shrew habitat, occupancy unknown, in sage-riparian portions. Fish habitat in river and ponds is low quality, in part due to lack of coarse woody material. Maintain trees and other river-bank vegetation to provide in-stream woody material, bank stability, and shade.

Area description: This Area is nearly all unvegetated or sparsely vegetated blocky aa lava flow. It is fairly flat, undeveloped and unroaded. It abuts suburban developments to the north.

Key Drivers: none

Secondary Drivers: Geology - Dominantly aa lava.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- Hazard is low. Lava is a firebreak. Medium risk in isolated ponderosa pine trees from lightning starts; medium risk from human activity in adjacent suburban development.

Geology -- All is lava from the Lava Butte Flow (aa and some inflated pahoehoe), with the exception of some small parts in the north. Lava includes some scattered tree molds. Not an Area of particularly high concern/sensitivity, but opportunities for study.

Heritage Resources -- Little concern or opportunity in interior of flows.

Recreation -- No developed recreation here; little to no dispersed recreation.

Scenery -- Viewshed from adjacent suburban residences to the NE. Middleground and background from Lava Butte. Little or no visual absorption capability.

Soil -- Essentially none.

Vegetation -- Less than 3% of Area is ponderosa pine (located along the northern boundary); some opportunities for old-growth. The rest is unvegetated or sparsely vegetated lava. Lava-edge ecotone species along edge of flow.

Water Quality -- No surface water. Ground water drains to the north and is probably relatively deep.

Wildlife and Fish -- Minor deer migration over lavas. Suitable bat roosting habitat and osprey nesting habitat, occupancies unknown.

Project Planning Criteria - Lava Butte Zone

Zone-wide Planning Issues:

Areas 3-7

Air Quality -- Some concerns along major automobile traffic corridors and in Lava River Cave. See individual Areas.

Fire Hazard/Risk -- Fire hazard is potentially medium to high in mature ponderosa pine due to brush component and needle castings. Medium to high hazard may occur in black bark units in the future if the brush component/needle castings are not treated.

Geology -- This Zone contains the northernmost eruptive features of Newberry Volcano's NW Rift Zone. The Zone includes Lava Butte (a cinder cone) and associated lava flows, tephra deposits, and non-eruptive fractures. The Lava Butte Flow lies mostly to the west and north of Lava Butte. It is primarily aa with some inflated pahoehoe. The Zone also includes some mafic tephra, spatter cones, pahoehoe flows, and tree molds southeast of Lava Butte.

Heritage Resources -- Significant and sensitive resources occur here. Uninventoried lands are common. High sensitivity and potential for locating significant resources.

Recreation -- This is the interpretive day-use hub for the Monument, the Deschutes National Forest, and the surrounding area. It includes U.S. Highway 97, an interpretive/greeting center (Lava Lands), day-use sites, and trails. Important opportunity to create a stronger connection among the day-use sites in the southern part of this Zone. This would create a more integrated Monument experience, although pedestrian/bicycle crossing of Highway 97 could become a major safety concern. ROS classes: rural, roaded natural, and semi-primitive. Winter use when snow cover is good. Restoration of existing facilities/trails in this Zone is designated as Level 2 priority in the Capital Improvement Program for NNVM; development and expansion of facilities/trails and creating a viable link with the Transition Zone is included in Level 3 priority (USDA Forest Service 1993).

Scenery -- This Zone includes a major travelway corridor (Highway 97) and important panoramic viewpoint (Lava Butte), which makes it highly sensitive.

Soil -- Sensitive tephra soils are associated with Lava Butte and the NW Rift Zone.

Vegetation -- Where vegetated, this Zone is predominately ponderosa pine. Good opportunity for developing old-growth stands in highly visible locations. Overall goal is to reintroduce fire to better approximate natural processes.

Water Quality -- This Zone is in the Kelsey Butte watershed.

Wildlife and Fish -- Deer use vegetated parts in the winter and for migration. Suitable goshawk nesting habitat in unthinned forest, as noted by Area, occupancy unknown. Low snag numbers in ponderosa pine.

Planning Criteria

Area 3

Lava Butte Zone

Area description: This Area is all within a broken aa lava flow. It is fairly flat, with a gentle slope to the north. With the exception of railroad tracks running E-NE near the north end, the Area is unroaded and undeveloped. The vegetation is generally sparse or occurs in clumps on small kipukas.

Key Drivers: none

Secondary Drivers: Geology - Aa lava flow.

Heritage Resources - Potential for sites.

Planning Issues:

Air Quality -- Air is well heated by sunshine on the barren lava flow, especially during long hot summer days.

Heritage Resources -- None of Area is surveyed.

Fire Hazard/Risk -- Hazard is low. Lava is a firebreak; however, risk is moderate because of potential for fire starts in isolated ponderosa pine trees, based on historic lightning occurrence.

Geology -- All is aa lava flow from Lava Butte. Contains some scattered tree molds.

Recreation -- No developed sites or trails. Dispersed recreation throughout, primarily in the winter during good snow years. ROS class: Semi-Primitive.

Scenery -- The entire Area is in the middleground from Lava Butte and is sensitive because it has little or no screening (low absorption capacity). The SE end is foreground for some of the Trail of the Molten Land. Area is also background from Paulina Peak.

Soil -- Essentially none.

Vegetation -- Sparse vegetation (ponderosa pine) on lava flow.

Water Quality -- No surface water. Ground water is deep, so potential for contamination is relatively low.

Wildlife and Fish -- Suitable bat roosting habitat, occupancy unknown.

Planning Criteria

Area 4

Lava Butte Zone

Area description: This Area includes Lava Butte and fairly flat lava flows. Highway 97 and the gasline corridor cross the SE portion, and the railroad crosses the NW portion. Current development is limited to Lava Butte Road and summit. Vegetation is sparse except on some kipukas and near the river.

Key Drivers: Geology & Soils - Lava Butte and associated pahoehoe and aa flows and features. Sensitive riparian soils.

Heritage Resources - Sites occur.

Recreation - Lava Butte summit developed site. Interpretive trails.

Scenery - Viewed from Lava Lands complex, Lava Butte summit, and major travelway corridors (including Highway 97).

Wildlife - Seasonal deer migration. Occupied osprey nesting habitat.

Secondary Drivers: **Vegetation** - Good opportunity for prescribed fire and potential for old-growth ponderosa on the kipukas.

Water Quality - Susceptible to pollution with increasing use near the river.

Planning Issues:

Air Quality -- High traffic, high pollutant potential from auto emissions along Highway 97. Concern about smoke impairing visibility along roadway during forest fires. Air is well heated above barren lavas by sunshine, especially during long, hot summer days.

Fire Hazard/Risk -- Hazard is moderate on kipukas due to large brush component and needle castings. Risk is moderate due to high use by humans. Lava is a fire break, but there is also potential for lightning starts in isolated ponderosa pine trees based on historic occurrence.

Geology -- All mafic lava flows and features. Includes Lava Butte cinder cone along east edge and spatter cones, pahoehoe flows, and non-eruptive fractures in the south finger. The rest is Lava Butte flow (aa and inflated pahoehoe). Scattered tree molds are present in the flows. Opportunities for study and interpretation (e.g. along the NW Rift Zone in the southeast). Concern for protection.

Heritage Resources -- One-fourth of Area is surveyed. Known resources, potential for locating other resources. Opportunities for study and interpretation. Concern for protection.

Recreation -- Contains Lava Butte Look-out day-use site, including the Lava Butte Crater interpretive loop trail. Area also contains the Trail of the Molten Lands interpretive trail, which originates at Lava Lands Visitor Center. Concern for resource protection due to intensive use. Opportunities for expanded interpretive programs/developments (e.g. trails). ROS class: roaded natural.

Scenery -- Lava Butte is a featured viewpoint. The Area is visible in the foreground and middleground from Lava Butte and Lava Lands complex, partly visible foreground and potentially-seen middleground from Benham Falls day-use area, and partly visible background from Paulina Peak. 85% of the Area is currently in the foreground of travelway corridors, including Highway 97, Benham Falls Road (9702), and road to summit of Lava Butte. This percentage is likely to increase. This Area has low visual absorption capacity due to lack of vegetation.

Soil -- Mostly barren lava (95%). Mafic tephra soils and steep slopes on Lava Butte (2-3% of Area). Mazama soils on kipukas and near river in meadows and sagebrush. Moist, riparian soils along the river are especially sensitive to compaction.

Vegetation -- Less than 5% of the Area is vegetated, mostly ponderosa pine and meadow and sagebrush near the river. Opportunities for old-growth ponderosa pine on the kipukas. Lava edge ecotones at flow edge and around the kipukas. Opportunities for interpretation.

Water Quality -- Access to Deschutes River at southwestern tip of Area. Potential for ground water contamination is low, except in the east near the river, where the water table is shallow. Increased human activity in riparian areas could threaten water quality in the river and ponds.

Wildlife and Fish -- Osprey habitat in kipuka in northern end. Deer and elk use the vegetated portions along the river. Some limited deer migration over lava.

Area description: This Area includes Lava Lands Visitor Center, Highway 97 and the gasline corridor. It is fairly flat, roaded and developed.

Key Drivers: Geology & Soils - Lava Butte tephra.

Heritage Resources - Sites and potential for sites.

Recreation - Interpretive trail and main NNVM visitor center.

Scenery - Viewed from Lava Lands complex, Lava Butte summit, and major travelway corridors (including Highway 97).

Vegetation - Existing ponderosa pine old-growth and opportunity for old-growth restoration.

Wildlife - Major seasonal deer migration corridor. Large area with few snags.

Secondary Drivers: Fire Hazard/Risk - High hazard in some parts could threaten Highway 97 and lands outside NNVM.

Planning Issues:

Air Quality -- High traffic, high pollutant potential from auto emissions along the highway. Also, visibility is a concern along roadways during forest fires because of smoke.

Fire Hazard/Risk -- Hazard is medium to high due to brush component and needle castings. Risk is medium because of Highway 97 and high use by humans.

Geology -- Nearly all is covered by mafic tephra deposits from Lava Butte eruption. This tephra contains important stratigraphic information. Opportunity for study and interpretation. Concern for disturbance.

Heritage Resources -- Approximately 50% of Area is surveyed. Opportunities for interpretation and concern for protection. Resources occur, with potential for more.

Recreation -- 5a includes Lava Lands Visitor Center and Trail of the Whispering Pines (interpretive trail). Opportunities for expanded interpretive experiences/programs/developments, including trails. Opportunity for trail to minimize resource damage and accommodate growing use between the visitor center and Benham Falls day-use area in Area 6. This trail should not encourage increased use by providing new activities/experiences. Only dispersed use currently in 5b. ROS classes: roaded natural and rural in 5a, roaded natural in 5b.

Scenery -- This Area is visible in the foreground and middleground from Lava Butte summit and Lava Lands complex. 90% of Area is foreground from travelway corridors: Highway 97, Benham Falls Road and trails. 5a is in the background from Paulina Peak; 5b is not.

Soil -- All mafic tephra, sensitive to compaction and disturbance, except for the far northern part of 5b.

Vegetation -- All ponderosa pine forest, with some unhealthy old-growth present. Primary objective is to enhance/maintain health of existing old-growth. All Area is potential *Castilleja chlorotica* (green-tinged

paintbrush) habitat, but has not been surveyed. Lava-edge ecotone habitat at the boundary of Areas 4 and 5. Recent vegetation management activities have occurred in this Area.

Water Quality -- No surface water. Ground water is deep, so potential for contamination is relatively low. Depth to water table is more than 400' in well at Lava Lands.

Wildlife and Fish -- Area is within a heavily-used deer migration corridor between lava flows. Deer are funnelled through small space. Concern because hiding cover is limited at present. Suitable goshawk nesting habitat, occupancy unknown, in 5b.

Planning Criteria

Area 6

Lava Butte Zone

Area description: This Area contains Lava River Cave, Benham Falls day-use area, Highway 97 and the gasoline corridor (SE) and the railroad (NW). It is vegetated and roaded.

Key Drivers: Heritage Resources - Sites occur.

Recreation - Lava River Cave and Benham Falls day-use areas.

Scenery - Viewed from major travelway corridors (including Highway 97), Lava River Cave, and Benham Falls day-use area.

Soils - Sensitive riparian soils.

Vegetation - Existing old-growth ponderosa pine at recreation sites and along Highway 97. Opportunities for old-growth restoration and reintroducing fire in highly visible areas. Protect/restore riparian communities.

Wildlife - Major seasonal deer migration corridor. Large area with few snags. Protect/restore riparian habitat.

Secondary Drivers: Air Quality - High potential for accumulation of pollutants at times.

Fire Hazard/Risk - High hazard in some parts could threaten Highway 97 or lands outside NNVM.

Geology - Protect and interpret Lava River Cave.

Water Quality - Susceptible to pollution with increasing use along the Deschutes River.

Planning Issues:

Air Quality -- High traffic, high pollutant potential from auto emissions along Highway 97. Concern about smoke impairing visibility along roadway during forest fires. Stagnant air and potential for accumulation of pollutants emitted in Lava River Cave. Also, auto traffic causes fugitive dust emissions on gravel roads, such as the Benham Falls Road.

Fire Hazard/Risk -- Hazard is medium to high due to brush component and needle castings. Risk is medium to high based on high level of human use. Roads to Lava River Cave and Benham Falls are particular concerns.

Geology -- Lava River Cave (lava tube). Pre-Lava Butte river channel is important for completing location survey of cave.

Heritage Resources -- One-third is surveyed. Resources occur here. Potential for locating other resources. High sensitivity, as well as potential for interpretation.

Recreation -- Developed sites: Lava River Cave and Benham Falls day-use areas. Includes underground cave trail. Opportunity for summer trail to minimize resource damage and accommodate growing use between Benham Falls day-use area and the Lava Lands complex in 5a. This trail should not encourage increased use by providing new activities/experiences. ROS class: roaded natural.

Scenery -- Whole Area is in foreground of travelway corridor viewsheds: Highway 97, Benham Falls Road (9702), trails, and Deschutes River. Includes foreground from Lava River Cave and Benham Falls day-use area, middleground from Lava Butte summit, and background from Paulina Peak.

Soil -- Wet, riparian soils (including meadows) adjacent to river at Benham Falls Day Use Site. Some steep slopes near Benham Falls. All soils are Mazama or alluvial.

Vegetation -- All ponderosa pine forest. Old growth present, including at Benham Falls and Lava River Cave day-use areas. Opportunities for restoration/enhancement of existing old growth and prescribed fire in blackbark near Lava River Cave and Benham Falls. All of Area is potential *Castilleja chlorotica* (green-tinged paintbrush) habitat, but has not been surveyed. Riparian species at Benham Falls day-use area. Lava-edge ecotone where Area 4 abuts Area 2. Recent vegetation management activities have occurred in this Area. Particular ongoing concern for hazard trees at Benham Falls and Lava River Cave day-use areas.

Water Quality -- NW end has access to Deschutes River at Benham Falls day-use area. Concerns for impacts to river water quality. Potential for ground-water contamination is highest near the river, where the water table is shallow. Ground water is deep and potential for contamination is much lower in rest of Area. Test water well drilled at a formerly-proposed Benham Falls campground in 1979 yielded sulfur-tasting water.

Wildlife and Fish -- Elk winter range near river in vegetated portions. Area is within a heavily-used deer migration corridor between lava flows. (Deer are funnelled through small space.) Hiding cover is limited at present. Bats use the east tube of Lava River Cave in summer. Bats hibernate in the west tube from fall to spring. About half of Area is suitable goshawk nesting habitat, occupancy unknown. Willows along Deschutes River are used by migrating song birds during nesting and migration. Restore snags for white-headed woodpeckers and flammulated owls.

Planning Criteria

Area 7a & b

Lava Butte Zone

Area description: Vegetated, flat, and roaded but otherwise undeveloped Area bordered on the southeast by lava.

Key Drivers: Wildlife - Major seasonal deer migration corridor. Large area with no snags.

Secondary Drivers: Geology - NW Rift Zone fracture.

Heritage Resources - Sites occur. Potential for other sites.

Scenery - Partly foreground from NNVM loop road.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- Hazard is moderate based on brush component and needle castings. Risk is moderate due to roaded access (moderate use by humans).

Geology -- Provides views of thick aa flow edges. 7b includes a segment of the non-eruptive fractures related to the NW Rift Zone.

Heritage Resources -- 50% is surveyed (7a - 100% surveyed, 7b - none surveyed). Resources occur, with potential for locating more.

Recreation -- No existing trails or developments. Possible siting of NNVM Trail and/or interpretive trail in Area 7a. ROS class: roaded natural.

Scenery -- Eastern edge of 7b is in the foreground viewshed from 9710 (NNVM loop road). All of 7 is middleground from Lava Butte. 7a is background from Paulina Peak; 7b is not.

Soil -- Some steep (sensitive) slopes on butte in 7a. All Mazama soils.

Vegetation -- All ponderosa pine forest. Opportunity to evaluate existing old growth. Whole area is *Castilleja chlorotica* (green-tinged paintbrush) habitat. Lava-edge ecotone occurs adjacent to Transition Zone. Recent vegetation management activities have occurred in this Area.

Water Quality -- No surface water. Ground water is deep, so potential for contamination is relatively low.

Wildlife and Fish -- All is potential future goshawk nesting habitat. 7a is currently suitable but unoccupied goshawk nesting habitat. Area is within heavily-used deer migration corridor between lava flows. (Deer are funnelled through small space.) Deer winter and transition range in 7b. Restore snags for white-headed woodpeckers and flammulated owls.

Project Planning Criteria - Transition Zone

Zone-wide Planning Issues:

Areas 8-16

Air Quality -- Safety concerns if visibility is impaired by smoke along roadways. Automobile traffic also causes fugitive dust emissions on native-surface and gravel roads. This is particularly a concern along the proposed Monument loop road. Air directly above barren lava flows is well-heated on sunny summer days.

Fire Hazard/Risk -- Approximately 1/4 to 1/3 of this Zone has medium to high fire hazard potential due to mortality levels, brush component, and needle castings. Zone has medium to high potential for lightning strikes.

Geology -- Wide variety of basaltic lava and tephra features associated with the NW Rift Zone of Newberry Volcano.

Heritage Resources -- Significant and potentially significant resources occur here. Uninventoried lands are common. High sensitivity and potential for locating significant resources. Zone contains a variety of historic and prehistoric sites, for example railroad grades and lithic scatters.

Recreation -- Lava edges and geologic features provide opportunities for interpretation and trails. This Zone is proposed to act as a secondary day-use/interpretive hub, expanding from the opportunities in the Lava Butte Zone. Day-use interpretive areas would be easily accessible from the Lava Butte Zone by the Monument trail and NNVM scenic loop road. ROS classes: roaded natural and semi-primitive. Monument trail will likely pass through all areas except 10 and 11. Loop road will consist of existing roads: 9710 north of Mokst Butte and all of 9720 within the Monument. See Activity Schedule for the priorities of development and restoration in this Zone according to the Capital Investment Program for NNVM (USDA Forest Service 1993).

Scenery -- Considerations for viewsheds along proposed NNVM trail, other trails, and scenic loop route, and at recreation sites. (See Recreation above and VQO map.) New facilities and trails will increase the visual sensitivity of this Zone.

Soil -- Some areas of sensitive mafic tephra associated with the NW Rift Zone. Steep slopes on cinder cones.

Vegetation -- This Zone has the greatest variety of vegetation communities within NNVM. Gradation from PP in north (lower elevations) to LP in south (higher elevations). Relatively unique communities of willow and/or aspen are common near lava edges. All areas except 1a have had recent vegetation management activities. Overall goal is to reintroduce fire to better approximate natural processes.

Water Quality -- No perennial surface water in this Zone. The Transition Zone officially falls in two different watersheds: Kelsey Butte and Lava Cast. Ground water is deep, so potential for contamination is relatively low.

Wildlife and Fish -- Lots of habitat diversity here. Water sources at flow edges, where precipitation collects in crevices and pockets. Lava flows act as important barriers to land migration of animals such as deer. East-west deer movement is important in vegetated corridors. Suitable goshawk nesting habitat is present over vegetated areas throughout this Zone. Suitable American marten habitat is present in vegetated areas in southern half of this Zone.

Area Description: Area composed entirely of sparsely vegetated thick, blocky aa lava flows. Basically undeveloped and unroaded, except for powerline corridor. 8A includes approximately 505 acres of state-owned land in the northwest.

Key Drivers: Heritage Resources - Sites occur.

Scenery - High visibility, lack of screening

Secondary Drivers: Geology - All is aa lava flow.

Recreation - NNVM trail would probably cross this area.

Vegetation - Good opportunities for reintroducing fire.

Planning Issues:

Air Quality -- See Zone-wide.

Fire hazard/Risk -- Low hazard. This area serves as a firebreak, but also has a high potential for lightning starts in isolated ponderosa pine, based on historical occurrence.

Geology -- Thick, blocky aa flow. Not an area of high concern/sensitivity. Potential for geologic interpretation along NNVM trail, depending on route.

Heritage Resources -- Area is 10% surveyed. Little concern or opportunity in interior of flows. Resources occur.

Recreation -- Do not develop in the south, close to the RNA. Potential for NNVM trail to cross this area. ROS classes: 8a - mostly semi-primitive, some roaded natural; 8b - roaded natural.

Scenery -- Entire Area 8 is highly sensitive because it has low visual absorption capacity with little to no screening. Northern 2/3 of 8a is middleground from Lava Butte; the rest is background from Lava Butte. Eastern edge of 8a is foreground for 9710 (proposed NNVM loop road); western edge is mostly foreground for 9723 in Area 9 and possibly for NNVM trail. The western 1/5 of 8a is in the background from Paulina Peak. Area 8b is background from Lava Butte; a portion in the southeast is middleground from Lava Cast Forest. All of 8b is foreground for 9723 in Area 9.

Soil -- Essentially none.

Vegetation -- Small "bonsai" PP (patches along western edges) and other scant vegetation. Protect unique vegetation forms. Potential for prescribed or prescribed natural fire.

Water Quality -- See Zone-wide.

Wildlife and Fish -- Limited migration of ground animals over lava. Unknown potential for bat habitat in small caves.

Area description: This area is a roaded, vegetated peninsula surrounded almost entirely by the lava of Areas 8 and 12. It includes two vegetated buttes, but is generally flat. Powerline corridor crosses NNVM at the northern end.

Key Drivers: Vegetation - Maintain and restore existing old-growth ponderosa pine ecosystem.

Wildlife and Fish - Large area with few snags.

Secondary Drivers: Heritage Resources - Sites occur.

Recreation - Potential future recreation/interpretive site(s) and NNVM trail.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- Medium hazard due to brush component and needle castings in ponderosa pine and on the buttes. Adjacent lava flows provide good fire break.

Geology -- No features of special interest.

Heritage Resources -- Area is 95% surveyed. Resources occur.

Recreation -- High potential for future development in all but southern end, which is close to the RNA. Proposed NNVM trail would probably run the length of this area. ROS class: roaded natural.

Scenery -- Foreground viewing for potential new day-use recreational site and NNVM Trail. Northern 1/4 is middleground from Lava Butte; a portion is background from Lava Butte. Potential new travelway corridor viewshed for access to any new recreation site(s). Sensitivity of this Area will increase with any new development; scenery could also become a key driver.

Soil -- All Mazama soils. Steep slopes (sensitive) on two buttes and at the southeast end.

Vegetation -- Mostly ponderosa pine (55%) and mixed pine (30-35%); southern end is lodgepole (10-15%). Opportunity to evaluate, enhance and maintain old-growth ponderosa pine (already old-growth on buttes). Good opportunities for prescribed fire.

Water Quality -- See Zone-wide.

Wildlife and Fish -- Restore snags for white-headed woodpeckers and flammulated owls. Known forage area for goshawk. Area contains unoccupied suitable goshawk nesting habitat and future suitable goshawk nesting habitat.

Area description: Flat, roaded, vegetated strips between Road 9710 and lava flow of Area 8a.

Key Drivers: Heritage Resources - Sites occur.

Scenery - Viewed from a major travelway corridor (proposed NNVM loop road).

Wildlife - Large area with few snags.

Secondary Drivers: Recreation - Potential future day-use area.

Vegetation - Potential for prescribed fire and old-growth ponderosa pine.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/risk -- Low hazard due to past vegetation management activities. Risk is moderate due to proximity to proposed scenic loop route (9710).

Geology -- No features of special interest.

Heritage Resources -- 10a is mostly unsurveyed; 10b has been surveyed. Resources occur, with potential for locating more.

Recreation -- Potential for development of a wayside/day-use/interpretive area accessible from Road 9710 (scenic loop). ROS class: roaded natural.

Scenery -- All in foreground of travelway corridor for Road 9710 (proposed NNVM loop route). 10a is visible in the middleground and 10b is in the background from Lava Butte.

Soil -- All Mazama soils.

Vegetation -- 10a is ponderosa pine (50% of total area 10), 10b is lodgepole (50%). Potential for old-growth ponderosa pine in 10a.

Water Quality -- See Zone-wide.

Wildlife and Fish -- Goshawk habitat throughout. Deer use is probably high because of proximity to Lava Butte migration corridor. Area is lacking large diameter snags in ponderosa pine. Suitable American marten habitat, occupancy unknown, in 10b.

Area Description: This area is mainly flat, except for one large cinder cone (Ikt Butte) at north end. It is forested and roaded.

Key Drivers: Geology & Soils - Mokst Butte tephra deposits.

Heritage Resources - Sites occur.

Scenery - Viewed from a major travelway corridor (proposed NNVM loop road).

Vegetation - Maintain and restore existing old-growth ponderosa pine ecosystem.

Secondary Drivers: Recreation - Potential for future day-use area.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- Potentially medium hazard due to brush component and needle castings in ponderosa pine. Moderate risk along Road 9710 (loop route).

Geology -- Portion south of Ikt Butte is all covered by mafic tephra from Mokst Butte. This Mokst Butte tephra, along with the underlying lava and tephra, is especially important for stratigraphic information.

Heritage Resources -- Half of the area is surveyed. Resources occur, with potential for locating more.

Recreation -- Borders route of proposed NNVM scenic loop. Area already contains and is bordered by roads. Potential for future recreation site/wayside in conjunction with scenic loop. Do not develop or encourage use along the southern boundary because of the RNA. ROS classes: semi-primitive and roaded natural.

Scenery -- Eastern part is foreground from Road 9710 (part of proposed NNVM scenic loop route). Background viewshed from Lava Butte.

Soil -- Sensitive mafic tephra soils south of Ikt Butte. Other soils are Mazama. Sides of butte are also sensitive (steep).

Vegetation -- Mostly dense, young mixed pine (80%), plus a couple hundred acre patch of ponderosa (25%). Another 15-25% is lava and other areas of sparse vegetation. Some big trees on Ikt Butte. Much of the mixed pine apparently has resulted from lodgepole encroachment into ponderosa pine, due to fire suppression.

Water Quality -- See Zone-wide.

Wildlife and Fish -- May have high concentrations of deer funneled between lava flows. Suitable American marten and goshawk nesting habitats throughout area, occupancies unknown.

Area Description: This is the Mokst Butte Research Natural Area (RNA), which was designated because of its white fir ecosystem on a cinder cone and its young lava flow. About two-thirds is lava. This area contains two buttes and a variety of vegetation types. Science and research are encouraged as per the RNA establishment report.

Key Drivers: Geology - Spatter cones, cinder cones, tephra.

Heritage Resources - Sites occur.

Vegetation - For study and protection of variety of communities.

Secondary Drivers: Recreation - Easement in west for NNVM trail.

Wildlife - Suitable goshawk nesting habitat.

Planning Issues:

Air Quality -- See Zone-wide.

Fire hazard/Risk -- Potentially high hazard in southern tip, based on mortality, aspect, and slope of adjacent area (Area 14). Potentially medium hazard in the rest of Area 12, due to multi-storied mixed vegetation, including brush, needle castings, and ladder fuels. Risk of lightning starts is moderate.

Geology -- Thick, blocky aa flows in lava areas. Vent area (N. of Mokst Butte) includes spatter cones. There are two prominent cinder cones of different ages. (Mokst Butte is post-Mazama.) Area also includes important mafic tephra stratigraphy in the northeast, equivalent to that in Area 11. Scattered tree molds.

Heritage Resources -- Same as Area 11, except 70% is unsurveyed.

Recreation -- Recreational activities will not be directed here. No road development. Pursue potential for NNVM trail easement across western tip. ROS class: semi-primitive.

Scenery -- Foreground for travelway corridors: 9710, 9720, 9723, and proposed NNVM Trail. Three patches (south sides of buttes and adjacent to Area 8b) are potentially seen middleground from Lava Cast Forest. Background from Lava Butte.

Soil -- Sensitive mafic tephra covers about one-third of the area in the northeast. Steep (sensitive) slopes on buttes.

Vegetation -- Wide variety: approximately 55% lava with sparse ponderosa pine, 35% mixed pine, 5-10% ponderosa pine, <5% lodgepole pine. Potential for old-growth mixed conifer or ponderosa pine. Lodgepole pine and white fir have encroached into this area due to fire suppression.

Water Quality -- See Zone-wide.

Wildlife and Fish -- South tip of area is part of deer migration corridor (Area 14). Suitable American marten and goshawk nesting habitat in vegetated areas, occupancies unknown.

Area description: This area is vegetated and mostly flat, with some road access.

Key Drivers: Scenery - Seen from major travelway corridors (including proposed NNVM loop route) and possible future recreation site(s).

Secondary Drivers: Heritage Resources - Sites occur.

Recreation - Potential for NNVM trail and educational group camp.

Vegetation - Potential for prescribed fire and old-growth ponderosa pine near NNVM trail and/or educational group camp.

Wildlife - Protect/restore mixed conifer habitat. Suitable goshawk nesting habitat.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- Hazard is generally low in ponderosa pine, moderate in mixed pine based on brush, needle castings, and ladder fuels.

Geology -- No features of special interest.

Heritage Resources -- Area is completely surveyed.

Recreation -- Potential site of group camp for education/research/interpretive groups. Opportunity for NNVM trail, probably in the southeast. Do not develop this area too close to the RNA boundary. ROS class: roaded natural.

Scenery -- Background viewing from Lava Butte. Southwest third is in foreground of Road 9720 corridor. Northeast third is foreground for 9723. Probable future foreground for NNVM Trail and educational group campsite.

Soil -- All Mazama soils. Some steep (sensitive) slopes in the southeast.

Vegetation -- Mixed pine (65%) and ponderosa pine (20%) areas have potential for old-growth ponderosa pine development. Mixed pine is apparently the result of encroachment of lodgepole into ponderosa stands. A patch of pine/fir (15%) exists as well.

Water Quality -- See Zone-wide.

Wildlife and Fish -- Potential for high use by deer during seasonal migration. Suitable goshawk nesting habitat in about half of the Area, occupancy unknown. Suitable American marten habitat throughout, occupancy unknown.

Area description: This area is a primary pass-through corridor between lava flows for animals and people. It is mostly vegetated, roaded, and fairly flat. It includes the Lava Cast Forest day-use area.

Key Drivers: Fire Hazard/Risk - Medium to high. May threaten human safety and wildlife corridor.

Geology - Sensitive lava flow features

Heritage Resources - Sites occur.

Scenery - Seen from day-use area and major travelways, including proposed NNVM loop route.

Wildlife - Major migration corridor.

Secondary Drivers: Recreation - Lava Cast Forest day-use area and trails. Proposed NNVM Trail.

Vegetation - Potential for prescribed fire and old-growth ponderosa pine.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- High hazard in the east (lodgepole and some mixed pine), based on mortality, aspect, and slope. Moderate hazard in rest of area due to multi-storied (fuel ladder) character of stands. Risk is moderate based on historical lightning occurrence and increased use of the area by humans.

Geology -- Small pahoehoe lava flow (Forest Road Flow) in center of area includes tree molds and vent area features. North end of Lava Cast Forest Flow (tree molds) is also in this area. On east side (within loop of Road 560) is a group of older spatter cones. Northeast corner (north of Road 9710) is mafic tephra from Mokst Butte. A narrow zone east of the Forest Road Flow is also covered with mafic tephra.

Heritage Resources -- Same as Area 11, except 20% is surveyed.

Recreation -- Contains one developed day-use site, Lava Cast Forest, including the northern part of its paved interpretive loop trail. Also includes the northern half of Hoffman Island Trail. Potential for expanded development at Lava Cast Forest or a new site. Provide for NNVM trail access across western part. Do not develop or encourage use along the northern edge of this area because of the RNA. ROS class: roaded natural.

Scenery -- Foreground viewshed all around Lava Cast Forest (includes Road 950). Majority of area is in foreground of travelway corridors for 9720 and 9710 (proposed scenic loop road). Western 1/3 is visible in the background from Lava Butte.

Soil -- Sensitive in northeast corner (N. of Road 9710) and N. of Lava Cast Forest (tephra deposit from Forest Road Flow). Steep slopes on two small buttes. Other areas are Mazama (less sensitive).

Vegetation -- Lodgepole pine makes up 35% of the area, occurring in the east and as a small patch along western edge. Mixed pine (45% of area) occurs in west, southeast, and northwest corner. Main butte has ponderosa pine and white fir on N. side (5% of area), ponderosa pine (<5% of area) on S. side. The other 10-15% is lava and other areas of sparse vegetation. Lodgepole has commonly encroached into

ponderosa pine due to fire exclusion. Opportunities for old-growth ponderosa pine and prescribed fire, especially on butte. Particular ongoing concern for hazard trees at lava Cast Forest.

Water Quality -- See Zone-wide.

Wildlife and Fish -- Important deer migration corridor. Suitable goshawk nesting habitat in about 30% of the Area, occupancy unknown. Quality of habitat is degrading as dead trees fall down. Suitable American marten habitat throughout, occupancy unknown.

Planning Criteria

Area 15a & b

Transition Zone

Area description: This area is basically flat and vegetated, with currently high tree mortality. It is unroaded, except for Rd. 9735 along southern edge and Road 9710 along the east. Area 5b is the Transferal Corridor, an powerline easement for potential future geothermal development.

Key Drivers: Geology - Sensitive lava features.

Fire Hazard/Risk - High in most of Area. May threaten areas outside NNVM.

Secondary Drivers: Heritage Resources - Sites occur.

Wildlife - Suitable goshawk nesting habitat.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- About 75% of area has high hazard based on mortality, aspect, and slope. Risk is moderate based on historical lightning occurrences and road access in east and south.

Geology -- Spatter cones (sensitive features) along western edge. Small lava flow and vents crossed by Road 9735. Area of stratigraphically significant tephra on west side, widening southward.

Heritage Resources -- None of the Area has been surveyed. Resources occur, with potential for locating more.

Recreation -- Potential for trail development (e.g. interpretive trails and eventual "phase 2" NNVM trail link from Lava Cast Forest to Rim trail). Snow-play areas are located at the southeast corner of 15a and eastern edge of 15b. ROS classes: 15a is semi-primitive and roaded natural. 15b is roaded natural.

Scenery -- Part of the south end is background viewing from Lava Butte. Foreground of travelway corridors: Roads 9710, 9735, and potentially for NNVM trail.

Soil -- Sensitive mafic tephra soils in the west. Eastern part is Mazama (less sensitive).

Vegetation -- Mostly mixed pine (60%) and lodgepole (35%), with a little ponderosa pine (5%). Denser vegetation in eastern part (Mazama soils). Some potential for old-growth ponderosa pine, potentially visible from NNVM Trail. Lodgepole pine is encroaching on ponderosa in mixed pine. 15b is all lodgepole pine.

Water Quality -- See Zone-wide.

Wildlife and Fish -- Deer migration corridors along north and south edges. About 20% of 15a and 90% of 15b is suitable goshawk nesting habitat, occupancy unknown. Suitable American marten habitat throughout area, occupancy unknown.

Planning Criteria

Area 16a & b

Transition Zone

Area description: This area is primarily lava with diversely vegetated islands. Unroaded, mostly flat with lots of buttes and westward slope in middle section. Area 6B is the Transferal Corridor, a powerline easement for potential geothermal development.

Key Drivers: Geology - Sensitive lava-flow features.

Wildlife - Protect/restore mixed conifer habitat.

Secondary Drivers: Recreation - Includes part of Lava Cast Forest interpretive trail. Potential for more interpretive trail development and NNVM trail here.

Heritage Resources - Sites occur.

Scenery - Partly foreground for interpretive trail.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- High hazard in lodgepole on isolated island on east side of butte, based on mortality, slope, and aspect. Medium hazard in ponderosa pine and mixed pine due to brush component, needle castings, and multi-storied ladder fuels. Risk of lightning starts is moderate.

Geology -- Important and sensitive area. Lava flows are thinner and more pahoehoe-like than in most of the rest of NNVM. Flows in this area are the Lava Cascade Flow and the Lava Cast Forest Flow. Features: tree molds, spatter cones and spatter ramparts on east side, narrow lava cascades between buttes, "bath-tub rings" of lava on sides of buttes, and many kipukas of varying sizes.

Heritage Resources -- Mainly unsurveyed, except for 10% of 16a. Resources occur, with potential for locating more.

Recreation -- Potential for trail development (e.g. interpretive trails, eventual NNVM trail link to Rim trail). Opportunities for unroaded, dispersed experiences in 16a. Snow-play area exists at eastern edge of 16b. ROS classes: roaded natural on Lava Cast Forest Flow (northern 15% of Area), semi-primitive on Lava Cascades Flow (south 85% of Area).

Scenery -- Much is foreground from Lava Cast Forest. Parts are also background from Lava Butte. West peninsula is in the background from Paulina Peak. Foreground for travelway corridors: Roads 9720 on north, 9735 on south. Foreground viewsheds for trails in Lava Cast Forest area; potential visibility from new trails.

Soil -- Sensitive on steep slopes (sides of buttes), otherwise not a high concern. Soil types are Mazama.

Vegetation -- Varied communities: pine/fir (10%), lodgepole (5-10%), mixed conifer (5-10%)(island), ponderosa pine (5-10%), sagebrush (<5%), hemlock at south end, some mixed pine (10%) in SW corner.

Potential for prescribed fire and old-growth ponderosa pine on buttes, potentially visible from NNVM trail. Rest of area (55%) is lava. High fire hazard in lodgepole only on isolated island on East side of butte.

Water Quality -- See Zone-wide.

Wildlife and Fish -- Mixed conifer is important habitat for diverse species. Key known goshawk foraging areas in SW corner. Some future suitable goshawk nesting habitat. Some suitable American marten habitat, occupancy unknown. Area lies between and separates two major E-W seasonal migration corridors.

Project Planning Criteria - Flanks Zone

Zone-wide Planning Issues:

Areas 17-26

Air Quality -- Air circulation is controlled largely by slope. Air tends to flow upslope in the morning and downslope in the evening. No portion of the Zone is of particularly high concern.

Fire Hazard/Risk -- Many parts of the Flanks have high fire hazard due to steep slopes and medium to high mortality conditions.

Geology -- This Zone includes the upper flanks of Newberry volcano and part of the NW Rift Zone.

Heritage Resources -- High concentrations of sensitive and significant resources occur, as well as high concentrations of potentially significant resources. 90% of Zone is unsurveyed, of which 50% has a high probability of locating significant resources. The remainder has a medium probability.

Recreation -- The Flanks Zone provides opportunities for semi-primitive hiking and self-discovery type interpretation. All winter trails are currently orange diamond (used mainly by snowmobiles). All of this Zone is in the semi-primitive ROS class, non-motorized during the summer, and motorized (over-the-snow vehicles only) during the winter. New trail development should be located 1/4 - 1/2 mile from perimeter roads, in order optimize potential for semi-primitive experiences. See Activity Schedule for the priority of restoration/improvements in this Zone according to the Capital Improvement Program for NNVM (USDA Forest Service 1993).

Roadless Areas -- The Flanks is 90-95% unroaded. Areas 17-22 include most of the North Paulina Roadless Area. Areas 23 and 24 include the South Paulina Roadless Area. (See Roadless Area map in FEIS Chapter 3.) Geothermal development could potentially enter some of this Zone (i.e. the Transferal Area) with roads in the future. Otherwise, the intent is to maintain the roadless character within unroaded parts of the Flanks Zone.

Scenery -- Newberry Volcano's high flanks are a significant regional landform, viewed in the background from nearby communities and vista points. Travelway corridors within this Zone include: perimeter roads along the NNVM boundary, the Rim trail, the Swamp Wells trail, and numerous orange-diamond (motorized) winter trails. See individual Areas for recreation-site viewsheds.

Soil -- Most are Mazama soils, except in the east.

Vegetation -- This Zone is almost completely forested. The vegetation type is mostly lodgepole pine, with substantial amounts of mountain hemlock and mixed conifer and lesser amounts of mixed pine and ponderosa pine. The overall goal is to reintroduce fire to these ecosystems to better approximate natural processes.

Water Quality -- This Zone has no surface water, but is part of the following watersheds: Lava Cast, Arnold, Orphan, Devils Garden, Long Prairie, and Paulina. Surface drainage is away from the caldera. Ground water is deep, so potential for contamination is relatively low.

Wildlife and Fish -- This Zone is important wildlife habitat because it is mostly roadless, relatively undisturbed and unfragmented. If large portions of the Zone burn, the rest should be protected with fire suppression. Most of the Flanks Zone is suitable goshawk nesting habitat, occupancy unknown. Unoccupied suitable peregrine falcon nesting habitat is adjacent to this Zone (see Area 29, Caldera Zone). All vegetated parts of the Flanks are also occupied American marten habitat. The Zone also contains some summer range for deer and elk.

Area description: This Area on the western flank of the volcano is predominately roadless and near the proposed geothermal project sites. Kawak Butte and several other buttes and knobs are included in this Area. About half of this Area, along the southwest side, is in the Special Management Area.

Key Drivers: Fire Hazard/Risk - High hazard in about half of Area may threaten lands outside NNVM and scenic resources.

Heritage Resources - Resources occur.

Scenery - Seen from Paulina Peak; managed for retention; scenic quality is threatened/declining.

Secondary Drivers: Recreation - The potential sno-park nearby (associated with geothermal development).

Wildlife - Daily deer movement to water in southern end. Suitable goshawk nesting habitat.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- Potentially high hazard in approximately 50% of the Area, based on mortality, slope, and aspect. Risk potential will rise with increased human activities related to adjacent geothermal development. Wildfires could create openings visible from Paulina Peak.

Geology -- Pre-Mazama lava flows and cinder cones. Ashflows in the south.

Heritage Resources -- 15% is surveyed. Resources occur, with potential for locating more.

Recreation -- The Rim trail forms the southeast boundary. Two orange diamond trails cross this Area: one along the rim, and the other across the southern third. Area is adjacent to potential sno-park associated with geothermal development. A snow-play area is located in the eastern portion of Area.

Scenery -- 90% of Area is middleground and 10% is background from Paulina Peak. Northern half of the Area is middleground and background from Lava Cast Forest. 20% of Area is background from Lava Butte. Area is also seen from Highway 97 and the Cascade range. Foreground travelway corridor viewsheds from three trails comprise 90% of the Area. Scenery is managed for retention (see VQO map) and is declining due to high forest mortality. Screening of geothermal developments from Paulina Peak and from within Area 17 are critical concerns.

Soil -- Some scattered, steep (sensitive) slopes occur in this Area. All soils are Mazama type.

Vegetation -- Forest types are mainly lodgepole (80%), with scattered mountain hemlock along the north and east (15%) and minor amounts of mixed conifer and mixed pine (<5% each) in the northwest and southwest. Contains two large patches of med-high mortality, one in the north and one in the center on the west side. TES plant species are not a known concern except for small patches of potential BOPU (pumice grapefern) habitat on butte in NW and along northeast boundary.

Water Quality -- See Zone-wide.

Wildlife and Fish -- About half the Area is suitable goshawk nesting habitat, occupancy unknown. Elk use all except the highest elevations for summer range. Deer migrate through the southern portion near the portal and creek. Some mixed conifer habitat occurs in the northwest corner and west near Kawak Butte.

Planning Criteria

Area 18

Flanks Zone

Area description: This Area is almost entirely roadless. It is located on the north flank of the volcano, including North Paulina Peak on the south and a butte at the northwest end. Less than a quarter mile of unimproved road enters the Area in the northwest end. The Area has varied topography including many steep slopes. Some of the eastern part and a small portion in the west is in the Transferal Area Adjacent.

Key Drivers: Geology - Sensitive lava features.

Secondary Drivers: Heritage Resources - Probability of locating sites.

Vegetation - Trail cuts through potential BOPU habitat.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- Low.

Geology -- Lava, tree molds, spatter features, and mafic tephra of the NW Rift Zone run N-NW through the Area. Tephra also occurs in the NW corner.

Heritage Resources -- None of the Area has been surveyed. Resources occur, with potential for locating more.

Recreation -- The highest elevation boundary is the Rim Trail. Swamp Wells trail meanders N-S near the eastern boundary. The winter version of the Rim trail is with this Area at a lower elevation than the summer Rim trail. Road 9710 is also a winter trail. The Area also includes the majority of the North Peak snow-play area and parts of two smaller snow-play areas. Potential for eventual NNVM trail link to Rim trail through this Area.

Scenery -- The Area is middleground and background from Lava Cast Forest in the northern half. About 2/3 of the Area is background of the Lava Butte viewshed. Except for one or two high points, this Area is excluded from the Paulina Peak viewshed. Travelway corridor viewsheds include the geothermal Transferral Corridor, the Swamp Wells trail in the east and the Rim Trail in the south.

Soil -- Sensitive mafic tephra soils occur in the NW and NE corners and along the eastern side of the NW Rift Zone vents. Other soils are Mazama. Steep (sensitive) slopes are common, especially in the northwest. Some barren lavas occur in the south and north, along the NW Rift Zone.

Vegetation -- The vegetation type is mostly (60%) mountain hemlock, with the rest predominately lodgepole pine. Less than 5% mixed pine and mixed conifer in the northwest. About 5% of the Area is unvegetated lava. Old-growth ponderosa pine is present in a few small patches. Very little of the Area has medium to high mortality. Potential BOPU (pumice grapefern) habitat occurs in about one-third of the Area north of North Paulina Peak, including along the Swamp Wells trail. Lava-edge ecotones occur in the north.

Water Quality -- See Zone-wide.

Wildlife and Fish -- Almost the entire Area is elk summer range. A bit of mixed conifer habitat occurs on the north side of the butte in the northwest corner of the Area. Suitable goshawk nesting habitat, occupancy unknown, in the northern 3/4 of the Area.

Planning Criteria

Area 19

Flanks Zone

Area description: This Area is the northeast corner of the Zone. It is forested, roadless and relatively flat. Road 9710 forms the northeastern boundary. The Transferal Corridor borders the Area on the northwest.

Key Drivers: Fire Hazard/Risk - High. Fire could threaten lands outside NNVM.

Secondary Drivers: Geology & Soils - Tephra deposits.

Heritage Resources - Probability of locating sites.

Wildlife - Suitable goshawk nesting habitat.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- Potentially high hazard throughout, based on mortality, slope, and aspect. Moderate risk of human-caused fire due to proximity to roads.

Geology -- The western portion is covered by mafic tephra. Other parts include buried tephra.

Heritage Resources -- None of the Area has been surveyed.

Recreation -- Road 9710 is a winter trail. Potential for "phase 2" of NNVM trail to pass through this Area.

Scenery -- A small part in the south is middleground and background from Lava Cast Forest. Two-thirds of the Area is visible in the background from Lava Butte. Almost the entire area is in visible in the foreground from travelway corridors of moderate sensitivity (Roads 9735 and 9710).

Soil -- Sensitive mafic tephra soils throughout much of the Area.

Vegetation -- Nearly all of the Area is lodgepole pine forest, bordered by mountain hemlock along the southwestern edge. About half of the Area (mostly in south and west) is potential BOPU (pumice grapefern) habitat. A small patch of lava-edge ecotone occurs in the southeast.

Water Quality -- See Zone-wide.

Wildlife and Fish -- The southern third is elk summer range.

Area description: This forested, roadless part of the northeast flank of the volcano has many steep slopes. It includes all of the Transferal Area, which may have geothermal development in the future, and parts of the Transferal Area Adjacent.

Key Drivers: Heritage Resources - Sites occur.

Wildlife - Protect/restore mixed conifer habitat.

Secondary Drivers: Fire Hazard/Risk - High in some portions. Fire could threaten lands outside NNVM.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- Potentially medium to high hazard in about 45% of the Area, based on mortality, slope, and aspect. Risk is moderate along north and east edges due to access along Road 9710.

Geology -- About a quarter of the Area in the northwest is mafic tephra. Also a slight bit of silicic tephra may occur along the southern edge.

Heritage Resources -- None of the Area has been surveyed. Resources occur, with potential for locating more.

Recreation -- The Swamp Wells trail meanders into this Area in a couple places along its western boundary. A winter trail crosses through the western half and Road 9710 is also a winter trail. The Area contains a small snow-play area on the NW edge.

Scenery -- The western half is in the background of the Lava Butte viewshed. About half the Area is in moderately sensitive travelway corridor viewsheds of Road 9710 and another winter trail. None of this Area is potentially visible from Paulina Peak.

Soil -- Approximately half of the Area has steep (sensitive) slopes. Nearly all soils are Mazama.

Vegetation -- About 65-70% of the Area is lodgepole pine, about 20% is mixed conifer, 5% is mixed pine, and less than 5% is hemlock. Some very small patches of old-growth ponderosa pine are present also. About 30% of the Area, mostly in lodgepole, is affected by medium to high mortality. About half of the Area along the SW edge is BOPU (pumice grapefern) habitat, including along the Swamp Wells Trail. Two small patches of lava-edge ecotones occur in the north and west. Concern about advanced tree regeneration in snow-play areas.

Water Quality -- See Zone-wide.

Wildlife and Fish -- Suitable goshawk nesting habitat, occupancy unknown, is present in the higher elevations. Elk use about 95% of the Area (all except the south end). The portion adjacent to the Paulina Fire provides hiding and thermal cover for big game using the burned area. A large patch of mixed conifer habitat occurs in the center and south. Concern for ponderosa pine and white fir in the mixed conifer.

Area description: This part of the eastern flank of the volcano is characterized by silicic tephra soils. It is essentially roadless, only Road 840 passes through (about a half mile) in the south. The Area includes parts of the Special Management Area in the east and south, and a small portion of the Transferal Area Adjacent in the northwest.

Key Drivers: none

Secondary Drivers: Geology & Soils - Tephra deposits.

Heritage Resources - Sites occur.

Wildlife - Protect/restore mixed conifer habitat.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- Low to moderate hazard potential based on mortality, aspect, and slope.

Geology -- Whole Area is covered by silicic tephra, which is mostly from the BOF eruption in the south and the Interlake eruption in the north.

Heritage Resources -- None of the Area has been surveyed. Resources occur, with potential for locating more.

Recreation -- The highest elevation boundary is the Rim Trail. The southern and part of the eastern edge is Road 9710, which is also a snowmobile trail. The winter version of the Rim trail (orange diamond) crosses the northwestern end. A piece of the North Peak snow-play area is in the NW end.

Scenery -- Approximately the western third of this Area is middleground and background from Paulina Peak. The northwest 15% is visible in the background from Lava Butte. Travelway corridor viewsheds are moderate to high sensitivity, including Road 9710 (summer and winter use) on the east and south, Road 21 on the south, and the Rim Trail on the west.

Soil -- 90% of the Area is sensitive caldera tephra (pumice). Other soil types are Mazama. Steep (sensitive) slopes occur throughout, but are concentrated in the southeast.

Vegetation -- The Area is mainly lodgepole pine (60-65%), with mixed conifer (20-25%) and large patches of mountain hemlock (10%) in the northern half. Mixed pine (5%) occurs, which may be the result of lodgepole encroaching into ponderosa pine stands, in the southeast in the north. Less than 5% of the Area is unvegetated. Mortality is generally low. Concern for advanced tree regeneration in snow-play area. A large area of potential BOPU (pumice grapefern) habitat occurs in the north, with some smaller patches in the south.

Water Quality -- See Zone-wide.

Wildlife and Fish -- Suitable goshawk nesting habitat, occupancy unknown, occurs in about 30% of the Area at lower elevations. The northern quarter of the Area is elk summer range. Eastern edge at border with Paulina Fire provides hiding and thermal cover for big game using the burned area. Mixed conifer habitat is important for species diversity. Concern for retaining early seral species.

Area description: This Area is roaded and mostly forested. Includes The Dome, Road 21 and Road 2127. About half of this Area is within the Special Management Area.

Key Drivers: Vegetation - Known BOPU populations threatened by human access.

Secondary Drivers: Geology & Soils - Tephra deposits.

Heritage Resources - Probability of locating sites.

Scenery - Major travelway corridor (Road 21) viewshed.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- Low to moderate hazard potential, based on mortality, aspect, and slope. Moderate risk due to roaded access and lightning starts.

Geology -- Whole Area is covered by silicic tephra from the BOF eruption. Area includes The Dome and Sand Butte, both cinder cones covered with caldera pumice.

Heritage Resources -- None of the Area has been surveyed.

Recreation -- Part of the northwest boundary is the Rim Trail. Other trails include The Dome trail and winter trails on Roads 21 and 2127 that cross the Area and connect to the Rim trail. A snow-play area is located near the northwest edge of the Area. Opportunity for low-key semi-primitive interpretation of The Dome and rerouting of The Dome trail to protect sensitive plants. Do not encourage private auto use through this Area. Manage for semi-primitive (non-motorized) experiences in the summer, despite roaded access.

Scenery -- All of this Area is in travelway viewsheds of moderate to high sensitivity, including Roads 21 and 2127 and The Dome trail.

Soil -- Soils are almost entirely sensitive caldera tephra (pumice). Slopes on the buttes are steep (sensitive).

Vegetation -- The Area is predominantly lodgepole pine forest, except for the unvegetated portions on The Dome and Sand Butte. Known and potential BOPU (pumice grapefern) habitat occurs here; concern for habitat protection.

Water Quality -- See Zone-wide.

Wildlife and Fish -- About half of the Area (at lower elevations) is suitable goshawk nesting habitat, occupancy unknown.

Area description: This part of the southeast flank of the volcano is roadless and characterized by tephra soils.

Key Drivers: none

Secondary Drivers: Geology & Soils - Tephra deposits.

Heritage Resources - Probability of locating sites.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- Low to moderate hazard potential, based on mortality, aspect, and slope. Risk is low to moderate.

Geology -- All of this Area is covered by silicic tephra from the BOF eruption.

Heritage Resources -- None of the Area has been surveyed. Half has probability of locating resources.

Recreation -- The northern boundary is the Rim Trail.

Scenery -- The northern edge of the Area is visible in the middleground from Paulina Peak. The eastern half is in the travelway corridor viewshed for Road 2127 (secondary forest road). The northern half to two-thirds of the Area is in the Rim trail's foreground viewshed.

Soil -- All of the Area is sensitive caldera tephra (pumice).

Vegetation -- This Area is all lodgepole pine vegetation type. BOPU (pumice grapefern) habitat occurs along most of the northern boundary. Talus/scree habitat is present in the NW corner. About a quarter of the Area in the northwest and west is affected by medium to high mortality.

Water Quality -- See Zone-wide.

Wildlife and Fish -- Suitable goshawk nesting habitat, occupancy unknown, occurs in the southern two-thirds of the Area.

Area description: This Area on the south and southwest of the volcano flank is forested and unroaded. It has many steep slopes, including Roman Nose. A small portion of the north side of Roman Nose is within the Special Management Area.

Key Drivers: Fire Hazard/Risk - High in most of Area. Could threaten resources inside and outside NNVM; likely to be a concern for human safety.

Scenery - Seen from Paulina Peak; managed for retention; scenic quality is threatened/declining.

Wildlife - Protect/restore mixed conifer habitat. Protect threatened/endangered species habitat (peregrine falcon).

Secondary Drivers: Soils - Restore/mitigate eroded soils on S. Paulina Peak trail.

Heritage Resources - Probability of locating sites.

Vegetation - Potential BOPU and talus/scree habitat adjacent to trail.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- Potentially high hazard in over half of Area, based on mortality, slope, aspect, multi-storied canopies in the mixed conifer and mixed pine, and brush component and needle castings in the ponderosa and pine/fir. Ladder fuels and slope would contribute to a crown fire in the event of a fire. Risk is moderate based on historical lightning occurrence.

Geology -- A patch of mafic tephra occurs in the east (less than 5% of the Area).

Heritage Resources -- 10% of Area is surveyed. 50% has potential for locating resources.

Recreation -- The highest elevation boundary is the Rim Trail. The southeastern boundary, along Road 2125, is a winter trail along the south edge. The South Peak trail (winter and summer use) crosses the neck of the Area south of Paulina Peak, concerns for erosion along this trail; needs rehabilitation. The southwest boundary at the base of Roman Nose is also a winter trail (i.e. Roads 100 & 200). The SE corner has a snow-play area along the road.

Scenery -- Portions in the north and south are in the middleground viewshed from Paulina Peak. Part of Roman Nose is in the Lava Butte background and potentially in the middleground from the Portal (Area 1) of the Caldera Zone. Travelway corridor viewsheds include Paulina Peak Road in the northwest, south Paulina Peak trail in the central portion, the Rim trail along the northern edge, and roads 2125 and 2121 in the south. Scenery is managed for retention (see VQO map) and is declining due to high forest mortality.

Soil -- A patch (about 40 acres) of sensitive mafic tephra soils is located in the east. Other soils are Mazama (less sensitive). About 1/3 of the Area has steep slopes, including the central portion and on Roman Nose. Erosion is a concern on South Peak trail.

Vegetation -- About 80% of the Area is lodgepole pine. Mountain hemlock (< 10%) occurs mainly in the west at high elevations; mixed conifer, mixed pine, and ponderosa pine stands occur mainly in the west, on Roman Nose. Opportunity for old-growth ponderosa pine here. One quarter to 1/3 of the Area has scattered med-high mortality. Potential for hazard trees along South Peak trail. Potential BOPU (pumice grapefern) habitat and talus/scree habitat occur along the northern edge and higher elevations of Roman Nose. Also two patches of potential BOPU habitat are present along the southeast border.

Water Quality -- See Zone-wide.

Wildlife and Fish -- About 40% of the Area (at lower elevations) is suitable goshawk nesting habitat, occupancy unknown. Important mixed conifer habitat occurs in small patches, with the largest one on Roman Nose. Some parts are sensitive because of potential future nesting by peregrine falcons (see planning record version of this text).

Area description: This Area is the southern tip of the Monument, containing important geologic features. The Area is roaded and forested. A small section on the western side is Special Management Area.

Key Drivers: Geology - Sensitive lava features.

Scenery - Seen from Paulina Peak; managed for retention; scenic quality is threatened/declining.

Vegetation - Variety of vegetation types. Opportunity to feature old-growth ponderosa pine.

Secondary Drivers: Heritage Resources - Sites occur.

Fire Hazard/Risk - Moderate to high in eastern portion. May threaten resources outside NNVM.

Wildlife - Protect/restore mixed conifer habitat. Suitable goshawk nesting habitat.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- Potentially medium to high hazard in vegetated portions, based on mortality, aspect and slope. Risk of ignition is moderate due to roaded access.

Geology -- This Area has spatter cones, pahoehoe flows, and mafic tephra in the southern third. Some tree molds are found in the pahoehoe lava. Concern for damage to resources here, due to remote but accessible character of Area.

Heritage Resources -- None of the Area has been surveyed. Resources occur, with potential for locating more.

Recreation -- A winter trail follows the eastern boundary (Road 2125) then crosses the Area on Road 2225. Snow-play areas are on the southern tip. Opportunities for low-key, guided interpretation here (see Geology).

Scenery -- The Area is mostly in the Paulina Peak viewshed. All of this Area is in foreground of travelway viewsheds for secondary forest roads. Scenery is managed for retention (see VQO map) and is declining due to high forest mortality.

Soil -- This Area has sensitive mafic tephra soils in the southeast and barren lava in the southwest corner. Other soils are Mazama (less sensitive). Slopes are steep on a butte in the northwest.

Vegetation -- About half of the Area is lodgepole pine. About a fifth is unvegetated lava. Mixed pine, mixed conifer and ponderosa pine occur in the west and south. About a quarter of the Area in the east has med-high mortality.

Water Quality -- See Zone-wide.

Wildlife and Fish -- Important mixed conifer habitat occurs in this Area. Suitable goshawk nesting habitat, occupancy unknown. Suitable bat roosting habitat in lava flow, occupancy unknown.

Area description: The Area is south of the portal entry to the caldera. The eastern boundary is the Paulina Peak Road. The Area is forested and roaded. The western half is in the Special Management Area.

Key Drivers: none

Secondary Drivers: Fire Hazard/Risk - High hazard in portions could threaten resources inside and outside NNVM; likely concern for human safety.

Scenery - Seen from major travelway corridors (Road 21, Paulina Peak road) and proposed portal facility.

Planning Issues:

Air Quality -- Fugitive dust emissions from vehicular traffic on Paulina Peak Road could be a concern. See also Zone-wide.

Fire Hazard/Risk -- Potentially medium to high hazard in 40% of Area based on mortality, aspect, and slope. Risk is moderate due to roaded access.

Geology -- West Flank ash flow (related to formation of the caldera) covers the whole Area.

Heritage Resources -- Area is 25% surveyed and has probability of locating resources.

Recreation -- The eastern boundary is the Rim Trail. An additional winter trail follows Road 050, and a string of snow-play areas lie along the western boundary (i.e. Road 2121). Opportunities for summer horseback trails in this Area. Potential for new trails (winter and summer) originating from proposed portal facility.

Scenery -- The northern portion is in the foreground viewshed from Road 21. The eastern side is foreground from Paulina Peak Road and the Rim trail. A small portion in the northwest is potential foreground for the proposed portal facility. About a sixth of the Area in the northwest corner is in the Paulina Peak viewshed. The western side is in the foreground viewshed for Road 2121. The whole Area is oriented toward Highway 97 and the Cascade range.

Soil -- All soils are Mazama.

Vegetation -- This Area is nearly all lodgepole pine forest, with about a third of the Area having medium-to-high mortality. A small patch of mountain hemlock exists in the east corner, and tiny patches of mixed pine exist along the western edge. Vegetation management activities have occurred here in the recent past.

Water Quality -- Water supply tank for Paulina Lake campground, day-use area and guard station is located along the Peak road on northeast edge of Area. This old wooden tank has a history and high potential of bacterial contamination and should be replaced.

Wildlife and Fish -- Deer use this Area in summer and for migration. Suitable goshawk nesting habitat in about 10% of the Area, along the western edge.

Project Planning Criteria - Caldera Zone

Zone-wide Planning Issues:

Areas 27-40

Air Quality -- Potential for build-up of pollutants during stagnant air conditions (inversions). Concern about air pollution from motor vehicles, woodstoves, campfires, and wildfires within or near the caldera. There is also a potential for pollutants from geothermal development to affect this Zone. Riparian habitat and water quality in the lakes are particularly sensitive to air pollution.

Fire Hazard/Risk -- Overall potential for fire is high. Hazard varies from low to high, based on available information for mortality, slope, and aspect. Risk is high in most parts of the Zone, due to high use by humans.

Geology -- The caldera is a nearly circular volcanic depression, about 4.5 miles across and 800 feet deep. It represents the summit of Newberry Volcano, which collapsed during a series of massive and violent eruptions. The caldera contains two deep lakes on its floor, Paulina Lake and East Lake, which have geothermal hot springs associated with them. Obsidian flows are other special geologic features that need to be protected here. Obsidian flows in NNVM occur almost exclusively within this Zone.

Heritage Resources -- High concentrations of significant and sensitive resources occur here. Known high concentrations of significant sites are especially common. 50% of Zone is surveyed, mainly on the caldera floor. Several of the most significant resources in the western hemisphere occur here.

Recreation -- This Zone is the hub of overnight recreation and a primary day-use Zone for NNVM. Boating and fishing on the two lakes are established, traditional activities. Interpretation, sight-seeing, and trail use are also popular. ROS classes here include: rural, roaded natural, and semi-primitive. Zone includes the Rim trail, which is used in both summer and winter. Unless otherwise noted in text, winter trails are designed for snowmobiles as the primary users (i.e. they are orange-diamond trails, versus blue-diamond trails designed for nordic skiing). All summer trails are non-motorized. The Caldera Zone is divided into Recreation Units, for which the recreation goals are described in the Standards and Guidelines. See Activity Schedule for the priorities of restoration and new developments in this Zone according to the Capital Improvement Program for NNVM (USDA Forest Service 1993).

Roadless Areas -- About half of the Caldera Zone falls within the North and South Paulina Roadless Areas. Areas 32-34 and 36-37 include parts of the North Paulina Roadless Area. Areas 29, 31, and 38 include a large portion of the South Paulina Roadless Area. Of these Areas, only Area 38 contains an existing road (Road 21). The intent is to manage unroaded parts of the Caldera Zone to maintain their roadless character. (See also Roadless Area map in NNVM FEIS, Chapter 3.)

Scenery -- The caldera is visually very significant and sensitive, because nearly all of it can be seen from Paulina Peak and/or developed sites in the caldera. These viewsheds need to be protected and/or enhanced. Nearly all of this Zone, except for some parts of Areas 33 and 38, are middleground from the peak or the caldera floor. All parts of the caldera are in the foreground viewshed for at least one travelway corridor, except for small parts of Areas 31 and 33. (See individual Areas and VQO map for details.)

Soil -- The eastern 2/3 of the caldera have sensitive tephra soils. See individual Area descriptions.

Vegetation -- This Zone is predominantly lodgepole pine and hemlock where vegetated. Riparian areas around lakes and creek. Overall goal is to reintroduce fire to better approximate natural processes.

Water Quality -- Surface water includes Paulina and East Lakes, and Paulina Creek which drains Paulina Lake. East Lake has no surface outlet or inflow. Drainage is toward the lakes, except where the Caldera Zone includes parts that are physically outside the caldera (see Areas 27 and 28). The entire Zone is officially in the Paulina watershed. Ground water is shallow (generally less than 50 feet deep) on the caldera floor.

Wildlife and Fish -- This Zone contains abundant surface water, which is important to wildlife, such as amphibians. The lakes provide fish and aquatic invertebrates for animals that prey on them and for recreational fishing. This Zone is important for bald eagles and osprey. Occupied and unoccupied bald-eagle nesting habitat occurs here. (See Areas 34 and 36 for descriptions of Bald Eagle Management Areas.) Occupied American marten habitat occurs throughout the vegetated portions of this Zone. Prebles shrew habitat may occur in riparian areas; habitat suitability and occupancy are unknown. Suitable goshawk nesting habitat, occupancy unknown, is present at lower elevations in forested parts, as noted by Area. Unoccupied, suitable peregrine falcon habitat also occurs in this Zone.

Planning Criteria

Area 27

Caldera Zone

Area description: This is the west entrance (Portal) to the Newberry caldera. The Area is forested, developed, roaded and slopes westward. Paulina Creek and Road 21 run through it. The western three-quarters is within the Special Management Area.

Key Drivers: Heritage Resources - High concentration of sites.

Recreation - Paulina Falls day-use area, proposed entrance/portal facility to direct and inform visitors.

Scenery - High-use road corridor and main entrance to caldera. Viewed from proposed portal and Paulina Falls day-use area.

Soils - Sensitive riparian soils.

Vegetation - Riparian communities adjacent to trail and day-use area.

Wildlife - Protect/restore riparian habitat.

Secondary Drivers: Fire Hazard/Risk - Moderate to high in places. Could threaten human health, safety, as well as other sensitive Monument resources.

Geology - Paulina Creek and Falls.

Water Quality - Paulina Creek is susceptible to pollution with increasing use.

Planning Issues:

Air Quality -- Not a significant concern of stagnation, but near to emission sources from potential geothermal development. Fugitive dust emissions from vehicular traffic on Paulina Peak Road could be a problem.

Fire Hazard/Risk -- Potentially medium to high hazard based on mortality, slope, and aspect. Risk is moderate because of human use.

Geology -- West Flank Ashflow (related to formation of the caldera) covers the whole Area. Paulina Creek canyon is significant for its evidence of post-Mazama flooding from Paulina Lake.

Heritage Resources -- 20% of Area is surveyed. Resources occur, with potential for locating more.

Recreation -- Includes Paulina Falls day-use area, the proposed portal facility, the Peter Skene Ogden National Recreation Trail (summer), and at least five other winter trails (including two blue-diamond trails designed for nordic skiing). A large snow-play area is located in the western half of the Area. A majority of winter recreation in NNVM currently originates at 10-Mile sno-park, west of this Area. The proposed portal facility/12-Mile sno-park will be located in this Area, probably near the intersection of Roads 21 and 2121. ROS classes: rural and roaded natural. Recreation Unit: Portal.

Scenery -- Foreground for Paulina Falls Day-use area, proposed portal facility and 12-Mile sno-park, Road 21 and Peter Skene Ogden trail. Whole Area is in middleground from Paulina Peak (sensitive). The western edge is in the background from Lava Butte. This Area is intended to provide a scenic arrival into NNVM.

Soil -- Protect riparian soils along Paulina Creek. Other soil types are Mazama. Some steep slopes, localized near Paulina Creek in the northern part of the Area.

Vegetation -- About 80% of Area is lodgepole pine. Mixed conifer occurs in the northeast, making up the other 20%. About half of the Area (all in lodgepole) has medium-high mortality. Riparian habitat for sensitive plants along Paulina Creek. Recent vegetation management activities have occurred in this Area.

Water Quality -- Paulina Creek, which is eligible for Wild & Scenic River status as a Recreational river, runs westward near the northern boundary and cuts through the western half of this Area. This is the only perennial or intermittent stream in the Monument. Subsurface drainage is toward the west, away from the caldera.

Wildlife and Fish -- Daily deer movement to water (Paulina Creek). Some elk summer range north of Paulina Creek. Suitable goshawk nesting habitat throughout, occupancy unknown. Riparian and mixed conifer habitats are important for species diversity (e.g. amphibians, birds). Creek is important water source; maintain access for wildlife.

Planning Criteria

Area 28

Caldera Zone

Area description: This is the developed and roaded shore in the vicinity of Paulina Lake. It includes campgrounds, day-use areas, Paulina Lake Lodge, the CCC building (visitor center), and Road 21. The Area is mostly forested.

Key Drivers: Air Quality - Potential for high emissions and accumulation of pollutants.

Heritage Resources - High concentration of sites and sites listed on the National Register occur here.

Recreation - Numerous existing developed sites and trails.

Scenery - Viewed from many high-use recreation sites and major travelway corridors (Road 21 and Paulina Lake).

Soils - Sensitive riparian soils.

Vegetation - Riparian and meadow communities adjacent to recreation sites and trails.

Wildlife - Occupied osprey nesting habitat. Protect T&E species (bald eagle). Protect/restore riparian and meadow habitats.

Water Quality - High potential for ground water and lake contamination.

Secondary Drivers: Fire Hazard/Risk - High in places. Could threaten human health and safety, as well as other sensitive Monument resources.

Geology - Lakeshore terraces.

Planning Issues:

Air Quality -- Potentially high emissions from campfires, woodstoves, and motor vehicles in this Area. Fugitive dust emissions from vehicle traffic on Paulina Peak Road could be a problem.

Heritage Resources -- All is surveyed. Interpretive and protection issues. Several resources located here are on the National Register of Historic Places and one of the most important sites in the Western Hemisphere is located here.

Fire Hazard/Risk -- Potentially moderate to high fire hazard based on mortality, aspect, and slope. Risk is high due to high levels of human activity, including overnight use.

Geology -- About 1/3 of Area in SE is tephra (Paulina Lake Ashflow) from BOF eruption. A thin (1-2 inch) layer of airfall ash from this eruption covers the rest of the Area. Wave-cut terraces along the east and SW shores of Paulina Lake may preserve important information on the history of lake levels. Area includes two post-caldera domes exist along the SW shore and the western part of Little Crater mafic tuff cone.

Recreation -- Heavily-used Area. Opportunities for high-quality stays, group activities and interaction with others. Concerns of noise, lack of privacy, and high impacts to resources. Area includes general-use campgrounds and day-use areas around Paulina lakeshore, Chief Paulina Horse Camp, Newberry Group camp and cabins, Paulina Lake Resort, and five summer homes. Also includes the Rim trail in the west and parts of the Paulina Lake, Little Crater and Newberry Caldera trails. Also includes at least five winter trails (some nordic ski loops, i.e. blue-diamond trails). Southwestern boundary of Area is Newberry caldera trail and powerline. Opportunities for some expansion of day-use facilities. ROS classes: rural and roaded natural. Recreation Unit: Paulina Lakeside.

Scenery -- Especially important for Paulina Lake viewing from recreation sites and Road 21. Foreground of Road 21 travelway corridor comprises most of the Area. 90% of area is middleground for Paulina Peak. Opportunities to improve viewshed screening of recreation sites, and screening between users. Area is viewed in the foreground from Paulina Lake.

Soil -- Protect riparian soils near the lake outlet and along the southern shore. Sensitive tephra soils are thickest in the eastern portion of the Area. In the west, Mazama soils are covered by only an inch or two of sensitive tephra. A few steep (sensitive) areas occur in the far east and center south.

Vegetation -- About 85% lodgepole, a third of which has medium to high mortality. About 15% of Area is hemlock, much of which is along the lakeshore. Also a little meadow habitat in the west, near the outlet of Paulina Lake. Exotic reed canary grass is invading the native riparian community at the lake outlet. Riparian habitat along creek. Particularly high ongoing concern for hazard trees at the summer homes and Newberry Group Camp.

Water Quality -- Area borders the south shore of Paulina Lake. Drainage is toward the lake. Concerns about shoreline erosion, run-off, and septic impacts to water quality in the lake and creek. Several water wells exist here; one well is in use at each of the following sites: Paulina Lake Lodge, Paulina guard

station, Newberry Group camp, and Little Crater campground. In addition, at least three private wells exist at the summer homes. The water table is shallow (generally less than 35'), so potential for contamination of drinking water is a concern. Intent is to investigate and protect Paulina Lake and drinking-water quality from impacts of high use. See also Area 26 for location and condition of water tank used for guard station well, which also serves Paulina Lake campground and day-use areas.

Wildlife and Fish -- Osprey nest in the western half of this Area. Suitable goshawk nesting habitat throughout, occupancy unknown. Riparian habitat along Paulina Creek. Concern for bald eagle perching (see planning record version of text).

Planning Criteria

Area 29

Caldera Zone

Area description: This Area includes Paulina Peak and the Big Obsidian Flow (BOF). The Peak road borders the Area on the west and enters it in the southwest; otherwise the Area is roadless. It is partially forested, with some bare lava, many steep slopes, and rocky cliffs below Paulina Peak.

Key Drivers: Heritage Resources - Sites occur.

Geology & Soils - Sensitive volcanic formations, including the BOF. Sensitive riparian soils.

Recreation - Paulina Peak day-use site, BOF interpretive trail.

Scenery - Viewed from Paulina Peak, Paulina Lake, Road 21, BOF.

Wildlife - Protect T&E species (peregrine falcon) habitat. Protect/restore riparian habitat at Lost Lake.

Secondary Drivers: Vegetation - Potential BOPU and talus/scree habitat adjacent to trails and recreation site.

Planning Issues:

Air Quality -- Fugitive dust emissions from vehicular traffic on Paulina Peak Road could be a problem.

Fire Hazard/Risk -- About 10% of the Area has potentially medium to high hazard based on mortality, slope, and aspect. Risk is fairly low.

Geology -- Eastern half includes the geologically young and well-preserved BOF (silicic flow) and its surrounding related tephra deposits. Explosion pits on the BOF are particularly significant. Protection of the BOF from vandalism and looting is critical. Area also includes the south rim stratigraphic sequence, the Lost Lake Pumice Ring, and a portion of the Paulina Lake Ashflow.

Heritage Resources -- Area is 25% surveyed. Resources occur, with potential for locating more.

Recreation -- Includes the Paulina Peak day-use area, Paulina Peak and South Peak trails, BOF trail. Paulina Peak Road (used as a winter trail) follows the western boundary; and the Pumice Flat trail forms the eastern boundary. Area includes the Rim trail along its southern boundary; Newberry Caldera trail and the powerline approximate the northern boundary. Area also includes a winter version of the South Peak trail, the "Hell Hole" winter play area on the BOF, and the "Rollercoaster" winter trail along the west edge of the BOF. Potential for more day-use/interpretive development. ROS classes: roaded natural and semi-primitive. Recreation Unit: Flow.

Scenery -- Foreground viewing for Paulina Peak, BOF day-use area and interpretive trail, Paulina Peak Road, Road 21, and several other trails including the Paulina Peak and Rim trails. Low visual absorption capacity on the BOF. North-central part of the Area is in the foreground from Chief Paulina Horse Camp. About 50% of area is middleground from Paulina Peak, and most is middleground from Paulina Lake recreation sites (long-duration viewing). Paulina Peak, with the cliffs and forest below it, is also a featured view from recreation sites around Paulina Lake. Paulina Peak is background from Lava Butte.

Soil -- Protect riparian soils around Lost Lake. About 1/3 of Area is barren lava (BOF), and another third has sensitive tephra soils. Other soils are Mazama, overlain by a thin (1-2 inch) layer of BOF airfall tephra. Steep (sensitive) slopes are scattered throughout, especially in the west and north along the caldera rim.

Vegetation -- About 35% of the Area is unvegetated or sparsely vegetated lava and pumice. Most of the rest is dominantly hemlock, with about 20% of the total Area in lodgepole pine. Medium to high mortality conditions affect lodgepole in 5-10% of the Area. About 40% of the Area (in the south and southwest) is potential BOPU and talus/scree habitat, including in the vicinities of Paulina Peak, Paulina Peak trail, and the Rim trail. A sliver of meadow and riparian habitats are present at Lost Lake, with a small patch of potential BOPU habitat immediately to the south. Lava-edge ecotones occur within the eastern half of the Area, around the obsidian flow.

Water Quality -- This Area contains Lost Lake, a shallow, crescent-shaped pond adjacent to the BOF. Most of the Area drains to Paulina Lake, except in the west and south, where ground water flows down to the Flanks Zone. A geothermal test well in the NE corner of this Area shows a water table depth of 50'.

Wildlife and Fish -- About 15% of the Area, along the north and west edges, is suitable goshawk nesting habitat, occupancy unknown. Suitable bat roosting habitat, occupancy unknown, exists in the BOF. Amphibian and waterfowl habitat are present at Lost Lake. Some parts are sensitive because of potential future nesting by peregrine falcons (see planning record version of this text).

Planning Criteria

Area 30

Caldera Zone

Area description: This Area includes the roaded, developed locations between East and Paulina Lakes. The Area is forested and contains Road 21, the southeastern shore of East Lake, the Big Obsidian Flow (BOF) day-use area, the eastern half of the Central Pumice Cone, and most of Little Crater Tuff Cone. The northern third of this Area is currently privately owned; it is a high priority for the Forest Service to acquire it.

Key Drivers: Geology - Sensitive volcanic formations.

Heritage Resources - Sites occur.

Recreation - BOF day-use area, trails.

Scenery - Viewed from major travelways (Road 21 and East Lake) and BOF day-use site.

Vegetation - Known BOPU populations could be threatened by human activities.

Secondary Drivers: Fire Hazard/Risk - High in places. Could threaten human health and safety, as well as other sensitive Monument resources.

Soils - Tephra deposits.

Water Quality - Susceptible to pollution with increasing lakeside use or potential new facilities.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- Half of Area has potentially medium to high hazard based on mortality, slope, and aspect. Risk is moderate due to human activity.

Geology -- Includes a wide variety of volcanic features: mafic tuff cone (Little Crater), pumice cone and ring deposits (Central Pumice Cone and northeast of BOF), obsidian flows associated with the Central Pumice Cone, and tephra deposits from the BOF in the southern half of the Area.

Heritage Resources -- All is surveyed. High sensitivity. Interpretive potential and protection issues.

Recreation -- Includes BOF day-use area and amphitheater, part of Little Crater trail, and two winter trails. Newberry caldera trail runs near the southern boundary. Proposed trail would traverse this Area to connect Areas 28 and 35. ROS classes: roaded natural and semi-primitive. Recreation Unit: Flow.

Scenery -- Especially important for foreground viewing from Road 21 and BOF day-use site. Middleground from lakes and campgrounds. Scenic quality could be affected by high mortality in vegetation in some portions. Views of East Lake from this Area. Views of the eastern part of this Area in the foreground from East Lake.

Soil -- All is sensitive tephra and pumice soils. Steep slopes scattered throughout.

Vegetation -- About 95 % of Area is lodgepole pine, a quarter of which shows medium to high mortality. The Area also contains small patches of hemlock near the lakes and Central Pumice Cone, a patch of mixed conifer in the eastern third of the Area, a meadow just north of Road 21, and unvegetated obsidian (BOF and on the Central Pumice Cone). Riparian habitat occurs along the shore of East Lake, and lava-edge ecotones are present along the BOF and Central Pumice Cone obsidian flows. Concern for known BOPU habitat.

Water Quality -- The northeast edge of this Area borders on East Lake. The eastern quarter of the Area drains toward East Lake, while the rest drains to Paulina Lake.

Wildlife and Fish -- Riparian habitat along East Lake edge. All forested parts are suitable goshawk nesting habitat, occupancy unknown. Mixed conifer patch is important for species diversity.

Area description: This Area is undeveloped, unroaded and mostly forested. It includes the steep, south inner wall of the caldera.

Key Drivers: Geology - Sensitive volcanic formations.

Heritage Resources - Sites occur.

Scenery - Viewed from high-use road corridor (Road 21) and recreation sites.

Secondary Drivers: Recreation - Trails around most of the Area's perimeter.

Soils - Tephra deposits.

Vegetation - Potential BOPU and talus/scree habitat along trails.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- Generally low hazard. About 5% of Area has medium to high hazard potential based on mortality, slope, and aspect. Risk is fairly low.

Geology -- Sensitive and stratigraphically important tephra from the BOF eruption covers the Area; however, older obsidian flows (East Lake Flows) are partially exposed in the northeast corner. Area also includes the Buried Obsidian Flow, mafic-tuff-cone deposits, and several small pumice rings and domes.

Heritage Resources -- 50% is surveyed. High protection and interpretive values. Resources occur, with potential for locating more.

Recreation -- Undeveloped, unroaded. Bounded by summer trails on the west and south. Includes Rim trail along south boundary. The Newberry Caldera trail approximates the northern boundary, except where this trail lies north of Road 21. Another trail (winter and summer) cuts across the southwest end. Area includes two snow-play areas, one in the northeast and one in the southwest. ROS classes: roaded natural and semi-primitive. Recreation Unit: Undeveloped.

Scenery -- Approximately half of the Area is in Road 21's foreground viewshed. Potential foreground or middleground views of ridges and higher elevations in this Area from almost all long-duration recreation sites in the caldera.

Soil -- Tephra soils throughout, except for some (10%) nearly barren lava in NE corner. Steep slopes scattered, but mainly in south half.

Vegetation -- About 70% lodgepole, 25% hemlock, and 5% unvegetated. Medium to high mortality, mostly in lodgepole, affects about 5% of the Area. Potential BOPU habitat is present. Potential talus/scree habitat makes up about 10% of the Area in the southwest corner along the Rim trail.

Water Quality -- No surface water. Subsurface movement toward East Lake.

Wildlife and Fish -- Northern half of Area is suitable goshawk nesting habitat, occupancy unknown.

Area description: This is the unroaded Area between the lakes, including the Interlake Obsidian Flow and the pond at its southeastern edge, the western half of the Central Pumice Cone, and the land between the Central Pumice Cone and Paulina Lake. The Area is mostly forested (lightly forested on flow) and is undeveloped except for the Paulina Lake trail. A small portion along the SE edge is currently private land; it is a high priority for the Forest Service to acquire this.

Key Drivers: Geology & Soils - Sensitive volcanic formations and riparian soils.

Heritage Resources - Sites occur.

Scenery - Visible from numerous high-use recreation sites. Most is foreground from lakes.

Vegetation - Riparian communities adjacent to trail.

Wildlife - Protect/restore riparian habitat.

Secondary Drivers: Water Quality - Susceptible to degradation with increasing use of Paulina Lake trail.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- Generally low hazard. About 10% of Area has medium to high hazard based on mortality, slope, and aspect. Risk is fairly low. Interlake Flow could act as a fire break.

Geology -- Interlake Obsidian Flow, which contains explosion pits, takes up the northern 2/3 of the Area. Central Pumice Cone and sensitive tephra make up the remainder.

Heritage Resources -- 10% is surveyed. Resources occur.

Recreation -- Currently, no development except for the Paulina Lake trail along the west edge, and a winter trail and snow-play area over part of the Interlake Flow. Protect semi-primitive character from high-use in adjacent developed Areas (28 and 30). Potential for future interpretive development after archaeological surveys. ROS Classes: roaded natural and semi-primitive. Recreation Unit: Flow.

Scenery -- This Area is highly visible from both lakes. It includes foreground viewsheds from the eastern edge of Paulina Lake and the western edge of East Lake. The Area is middleground from long-duration rec sites--the lodges and most campgrounds--as well as from Paulina Peak and the BOF interpretive trail. Little visual screening on Interlake Flow.

Soil -- Protect riparian soils along Paulina lakeshore and around the pond adjacent to East Lake. Sensitive tephra soils occur in the south, barren lava with limited soil is present in the north. Very steep (sensitive) slopes on sides of Central Pumice Cone.

Vegetation -- The central and northern 45% of the Area is hemlock, including some on the Interlake Flow. The central and northeastern 35-40% of the Area is unvegetated or sparsely vegetated lava. Less than 5% of Area has medium to high mortality. Lodgepole makes up the southern 15-20% of the Area. Riparian habitat along lakeshore (Paulina Lake trail).

Water Quality -- This Area lies between and borders on both lakes. It includes a small pond at the southeastern edge of the Interlake Obsidian Flow. Subsurface drainage in the eastern third of the Area is toward East Lake and in the western 2/3 is toward Paulina Lake. Water quality concern due to erosion and trampling of riparian area along Paulina Lake trail.

Wildlife and Fish -- Riparian wildlife and habitat along both lake shores. Vegetated portions are suitable goshawk nesting habitat, occupancy unknown.

Planning Criteria

Area 33

Caldera Zone

Area description: This is the northern inner wall of the caldera, including the north shore of Paulina Lake. It is above and adjacent to the Bald Eagle Management Area (BEMA) on East Lake. The Area is steep, forested, and unroaded. It is basically undeveloped except for two existing boat-in/hike-in campgrounds.

Key Drivers: Heritage Resources - Sites occur.

Scenery - Seen from Paulina Peak; managed for retention; scenic quality is threatened/declining.

Soils - Sensitive riparian soils.

Vegetation - Protect/restore riparian communities.

Wildlife - Occupied osprey nesting habitat. Protect T&E species (bald eagle). Protect/restore riparian habitat.

Secondary Drivers: Geology - Sensitive lava features, hot springs.

Recreation - Existing boat-in/hike-in campgrounds, hot springs.

Water Quality - Susceptible to degradation with increasing use of Paulina Lake trail.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- Hazard is moderate. About 20% of the Area has potentially medium to high hazard based on mortality, slope, and aspect. Risk is moderate to high due to human activities, including overnight use.

Heritage Resources -- Like Area 32, except 80% is unsurveyed.

Geology -- Spatter ramparts and mafic tephra deposits of the NW Rift Zone cross N-S through the center of the Area. Pumice cones are present northwest of the Interlake Flow. The Area also includes the North Rim stratigraphic sequence. Concern for damage or human-caused alterations of hot springs along the northeast shore of Paulina Lake.

Recreation -- Concern about impact of recreation to other resources in this Area, especially along Paulina Lakeshore. Paulina Lake trail is a popular hiking route along the north shore of the lake. Bathers use hot springs along northeast shore of lake. North Cove and Warm Springs campgrounds are accessible by boat or trail on the north and northeast shore of Paulina Lake, respectively. Intent is to eventually relocate campgrounds to mitigate resource concerns. The Rim trail is included in this Area all along its north

boundary. Also part of Newberry caldera trail in the east, where it links Cinder Hill campground (Area 35) to the Rim trail. A small snow-play area lies on the middle of the northern boundary. Area is intended to provide predominantly for semi-primitive experiences. ROS classes: roaded natural and semi-primitive. Recreation Unit: Undeveloped.

Scenery -- Majority is middleground from Paulina Peak. Scenic quality is threatened by high levels of tree mortality in places. Area includes foreground views from Paulina Lake, Paulina Lake trail and the Rim trail. Also is viewed in the middleground for long periods from Paulina Lake and its recreation sites, and in the foreground and middleground from Cinder Hill campground. Viewed from BOF trail. Only a small part in the north of this Area is not seen from any major travelway corridors, Paulina Peak, or any long-duration rec sites. Portions are may be seen from the proposed 12-Mile sno-park and portal facility.

Soil -- Protect riparian soils along NE shore of Paulina Lake. Mafic and silicic tephra soils are present in the eastern half of the Area and are sensitive to compaction and disturbance. Other soil types are Mazama. Steep (sensitive) slopes are scattered throughout.

Vegetation -- The Area is about 70% lodgepole, with 5-10% mixed pine and 5-10% mixed conifer in the east, about 10% hemlock in the central and western parts, and a few small unvegetated patches in the east and north. About 10% of the Area (lodgepole and mixed pine) is in medium to high mortality conditions. Riparian habitat is present along the northeast shore of Paulina Lake, adjacent to Paulina Lake trail. Particular ongoing concern for hazard trees at Warm Springs and North Cove campgrounds.

Water Quality -- The Area borders Paulina Lake along its northern and western shores. The Area drains to East Lake in the east and to Paulina Lake in the west. Concern about impact of existing and increasing use on Paulina Lake trail to lake shore and water quality. Hot springs occur at or slightly above lake level at the northeast corner of Paulina Lake.

Wildlife and Fish -- Concern for bald eagle nesting habitat (see planning record version of this text). Mixed conifer habitat in northeast is important for species diversity. Suitable goshawk nesting habitat, occupancy unknown, makes up about 5% of the Area in the southwest and east. Riparian habitat occurs along the northeast shore of Paulina Lake.

Planning Criteria

Area 34

Caldera Zone

Area description: This is the existing Bald Eagle Management Area (BEMA) on the north shore of East Lake. The Area is steep and mostly forested, with some rocky outcrops.

Key Drivers: Heritage Resources - Sites occur.

Fire Hazard/Risk - High. Could threaten human health, safety, and sensitive Monument resources (e.g. eagles).

Geology - Sensitive NW Rift Zone features.

Scenery - Most is foreground from major travelway (East Lake). Seen from Paulina Peak; managed for retention; scenic quality is threatened/declining.

Wildlife - Occupied osprey habitat. Protect T&E species (bald eagle). Protect/restore riparian habitat.

Secondary Drivers: Soils - Tephra deposits.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- Potentially high hazard based on mortality, aspect, and slope. Risk is mostly moderate, but is high on the east end due to the high level of human activity in Area 35.

Geology -- NW Rift Zone vents, including the East Lake Fissure and spatter ramparts, cut N-S through the west half of Area. Rest of Area is covered by a thin layer of silicic tephra on steep slopes. Includes exposures of mafic tuffs and very old (> 100,000 years) obsidian flow. Opportunity to interpret NW Rift Zone from East Lake.

Heritage Resources -- 25 % of Area is surveyed. Resources occur, with potential for locating more.

Recreation -- No developed recreation, but adjacent to Cinder Hill campground in Area 35. Intent is to protect eagles from human disturbance. Trail from Cinder Hill campground to Rim Trail runs along part of the eastern boundary of the Area. User trail exists along East Lake shore. No existing or potential winter trails. ROS class: semi-primitive. Recreation Unit: Eagle.

Scenery -- Most is foreground from East Lake; eastern portions are foreground from Cinder Hill campground. Most is also middleground from Paulina Peak. Scenic quality is declining due to high forest mortality. Majority is also middleground from East Lake long-duration recreation sites.

Soil -- Extremely sensitive because all of the Area has tephra soils, and almost all is very steep.

Vegetation -- Over 95 % of the Area is vegetated with lodgepole pine; less than 5 % is unvegetated, rocky outcrops. Over 55 % of the vegetated part is in medium to high mortality conditions. Riparian habitat is present along the East Lake shore. Recent vegetation management activities?

Water Quality -- The Area borders the north edge of East Lake. All of this Area drains to East Lake.

Wildlife and Fish -- Important bald eagle habitat (see planning record version of this text). Concern for maintaining large-diameter ponderosa pine nest trees. About 5 % of the Area in the northeast is suitable goshawk nesting habitat, occupancy unknown. Some riparian habitat occurs along the lakeshore.

Planning Criteria

Area 35

Caldera Zone

Area description: This Area is the south and east shore of East Lake. It includes Road 21, campgrounds, day-use areas, East Lake Lodge and RV park, and the pond on the east side of the lake. The Area is fairly flat and mostly forested.

Key Drivers: Air Quality - Potential for high emissions and accumulation of pollutants.

Heritage Resources - Sites occur.

Recreation - Numerous developed sites.

Scenery - Seen from high-use recreation sites and major travelways (East Lake and Road 21).

Soils - Sensitive riparian soils.

Vegetation - Riparian communities adjacent to recreation sites.

Water Quality - High potential for lake and ground water contamination.

Wildlife - Protect T&E species (bald eagle). Protect/restore riparian habitat.

Secondary Drivers: Geology - Tephra deposits, hot springs.

Planning Issues:

Air Quality -- Potentially high emissions from campfires, woodstoves, and motor vehicles in this Area. See Zone-wide.

Fire Hazard/Risk -- Low hazard potential based on mortality, slope, and aspect. Risk is high due to high levels of human activity, including overnight use.

Geology -- Hot springs and mafic-tuff-cone deposits are present along the southeast shore of the lake. Lakeshore deposits record changes in lake level. All of Area is covered by stratigraphically important tephra; southern half is from the BOF eruption. Concern for damage or human-caused alteration of shoreline hot springs.

Heritage Resources -- All is surveyed. Interpretive potential, protection issues.

Recreation -- Heavily-used Area. This Area is intended to provide lower-key, quieter experiences than the Paulina Lakeside (Area 28). Opportunities for high-quality stays, maximizing privacy, and renovating or replacing boating facilities to emphasize accommodation of non-motorized and smaller boats than at Paulina Lake. Concerns include noise, current lack of privacy, and high impacts to resources. Area includes Cinder Hill campground and day-use area, East Lake Resort and RV Park, Hot Springs campground and day-use area, and East Lake campground. The Newberry Caldera trail follows parts of the southern and eastern boundaries. Two winter trails also are present. Expansion of day-use capacity is not appropriate in this Area. ROS classes: rural and roaded natural. Recreation Unit: East Lakeside.

Scenery -- Especially important for viewing East Lake and as foreground from East Lake. Entire Area is foreground from all East Lake long-duration recreation sites. Mostly visible in the middleground from Paulina Peak. Opportunities to improve vegetative screening.

Soil -- Protect riparian soils, especially near the pond and along the SE lakeshore near the hot springs. Otherwise, soils are tephra throughout, sensitive to compaction and disturbance. Some bank erosion is occurring near the high-water mark around the resort.

Vegetation -- Over 95% of the Area is lodgepole, with the remaining vegetation being meadow around the pond at the northeast corner of East Lake. Riparian habitat occurs all along the lakeshore. Recent vegetation management activities have occurred in this Area.

Water Quality -- The Area borders the east and south shores of East Lake. Drainage is toward the lake. Hot springs occur at or slightly above lake level at the south end of East Lake. Concerns about shoreline erosion, run-off and septic impacts to water quality in the lake. Several water wells exist here, one in use at each of the following sites: Cinder Hill campground, East Lake campground, East Lake Lodge, and East Lake RV Park. The water table is shallow, (generally less than 30') so potential for contamination of drinking water is a concern. Protection of East Lake and drinking water quality from impacts of high use.

Wildlife and Fish -- Concern for bald eagle perching (see planning record version of this text). Riparian habitat occurs all along the shoreline; it is especially important for amphibians around and in the pond. Suitable goshawk nesting habitat throughout, occupancy unknown.

Planning Criteria

Area 36

Caldera Zone

Area description: This is the unroaded, heavily forested, steep portion of the caldera above East Lake Lodge, extending to the rim. The Area is a designated Bald Eagle Management Area (BEMA) in the C-Modified alternative.

Key Drivers: Scenery - Seen from high-use recreation sites and major travelways (East Lake and Road 21).

Wildlife - Protect T&E species (bald eagle). Protect/restore mixed conifer habitat.

Secondary Drivers: Geology & Soils - Steep tephra-covered slopes. East Rim eruptive features.

Heritage Resources - Sites occur.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- Low hazard potential based on mortality, aspect, and slope. Risk is low to moderate due to human activity, which is mainly on trails.

Geology -- Includes East Rim Fissure eruptive features and East Rim stratigraphic sequence. Whole Area contains stratigraphically important tephra.

Heritage Resources -- 25% surveyed. Resources occur, with potential for locating more.

Recreation -- No developed recreation. Includes the Rim trail along the Area's eastern edge. The Newberry Caldera trail cuts north-south through the southwestern part of the Area. No winter trails in this Area. ROS class: semi-primitive. Recreation Unit: Eagle.

Scenery -- Western half is in the foreground viewshed from most East Lake recreation sites. Area is middleground from long-duration rec sites, including East Lake campground and some Paulina Lake recreation sites. Area is also middleground from Paulina Peak, and in foreground travelway corridor viewsheds for the Rim Trail and Newberry caldera trail. Southern third is foreground for Road 21.

Soil -- Extremely sensitive because all are tephra soils and most of the Area is very steep.

Vegetation -- 70-75% lodgepole, with 25-30% mixed conifer in the north. Patches of mortality occur in lodgepole.

Water Quality -- No surface water. Subsurface drainage to East Lake.

Wildlife and Fish -- Concern for bald eagle perch habitat (see planning record version of this text). Need to maintain large-diameter trees. Mixed conifer is important habitat for species diversity. The western 20% of the Area is suitable goshawk nesting habitat, occupancy unknown.

Area description: This Area is the southeastern inner wall of the caldera, east of the Road 21 corridor. It is undeveloped, unroaded, forested and fairly steep.

Key Drivers: Recreation - Rim trail.

Scenery - Seen from major travelway (Road 21) and numerous high-use recreation sites.

Secondary Drivers: Heritage Resources - Sites occur.

Geology & Soils - Tephra deposits. East Rim Fissure eruptive features.

Planning Issues:

Air Quality -- See Zone-wide.

Fire Hazard/Risk -- Low hazard potential based on mortality, slope, and aspect. Risk is moderate to low due to human activity along Rim trail.

Geology -- Whole Area is covered by tephra, all from the BOF eruption except in the northern end. Includes East Rim eruptive fissure.

Heritage Resources -- Largely unsurveyed (95-99%). Resources occur, with potential for locating more.

Recreation -- No developed recreation. The Rim trail is included along the eastern boundary. Intent is to manage for semi-primitive experiences, although Road 21 nearby limits this character. ROS class: semi-primitive. Recreation Unit: Undeveloped.

Scenery -- Northwest portion is in the foreground viewshed from East Lake Lodge and RV Park. Area is middleground from several long-duration recreation sites and Paulina Peak. Majority is in foreground of both Road 21 and Rim Trail. A portion is foreground from the Parallel trail in Area 38.

Soil -- All is tephra. Some steep (sensitive) slopes.

Vegetation -- About 65% lodgepole, with 30% hemlock in south and 5% mixed conifer scattered in the north half. Small patch of unvegetated.

Water Quality -- No surface water. Subsurface drainage to East Lake.

Wildlife and Fish -- About 10% of Area in northwest is suitable goshawk nesting habitat, occupancy unknown. Mixed conifer patches are important for species diversity.

Area description: This is the Road 21 corridor, which provides a "back door" into the caldera from the east. The Area is forested and undeveloped. This section of Road 21 is unpaved.

Key Drivers: Heritage Resources - Sites occur.

Recreation - Trail on east side of road.

Scenery - Viewed from a major travelway (Road 21).

Secondary Drivers: Geology & Soils - Tephra deposits.

Planning Issues:

Air Quality -- Fugitive dust emissions from vehicular traffic on Road 21 could be a problem.

Fire Hazard/Risk -- Low hazard potential based on mortality, slope, and aspect. Risk is moderate due to roaded access.

Geology -- All of Area is covered by tephra from the BOF eruption. Includes important stratigraphic sites in pumice pits, along Road 21.

Heritage Resources -- 25% of Area is surveyed. Resources occur, with potential for locating more.

Recreation -- Area contains graveled portion of Road 21, which serves as a trail in winter. One summer trail (the Parallel trail) meanders through the Area on the east side of the road. Intent is provide semi-primitive non-motorized experiences in much of this Area in the summer. Therefore, do not encourage use of Road 21 by automobiles. ROS classes: roaded natural and semi-primitive. Recreation Unit: Undeveloped.

Scenery -- Parts of Area are middleground from Paulina Peak. South end is foreground from the Dome. All of Area is foreground travelway corridor for Road 21 and the Parallel trail.

Soil -- All of Area has sensitive tephra soils.

Vegetation -- About 50% lodgepole and 50% hemlock.

Water Quality -- No surface water. Subsurface drainage to East Lake.

Wildlife and Fish -- Northern 70% is suitable goshawk nesting habitat, occupancy unknown.

Area description: Paulina Lake. The lake is deep, with less than 3% of its area shallower than ten feet. Lake level is augmented up to four feet above its natural level by a small dam at the outlet.

Key Drivers: Heritage Resources - Resources occur.

Recreation - Major recreation site for boating, fishing.

Water Quality - Potential water quality effects of recreation use and geothermal development.

Wildlife & Fish - Eagle and osprey foraging. Protect fish resources.

Secondary Drivers: Air Quality - High potential for accumulation of pollutants during stable air conditions.

Geology - Hot springs.

Planning Issues:

Air Quality -- Airflow over lakes is normally good, but there is a potential for pollutants originating in lakeside areas or from outside the caldera to be trapped here during inversions. Deposition of particulates could affect the lake's water quality.

Fire Hazard/Risk -- N/A

Geology -- Hot springs occur on the lake bottom and along the eastern shore. Lake is bordered on the south by exposed BOF eruption tephra. The lake floor potentially preserves important stratigraphic information. A shoreline feature that is underwater due to the dam may preserve important information on the history of lake levels.

Heritage Resources -- Resources occur, with potential for locating more.

Recreation -- High motorized-boat use, primarily for fishing (trolling) purposes. ROS classes: rural and roaded natural.

Scenery -- Major viewing area and focus. Highly visible foreground for lake users, campgrounds, Paulina Lodge and day-use areas. No screening.

Soil -- N/A

Vegetation -- Aquatic and riparian plants only. Includes undesirable exotic species, reed canary grass, near outlet to Paulina Creek.

Water Quality -- High potential for contamination due to human activities, for example, fuel leaks and spills from boats, deposition from geothermal emissions, seepage from contaminated ground water (see Areas 28 and 35). Lake drains to Paulina Creek. Outflow is regulated by a small dam. See also Air Quality.

Wildlife and Fish -- Forage area for bald eagles and osprey. Ice-free areas in winter are important for waterfowl and eagles. Fish are stocked by ODFW; opportunities to cooperate in fishery management. Amphibians in shallow water. Important for waterfowl nesting and migration. Concern for disturbance to eagles.

Area description: East Lake. The lake is deep, with less than 12% of its area shallower than ten feet. East Lake has two associated ponds: See Area 35 for the pond on the NE corner and Area 32 for the pond on the west side.

Key Drivers: Heritage Resources - Resources occur.

Recreation - Major recreation site for boating, fishing.

Water Quality - Potential water quality effects of recreation use and geothermal development.

Wildlife & Fish - Eagle and osprey foraging. Protect fish resources.

Secondary Drivers: Air Quality - High potential for accumulation of pollutants during stable air conditions.

Geology - Hot springs.

Planning Issues:

Air Quality -- Airflow over lakes is normally good, but there is a potential for pollutants originating in lakeside areas or from outside the caldera to be trapped here during inversions. Deposition of particulates could affect the lake's water quality.

Fire Hazard/Risk -- N/A

Geology -- Hot springs occur on the lake bottom and along the southeastern shore. East Lake is underlain by tephra deposits. The lake bottom potentially preserves important stratigraphic information. Vent for East Lake tephra is believed to be on the lake bottom in the southwest corner of the lake. The Interlake Obsidian Flow extends to 100' depth in the northwest corner. Potential for interpretation of NW Rift Zone (East Lake Fissure in Area 34) from the lake.

Heritage Resources -- Resources occur, with potential for locating more.

Recreation -- High motorized boat use, primarily for still-fishing. Intent is to emphasize use of smaller, non-motorized boats on this lake, to fit a lower-key atmosphere than Paulina Lake. Opportunities for interpretation by guided canoe excursions. ROS class: roaded natural.

Scenery -- Major viewing area and focus. Highly visible foreground for lake users, campgrounds, East Lake Resort, and day-use areas.

Soil -- N/A

Vegetation -- Aquatic and riparian plants only.

Water Quality -- High potential for contamination due to human activities, for example, fuel leaks and spills from boats, deposition from geothermal emissions, seepage from contaminated ground water (see Areas 28 and 35). See also Air Quality.

Wildlife and Fish -- Forage area for bald eagles and osprey. North shore of lake is within 200' of eagle nests. Ice-free areas in winter are important for waterfowl and eagles. Fish are stocked by ODFW; opportunities to cooperate in fishery management. Amphibians in shallow water. Important for waterfowl nesting and migration.

Project Priority Areas by Resource

Below is a list of the Areas of Concern and Opportunity that qualify as key planning drivers for each resource, based on the "Criteria for Drivers." Key drivers were determined from available information and have not been field-checked. Note also that conditions on the ground are dynamic, so driver determinations made in 1994 need to be verified at the time of project planning.

Use the list below as a preliminary guide to help determine which Areas may be good candidates for projects addressing particular resources. For example, if you are interested in planning a project to protect or enhance air quality, note that Air Quality is a key planning driver in Areas 28 and 35. For an explanation of the planning issues related to Air Quality in these Areas, refer to the "Project Planning Criteria" section.

<u>Resource</u>	<u>Area numbers</u>
Air Quality:	28, 35
Fire Hazard/Risk:	14, 15, 17, 19, 24, 34
Fish:	39, 40
Geology:	4, 5, 11, 12, 14-16, 18, 25, 29, 30-32, 34
Heritage Resources:	1, 4-6, 8, 10-12, 14, 17, 20, 27-35, 38-40
Recreation:	4-6, 27-30, 35, 37-40
Scenery:	1, 4-6, 8, 10, 11, 13, 14, 17, 24, 25, 27-38
Soil:	1, 4-6, 11, 27-29, 32, 33, 35
Vegetation:	1, 5, 6, 9, 11, 12, 22, 25, 27, 28, 30, 32, 33, 35
Water Quality:	28, 35, 39, 40
Wildlife:	1, 4-7, 9, 10, 14, 16, 20, 24, 27-29, 32-36, 39, 40



MANAGEMENT DIRECTION

**MONITORING
PROGRAM**

**CRITERIA
FOR SCIENCE
AND RESEARCH
PROJECTS**



Monitoring Program Newberry National Volcanic Monument

Introduction

The Monument legislation gives specific direction regarding monitoring in Section 6 (b):

...the management plan shall address at least the following issues....

(7) Monitoring, including monitoring needs for air, water, wildlife, soil, and other resources. The Secretary [of Agriculture], in cooperation with the Secretary of the Interior, shall maintain a research and monitoring program for geothermal resources for the purpose of identifying and assessing the impact that present and proposed geothermal development in the vicinity of the Monument and Special Management Area may have on the values for which such Monument and Special Management Area were established.

(from Public Law 101-522, Sections 6 (b) and 6 (b) (7))

The purpose of the monitoring program described in this section is to:

- * help us understand how our management of the Monument and adjacent special areas (Newberry Special Management Area, Transferal Area, Transferal Area Adjacent, and Transferal Corridor) is affecting the values for which the Monument was established;
- * help us identify any corrective actions that may be needed to ensure that Monument values continue to be "protected, conserved, interpreted, and enhanced."
- * help us understand how geothermal developments are (or are not) affecting these values.

Section 1 (a) of the Monument legislation sets out the basic purposes for which the Monument was established:

...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.

(from Public Law 101-522, Section 1 (a))

This section of the legislation reflects the broad resource values for which the Monument was established. These resource values are the focus of this monitoring program.

Types of Monitoring

Before we can assess the effect of changes that have resulted from a given management activity (or set of activities) we need to understand:

- 1) what the condition was before the activity took place, and
- 2) what specific activity(ies) took place.

Collecting relevant baseline data before we undertake projects is an important first step in monitoring. The second step is to verify that projects whose effect we're trying to monitor were actually carried out as planned. This second step is known as implementation monitoring. It should answer the question, "**Were projects done in the manner intended?**"

When we know baseline conditions, and have confirmed that projects took place as planned, we can then assess whether the results and effects were what we anticipated. This third step is effectiveness monitoring. It asks the questions, "**What's happening as a result of our activities? What are the trends?**" This assessment is most effective at a landscape or Monument scale.

If projects are not achieving anticipated results, the next step is to re-examine the assumptions and logic that went into planning, design, and implementation. This fourth step, called validation monitoring, allows us to identify whether there is a need for change in overall direction in planning, designing or carrying out activities. Validation monitoring asks the question, "**Is there anything we should do differently in managing the Monument?**" The answer may be as specific as changing an implementation technique or standard, or as broad as changing an overall goal for the Monument. Validation monitoring is also applied at a broader scale, and is used to periodically reexamine the broader goals and objectives of the Monument Plan to verify whether they are still relevant and appropriate. The Monument Plan could be amended or revised as a result of validation monitoring.

To summarize, the general sequence when monitoring any activity, or set of activities, is:

- 1) collect relevant baseline data before the activity.
- 2) do implementation monitoring to verify activities were carried out as designed.
- 3) do effectiveness monitoring to assess results.
- 4) if results are different from what is desired, do validation monitoring to assess whether a change in management direction is needed. Also, periodically assess direction and assumptions in the Monument Plan to evaluate whether they need to be changed.

These steps can vary quite a bit in complexity. In some cases the steps can overlap to some extent for a given project. Implementation monitoring may be a half day in the field, confirming that a project has been carried out as designed and that mitigation measures have been applied as specified.

Effectiveness and/or validation monitoring could take several years of data collection before trends can be adequately assessed, and appropriate changes in management direction determined.

General Requirements for Monitoring

Implementation and effectiveness monitoring will be a routine task and part of the process of carrying out management projects and activities in the Monument. Apply validation monitoring when there is enough data on implementation and effectiveness to make a validation assessment meaningful. This will generally mean validation monitoring takes place when the Monument Plan is reviewed as a whole for possible revision.

Do implementation monitoring to determine if project plans and prescriptions are implemented as designed and are in compliance with the standards and guidelines found in the Monument Comprehensive Management Plan (CMP). Some projects have several steps. Project leaders need to decide whether each step requires monitoring or if monitoring should wait until the completion of the project.

Do effectiveness monitoring to assess the effectiveness of activities in protecting Monument values, and trends across the Monument. Focus effectiveness monitoring efforts on broader scale assessments (e.g. at the landscape level, Monument level or program level). Although some individual projects (especially non-routine activities) may also need effectiveness monitoring, generally perform effectiveness monitoring on an intensive sampling basis, rather than project by project.

Do validation monitoring for the Monument Plan as a whole, at the time it is incorporated into the Forest Plan (the next regularly scheduled revision of the Forest Plan). Validation monitoring for specific direction, provisions, or assumptions in the Plan may be undertaken earlier if needed.

General Direction for Project Monitoring

The project file for each project will contain:

- 1) documentation showing the project's consistency with the intent and direction of the Monument Plan. (This is provided in the environmental and decision documents for the project).
- 2) an implementation checklist, to be completed by the time the project is done. The checklist will be based on standards and guidelines applicable to the project.

3) A monitoring strategy for the project, including:

a) a list of what elements of the project are important to monitor in light of planning issues identified for the project. Include specific descriptions of what implementation and (if appropriate) effectiveness monitoring is needed and how it will be done. Monitoring may range from informal observations (like "walk throughs") to quantified, statistical sampling. For implementation monitoring, methods should answer the question, "Were the project plans and management prescriptions followed?" For effectiveness monitoring, methods should answer the question, "Was the management activity effective in accomplishing the stated objectives?" **In the case of routine projects, effectiveness monitoring should be done on a sampling basis.**

B) a description of what additional baseline data (if any is needed) will be collected to accomplish this monitoring.

C) a schedule for completion of the monitoring activities. In many instances it may be possible to coordinate implementation and effectiveness monitoring activities.

When the project has been completed, monitoring should be done as directed in the project file and within the timeframes specified. As a minimum, monitoring documentation should include a short narrative assessing to what extent project objectives have been met, and the completed standards and guidelines checklist. If implementation was not as expected and/or the project was not effective in achieving the desired results (and changes are needed), follow-up measures are prescribed at this time.

The rest of this document provides monitoring guidance for the broad resource values identified in the Monument legislation. It is organized by biophysical and human/social ecosystem components, and includes sections for the following:

Biophysical Ecosystem Components

Geologic Features
Soil
Air Quality
Vegetation
Fish and Wildlife

Human/social Ecosystem Components

Heritage Resources
Recreation and Interpretation
Scientific

Sections for these resource values provide general direction for what to monitor, by identifying the broad monitoring questions to be answered for each resource value. The general direction is followed by more specific guidance for the baseline, implementation, and effectiveness steps of monitoring. Suggestions are also made for specific monitoring methods. These lists are suggestions and are not comprehensive. Monitoring techniques change quickly, and newer methods may often be both more accurate and more economical. Any methods which will adequately answer the monitoring questions may be used; professional judgement will be used to determine monitoring methodology that is appropriate to the scope of the issues and environmental conditions.

Biophysical Ecosystem Components

Geological Features

Broad Questions to be Answered

- 1) Are geologic features being adequately protected from damage?
- 2) Is the education program getting the message to the public about the irreplaceable nature of geologic features?
- 3) Are problems with protection of geologic features limited to certain sites or are they Monument-wide?

Baseline Data and Implementation Monitoring

During environmental analysis for projects, conduct an inventory for any geologic features that may be notable, and document results in the planning file. Prior to implementing the project, if notable geologic features have been found, establish photo points which cover the representative geologic features within the project area.

When the project has been implemented, review to answer the following questions and document in the project file:

- 1) Were inventories done, and are the notable geologic features documented in the environmental analysis for the project?
- 2) Were the geologic feature protection elements of the project plan followed and completed?

Effectiveness Monitoring

Review a sampling of projects 2-3 years after their completion to evaluate effectiveness of design elements related to geologic feature protection. If review indicates a need for follow-up action, determine what corrective actions are needed, and present to the decisionmaker.

Develop a Monument-wide photo point system for a representative sample of geologic features at and near developed sites, as well as away from development. Periodically revisit photo points and photograph the condition of representative geologic features. Conduct periodic reviews of the condition of geologic features (using condition inventories, photo points, and site visits) to identify problem areas and trends. Document findings in a report and brief the decisionmaker on findings and recommendations.

Suggested Methods

- * Survey proposed project and document notable geologic features
- * Establish representative photopoints; rephotograph annually
- * Develop and maintain geologic features database layer in GIS
- * Monument-wide review and report by specialist every second year

Soil

Broad Questions to be answered

- 1) Is soil productivity within the Monument adequately protected?

Baseline Data and Implementation Monitoring

For projects with potential for adverse soil disturbance, collect baseline data on the level of soil compaction present within the project area, on a sample basis determined in consultation with the Forest Soil Scientist. If mitigation measures for soil protection were required for the project, implementation monitoring should verify whether such measures were applied as designed.

Effectiveness Monitoring

Every five years, visit a representative sample of projects that included soil mitigation measures within three years of when the project was completed, and check soil samples within the project area for decreases in soil productivity. Summarize findings and trends in a short report. If adverse trends are identified, consult with Forest Soil Scientist to improve the mitigation measures or identify other ways to protect soil productivity. If soil productivity has been unacceptably affected, take follow-up measures.

Suggested Methods

- * Establish test plots and take samples before and after activity for compaction, erosion, or soil "burning" (from prescribed fire)
- * Review Monument-wide sample of projects with soil measures and report findings every five years.

Air Quality

Broad Questions to Be Answered

- 1) Does air quality within the Monument meet applicable Federal and state standards?
- 2) Have management activities or other uses within the Monument unacceptably degraded air quality within the Monument?
- 3) Have there been unacceptable adverse impacts to air quality as a result of adjacent geothermal development?

Baseline Data and Implementation Monitoring

Implementation monitoring at the project level for air quality will be most relevant to vegetation treatments that involve prescribed burning or extensive construction projects that create potential for dust. In both cases, implementation monitoring reviews should validate whether project design and mitigation measures with respect to air quality were applied as intended.

Effectiveness Monitoring

Collect relevant baseline data on air quality and meteorological conditions at several sampling points for emissions and potential effects to ecosystems, human health, and visitor satisfaction related to recreational use (wood smoke and motorized vehicles) and geothermal development.

Monitoring to be done for air quality emissions in conjunction with the Newberry Geothermal Pilot Project is described in Attachment C of the Record of Decision for that project. It includes monitoring for hydrogen sulfide at the power plant site and at a site near Paulina Lake or Paulina Lake lodge; monitoring of lichen tissues at selected sites to assess impacts to vegetation from emissions generated by the development; and collection of meteorological data at the power plant site and on the south shore of Paulina Lake. Use the data from these monitoring efforts as part of effectiveness monitoring for air quality impacts related to geothermal emissions.

Establish two photo points, one in the caldera area and one from Lava Butte, as monitoring sites for visibility. Evaluate data from the photopoints at three-year intervals to determine trends.

Suggested Methods

- * Nephelometer measurements for visibility and estimated fine particulates
- * Visitor surveys
- * Photo point chronology
- * Air sampling and analysis

- * Meteorological data collection at varying altitudes
- * Review of data from air quality monitoring for geothermal projects

Water Quality

Broad Questions to Be Answered

- 1) Does water quality within the Monument meet applicable Federal and state standards?
- 2) Have management activities or other uses within the Monument unacceptably degraded water quality within the Monument?
- 3) Have there been unacceptable adverse impacts to water quality as a result of adjacent geothermal development?

Baseline Data and Implementation Monitoring

Implementation monitoring at the project level for water quality will be most relevant to water-supply projects, fueling and maintenance stations, and construction projects or vegetation treatments near shorelines that create potential for erosion. Implementation monitoring reviews should validate whether project design and mitigation measures with respect to water quality were applied as intended.

Effectiveness Monitoring

Review a sample of projects with mitigation measures for water quality issues and assess effectiveness of measures. Additionally, collect relevant baseline data on water quality and potential effects to ecosystems, human health, and aesthetics (lake clarity) related to human uses inside the Monument (e.g. wastewater disposal, motorized-boat use) and geothermal development adjacent to the Monument. Use data collected from water quality monitoring to be done for the Newberry Geothermal Pilot Project (see Record of Decision and associated documents for that project). Monitoring will continuation of hydrology studies being done by USGS.

Suggested Methods

- * Secchi disk depth to monitor lake water clarity
- * Water sampling and analysis for organics (including petroleum products) in lakes and in selected wells; could include installation of monitoring wells for groundwater quality between the lakes and some campground leach fields.
- * Additional water quality sampling and analysis at detection levels less than .012 ppb (State standard for protection of aquatic life) for mercury (e.g. by atomic fluorescence methods).
- * Review of data on geothermal reservoir and hot springs monitoring (done as part of geothermal project monitoring) to evaluate any changes to hot springs.

Vegetation

Broad Questions to be Answered

- 1) Are activities to restore "historic" ponderosa pine old growth resulting in progress toward that condition? How effective are the activities in achieving this goal?
- 2) Are vegetation treatments for other resource objectives, such as habitat enhancement for wildlife or sensitive plants, achieving the desired result? (See monitoring for the other ecological components for a complete understanding of the total monitoring program requirements.)
- 3) What are the general trends for insect and tree disease activity within the Monument? Are insect and disease levels increasing or decreasing? Are resources outside of the Monument or important values within the Monument being seriously threatened by insect and disease activity?
- 5) Are activities to reduce fuel loading making a difference in the extent of (or likelihood for) high-intensity wildfires in the Monument?

Baseline Data and Implementation Monitoring

Monitoring of reforestation activities will follow established Regional policy. The environmental analysis for each vegetation management project will meet the general direction for project implementation monitoring specified earlier in this document. Implementation monitoring should answer the question: "Were the project plans or management prescriptions followed for vegetation management treatments?"

Enter all vegetation management activities into the established Forest database. Annually, evaluate the extent of on-the-ground vegetation management activities conducted during the year and document this in a short summary for the files. At a minimum, identify the acreage treated to meet objectives for "historic" (fire-based) old growth ponderosa pine. Follow-up measures, (if any are needed) are specified at this time.

Inventory existing old growth using Regional definitions to establish baseline acreages. It may be possible to extract this information from recent vegetation inventories. Review vegetation inventory information, periodically, as it becomes available, to determine areas susceptible to mountain pine beetle and western pine beetle, and to determine areas that meet old growth definitions for ponderosa pine.

Effectiveness Monitoring

Effectiveness monitoring will generally occur on a sample of the vegetation management activities that have been carried out. Monitoring at this level should begin to address the broad monitoring questions for vegetation set out at the beginning of this section. Data needed to help answer those questions include:

- * the extent of the area of ponderosa pine communities that meet old growth definitions as described in the Monument Plan, and the characteristics of each old growth stand.
- * extent of areas where vegetation conditions within the Monument pose serious threats to resources outside the Monument from fires, insect or disease epidemics.
- * extent and location of high-intensity wildfires and their effects on soil productivity, scenic conditions, and distribution/amount of wildlife habitat components.

Annually, review the Forest Pest Management aerial detection survey to determine current levels of insect and disease activity. Follow up with field visits to identified, problem areas. Determine current levels of insect and disease activity.

Evaluate the above data and propose follow-up measures, if any are needed.

Suggested Methods

- * "Walk through" field observations and examinations;
- * Temporary or permanent plot sampling, stand examinations;
- * Photo point chronology - establish photo points in treated and untreated areas in selected vegetation communities (coordinate with photo point establishment for scenery monitoring to consolidate where feasible);
- * Field notes, reports, databases;
- * Analysis of database contents;
- * Broad scale inventories;
- * Evaluation of data, including results of implementation monitoring;
- * Formal and informal reports

Sub-Element - Threatened, Endangered and Sensitive Plants

Broad Questions to be Answered

- 1) Are these plants being protected as management activities (projects) are carried out?
- 2) Are these plants being protected from day-to-day threats from visitors, routine maintenance activities, encroachment by other vegetation and other environmental factors?
- 3) Are activities designed to enhance plant habitats/populations effective in maintaining or increasing plant populations?

Baseline Data and Implementation Monitoring

Survey ground-disturbing projects for Threatened, Endangered or Sensitive plants before the disturbance takes place. If any Threatened, Endangered or Sensitive plants are found, properly document such discoveries. Record information on areas surveyed and survey results in the Forest database.

Review projects to make sure any mitigation measures specified in the decision documents have been carried out. See "General Direction for Project Monitoring".

Effectiveness Monitoring

Conduct effectiveness monitoring following the completion of activities that could potentially affect populations identified during surveys. For habitat enhancement, effectiveness monitoring should be conducted to determine if the results were consistent with stated objectives. Extended monitoring over longer time periods could be required to determine effectiveness for enhancement.

Continue intensive monitoring activities for two populations of Botrychium Pumicola, a sensitive species. Include results in Forest monitoring program. Determine if additional populations will require intensive monitoring (including an existing population where concern exists about the effects of recreation activities on it).

Evaluate the above information and propose follow-up measures, if any are needed.

Suggested Methods

- * Temporary or permanent plot sampling
- * Informal observations or "walk throughs" following project completion
- * Photo point chronology
- * Field notes, reports, database input
- * Analysis of database contents
- * Summaries of field observations and surveys
- * Evaluation of data, including results of implementation monitoring
- * Formal and informal reports
- * Use track counts of skis and snowmobiles in winter to assess frequency of potential winter impact where pumice grape-fern grows

Fish and Wildlife

Sub-element - Threatened, Endangered and Sensitive Species

Broad Questions to be Answered

- 1) Is the habitat these species occupy being protected as management activities (projects) are carried out? Are currently unoccupied high quality habitats (for bald eagles) retaining the characteristics that would attract this species?
- 2) Is the habitat they occupy being protected from day-to-day threats from human visitors, routine maintenance activities or environmental factors?
- 3) Are activities that are designed to enhance or restore habitat effective in maintaining or increasing species populations?

Baseline Data and Implementation Monitoring

Survey ground-disturbing projects for species before the disturbance takes place. If any Threatened, Endangered or Sensitive animals are found, properly document such discoveries. After completion of environmental analysis (including biological evaluations and identification of any appropriate mitigation measures), review projects to verify that any mitigation measures were applied as specified in the decision documents. See "General Direction for Project Monitoring".

Record information on areas surveyed and survey results in the Forest database.

Effectiveness Monitoring

Conduct effectiveness monitoring following the completion of activities that could potentially affect species identified during surveys. Effectiveness monitoring will address questions relating to the effectiveness of projects in protecting species and their habitat. For habitat enhancement, effectiveness monitoring should be conducted to determine if the results were consistent with stated objectives. Extended monitoring over longer time periods could be required to determine effectiveness for enhancement.

Over the long term, effectiveness monitoring will address the question "are habitats and/or populations increasing, decreasing, or stable in the Monument?"

Record observations of species reported by employees and the public. Use data collected for vegetation, recreation, and water quality monitoring to assess changes in amount and quality of habitat components for these species.

Evaluate the above information and propose follow-up measures, if any are needed.

Suggested Methods

- * Temporary or permanent plot samples to measure vegetation (habitat)
- * Conduct surveys for species using established protocols
- * Informal observations or "walk-throughs" following project completion
- * Field notes, reports, database input
- * Continue cooperation with Oregon Cooperative Wildlife Research Unit to conduct annual bald eagle nest surveys;
- * Photo point chronology for habitat- take follow-up photos (coordinate where feasible with vegetation and scenery photopoint monitoring)
- * Maintain records of verified observations of threatened, endangered, and sensitive wildlife in the District and Forest wildlife observation databases
- * Analysis of database contents;
- * Summaries of field observations and surveys;
- * Evaluation of data, including results of implementation monitoring
- * Formal and informal reports
- * Review geothermal project monitoring data and results

Sub-element - Other Wildlife Habitat Components

Broad Questions to be Answered

1) Is the habitat that wildlife species occupy being protected as prescribed when management activities are carried out? Specific questions of interest include:

*Do activities achieve the objectives for snags and down woody material?

2) Are activities designed to enhance or restore wildlife habitat effective? Are habitat restoration areas occupied by the desired species?

Specific questions of interest include:

*Do flammulated owls and white-headed woodpeckers occupy "historic" old growth ponderosa pine stands containing large snags?

*Do black-backed woodpeckers, northern three-toed woodpeckers, and American marten use lodgepole pine stands treated with prescribed fire?

*Do goshawks continue to nest in stands following habitat improvement projects designed to maintain their habitat?

3) Are goals for amount and quality of specified types of habitat being met? If so, is this reflected in stable or increasing population levels for selected species?

Specific questions of interest include:

*Do mule deer continue to migrate through the Monument in numbers which help meet Forest Plan objectives?

*Is hiding and thermal cover sufficient in mule deer winter and transition range to provide security and weather moderation?

*Are levels of deer/vehicle collisions on Highway 97 increasing, decreasing, or remaining stable?

*Are recreation activities or programs conflicting with habitat use by "species of interest" (goshawk, deer, marten) in the Monument?

4) Does the Monument contribute to habitat diversity on a landscape scale, i.e., are habitat patch sizes of the vegetation communities and successional stages different in the Monument as compared to patch sizes on the Fort Rock District?

Baseline Data and Implementation Monitoring

Maintain a database of wildlife habitat enhancement projects and use vegetation databases as a reference for assessing changes to wildlife habitat components, in addition to field data collected during project analysis and after project implementation. Monitoring should be sufficient to determine if habitat improvement projects were carried out at the planned rate. Prescribe follow-up measures.

Conduct implementation monitoring to verify whether project plans and prescriptions were implemented as designed (including any mitigation measures identified in decision documents) and in compliance with standards and guidelines found in the Monument Plan. The purpose of projects will vary, some will contain mitigation measures to help protect wildlife, others will be designed specifically to enhance wildlife habitat for selected species. See "General Direction for Project Monitoring" for monitoring procedures.

Effectiveness Monitoring

Conduct effectiveness monitoring following the completion of activities designed to enhance habitat. Effectiveness monitoring will generally occur on a sample basis, and may include data collection such as temporary or permanent plot samples for habitat; species surveys, field observations, and data from other related monitoring efforts for vegetation, water quality, and recreation. Evaluate the above information and propose follow-up measures, if any are needed.

For habitat enhancement, effectiveness monitoring should be conducted to determine if the results were consistent with stated objectives. Extended monitoring over longer time periods could be required to determine effectiveness for habitat enhancement. Effectiveness monitoring will address questions relating to the effectiveness of projects and their habitat such as: "Are species successfully reproducing in areas where treatment objectives included meeting

reproductive habitat objectives?"

Over the long term, effectiveness monitoring will address the following question: "Are populations of "interest" increasing, decreasing, or stable in the Monument?"

Suggested Methods

- * Temporary or permanent plot samples to measure vegetation (habitat)
- * Surveys following established protocols (when available) to locate species
- * Informal observations or "walk-throughs" prior to and following project completion to address variables such as hiding or thermal cover or snag levels
- * Field notes, reports, database input
- * Observations of species reported by employees and the public recorded in the District and Forest databases;
- * Cooperative efforts with ODFW to conduct animal census'
- * Cooperative efforts with ODFW to conduct track counts along Highway 97 during deer migration period
- * Contacts with Oregon Department of Transportation and ODFW to obtain estimates of deer killed by vehicles and/ or numbers of accidents involving vehicles and deer
- * Aerial photo interpretation of habitat or other broad inventory methods
- * Review aerial photos at five-year intervals to compare patch sizes in the Monument with those outside the Monument
- * Photo point chronology - take follow-up photos for habitat (coordinate photopoint establishment with vegetation and scenic condition monitoring, where feasible)
- * Analysis of database contents
- * Summaries of field observations and surveys
- * Formal and informal reports

Human/social Ecosystem Components

Cultural Resources

Broad Questions to be Answered

- 1) What percentage of recorded cultural/heritage resource sites are being disturbed by looting or vandalism?
- 2) How many cultural/heritage sites were located and recorded during the previous year? How many were evaluated? How many nominations to the National Register were made? (Do not provide site-specific data in any report intended for public release).
- 3) Are programs being implemented to rehabilitate, restore, reconstruct or adaptively reuse previously disturbed cultural/heritage resource sites?
- 4) Is consultation occurring with the Confederated Tribes of the Warm Springs Reservation, the Klamath Tribe and the Burns Paiute Tribe? What kinds of activities are being implemented? How much and how effective?
- 5) Are protection methods or mitigation methods for cultural/heritage resources being implemented as stated in the Monument Plan and project decision documents? What kinds of methods are being employed and how much? How effective are these methods?

Baseline Data and Implementation Monitoring

The goal is to protect cultural/heritage resources from potentially adverse effects. Site-specific inventory and analysis, consultation with Native American Indians, and application of appropriate mitigation measures are used to meet this goal. Conduct implementation monitoring to verify whether projects are implemented as designed (including any mitigation measures specified by decision documents) and are in compliance with the standards and guidelines of the Monument Plan. Follow "General Direction for Project Monitoring".

Document site testing with a final report describing the results of the work. Enter cultural/heritage resource management activities and sites into the established Forest database and/or informational systems.

Annually evaluate the extent of Cultural/Heritage management activities conducted during the previous year and provide written documentation in a summary for the files. At a minimum, identify the number of sites monitored, the number of sites undergoing treatment, the type of treatment, follow up recommendations, associated monitoring costs, the number of sites recorded, and the number of sites found eligible and ineligible for the National Register of Historic Places.

Effectiveness Monitoring

Effectiveness monitoring will address questions relating to the effectiveness of the program (or in some cases individual projects) in meeting specified objectives for protecting cultural resources. Following implementation of any cultural/heritage resource management project:

--prepare a report evaluating the effectiveness of protection measures. Include a narrative evaluation of whether the objectives of the project were met, and any quantitative measurements, as appropriate. Make the report and accompanying analysis available to the Oregon State Historic Preservation Officer and the Advisory Council of Historic Preservation.

Recommendations or follow-up measures are prescribed at this time.

Monitor a sample of sites protected by project design to assess the effectiveness of design measures. On a sampling basis, evaluate effectiveness of avoidance activities for project sites where avoidance has been used as a mitigation measure. Aim for sampling of 10% or more of such projects. Monitor all sites for which data is recovered to determine the effectiveness of data recovery in preserving significant data for that particular site.

Review current levels of consultation with Native American Indians and Tribes.

At least every three years, evaluate the effectiveness of the cultural/Heritage resources management program for the Monument and summarize findings in a written report (include any recommendations for follow-up measures). Provide the report to the District Ranger and Forest Archaeologist. At a minimum, identify the number of sites monitored, the number of sites found looted/vandalized, the number of activities receiving consultation with Native American Indians, associated monitoring costs, the number of sites evaluated, and the number of nominations to the National Register of Historic Places.

Suggested Methods

- * Informal "walk-throughs"
- * Statistical sampling
- * Field forms devised with applicable elements for monitoring each site throughout the project or at the completion of the project
- * Interdisciplinary field review at completion of project
- * Review databases
- * Written reports
- * Correspondence with appropriate individuals

Recreation and Interpretation

Broad Questions to be Answered

- 1) What are the visitor use patterns and preferences in the Monument, and what are the reasons for these patterns and preferences ? How much of this use is for interpretive activities, and of what type?
- 2) Is the Monument providing the experiences and settings that visitors want? Is it providing barrier-free opportunities at a range of challenge levels?
- 3) What indicators and thresholds can be established as a means of understanding, defining and monitoring a recreational carrying capacity within the Monument (social, ecological, physical, facility)?

Baseline data and Implementation Monitoring

Verify whether projects are consistent with ROS allocations, Monument standards and guidelines, and interpretive strategies. Verify whether any monitoring or mitigations related to recreation and interpretation were done as specified in the project environmental documents.

Collect baseline visitation frequency at key entry points into the Monument. Set up counters for selected trails, roads, and developed recreation areas. Collect baseline information for barrier-free opportunities.

Set up processes for gathering user preference information and evaluating the effectiveness of interpretive programs (e.g. visitor surveys, observations of visitor behavior).

Record the number of visitors at all interpretive programs, including off-site outreach programs. It may also be useful to record the number of information requests of different types received at different locations (e.g. lava Lands Visitor Center, Paulina Guard Station, District Office and Headquarters). Keep these records and reports in a central location (along with visitor use and preference studies) to be used for improving recreational and interpretive programs in the Monument.

Effectiveness Monitoring

Review data collected (see above) and assess to what extent the Monument is providing for the ROS classifications and meeting broad interpretive goals described in the Monument Plan. Do this evaluation every three years (sooner if needed).

Use monitoring data, in conjunction with data on other resource values (i.e., wildlife, water quality, air quality, etc.) to define indicators of "overuse" and "overdevelopment" and to refine recreational carrying capacities for different areas in the Monument. Assess whether levels or types of recreational activities are unacceptably affecting visitors' experiences or other resources.

Annually, use data collected on number of visitors attending interpretive programs to evaluate the success of the various types of programs offered.

Evaluate each major recreational project (after completion) in a short written report. Include relevant quantitative measurements. Identify and assign follow-up measures and maintenance procedures, if necessary. Inventory, document and make recommendations regarding condition of recreation facilities, including trails every three years. Include assessment of barrier-free facilities and trails.

Periodically review data to assess whether use levels and/or patterns are changing, if the Monument is providing for new trends, and if trends and/or patterns are consistent with the purposes of the Monument legislation. Do this every five years or at Plan revision, depending on rate of change in visitation.

Suggested Methods

- * Visitor use and preference surveys
- * Trail and road counters
- * Facility inventories
- * Participant counts for interpretive programs
- * Comment forms
- * Establish photopoints and maintain periodic photo inventory
- * Studies to observe visitor behavior/preferences

Scenery

Broad Questions to be Answered

- 1) Are the projects being implemented meeting scenery standards (VQO's, SVCR, SFCR) for the Monument? Are the landscape character subtypes changing, and if so at what rate?
- 2) Are structures, facilities and signs consistent with architectural themes stated for the Monument and associated standards and guidelines?
- 3) Are management activities and/or uses unacceptably altering scenic quality within the Monument?
- 4) How is fire affecting the scenic quality within the Monument? What is the public response and participation with prescribed fire management? How is public perception and interpretation being linked with and integrated with prescribed fire management?

Baseline data and Implementation Monitoring

Prior to implementation of activities with potential to alter scenic condition and/or landscape character document the appearance of the project site and the viewshed in which the project occurs with photographs and establish photo points for future reference. Link photo points to GIS. Maintain photo inventories and narrative in a central location and update periodically.

Review projects immediately following project completion and again one to three years later. Verify whether design and mitigation measures specified in environmental decision documents were carried out as planned. Document visual conditions and landscape character with photographs and narrative describing whether the expected results were achieved and what the effects were. Update affected summary viewshed condition and landscape character inventories. Also document results of interpretive or educational projects that are linked to the project (if any). Determine any follow-up measures or corrective actions that may be needed.

Effectiveness Monitoring

On a sample basis by viewshed, review the amount of cumulative change that is taking place in seen areas of the Monument (every three to five years, depending on rate of project activities and natural disturbances).

In order of the priority shown below, establish photopoints and take photographs of major viewsheds and developed recreation sites in summer and winter conditions:

- 1) Paulina Peak
- 2) Lava Butte
- 3) Highway 97 corridor in the Lava Butte Zone
- 4) Selected developed recreation sites in the Caldera Zone
- 5) Roads 9702, 9710, 9720, 9723, 9735

- 6) Lava Cast Forest
- 7) Lava River Cave/Lava Lands Visitor Center
- 8) Northern half of the Flanks Zone
- 9) Southern half of the Flanks Zone
- 10) Benham Falls

Establish photopoints for other viewsheds and developed recreation sites as time and funding permit. Should a project be planned in a viewshed for which photopoints have not yet been established, establishing photopoints and doing baseline photography for that project will take priority over the above list. From this photopoint data, establish the baseline scenic condition and fire character for viewsheds, including insect, disease, and wildfire disturbances.

Conduct effectiveness monitoring for scenic quality using a representative sample of vegetation management activities and recreation projects. Assess whether design and mitigation measures are creating the intended result. In the event of significant wildfires, evaluate the cumulative their cumulative effects on scenic condition and landscape character and document for the files, for use in future project planning. Assess rates of scenic change occurring at a viewshed level (for selected viewsheds) and the consistency of this rate with Visual Quality Objectives (every three to five years, depending on rate of activities and natural disturbance).

Conduct surveys of visitor reactions to prescribed fire management activities and effects, on a sample basis. Assess public reaction to amounts and rates of visual change related to reintroduction of fire into ecological processes within the Monument. At Monument Plan revision, recommend any needed changes to standards regarding rates of change.

Suggested Methods

- * Photopoint establishment, photographic data collection and maintenance
- * Surveys to assess reaction to prescribed fire treatments
- * GIS analysis and visual simulations to model expected effects of site-specific activities on visual quality

Scientific Research

Broad Questions to be Answered

- 1) Do research programs meet the intent of the Monument legislation? How many research programs have been enacted and what kinds?
- 2) How effectively does research contribute to meeting the research categories outlined in the research section (see section on criteria for science and research in the Monument Plan)?
- 3) Are research programs adversely affecting other resources or Monument uses?
- 4) Does the research aid in the public's understanding of the Monument's ecosystems?

Baseline Data and Implementation Monitoring

Conduct implementation monitoring to verify whether research activities, plans and proposals are implemented as designed and that they are in compliance with the standards and guidelines of the Monument Plan. Implementation monitoring should follow the "General Direction for Project Monitoring".

Enter all research activities and data into the established Forest database and/or informational systems. Annually provide a short written narrative summarizing research activities within the Monument and adjacent special areas for the files. At a minimum, identify the number and types of research activities, their objectives and their status as far as completion.

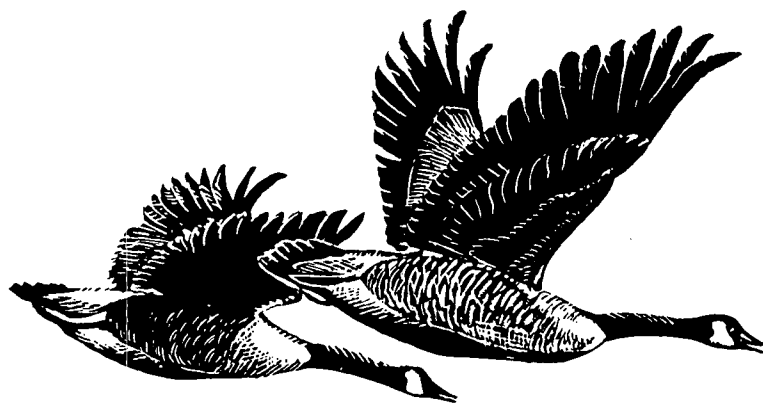
Effectiveness Monitoring

Review each research project once during its life and at its conclusion to evaluate its effectiveness in contributing to one or more of the three categories for research identified in the Monument Plan. Add this evaluation to the files. Ensure that research results are provided to the Forest Service. If there are any recommendations for follow-up measures, forward these to the responsible official.

Every five years (or sooner, if needed) evaluate a sample of research projects to determine the effectiveness of research activities in providing information for one or more of the three categories in the Monument Plan (see science and research section). At a minimum, summarize the findings from research that contributed to information on the Monuments ecosystems, any trends in research locales or topics, types and levels of impacts to other uses or resources within the Monument, and any associated monitoring costs.

Suggested Methods

- * Informal "walk-throughs" of the project area
- * Field forms devised with applicable elements for monitoring each phase through out the project or at the completion of the project
- * Interdisciplinary field review at completion of project





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Science and Research

Opportunities and Priorities

The legislation establishing Newberry National Volcanic Monument states: **"Scientific research shall be allowed consistent with the purposes for which the Monument was established... The Management Plan shall address the following issues: ... Research, including identification and prioritization of research opportunities."** (Sections 2 f and 6 b, Public Law 101-522).

This section includes a list of identified and prioritized research opportunities. Many future research opportunities cannot be anticipated or foreseen. The following categories indicate the priorities (in order of importance) for research with the Monument and adjacent special areas. They may be use as a selection tool in the event of competing research proposals.

1. Research needed to meet requirements for resource protection.
2. Research with strong direct ties to the management of the Monument.
3. Research that produces interpretive information for the Monument.

The Monument Plan covers all lands mentioned in the Monument legislation. Geothermal leases occur in much of the Special Management Areas (no surface occupancy) and the Transferal Area (surface occupancy). Research in these areas is subject to leaseholders' rights as granted by the Monument legislation

Research can be proposed by groups or individuals, such as universities, graduate students, U.S. Geological Survey, U.S. Forest Service, corporations, or other agencies. Research can be cooperatively conducted by the Forest Service and other groups or individuals.

The Forest Service will review each research proposal for consistency with the purposes for which the Monument was established. Forest Service specialists will have input in the review process for all proposed research projects. Research proposals should adhere to the following requirements and will be evaluated against at least the following criteria:

1. Are the results of the research available to the Forest Service (yes or no)? Unavailable research results are not appropriate for research within the Monument. The Forest Service must have access to all data.
2. Research shall follow all of the applicable laws, regulations and policies (For example, the Threatened and Endangered Species Act or the National Historic Preservation Act).
3. Written analysis shall be finalized within two years after completion of field work.

4. The integrity of cultural resources is maintained.

5. Evidence of consultation with Native American Indians shall occur for all undertakings that have the potential to affect cultural resources, and documentation of any concerns shall be included as a part of the research proposal (National Historic Preservation Act and American Indian Religious Freedom Act consultation with the Confederated Tribes of the Warm Springs Reservation of Oregon, the Klamath Tribes and the Burns Paiute Tribe).

The following questions should also be asked when evaluating and/or prioritizing research proposals:

1. Which of the three categories does the research fall into? Category 1 (above) has the highest priority; Category 3 the lowest.

2. Can this research be done only in the Monument? (A justification is needed for research that could be done outside of the Monument.)

3. What is the proposed location of the research project and why does it need to be done there? (evaluate conflicts with other resources).

4. How long will the research project take ?

5. To what extent does the research project meet legislative intent? (The research proposal should demonstrate how the proposal supports the intent of the Monument legislation).

7. Consider potential for impacts (noise, dust, site damage, visibility, etc).

8. Consider potential for conflicts with other users (for example, displacing campground use may not be appropriate during certain times of the year).

9. How will results be made available to the public by researcher (Copy of research report to Forest Service? Developed interpretive materials? Developed display)?

10. Does the research aid in the public's understanding of the Monument's ecosystems and how natural processes work?

11. Does this research tie the Monument to a global context?

12. Is the information gained useful in managing the Monument?

13. Does the research proposal include an effective monitoring program or contribute to the Monument monitoring program?

14. In considering cultural resource proposals, what is the significance of a cultural resource property? Significance is based on previously established criteria for the National Register).

15. What is the presence or potential presence for Mazama or pre-Mazama components in archaeological research proposals ?

16. Is research guided by appropriate designs and methodologies relevant to the specific research questions? Proposals that meet this criterion would have a higher priority; those that do not would need a justification for varying standard practices.

Research topics identified to date

On a broad scale, some appropriate topics for research would include: geology; archaeology; fire ecology; cave ecology; wildlife habitat relationships; social research on visitor expectations of the Monument; effects of geothermal development on Monument values; effects of vegetation management practices on vegetation and communities, identifying the "natural" burn patterns over time; and effects of prescribed fire activities and wildfire on wildlife, vegetation, and recreation. Some research projects could use the Monument as one site to make comparisons with sites in other areas.

The following lists of research opportunities recognize some research needs. We expect that many other opportunities are possible.

Research to meet requirements for resource protection (Category 1)

Air Quality

Air pollution impacts on wildlife, visibility, plants (consider *Botrychium*), human health, and visitor satisfaction.

Heritage (Cultural) Resources

Complete the cultural resource inventory and evaluation of the area between the two lakes.

Complete research to aid in the analysis and write up of data recovery and evaluation projects done on Paulina Lake Site (sewer-92' Halloran, data recovery), East Lake Resort Site (84' Davis, data recovery) and (89' Ritchie, evaluation) and Newberry Group Site prehistoric component (87' Ritchie, evaluation).

Research needed to complete cultural resource treatment plans for East Lake resort area and Paulina Lake resort area prior to approval of special use permit.

Research needed in order to complete cultural resource treatment plan for the Paulina Lake site.

Complete research for feasibility and in order to nominate the caldera as a site complex to the National Register of Historic Places, and/or a world heritage site.

Rehabilitation or restoration of the Paulina Guard Station and its usage for housing interpretive displays.

Complete research in order to rehabilitate or relocate or adaptively reuse the IOOF Cabins.

Research needed in order to complete cultural resource treatment plans for sensitive areas where recreation and significant cultural resources occur together. These areas include campgrounds and attractions within the caldera, such as the Big Obsidian Flow and Cinder Hill Campground.

Complete research to enable cultural resource evaluation and rehabilitation of cave sites.

Complete cultural resource inventory of the Monument lands.

Complete research in order to formally nominate significant cultural resource sites to the National Register of Historic Places.

Research to identify the type and extent of cultural resource site damage within the Monument, including looting and artifact collection. A protection plan based on the initial research is also another opportunity.

Research to identify traditional cultural properties located within the Monument. A protection plan based on the initial research is another opportunity.

Cultural resource inventory of underwater hydrological sources such as Paulina Lake, East Lake, Paulina Creek and the Deschutes River.

Complete research in order to rehabilitate and/or restore damaged cultural resource sites.

Wildlife

Research on spring, summer, and fall habitat use and diet by Townsend big-eared bats.

Sampling of pollutant levels in fish and wildlife as part of monitoring efforts for recovery of threatened, endangered, or sensitive species.

Long-term monitoring of populations of rare plants and animals.

Bioaccumulation of mercury and other potential toxins within bald eagles, osprey, and fish.

Water Quality

Investigate the effectiveness of septic systems in the caldera, by looking at changes in water quality in the lakes, in terms of organic and other potentially sewage-induced components like coliform, nitrates, and nitrites.

Changes in levels of geothermal emissions in the lakes (those that could be deposited into the water from the steam of geothermal exploration and operation activities). Study the effects of these levels in the lakes on aquatic life.

Study effects of other human activities (e.g. motorized boating, camping) on water quality in the lakes.

Research with strong ties to management of the Monument (Category 2)

Heritage (Cultural) Resources

Site prediction models such as the study of spatial distribution patterns for predicting cultural resource site locales and site types.

Studies on the effects of modern vegetative practices on cultural resource properties, including sub-soiling.

Potential for buried archaeological sites located within the Monument.

Relevancy of past to contemporary issues, such as land management.

Research to investigate and design appropriate interpretive displays of the Paulina Lake site, Paleo-Indian occupation of the caldera; and lithic technologic activities. Focus is on who these people were, how and what they exploited and their relationship with the environment.

Wildlife

Determine the response of bird communities, including woodpeckers, to management of ponderosa pine in fire-dependent, park-like conditions.

Studies of cave ecology of lava tubes.

Responses of plant and animal communities to vegetation manipulation, with a focus on the use of fire.

Research projects within the Mokst Butte Research Natural Area.

Natural resource inventories to determine the extent of a given resource.

Vegetation

Response of ponderosa pine to prescribed fire in stands with mixed species (particularly lodgepole pine).

Recreation/Interpretation

Effect of interpretive programs on resource protection and visitor satisfaction.

Effects of wildfire and prescribed fire activities on recreation.

Visitor perception of scenery in forest areas managed with fire (ponderosa and lodgepole pine).

Effects of limiting recreational use on visitor preference, recreational experiences, user trends, and resource damage.

New or different methods for measuring visitor use levels and preferences.

Research that produces interpretive information for the Monument (Category 3)

Geology

Radiometric dating of features within the Monument or related to Newberry Volcano. Examples include South (or Buried) Obsidian Flow, East Lake Obsidian Flows, Little Crater, The Dome, Devils Horn, North Kawak Butte and flows, Pilpil Butte and flows, Mokst Butte and flows, and additional dating to refine the length time involved in the Northwest Rift, Big Obsidian, and Interlake Eruptive episodes.

Studies of the tephra deposits along the NW Rift Zone and within the Caldera. These could prove to be important time markers for archaeological sites.

Studies of the formation of obsidian flows and their degassing.

Studies of the fossils along the lake shore at Little Crater Campground.

Studies of the charcoal logs along Road 21 between the Group Camp and Little Crater Campground roads.

Studies of the effect and results of damming of the Deschutes River by the Lava Butte

Lava Flow (most of this research would likely occur outside the Monument but some opportunities may exist within).

Heritage (Cultural) resources

Investigation of travel corridors into the caldera in pre-Mazama times.

Study and list of traditional culturally used plants within the Monument.

Oral history research and documentation of local inhabitants, including "old timers" and Native American Indians.

Evolution of human use activities in the caldera.

Distribution of Newberry obsidian outside of the caldera.

Human exploitation of the environmental resources over time.

Human adaptation, activity and changes over time to the local terrain and volcanic activity.

Establishment of a cultural chronology within the Monument.

Practices and evolution of lithic technology and reduction sequences at all of the obsidian quarries within the Monument.

Effects of volcanic activity on the relative biotic productivity.

Identification of culturally or functionally diagnostic occurrences of lithic technology activities.

Chronological direction and range of Newberry obsidian outside of the caldera.

Differences between big game hunter groups and hunter/gatherer groups within the Monument.

Dating to establish the eruption chronology and unrecorded volcanic events.

Distinguishing chemical signatures between the obsidian flows located within the caldera.

Vegetation

Studies of fungus flora.

Wildlife

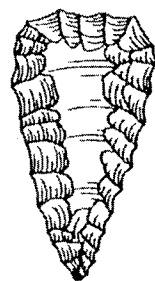
Establish research effort as part of western North American neotropical migratory bird population monitoring and habitat relationships studies.

Water quality

Characterize the ground water hydrology of the caldera area, including horizontal and vertical circulation.

Locate and characterize hot spring locations in the lakes.

Document variations in hot spring and fumarole activity through time in the caldera.



ACTIVITY SCHEDULE

Activity Schedule

The following pages display activity schedules anticipated for recreation and interpretation projects, ecosystem protection, restoration or enhancement activities, and trail and road projects in Newberry National Volcanic Monument. The schedules summarize projects planned for the next 10-15 years. These projects are additional to the current on-the-ground situation.

A Capital Investment Program (CIP) Team, which included representatives from the Regional Office, Supervisor's Office and Fort Rock Ranger District, developed criteria to be applied in prioritizing facilities, trails, and roads projects. The criteria are summarized below. Detailed records of the discussions by the CIP team that led to these priorities are available in the planning record.

Criteria for Selecting NNVM CIP Projects

Developed Recreation

PRIORITY 1: Invest in existing development in the caldera (renovate, expand, enhance) - both overnight and day use.

PRIORITY 2: Invest in existing development in the Lava Butte Zone hub area.

PRIORITY 3: Invest in new development - expand the Lava Butte Zone hub area south into the Transition Zone. Invest in existing and new development in the Transition Zone.

PRIORITY 4: Invest in new development - establish new day-use opportunities in the caldera.

Trails

PRIORITY 1: Invest in existing trails and trailheads in the Caldera and Flanks Zones (mitigate, renovate, enhance).

PRIORITY 2: Invest in existing and new trails/trailheads in the Lava Butte Zone hub (in conjunction with renovation of Lava Lands Visitor Center, etc.)

PRIORITY 3: Invest in existing and new trails/trailheads that enhance and connect the Transition and the Lava Butte Zones.

PRIORITY 4: Invest in new (day-use) trail development in the Caldera and Flanks Zones.

More specific criteria to be applied to the above categories

Within each category above, use the following more specific criteria for prioritizing

specific projects.

1. First, work on projects that mitigate safety concerns, resource concerns, or heavy use areas.
2. Second, work on projects that renovate or enhance existing facilities to better meet user needs.
3. Last, work on projects that would expand recreational development in the Monument through addition of new facilities.

Projects shown on the following pages will be reviewed annually and may be revised if management direction, priorities, projected budgets, or resource conditions change. Site-specific environmental analyses will be required to assess the environmental impacts of each specific project before it can be approved and implemented.

Monument-wide Activity Emphases

Interpretation

*Develop comprehensive, theme-driven interpretive program and strategies, based on the major interpretive topics of archaeology, geology, and ecology.

*All interpretive facility development and/or reconstruction shown in this schedule is driven by needs of the interpretive program and will occur only as needed to support objectives of this program and customer demand.

Ecosystem Treatments

*Undertake a program to restore some of the "historic" fire-based ponderosa pine ecosystems.

*Restore natural processes (fire) in some lodgepole pine areas and accomplish other objectives for scenic quality and wildlife habitat;

*Maintain or increase diversity in selected vegetation communities and at the landscape level.

*enhance wildlife habitat in selected areas.

Facilities, Trails, Roads and Signs

*Build and place portal signs at major Monument entrances; upgrade/replace interpretive and informational signing throughout the Monument.

*Rehabilitate facilities or trails that pose safety concerns, have deteriorated, or need redesign to correct/prevent resource damage or improve visitor orientation and dispersal.

*Close and/or obliterate unneeded roads. Improve road surfaces and/or design where safety concerns or maintenance problems are an issue.

The following pages show activities and projects anticipated to be carried out in the next 10-15 years, by Management Zone. Accomplishment of these projects and activities is contingent on funding, and site-specific NEPA analysis and approval.

Table 5.

**Activity Schedule, NNVM, Decade 1
by Management Zone**

River Zone - Activities Anticipated in the Next Decade		
Category	Nature of Activity	Extent of Activity ^{1/}
Facilities <ul style="list-style-type: none"> ● None planned in this zone. 	N/A	N/A
Trails <ul style="list-style-type: none"> ● None planned in this zone. 	N/A	N/A
Roads <ul style="list-style-type: none"> ● None planned in this zone. 	N/A	N/A
Ecosystem Restoration/Enhancement <ul style="list-style-type: none"> ● Riparian/Willow Enhancement ● Deschutes River streambank 	Burning to remove dead material Stabilization	5 acres 1 mile

^{1/} With respect to acres, figures displayed under extent reflect the combined acreage treated in a project or set of projects, not the size of a single treatment unit. See standards and guidelines regarding appropriate size and configuration of treatment units.

Table 5, continued.

Activity Schedule, NNVM, Decade 1
by Management Zone

Lava Butte Zone - Activities Anticipated in the Next Decade		
Category	Nature of Activity	Extent of Activity ^{1/}
Facilities <ul style="list-style-type: none"> • Lava Lands Visitor Center and Lava Butte Lookout/Visitor Center • Wildlife viewing platform/kiosk at Benham Falls 	Renovate to improve interpretive program. Design to provide viewing options and reduce damage to riparian habitats	Renovation ^{2/} New construction
Trails <ul style="list-style-type: none"> • None planned in the first decade. ^{3/} 	N/A	N/A
Roads <ul style="list-style-type: none"> • Cottonwood interchange 	Redesign access off Hwy. 97 in vicinity of Lava Lands Visitor Center to address safety	2 miles construction
Ecosystem Restoration/Enhancement <ul style="list-style-type: none"> • Ponderosa pine old-growth restoration • Ponderosa pine old-growth restoration • Road Closures/obliteration 9702-125, 9702-200 • Road Closures/obliteration 9700-100, 270, 271, 275, 276, 278, and others 	Prescribed burn/mechanical pre-treatment near Lava Butte to protect existing old growth Prescribed burn/mechanical pre-treatment, other areas Close or obliterate unneeded segments near Annie's Garden (maintain access to memorial) Close or obliterate unneeded segments in vicinity of utility corridors	75 acres 100 acres 1 mile 5 miles

^{1/} With respect to acres, figures displayed under extent reflect the combined acreage treated in a project or set of projects, not the size of a single treatment unit. See standards and guidelines regarding appropriate size and configuration of treatment units.

^{2/} Substantial expansion of these facilities not anticipated until Decade 2.

^{3/} Construction of new trail segments expected in Decade 2.

Table 5, continued.

Activity Schedule, NNVM, Decade 1
by Management Zone

Transition Zone - Activities Anticipated in the Next Decade		
Category	Nature of Activity	Extent of Activity ^{1/}
Facilities <ul style="list-style-type: none"> No changes planned in this decade. 	N/A	N/A
Trails <ul style="list-style-type: none"> None planned in the first decade. ^{2/} 	N/A	N/A
Roads <ul style="list-style-type: none"> No construction planned in this decade. Upgrade surface of 9720 with rock; upgrade safety of link to 9710. 	Upgrade existing roads.	2 miles
Ecosystem Restoration/Enhancement <ul style="list-style-type: none"> Ponderosa pine old-growth restoration Ponderosa pine old-growth restoration Maintenance of species diversity in mixed conifer stands for wildlife habitat. Restore fire in lodgepole pine communities. Road closures/obliterations. 	Prescribed burn or mechanical pre-treatment in areas north of Mokst Butte to preserve existing old-growth. Prescribed burn/light thinning to reintroduce fire as ecological component, various areas (black bark). Prescribed fire/mechanical treatments to allow ponderosa pine reseeding, various mixed conifer areas. Mechanical treatment or prescribed fire to reduce fuels in areas of high fire hazard, various areas. Vicinity of Mokst Butte.	100 acres 200 acres 50 acres 200 acres 6 miles

^{1/} With respect to acres, figures displayed under extent reflect the combined acreage treated in a project or set of projects, not the size of a single treatment unit. See standards and guidelines regarding appropriate size and configuration of treatment units.

^{2/} Construction of Monument trail and other segments expected in Decade 2.

Table 5, continued.

Activity Schedule, NNVM, Decade 1
by Management Zone

Flanks Zone - Activities Anticipated in the Next Decade		
Category	Nature of Activity	Extent of Activity ^{1/}
Facilities <ul style="list-style-type: none"> • None planned in this Zone. 	N/A	N/A
Trails <ul style="list-style-type: none"> • Peak/Rim trail • South Rim winter trail 	<ul style="list-style-type: none"> • Improve trailhead; mitigate impacts • Provide additional winter opportunity 	4 miles 5 miles
Roads <ul style="list-style-type: none"> • None planned in this Zone. 	N/A	N/A
Ecosystem Restoration/Enhancement <ul style="list-style-type: none"> • Lodgepole pine re-establishment of fire as agent of disturbance. 	Prescribed burn/manual pre-treatment to create fuelbreaks that allow for prescribed natural fire, northeast edge of Flanks Zone. ^{2/}	200 acres

^{1/} With respect to acres, figures displayed under extent reflect the combined acreage treated in a project or set of projects, not the size of a single treatment unit. See standards and guidelines regarding appropriate size and configuration of treatment units.

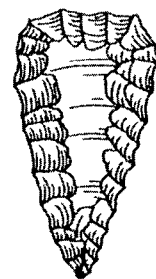
^{2/} Methods that do not require roads.

Table 5, continued.

Activity Schedule, NNVM, Decade 1
by Management Zone

Caldera Zone - Activities Anticipated in the Next Decade		
Category	Nature of Activity	Extent of Activity ^{1/}
Facilities <ul style="list-style-type: none"> ● Portal entrance station ● Upgrade/enhance overnight campgrounds ● Upgrade selected day-use facilities 	<p>Redesign portal entrance station to better orient and direct visitors; provide parking area</p> <p>Redesign general-use campgrounds to reduce impacts to riparian areas, provide higher-quality experiences; improve traffic patterns.</p> <ul style="list-style-type: none"> ● Rehabilitate Paulina Falls day-use area ● Improve Big Obsidian Flow amphitheater 	<p>Redesign/expand</p> <p>Redesign/relocate/ replace</p> <p>current day-use area expand/redesign</p>
Trails <ul style="list-style-type: none"> ● Big Obsidian Flow trailhead and barrier-free trail ● Paulina Falls trail/trailhead ● Paulina Lake loop/barrier free trail 	<p>Improve trailhead; create barrier free trail segment</p> <p>Mitigate resource impacts</p> <p>Mitigate resource impacts; develop barrier free trail segment</p>	<p>0.2 miles</p> <p>0.5 miles</p> <p>8 miles</p>
Roads <ul style="list-style-type: none"> ● Paulina Peak road 	<p>Improve safety, drainage, surfacing, and stabilize cut slope.</p>	<p>3 miles</p>
Ecosystem Restoration/Enhancement <ul style="list-style-type: none"> ● Riparian revegetation ● Reed canary grass removal ● BOPU lodgepole pine pruning ● East Lake BEMA improvements ● Construct bat roosts 	<p>Encourage revegetation in areas trampled and compacted.</p> <p>Manual or chemical removal of exotic species</p> <p>Remove invading lodgepole seedlings from BOPU meadow</p> <p>Light thinning to promote large nest trees, reduce fire risk</p> <p>Bat roost construction in facilities to improve habitat</p>	<p><20 acres</p> <p><10 acres</p> <p><20 acres</p> <p>50 acres</p>

^{1/} With respect to acres, figures displayed under extent reflect the combined acreage treated in a project or set of projects, not the size of a single treatment unit. See standards and guidelines regarding appropriate size and configuration of treatment units.



**NEWBERRY
NATIONAL
VOLCANIC
MONUMENT
LEGISLATION
(PUBLIC LAW 101-522)**

PUBLIC LAW 101-522—NOV. 5, 1990

**NEWBERRY NATIONAL VOLCANIC
MONUMENT**

Public Law 101-522
101st Congress

An Act

Nov. 5, 1990

[H.R. 3840]

To establish the Newberry National Volcanic Monument in the State of Oregon, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. ESTABLISHMENT.

(a) **IN GENERAL.**—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.

(b) **AREA INCLUDED.**—(1) The Monument shall comprise those lands generally depicted on the map entitled “Newberry National Volcanic Monument” and dated September 1990, which shall be on file and available for public inspection in the Office of the Chief, Forest Service, Department of Agriculture, Washington, District of Columbia.

(2) The Newberry Special Management Area, the Transferal Area, the Transferal Area Adjacent, and the Transferal Corridor shall comprise those lands generally depicted as such on the map referred to in paragraph (1).

(3) The Secretary may, by publication of a notice of availability of a revised map and after public comment, make corrections or minor changes to the boundary of the Monument or Special Management Area if such changes are—

(A) necessary to facilitate management of the Monument, Special Management Area and the immediately surrounding area,

(B) consistent with the purposes of this Act, and

(C) noncontroversial.

Any proposed boundary change shall be made pursuant to the National Environmental Policy Act of 1969.

SEC. 2. ADMINISTRATION.

(a) **IN GENERAL.**—Subject to valid existing rights, the Secretary shall administer the Monument and Special Management Area in accordance with the laws, rules, and regulations pertaining to the National Forest System and this Act as part of the Deschutes National Forest.

(b) **TRANSFERAL AREA.**—(1) Upon termination, cancellation, or relinquishment of all Federal geothermal leases (numbered OR-12008, OR-11612, and OR-11613), the lands and mineral rights encompassed by such leases, and other Federal land identified as the Transferal Area on the map referred to in section 1(b)(1), shall become part of the Monument and shall be administered under this Act.

Historic
preservation.
16 USC 431 note.

(2) The Transferal Corridor is a part of the Transferal Area and shall be managed as such, except as otherwise provided in section 4.

(3) Prior to the termination, cancellation, or relinquishment of such geothermal leases, the Secretary of the Interior and the Secretary of Agriculture shall, to the extent practicable and consistent with the Geothermal Steam Act of 1970 and rights under such leases, manage the Transferal Area under the laws, rules, and regulations pertaining to the National Forest System in such a manner so as to preserve the natural values of the area which would qualify it for designation as a national monument.

(4) Upon discovery of commercial quantities of geothermal resources, paragraphs (1), (2), and (3) shall no longer apply.

(c) **NEWBERRY SPECIAL MANAGEMENT AREA.**—The area identified on the map referred to in section 1(b)(1) as the Newberry Special Management Area shall be managed as if it were part of the Monument, except as otherwise provided in section 4.

(d) **TRANSFERAL AREA ADJACENT.**—The area identified on the map referred to in section 1(b)(1) as the Transferal Area Adjacent is a part of the Special Management Area, except as otherwise provided in section 4.

(e) **MANAGEMENT REQUIREMENTS.**—The Monument and Special Management Area shall be administered in accordance with the following management requirements:

(1) Land management activities shall allow natural ecological succession of vegetation to continue to the maximum extent practical, as determined by the Secretary. Timber removal shall be permitted only to the extent the Secretary determines necessary to achieve the purposes of this Act and to protect health and safety. Timber within the Monument and Special Management Area shall not be considered part of the allowable sale quantity for the Deschutes National Forest.

(2) Recreation uses and interpretive facilities shall be provided, including (but not limited to) trails, campgrounds, resorts, and visitor centers, as identified in the management plan.

(3) Roads shall be permitted in the Monument and Special Management Area consistent with the purposes of this Act and in accordance with the management plan.

(f) **SCIENTIFIC RESEARCH.**—Scientific research shall be allowed consistent with the purposes for which the Monument was established.

(g) **DISEASE, INSECT INFESTATION, AND FIRE HAZARD.**—The Secretary is authorized to take action to the extent practicable to 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.

SEC. 3. EXCHANGES OF GEOTHERMAL LEASE RIGHTS.

(a) **IN GENERAL.**—Those holders of all Federal geothermal leases within the Monument as of the date of enactment of this Act and who are listed in subsection (c) of this section are authorized, without penalty, to relinquish all rights to such leases on the terms and conditions provided in this section and section 10 of the Geothermal Steam Act of 1970. Such leases are depicted on the map entitled "Geothermal Lease Compensation" which is a part of the Surface Resource Analysis of Newberry Volcano.

(b) **GEOTHERMAL LEASE EXCHANGE.**—Upon the acceptance by the Secretary of the Interior of a lease relinquished pursuant to subsection (a), the Secretary of the Interior shall immediately issue, in lieu thereof and in full compensation for such relinquishment, geothermal leases of like value as described in subsection (c). The leases issued in lieu of relinquished leases shall contain the terms and conditions prescribed in the Surface Resource Analysis of Newberry Volcano and the Land and Resource Management Plan for the Deschutes National Forest, dated August 1990. Consistent with such terms and conditions, such in-lieu leases shall be administered under the Geothermal Steam Act of 1970.

(c) **DESCRIPTIONS.**—(1) The parties (including their successors, or assignees), and lands referred to in subsection (a), are those specified on the map referred to in subsection (a).

(2) The leases to be issued pursuant to subsection (b) and the interests in lands subject to such leases are as follows:

(A) Within the Newberry Caldera Known Geothermal Resource Area, lease area 1, leases shall be issued with an undivided fractional interest distributed as follows:

- (i) 62.37 percent to California Energy Co., Inc.
- (ii) 35.09 percent to Christian F. Murer.
- (iii) 2.54 percent to Delta Funds, Inc.

(B) Within the Newberry Caldera Known Geothermal Resource Area, lease area 2, leases shall be issued with an undivided fractional interest distributed as follows:

- 0.84 percent to L.H. Armour, Jr.
- 5.49 percent to Frances B. Bunn.
- 1.73 percent to Robert B. Bunn.
- 8.52 percent to Geo-Newberry Crater, Inc.
- 15.10 percent to Hawthorn Oil Co.
- 3.42 percent to Terry Allen Kramer.
- 64.90 percent to George W. Waters.

(C) Outside the Newberry Caldera Known Geothermal Resource Area, leases shall be issued for the approximate acreage noted:

- (i) Lease Area 3—Robert B. Bunn—1,280.00 acres.
- (ii) Lease Area 4—Frances B. Bunn—1,240.00 acres.
- (iii) Lease Area 5—Geo-Newberry Crater, Inc.—2,928 acres.

(d) **AVAILABILITY OF CERTAIN LANDS FOR GEOTHERMAL LEASING UNDER THE GEOTHERMAL STEAM ACT.**—Following the expiration, relinquishment, or termination of any geothermal lease issued for lands identified in subsection (c), except for lands situated within the Special Management Area, such lands may be offered for lease under the Geothermal Steam Act of 1970.

(e) **AVAILABILITY OF CERTAIN LANDS FOR GEOTHERMAL LEASING UNDER THIS ACT.**—Following expiration, relinquishment, or termination of a geothermal lease on lands identified in subsection (c), within the Special Management Area, lands shall be offered for lease as provided in section 4(a)(5) of this Act.

(f) **NONAPPLICABLE PROVISIONS.**—The provisions of subsection (g) of section 6 of the Geothermal Steam Act of 1970 (30 U.S.C. 1005 (c) and (g)) shall not apply to any geothermal lease within the Monument existing on the date of enactment of this Act.

SEC. 4. SUBSURFACE RIGHTS.

(a) **WITHDRAWAL.**—

(1) **MONUMENT.**—Subject to valid existing rights, Federal lands within the Monument are hereby withdrawn from all forms of entry, appropriation, or disposal under the public land laws, from location, entry, or patent under the mining laws, and from disposition under all mineral and geothermal leasing laws.

(2) **TRANSFERAL AREA.**—Subject to valid existing rights, Federal lands within the Transferal Area are hereby withdrawn from all forms of entry, appropriation, or disposal under the public land laws, from location, entry, or patent under the mining laws, and from disposition under all mineral and geothermal leasing laws. Upon completion of a well capable of producing geothermal steam in commercial quantities, as defined in section 6(d) of the Geothermal Steam Act of 1970 (30 U.S.C. 1005(d)) on valid existing leases within the Transferal Area, as determined by the Secretary of the Interior, the withdrawal made by this subsection shall be revoked, and such lands shall be restored to the operation of the public land laws, mining laws, and mineral and geothermal leasing laws.

(3) **TRANSFERAL CORRIDOR.**—Subject to valid existing rights, Federal lands within the Transferal Corridor are hereby withdrawn from all forms of entry, appropriation, or disposal under the public land laws, from location, entry or patent under the mining laws, and from disposition under all mineral and geothermal leasing laws.

(4) **TRANSFERAL AREA ADJACENT.**—Subject to valid existing rights, Federal lands within the Transferal Area Adjacent are hereby withdrawn from all forms of entry, appropriation, or disposal under the public land laws, from location, entry, or patent under the mining laws, and from disposition under all mineral leasing laws except the Geothermal Steam Act of 1970. Upon completion of a well capable of producing geothermal steam in commercial quantities, as defined in section 6(d) of the Geothermal Steam Act of 1970 (30 U.S.C. 1005(d)) within the Transferal Area, as determined by the Secretary of the Interior, this area will be managed as part of the Special Management Area and be governed by provisions in section 4(a)(5). Geothermal leases issued in this area shall contain stipulations that prohibit surface occupancy and no plans of operation will be approved by the Secretary until commercial quantities of geothermal resources are found within the Transferal Area.

(5) **SPECIAL MANAGEMENT AREA.**—Subject to valid existing rights, Federal lands within the Special Management Area are hereby withdrawn from all forms of entry, appropriation, or disposal under the public land laws, from location, entry, or patent under the mining laws, and under all mineral leasing laws except the Geothermal Steam Act of 1970. Geothermal leases issued in this area shall contain stipulations that prohibit surface occupancy and shall require that the Special Management Area be entered only by directional drilling from outside the Special Management Area boundaries. In the event that no commercial quantities of geothermal resources are developed under leases within 30 years after the date of enactment of this Act, the Secretary of the Interior is authorized and directed to withdraw such areas in perpetuity from all further leasing under the Geothermal Steam Act of 1970. Upon such withdrawal, the Special Management Area designations shall terminate and such areas shall become part of the Monument. All or

portions of the Special Management Area may be withdrawn from the Geothermal Steam Act of 1970 and made a part of the Monument earlier at the joint discretion of the Secretaries of Interior and Agriculture. This provision shall in no way restrict the Secretary's authority to acquire by purchase, donation or exchange any lease within the Special Management Area prior to the expiration of the term of years set forth in this paragraph.

(b) **GEOHERMAL LEASE SALES.**—(1) Within one year after the date of the enactment of this Act, pursuant to the Geothermal Steam Act of 1970, the Secretary of the Interior shall offer for lease by competitive bid the lands depicted on the map entitled "Geothermal Lease Sale Parcels," which is part of the Surface Resource Analysis of Newberry Volcano, with stipulations as provided therein.

(2) Any of the lands described in paragraph (1) of this subsection which are not leased as a result of the first competitive bid offering, or any of the initial leases which are relinquished, terminated, or otherwise canceled, may be reoffered by the Secretary of the Interior for lease by competitive bid under the Geothermal Steam Act of 1970, except that all lands within the Special Management Area shall be subject to the leasing provisions of subsection (a)(5) of this Act.

(c) **AUTHORITY FOR PLANS OF OPERATION.**—The Secretary of Agriculture shall regulate all surface disturbing activities conducted pursuant to any lease issued under this section and section 3 and shall determine reclamation and all other actions as required in the interest of conservation of these resources. No permit to drill on a geothermal lease for areas covered under this Act may be granted without the analysis and approval by the Secretary of Agriculture of a plan of operations covering proposed surface disturbing activities within the lease area. In making such determination, the Secretary shall consider the effects of the proposed operations on the values for which the Monument and Special Management Area were established.

SEC. 5. FISH AND WILDLIFE.

Nothing in this Act shall be construed to affect the jurisdiction or responsibilities of the State of Oregon with respect to fish and wildlife, including the regulation of hunting, fishing, and trapping, except that the Secretary may designate zones where, and establish periods when, no hunting, fishing, or trapping shall be permitted for reasons of public safety, administration, or public use and enjoyment. Except in emergencies, any regulations of the Secretary pursuant to this section shall be put into effect only after consultation with the Department of Fish and Wildlife of the State of Oregon or its successor agency.

SEC. 6. MANAGEMENT PLAN.

(a) **IN GENERAL.**—(1) Within three fiscal years beginning after the date of enactment of this Act, the Secretary shall develop a management plan which shall address the lands established in section 1. The management plan shall be developed in consultation with the Council (established by section 7), interested Federal, State, and local government agencies, and the public.

(2) The management plan shall be periodically updated, amended, or revised as necessary and, at the discretion of the Secretary, such updates, amendments, or revisions may be done separately or in

conjunction with land management planning for other adjacent areas of the Deschutes National Forest.

(3) No actions taken under the authority of this Act shall require the reconsideration, amendment, or revision of the Deschutes National Forest Land and Resource Management Plan prepared pursuant to section 6 of the Forest and Rangeland Renewable Resources Planning Act of 1974 (16 U.S.C. 1604). The management plan required by paragraph (1) shall be incorporated into the Deschutes National Forest Land and Resource Management Plan upon the regular revision of the the Deschutes National Forest Land and Resource Management Plan.

(b) **ISSUES TO BE ADDRESSED BY MANAGEMENT PLAN.**—Consistent with the purposes for which the Monument and Special Management Area were established, the Management Plan shall address at least the following management issues:

(1) Recreation, including consideration of a full range of existing and appropriate new facilities and programs for recreation during all seasons of the year.

(2) Vegetation, including consideration of a full range of management options, and a program to reestablish old growth ponderosa pine ecosystems.

(3) Roads and facilities, including—

(A) consideration of the general location, design, construction, and maintenance criteria;

(B) standards for motorized vehicle use;

(C) traffic management; and

(D) criteria for the closing and obliteration of roads.

(4) Fire and fuel management prescriptions, including consideration of a full range of management options for fuel hazard reduction and prescribed fire and fire control strategies to minimize the risk of catastrophic wildfire and to meet other resource objectives.

(5) Wildlife management, including general prescriptions for wildlife habitat improvements.

(6) Research, including identification and prioritization of research opportunities.

(7) Monitoring, including monitoring needs for air, water, wildlife, soil, and other resources. The Secretary, in cooperation with the Secretary of the Interior, shall maintain a research and monitoring program for geothermal resources for the purpose of identifying and assessing the impact that present and proposed geothermal development in the vicinity of the Monument and Special Management Area may have on the values for which such Monument and Special Management Area were established.

(8) Conflicts, including consideration of potential conflicts among uses and resources.

SEC. 7. ADVISORY COUNCIL.

(a) **ESTABLISHMENT.**—There is hereby established the Newberry National Volcanic Monument Advisory Council for the purpose of advising the Secretary on the preparation of the initial management plan required by section 6(a) and on other matters at the Secretary's request.

(b) **MEMBERSHIP.**—The Council shall be composed of 11 members appointed by the Secretary, as follows:

(1) One member who represents the scientific community.

(2) One member who represents organized recreational interests.

(3) One member who represents organized timber industry interests.

(4) One member who represents organized geothermal industry interests.

(5) One member who represents organized tourism interests.

(6) One member of the Deschutes County Board of Commissioners.

(7) One member who represents organized environmental interests.

(8) One member who represents organized wildlife and fish interests.

(9) One at-large member from nominations submitted to the Secretary by the Governor of Oregon.

(10) The Forest Supervisor, Deschutes National Forest, and the District Manager, Prineville District, Bureau of Land Management, who shall serve as nonvoting, ex officio members.

(c) VACANCY.—A vacancy on the Council shall be filled in the same manner as the original appointment.

(d) QUORUM.—A quorum shall be 6 appointed members of the Council. The operations of the Council shall not be impaired by the fact that a member has not been appointed as long as a quorum has been attained.

(e) CHAIRPERSON AND PROCEDURES.—The Council shall elect a chairperson and establish such rules and procedures as it deems necessary or desirable.

(f) CONSULTATION.—The Secretary shall consult with the Council on a periodic and regular basis with respect to the management plan.

(g) PAY.—Members of the Council who are not full-time officers or employees of the United States shall serve without pay. Members who are full-time officers or employees of the United States shall receive no additional pay by reason of their service on the Council.

(h) SCIENTIFIC ADVISORY SUBCOMMITTEE.—The Council may appoint a Scientific Advisory Subcommittee, to be chaired by the Council member who represents the scientific community, for the purposes of advising the Council on matters related to the management plan. Subcommittee members shall be appointed for their expertise and need not be members of the Council.

(i) TERMINATION.—The Council and the Scientific Advisory Subcommittee, if any, shall cease to exist on the date upon which the management plan is officially adopted by the Secretary, or later at the discretion of the Secretary, except in no event shall the Council exist later than 5 years after the date of enactment of this Act.

SEC. 8. SAVINGS PROVISIONS.

(a) MANAGEMENT OUTSIDE BOUNDARIES OF MONUMENT.—Nothing in this Act shall be construed as authorizing or directing the establishment of protective perimeters or buffer zones around the Monument or Special Management Area for the purpose of precluding activities outside the Monument and Special Management Area boundary which would otherwise be permitted under applicable law. Nothing in this Act shall be construed as limiting the existing authority of the Secretary to take actions on Federal lands adjacent to the Monument and Special Management Area necessary to protect public health and safety in emergencies. The fact that activities

or uses outside the Monument and Special Management Area can be seen, heard, measured, or otherwise perceived within the Monument and Special Management Area shall not, of themselves, limit, restrict, or preclude such activities or uses up to the boundary of the Monument and the Special Management Area.

(b) **CONTRACTS.**—Nothing in this Act shall limit, restrict, or preclude the implementation of valid timber sale contracts or other contracts or agreements executed by the Secretary or the Secretary of the Interior prior to the date of enactment of this Act.

(c) **ADMINISTRATION OF GEOTHERMAL STEAM ACT OF 1970.**—Except as specifically provided in sections 3 and 4, nothing in this Act shall be construed to affect the authority of the Secretary of the Interior to administer the Geothermal Steam Act of 1970 (30 U.S.C. 1001 et seq.).

SEC. 9. DEFINITIONS.

As used in this Act:

(1) the term “allowable sale quantity” has the same meaning as such term has in section 13 of the Forest and Rangeland Renewable Resources Planning Act of 1974 (16 U.S.C. 1611).

(2) The term “Council” means the Newberry National Volcanic Monument Advisory Council established by section 7.

(3) The term “Management Plan” means the plan developed under section 6.

(4) The term “Monument” means the Newberry National Volcanic Monument established by section 1.

(5) The term “Newberry Caldera Known Geothermal Resource Area” refers to the area established by the United States Geological Survey in 1974 and identified on the map referred to in section 3(a).

(6) The term “Special Management Area” means the Newberry Special Management Area established by section 1.

(7) The term “Secretary” means the Secretary of Agriculture.

(8) The term “Surface Resource Analysis of Newberry Volcano” means the document dated September 1990, prepared by the Forest Service and the Bureau of Land Management, and available for public inspection in the Office of the Chief, United States Forest Service, United States Department of Agriculture, Washington, District of Columbia.

(9) The terms “Transferal Area”, “Transferal Corridor” and “Transferal Area Adjacent” mean the areas established by section 1.

SEC. 10. AUTHORIZATION OF APPROPRIATIONS.

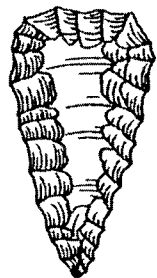
There are authorized to be appropriated such sums as may be necessary to carry out this Act.

Approved November 5, 1990.

LEGISLATIVE HISTORY—H.R. 3840:

HOUSE REPORTS: No. 101-827 (Comm. on Interior and Insular Affairs).
CONGRESSIONAL RECORD, Vol. 136 (1990):
Oct. 10, considered and passed House.
Oct. 22, considered and passed Senate.





SPECIES LIST

**WILDLIFE/FISH SPECIES LIST
NEWBERRY NATIONAL VOLCANIC MONUMENT**

<u>COMMON NAME</u>	<u>SCIENTIFIC NAME</u>	<u>Presence Code</u>
<u>PRESENCE CODE</u>	Species documented to occur within NNVM	X
	Habitat occurs within NNVM, but species has not been documented to occur	+
<u>FISH</u>		
Rainbow trout	<i>Oncorhynchus mykiss</i>	X
Brown trout	<i>Salmo trutta</i>	X
Brook trout	<i>Salvelinus fontinalis</i>	X
Kokanee	<i>Oncorhynchus nerka</i>	X
Atlantic salmon	<i>Salmo salar</i>	X
Blue chub	<i>Gila coerulea</i>	X
Tui chub	<i>Gila bicolor</i>	X
<u>AMPHIBIANS</u>		
Long-toed salamander	<i>Ambystoma macrodactylum</i>	X
Great Basin spadefoot toad	<i>Scaphiopus intermontanus</i>	X
Western toad	<i>Bufo boreas</i>	X
Pacific treefrog	<i>Hyla regilla</i>	X
Spotted frog	<i>Rana pretiosa</i>	X
<u>REPTILES</u>		
Western fence lizard	<i>Sceloporus occidentalis</i>	X
Sagebrush lizard	<i>Sceloporus graciosus</i>	+
Short horned lizard	<i>Phrynosoma douglassi</i>	+
Western skink	<i>Eumeces skiltonianus</i>	X
Rubber boa	<i>Charina bottae</i>	+
Striped whipsnake	<i>Masticophis taeniatus</i>	+
Gopher snake	<i>Pituophis melanoleucus</i>	+
Common garter snake	<i>Thamnophis sirtalis</i>	+
<u>MAMMALS</u>		
Malheur (Preble's) shrew	<i>Sorex preblei</i>	X
Vagrant shrew	<i>Sorex vagrans</i>	+
Dusky shrew	<i>Sorex obscurus</i>	+
Northern water shrew	<i>Sorex palustris</i>	+
Merriam shrew	<i>Sorex merriami</i>	+
Coast mole	<i>Scapanus orarius</i>	+
Little brown myotis	<i>Myotis lucifugus</i>	+
Yuma myotis	<i>Myotis yumanensis</i>	+

COMMON NAME**SCIENTIFIC NAME****Presence Code****MAMMALS** (continued)

Long-eared myotis	<i>Myotis evotis</i>	+
Long-legged myotis	<i>Myotis volans</i>	+
California myotis	<i>Myotis californicus</i>	+
Small-footed myotis	<i>Myotis leibi</i>	+
Silver-haired bat	<i>Lasiomycteris noctivagans</i>	+
Big brown bat	<i>Eptesicus fuscus</i>	X
Hoary bat	<i>Lasiurus cinereus</i>	+
Western big-eared bat	<i>Plecotus townsendi</i>	X
Pika	<i>Ochotona princeps</i>	X
Mountain cottontail	<i>Sylvilagus nuttalli</i>	+
Snowshoe hare	<i>Lepus americanus</i>	X
Least chipmunk	<i>Eutamias minimus</i>	+
Yellow pine chipmunk	<i>Eutamias amoenus</i>	+
Yellow-bellied marmot	<i>Marmota flaviventris</i>	+
Belding ground squirrel	<i>Spermophilus beldingi</i>	+
California (Beechey) ground squirrel	<i>Spermophilus beecheyi</i>	+
Mantled ground squirrel	<i>Spermophilus lateralis</i>	X
Western gray squirrel	<i>Sciurus griseus</i>	X
Chickaree	<i>Tamiasciurus douglasi</i>	X
Northern flying squirrel	<i>Glaucomys sabrinus</i>	X
Northern pocket gopher	<i>Thomomys talpoides</i>	+
Mazama pocket gopher	<i>Thomomys mazama</i>	+
Western harvest mouse	<i>Reithrodonotomys megalotis</i>	+
Canyon mouse	<i>Peromyscus crinitus</i>	+
Deer mouse	<i>Peromyscus maniculatus</i>	+
Pinyon mouse	<i>Peromyscus truei</i>	+
Northern grasshopper mouse	<i>Onychomys leucogaster</i>	+
Bushy-tailed woodrat	<i>Neotoma cinerea</i>	+
Mountain vole	<i>Microtus montanus</i>	+
Long-tailed vole	<i>Microtus longicaudus</i>	+
Water vole	<i>Microtus richardsoni</i>	+
Muskrat	<i>Ondatra zibethicus</i>	X
Western jumping mouse	<i>Zapus princeps</i>	+
Porcupine	<i>Erethizon dorsatum</i>	X
Coyote	<i>Canis latrans</i>	X
Black bear	<i>Ursus americanus</i>	X
Raccoon	<i>Procyon lotor</i>	X
Marten	<i>Martes americana</i>	X
Fisher	<i>Martes pennanti</i>	+
Short-tailed weasel	<i>Mustela erminea</i>	+
Long-tailed weasel	<i>Mustela frenata</i>	+
Mink	<i>Mustela vison</i>	X
Badger	<i>Taxidea taxus</i>	X

<u>COMMON NAME</u>	<u>SCIENTIFIC NAME</u>	<u>Presence Code</u>
<u>MAMMALS</u> (continued)		
River otter	<i>Lutra canadensis</i>	X
Puma	<i>Felis concolor</i>	X
Bobcat	<i>Lynx rufus</i>	+
Elk	<i>Cervus elaphus</i>	X
Mule deer	<i>Odocoileus hemionus</i>	X
<u>BUTTERFLIES</u>		
W. tiger swallowtail	<i>Papilio rutulus</i>	X
White tiger swallowtail	<i>Papilio eurymedon</i>	X
Pine white	<i>Neophasia menapia</i>	X
Western white	<i>Pieris occidentalis</i>	X
Alfalfa butterfly	<i>Colias eurytheme eurytheme</i>	X
Sara orange tip	<i>Anthocharis sara stella</i>	X
Least woodnymph	<i>Cercyonis oetus oetus</i>	X
Great arctic	<i>Oeneis nevadensis</i>	X
Lorquin's admiral	<i>Limenitis lorquini</i>	X
Western lady	<i>Vanessa annabella</i>	X
California tortoise-shell	<i>Nymphalis californica</i>	X
Milbert's tortoise-shell	<i>Nymphalis milberti</i>	X
Morning cloak	<i>Nymphalis antiopa</i>	X
Zyphyr anglewing	<i>Polygonia zyphyrus</i>	X
Field crescent	<i>Phycoides campestris</i>	X
Mylitta crescent	<i>Phycoides mylitta</i>	X
Chalcedon checkerspot	<i>Euphydryas chalcedona wallacensis</i>	X
Silver-bordered meadow fritillary	<i>Bolaria epithore chemocki</i>	X
Zerene fritillary	<i>Speyeria zerene conchyliatus</i>	X
Callope fritillary	<i>Speyeria mormonia erinna</i>	X
Behr's hairstreak	<i>Satyrium behrii</i>	X
Russet hairstreak	<i>Satyrium saepium</i>	X
California hairstreak	<i>Satyrium californica</i>	X
Nelson's hairstreak	<i>Mitoura nelsoni</i>	X
Western pine elfin	<i>Incisalia eyphon eryphon</i>	X
Edith's copper	<i>Lycaena editha editha</i>	X
Purplish copper	<i>Lycaena helloides</i>	X
Glossy blue	<i>Plebejus saepiolus saepiolus</i>	X
Rice's blue	<i>Lycaeides argyrognomon</i>	X
Boisdural's blue	<i>Icaricia icarioides</i>	X
Columbia silvery blue	<i>Glaucopsyche lygdamus columbia</i>	X
Sandhill skipper	<i>Polites sabuleti</i>	X
Juba skipper	<i>Hesperia juba</i>	X
Harpalus skipper	<i>Hesperia comma harpalus</i>	X

<u>COMMON NAME</u>	<u>SCIENTIFIC NAME</u>	<u>Y</u>	<u>W</u>	<u>M</u>	<u>B</u>
<u>PRESENCE CODE</u>	Yearlong resident	Y			
	Winter resident (December - February)		W		
	Migrant (March-May and/or September-November)			M	
	Breeding (June - August)				B
<u>BIRDS</u>					
<u>LOONS</u>					
Pacific Loon	<i>Gavia pacifica</i>	-	-	+	-
Common Loon	<i>Gavia immer</i>	-	-	X	-
<u>GREBES</u>					
Pied-billed Grebe	<i>Podilymbus podiceps</i>	-	-	X	+
Horned Grebe	<i>Podiceps auritus</i>	-	-	+	+
Eared Grebe	<i>Podiceps nigricollis</i>	-	-	X	+
Western Grebe	<i>Aechmophorus occidentalis</i>	-	-	+	+
Clark's Grebe	<i>Aechmophorus clarkii</i>	-	-	+	+
<u>CORMORANTS</u>					
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	-	-	+	+
<u>BITTERNS and HERONS</u>					
American Bittern	<i>Botaurus lentiginosus</i>	-	-	+	+
Great Blue Heron	<i>Ardea herodias</i>	-	-	X	+
Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	-	-	+	+
<u>SWANS, GEESE, and DUCKS</u>					
Tundra Swan	<i>Cygnus columbianus</i>	-	-	X	-
Greater White-fronted Goose	<i>Anser albifrons</i>	-	-	+	-
Canada Goose	<i>Branta canadensis</i>	-	-	X	+
Wood Duck	<i>Aix sponsa</i>	-	-	+	+
Green-winged Teal	<i>Anas crecca</i>	-	-	X	+
Mallard	<i>Anas platyrhynchos</i>	+	-	X	-
Northern Pintail	<i>Anas acuta</i>	-	-	X	-
Blue-winged Teal	<i>Anas discors</i>	-	-	+	+
Cinnamon Teal	<i>Anas cyanoptera</i>	-	-	X	X
Northern Shoveler	<i>Anas clypeata</i>	-	-	+	+
Gadwall	<i>Anas strepera</i>	+	-	-	-
Eurasian Wigeon	<i>Anas penelope</i>	-	-	+	-
American Wigeon	<i>Anas americana</i>	+	-	X	-
Canvasback	<i>Aythya valisineria</i>	-	-	+	-
Redhead	<i>Aythya americana</i>	-	-	+	-
Ring-necked Duck	<i>Aythya collaris</i>	+	-	X	-
Greater Scaup	<i>Aythya marila</i>	-	-	+	-
Lesser Scaup	<i>Aythya affinis</i>	+	-	X	-
Common Goldeneye	<i>Bucephala clangula</i>	+	-	-	-
Barrow's Goldeneye	<i>Bucephala islandica</i>	+	-	X	-
Bufflehead	<i>Bucephala albeola</i>	X	-	X	-
Hooded Merganser	<i>Lophodytes cucullatus</i>	-	X	+	-
Common Merganser	<i>Mergus merganser</i>	+	-	X	-
Ruddy Duck	<i>Oxyura jamaicensis</i>	+	-	X	-

<u>COMMON NAME</u>	<u>SCIENTIFIC NAME</u>	<u>Y</u>	<u>W</u>	<u>M</u>	<u>B</u>
AMERICAN VULTURES					
Turkey Vulture	<i>Cathartes aura</i>	-	-	X	X
KITES, HAWKS, EAGLES, and ALLIES					
Osprey	<i>Pandion haliaetus</i>	-	-	+	X
Bald Eagle	<i>Haliaeetus leucocephalus</i>	X	-	-	-
Northern Harrier	<i>Circus cyaneus</i>	-	-	+	+
Sharp-shinned Hawk	<i>Accipiter striatus</i>	+	-	X	-
Cooper's Hawk	<i>Accipiter cooperii</i>	+	-	X	-
Northern Goshawk	<i>Accipiter gentilis</i>	+	-	-	-
Red-tailed Hawk	<i>Buteo jamaicensis</i>	+	-	X	X
Golden Eagle	<i>Aquila chrysaetos</i>	+	-	-	X
CARACARAS and FALCONS					
American Kestrel	<i>Falco sparverius</i>	-	-	+	+
Merlin	<i>Falco columbarius</i>	-	-	+	-
Peregrine Falcon	<i>Falco peregrinus</i>	-	-	+	-
Prairie Falcon	<i>Falco mexicanus</i>	-	-	X	+
PARTRIDGES, GROUSE, TURKEYS, and QUAIL					
Blue Grouse	<i>Dendragapus obscurus</i>	+	-	-	-
Ruffed Grouse	<i>Bonasa umbellus</i>	+	-	-	-
RAILS, GALLINULES, and COOTS					
Virginia Rail	<i>Rallus limicola</i>	-	-	X	+
Sora	<i>Porzana carolina</i>	-	-	+	X
American Coot	<i>Fulica americana</i>	+	-	X	-
PLOVERS and LAPWINGS					
Semipalmated Plover	<i>Charadrius semipalmatus</i>	-	-	+	-
Killdeer	<i>Charadrius vociferus</i>	-	-	+	+
SANDPIPERS, PHALAROPES, and ALLIES					
Greater Yellowlegs	<i>Tringa melanoleuca</i>	-	-	+	-
Lesser Yellowlegs	<i>Tringa flavipes</i>	-	-	+	-
Solitary Sandpiper	<i>Tringa solitaria</i>	-	-	+	+
Spotted Sandpiper	<i>Actitis macularia</i>	-	-	+	+
Western Sandpiper	<i>Calidris mauri</i>	-	-	+	-
Least Sandpiper	<i>Calidris minutilla</i>	-	-	+	-
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>	-	-	+	-
Common Snipe	<i>Gallinago gallinago</i>	-	-	+	+
Wilson's Phalarope	<i>Phalaropus tricolor</i>	-	-	+	+
SKUAS, GULLS, TERNS, and SKIMMERS					
Ring-billed Gull	<i>Larus delawarensis</i>	-	-	X	+
California Gull	<i>Larus californicus</i>	-	-	X	+
Forster's Tern	<i>Sterna forsteri</i>	-	-	+	+
PIGEONS and DOVES					
Mourning Dove	<i>Zenaida macroura</i>	-	-	X	+

<u>COMMON NAME</u>	<u>SCIENTIFIC NAME</u>	<u>Y</u>	<u>W</u>	<u>M</u>	<u>B</u>
TYPICAL OWLS					
Flammulated Owl	<i>Otus flammeolus</i>	-	-	-	+
Western Screech-Owl	<i>Otus kennicottii</i>	+	-	-	-
Great Horned Owl	<i>Bubo virginianus</i>	+	-	-	X
Northern Pygmy-Owl	<i>Glaucidium gnoma</i>	+	-	-	-
Long-eared Owl	<i>Asio otus</i>	+	-	-	-
Northern Saw-whet Owl	<i>Aegolius acadicus</i>	+	-	-	-
GOATSUCKERS					
Common Nighthawk	<i>Chordeiles minor</i>	-	-	-	X
Common Poorwill	<i>Phalaenoptilus nuttallii</i>	-	-	-	+
SWIFTS					
Vaux's Swift	<i>Chaetura vauxi</i>	-	-	-	+
White-throated Swift	<i>Aeronautes saxatalis</i>	-	-	-	X
HUMMINGBIRDS					
Black-chinned Hummingbird	<i>Archilochus alexandri</i>	-	-	-	+
Calliope Hummingbird	<i>Stellula calliope</i>	-	-	-	+
Rufous Hummingbird	<i>Selasphorus rufus</i>	-	-	-	X
KINGFISHERS					
Belted Kingfisher	<i>Ceryle alcyon</i>	-	-	-	X
WOODPECKERS and ALLIES					
Lewis's Woodpecker	<i>Melanerpes lewis</i>	-	-	X	X
Red-naped Sapsucker	<i>Sphyrapicus nuchalis</i>	-	-	X	+
Red-breasted Sapsucker	<i>Sphyrapicus ruber</i>	-	-	-	+
Williamson's Sapsucker	<i>Sphyrapicus thyroideus</i>	-	-	-	+
Downy Woodpecker	<i>Picoides pubescens</i>	+	-	-	-
Hairy Woodpecker	<i>Picoides villosus</i>	+	-	-	-
White-headed Woodpecker	<i>Picoides albolarvatus</i>	+	-	-	-
Three-toed Woodpecker	<i>Picoides tridactylus</i>	+	-	-	-
Black-backed Woodpecker	<i>Picoides arcticus</i>	+	-	-	X
Northern Flicker	<i>Colaptes auratus</i>	+	-	-	-
TYRANT FLYCATCHERS					
Olive-sided Flycatcher	<i>Contopus borealis</i>	-	-	-	+
Western Wood-Pewee	<i>Contopus sordidulus</i>	-	-	-	X
Willow Flycatcher	<i>Empidonax traillii</i>	-	-	-	+
Hammond's Flycatcher	<i>Empidonax hammondii</i>	-	-	-	+
Dusky Flycatcher	<i>Empidonax oberholseri</i>	-	-	-	+
Gray Flycatcher	<i>Empidonax wrightii</i>	-	-	-	+
Cordilleran Flycatcher	<i>Empidonax occidentalis</i>	-	-	-	+
Say's Phoebe	<i>Sayornis saya</i>	-	-	-	+
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>	-	-	-	+
Western Kingbird	<i>Tyrannus verticalis</i>	-	-	+	+
SWALLOWS					
Tree Swallow	<i>Tachycineta bicolor</i>	-	-	+	X
Violet-green Swallow	<i>Tachycineta thalassina</i>	-	-	+	X
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	-	-	+	X

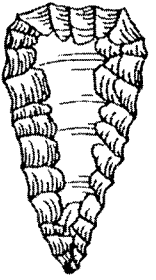
COMMON NAME	SCIENTIFIC NAME	Y	W	M	B
SWALLOWS (continued)					
Bank Swallow	<i>Riparia riparia</i>	-	-	-	X
Cliff Swallow	<i>Hirundo pyrrhonota</i>	-	-	-	+
Barn Swallow	<i>Hirundo rustica</i>	-	-	X	X
JAYS, MAGPIES, and CROWS					
Gray Jay	<i>Perisoreus canadensis</i>	+	-	-	-
Steller's Jay	<i>Cyanocitta stelleri</i>	-	-	-	X
Pinyon Jay	<i>Gymnorhinus cyanocephalus</i>	-	-	+	-
Clark's Nutcracker	<i>Nucifraga columbiana</i>	+	-	-	-
American Crow	<i>Corvus brachyrhynchos</i>	-	-	+	+
Common Raven	<i>Corvus corax</i>	+	-	-	X
TITMICE					
Black-capped Chickadee	<i>Parus atricapillus</i>	-	-	+	+
Mountain Chickadee	<i>Parus gambeli</i>	+	-	X	X
Plain Titmouse	<i>Parus inornatus</i>	-	-	X	-
BUSHTITS					
Bushtit	<i>Psaltriparus minimus</i>	+	-	-	-
NUTHATCHES					
Red-breasted Nuthatch	<i>Sitta canadensis</i>	+	-	-	X
White-breasted Nuthatch	<i>Sitta carolinensis</i>	+	-	-	-
Pygmy Nuthatch	<i>Sitta pygmaea</i>	+	-	X	X
CREEPERS					
Brown Creeper	<i>Certhia americana</i>	+	-	-	-
WRENS					
Rock Wren	<i>Salpinctes obsoletus</i>	-	-	-	+
Canyon Wren	<i>Catherpes mexicanus</i>	-	-	-	+
House Wren	<i>Troglodytes aedon</i>	-	-	-	X
Winter Wren	<i>Troglodytes troglodytes</i>	+	-	-	-
Marsh Wren	<i>Cistothorus palustris</i>	-	-	+	+
DIPPERS					
American Dipper	<i>Cinclus mexicanus</i>	+	-	-	-
OLD WORLD WARBLERS					
Golden-crowned Kinglet	<i>Regulus satrapa</i>	-	-	+	+
Ruby-crowned Kinglet	<i>Regulus calendula</i>	-	-	+	+
THRUSHES					
Western Bluebird	<i>Sialia mexicana</i>	-	-	+	X
Mountain Bluebird	<i>Sialia currucoides</i>	-	-	+	X
Townsend's Solitaire	<i>Myadestes townsendi</i>	-	-	X	X
Swainson's Thrush	<i>Catharus ustulatus</i>	-	-	+	+
Hermit Thrush	<i>Catharus guttatus</i>	-	-	+	+
American Robin	<i>Turdus migratorius</i>	-	-	+	X
Varied Thrush	<i>Ixoreus naevius</i>	-	-	+	-
WAGTAILS and PIPITS					
American Pipit	<i>Anthus rubescens</i>	-	-	X	-

COMMON NAME	SCIENTIFIC NAME	Y	W	M	B
WAXWINGS					
Bohemian Waxwing	<i>Bombycilla garrulus</i>	-	-	+	-
Cedar Waxwing	<i>Bombycilla cedrorum</i>	-	-	+	-
SHRIKES					
Loggerhead Shrike	<i>Lanius ludovicianus</i>	-	-	+	-
STARLINGS and ALLIES					
European Starling	<i>Sturnus vulgaris</i>	-	-	+	X
VIREOS					
Solitary Vireo	<i>Vireo solitarius</i>	-	-	-	+
Warbling Vireo	<i>Vireo gilvus</i>	-	-	-	+
WOOD-WARBLERS					
Orange-crowned Warbler	<i>Vermivora celata</i>	-	-	X	+
Nashville Warbler	<i>Vermivora ruficapilla</i>	-	-	+	+
Yellow Warbler	<i>Dendroica petechia</i>	-	-	+	+
Yellow-rumped Warbler	<i>Dendroica coronata</i>	-	-	X	+
Black-throated Gray Warbler	<i>Dendroica nigrescens</i>	-	-	+	+
Townsend's Warbler	<i>Dendroica townsendi</i>	-	-	+	+
Hermit Warbler	<i>Dendroica occidentalis</i>	-	-	+	+
MacGillivray's Warbler	<i>Oporornis tolmiei</i>	-	-	+	+
Common Yellowthroat	<i>Geothlypis trichas</i>	-	-	X	X
Wilson's Warbler	<i>Wilsonia pusilla</i>	-	-	+	+
Yellow-breasted Chat	<i>Icteria virens</i>	-	-	+	+
TANAGERS, GROSBEAKS, and CARDINALS					
Western Tanager	<i>Piranga ludoviciana</i>	-	-	-	X
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>	-	-	+	-
Lazuli Bunting	<i>Passerina amoena</i>	-	-	+	+
SPARROWS, TOWHEES, JUNCOS, and ALLIES					
Green-tailed Towhee	<i>Pipilo chlorurus</i>	-	-	-	X
Rufous-sided Towhee	<i>Pipilo erythrophthalmus</i>	-	-	X	+
Chipping Sparrow	<i>Spizella passerina</i>	-	-	+	X
Fox Sparrow	<i>Passerella iliaca</i>	-	-	X	+
Song Sparrow	<i>Melospiza melodia</i>	-	-	+	+
Lincoln's Sparrow	<i>Melospiza lincolnii</i>	-	-	+	-
Golden-crowned Sparrow	<i>Zonotrichia atricapilla</i>	-	-	X	-
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	-	-	X	+
Dark-eyed Junco	<i>Junco hyemalis</i>	-	-	+	X
BLACKBIRDS and ORIOLES					
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	-	-	X	X
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	-	-	X	X
Brown-headed Cowbird	<i>Molothrus ater</i>	-	-	X	X
Northern Oriole	<i>Icterus galbula</i>	-	-	+	+
FINCHES and ALLIES					
Rosy Finch	<i>Leucosticte arctoa</i>	-	-	+	+
Pine Grosbeak	<i>Pinicola enucleator</i>	-	-	X	-
Purple Finch	<i>Carpodacus purpureus</i>	-	-	+	-

<u>COMMON NAME</u>	<u>SCIENTIFIC NAME</u>	<u>Y</u>	<u>W</u>	<u>M</u>	<u>B</u>
FINCHES and ALLIES (continued)					
Cassin's Finch	<i>Carpodacus cassinii</i>	-	-	+	X
Red Crossbill	<i>Loxia curvirostra</i>	-	-	+	X
Pine Siskin	<i>Carduelis pinus</i>	-	-	+	X
American Goldfinch	<i>Carduelis tristis</i>	-	-	+	+
Evening Grosbeak	<i>Coccothraustes vespertina</i>	-	-	+	+
OLD WORLD SPARROWS					
House Sparrow	<i>Passer domesticus</i>	-	-	+	+

The species list was developed from the following sources.

- 1 Deschutes National Forest's wildlife observation database, on file at Supervisor's Office.
- 2 Dunlap, D. G.. 1959. Notes on the amphibians and reptiles of Deschutes County, Oregon. *Herpetologica*, 15:173-177.
- 3 Fort Rock Ranger District wildlife observation database, on file at District Office.
- 4 Ingles, L. G.. 1967. *Mammals of the Pacific States*. Stanford University Press, California.
- 5 Nussbaum, R. A., E. D. Brodie, Jr., and R. M. Storm. 1983. *Amphibians and Reptiles of the Pacific Northwest*. University Idaho Press, Moscow.
- 6 Sharp, Brian E. 1992. *Neotropical Migrants on National Forest in the Pacific Northwest*. Prepared for U.S.D.A. Forest Service.
- 7 Styskel, E.. 1993. *Birds of the Newberry National Volcanic Monument*. Report on file at Fort Rock Ranger District, Deschutes National Forest, USDA Forest Service.
- 8 Thomas, Jack W., ed. 1979. *Wildlife Habitats in Managed Forests the Blue Mountains of Oregon and Washington*. USDA, Forest Service, Ag. Handbook No. 553. Washington, D.C.
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