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Environmental Assessment

Pine Mountain Observatory Master Plan Environmental Analysis

Bend/Ft. Rock Ranger District, Deschutes National Forest
Deschutes County, Oregon

ALTERNATIVES
ALTERNATIVE 1 – NO ACTION
ALTERNATIVE 2 – PROPOSED ACTION
ALTERNATIVE 3 – MODIFIED PROPOSED ACTION

ALTERNATIVE 3 is the PREFERRED ALTERNATIVE

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1.0 Background

The Forest Service has prepared this environmental assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This environmental assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into the following sections: Introduction; Alternative Descriptions including the No Action Alternative; Existing Conditions and Environmental Consequences; Agencies and Persons Consulted; and Appendices.

This section includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. It also details how the Forest Service informed the public of the proposal and how the public responded and identifies key issues developed from scoping and internally through the interdisciplinary process.

Introduction

The Pine Mountain Observatory is located approximately 30 miles southeast of Bend, Oregon in Township 20 South Range 15 East Section 33 (Figure 1-2). Located near the summit of Pine Mountain, the Observatory is a nationally recognized and renowned astronomic research facility. In addition to a wide array of research conducted by university and other scientists, it also provides important educational opportunities to the public and school children in grades Kindergarten through 12th. The Observatory is owned and operated by the University of Oregon.

The current special use permit was issued in 1967 to the University of Oregon. Over the past 36 years, three (3) telescopes, quarters for visiting researchers and staff, a site manager's residence, access roads, pathways, two (2) septic systems, a small storage building, and a parking lot for approximately 25 vehicles have been constructed. Figure 1-1 shows many of the existing facilities.

Figure 1-1 Pine Mountain Observatory from the southeast. The 32-inch telescope is located in the left center portion of the photograph with the 24-inch telescope located immediately above it. The researcher's quarters is the partially hidden building located at the center left edge of the photograph. The residence manager's residence is located in the upper left portion of the photograph. The 15-inch telescope is located behind and hidden by the trees at the center left portion of the photograph and to the right of the small storage building.

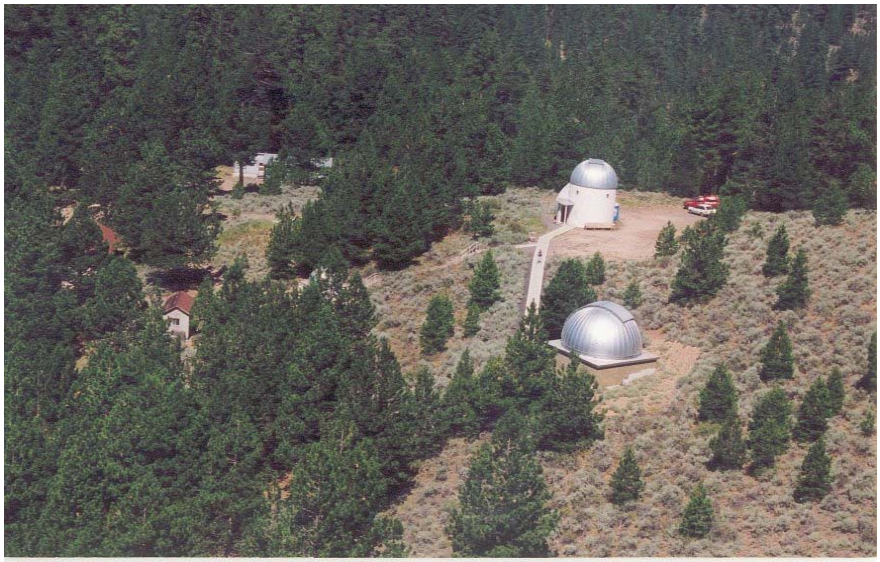
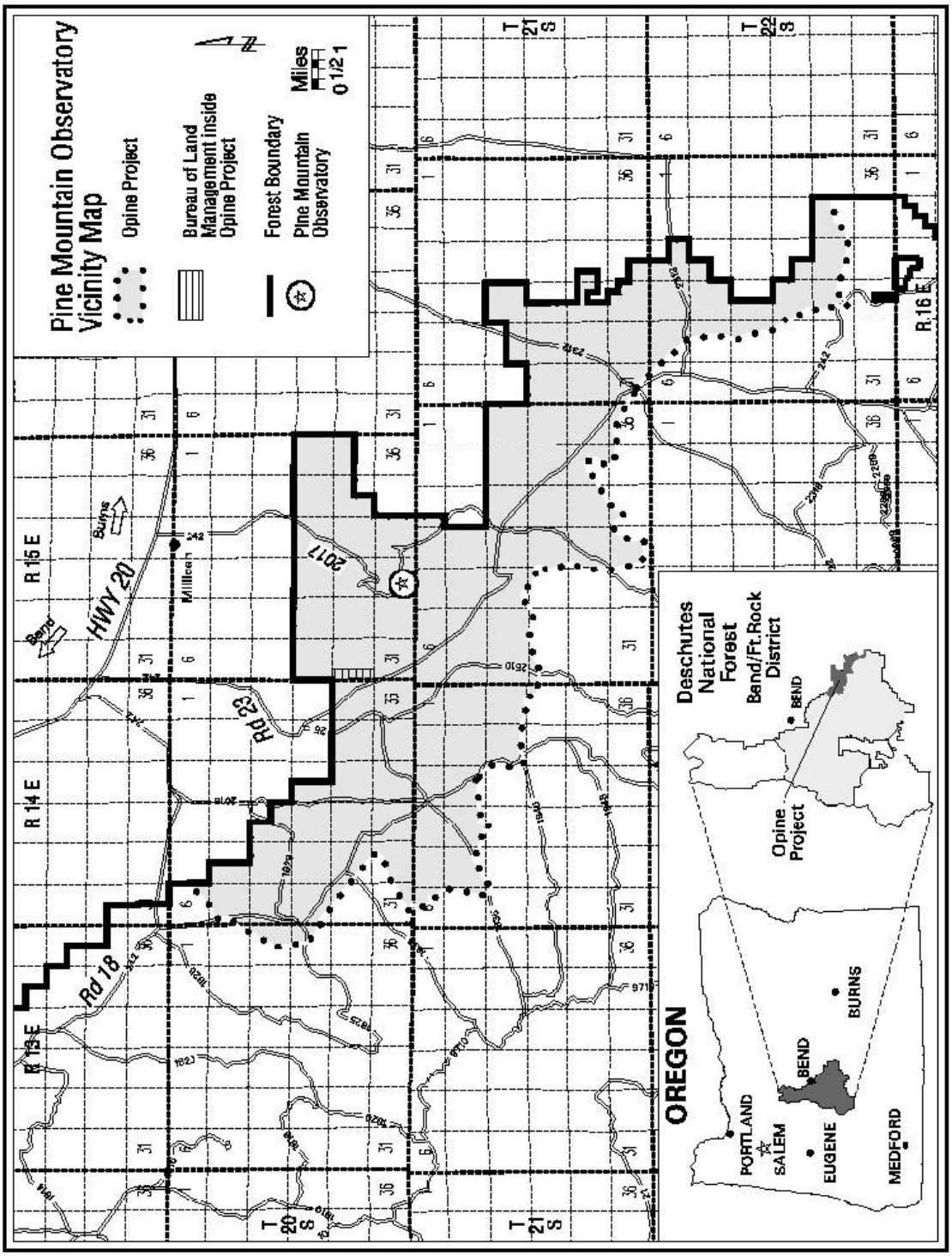


Figure 1-2 Pine Mountain Observatory Vicinity Map



Two additional small telescopes were approved for placement in early summer 2003. A 10-inch optical telescope with associated building is being placed on the gravel pad on the southeast side of the 24-inch telescope. A small 4-meter radio telescope is being placed adjacent to and on the south side of the 15-inch telescope on another area of disturbed ground.

Electrical power is supplied to the site by an underground cable, laid in 1967.

The observatory receives approximately 2,500 to 3,000 visitors per year, most of who visit during the 16 week season between Memorial Day and the end of September. Visitors include amateur astronomers, school groups, and others. University use of the area ,through classes in other subjects, has increased in recent years.

The observatory has turned to distance learning during the school year to reach approximately 3,000 kindergarten through 12th grade school children. The Internet is used for this learning and allows students to propose and conduct scientific research using observatory facilities without physically being on site.

Description of the Pine Mountain Observatory Project Analysis Area

The Pine Mountain Observatory and Special Use Permit Area are located at the top of Pine Mountain within the boundaries of the Deschutes National Forest. The Observatory and Special Use Permit site are located within the administrative boundaries of the Bend-Fort Rock Ranger District (Figure 1). The current special use permit includes approximately four (4) acres of National Forest lands.

In 1967, the upper slope areas of the permit site were shrub-steppe communities dominated by bitterbrush, sagebrush, grasses and forbs with a very few scattered, small, young ponderosa pine. The lower slope areas were dominated by relatively open, large diameter ponderosa pine surrounded by open grass and shrub communities. Figures 1-3, 1-4, and 1-5 show the relatively open character of the observatory permit area as it existed in the late 1960s.

Figure 1-3 Pine Mountain Observatory from the west, 1968. The 24-inch telescope is at the top center of the photograph. The oblong building at the center of the photograph is the researcher quarters. The Pine Mountain Campground is located in the lower left portion of the photograph.

Figure 1-4 Pine Mountain Observatory from the North, Summer, 1968

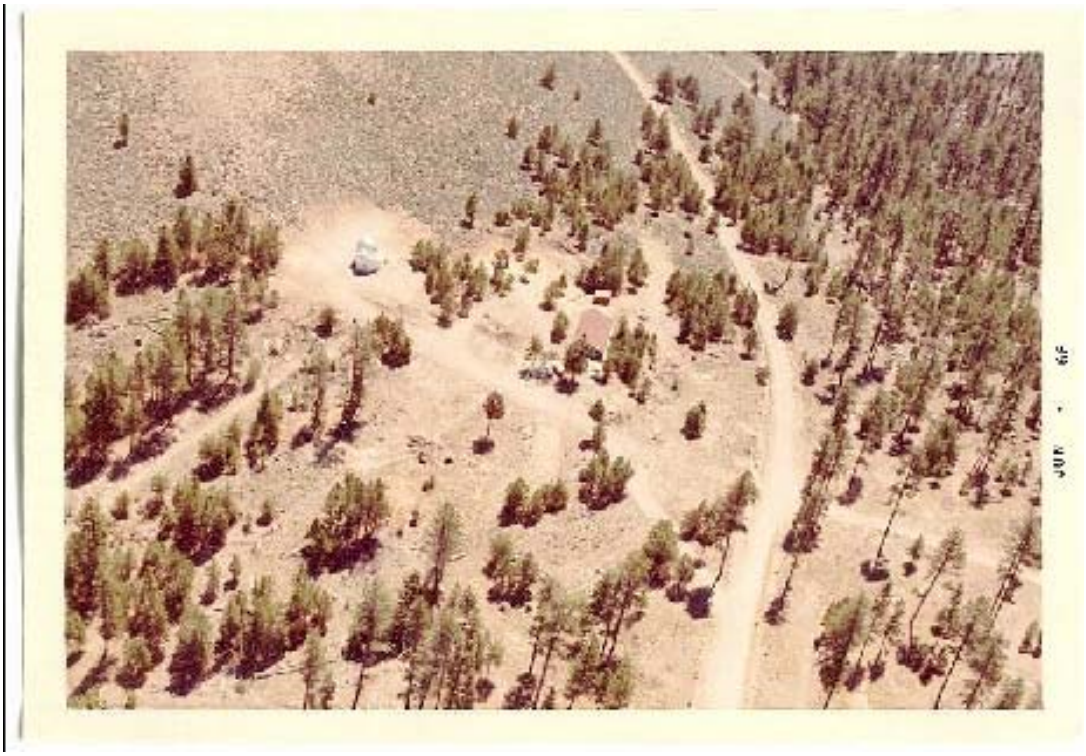


Figure 1-5 Pine Mountain Observatory from the East, Summer 1968.

Figures 1-6 and 1-7 illustrate the permit area 30 years after initial construction and show the change in tree density and cover.

Figure 1-6 Pine Mountain Observatory from the East, 1997. The three telescopes are visible in the upper center portion of the photo. Compare this photo with Figure 1-5.

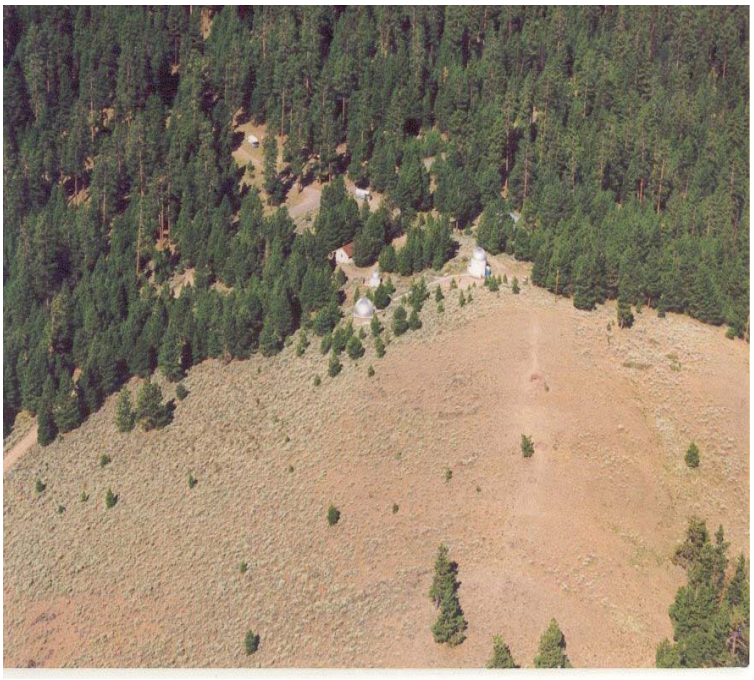


Figure 1-7 Pine Mountain Observatory from the Northwest, 1997. Compare this photo with Figure 1-4 taken in 1968. The 32-inch telescope is visible at the top center of the photo; the 24 inch below and to the left; the 15 inch below and to the right. The resident managers residence is visible in the bottom center of the photo.

Throughout the document, there may be slight acreage differences in the tables displayed. This is due to polygon calculation variations within the different Geographic Information System (GIS) theme layers used to analyze this project.

Purpose and Need

The purpose of this project is to:

- issue a new, updated special use permit to allow the University of Oregon to operate the Pine Mountain Observatory;
- permit reasonable expansion of facilities to address existing and projected research and educational use; and
- adjust the permit boundaries to include all existing and reasonable future facilities.

There is a need for an auxiliary power source. The increasing age of the electric power cable is resulting in an increasing frequency of power disruptions. These disruptions affect operations of the facilities and affect the safety of staff, particularly during winter months. There are no plans by Central Electric Cooperative, Inc. to replace the cable, estimated to cost approximately $1,000,000.

There is a need for all facilities associated with the observatory to be located within the permit boundaries. All or portions of some improvements, including the primary access road to the facilities from Road 2017 to the gate, most of the access road from Road 2017 to the site manager's residence, the existing parking lot, and potentially a portion of the septic system servicing the site manager's residence, are located outside the current permit boundaries.

There is a need to restore and maintain telescope views to within 10 degrees of the horizon. The three (3) existing optical telescopes were constructed in areas dominated by shrub-steppe communities with few, scattered trees. At the time of construction of each telescope, the sites provided views of the sky to within approximately 10 degrees of the horizon. All the telescopes were able to view objects that only occurred in the lower horizon in this portion of the northern hemisphere. Trees did not impede these views. Since construction, growth of existing trees and the encroachment and growth of additional trees has restricted or eliminated views of the lower skies from all three telescopes. Views to within 10 to 20 degrees of the horizon are now either totally eliminated or greatly reduced to small, relatively narrow areas between tree crowns.

There is a need for public restroom facilities to serve visitors to the observatory. No public restroom facilities are present on site. The site manager's residence and the quarters for staff and visiting researchers each contain restroom facilities, which are serviced by separate septic systems. Visitors to the site are limited to using the vault toilet located in the Pine Mountain Campground across Road 2017 from the observatory. For the past several years, the observatory has also placed several portable restrooms within the permit area for public use.

There are no classroom facilities on site. All teaching activities must be conducted either outdoors or within the limited confines of the buildings housing the telescopes. None of the telescope buildings has seating; this requires folding chairs to be set up and removed for each session or event. The building housing the 32 inch telescope has the largest space, but is limited to seating approximately 20 to 25 people. This requires multiple sessions for larger groups.

Use of the telescope buildings for educational events precludes the use of the same buildings for research and vice versa. As a result current research and educational needs and requirements are stretching or exceeding the capacity of existing facilities and staff. This is resulting in increasing conflicts between researchers, educators, and the public.

The lack of educational facilities also limits the ability of the observatory to conduct distance learning activities. The number of classes that can participate are also limited by research demands on telescope time. The limitation on telescope time also limits student directed research opportunities. The limited distance learning opportunities also result in an increase in demand for on-site visits by schools.

Research opportunities are limited to the capabilities of the existing telescopes. Sufficient for research needs and requirements for the past several decades, their sizes, 32, 24, and 15 inches, increasingly limit the ability of researchers to address current research needs and opportunities. Existing facilities are increasingly unable to provide opportunities to conduct world class research.

There are no facilities on site to perform needed maintenance or repair of equipment, such as for telescopes, electronic equipment, and vehicles. All repairs must be done off-site and often result in increased costs, delays in repairs, and impacts to research and educational programs.

The existing researcher's quarters provide housing opportunities for a maximum of 15 people in a dormitory type setting. There are limited kitchen and restroom facilities.

There is a need

- to reduce or eliminate conflicts between research and researchers and education and educators;
- to limit on-site visitors to a maximum of 5,000 visitors;
- to improve distance learning capabilities;
- improve and expand living quarters for visiting researchers and staff; and
- to maintain and improve existing research and educational capabilities.

Fire control and suppression has allowed existing trees to continue to grow. It has also allowed the establishment and growth of additional trees. This is resulting in a change from a shrub-steppe community to a closed ponderosa pine woodland or forest (Figure 1-8). This is resulting in increased fuel loadings and an increased risk of damage to facilities associated with wildfire.

Tree growth and encroachment is also eliminating or blocking portions of the views from the telescopes to the lower night skies.

Figure 1-8 Tree Growth and Encroachment, Pine Mountain Observatory.

Vegetation also serves to screen observatory facilities from both Road 2017 and the Pine Mountain Campground. This helps to meet Scenic View management area direction.

Vegetation also serves to block light from vehicles entering the parking lot and driving Road 2017. Light pollution associated with vehicles can affect the ability of telescopes to clearly see the night skies and the vision and operations of researchers using the facilities.

There is a need to maintain vegetation levels that

- minimize long-term fuel loadings;
- reduce the risk of wildfire;
- protect structures and other improvements from wildfire;
- restore or maintain telescope views to within 10 degrees of the horizon;
- screen structures, particularly telescopes, from Road 2017; and
- reduce or eliminate light pollution from vehicles on Road 2017 and the parking lot.

Proposed Action

This alternative would reissue the special use permit to the University of Oregon for a period of 20 years.

It would approve the construction of new facilities in three (3) phases over the 20-year period of the permit. Construction of facilities proposed under Phases I and II would be approved and constructed within the next 10 years. These facilities are estimated to be constructed within the first 10 years of the permit period. Facilities proposed in Phase III would be approved in concept but would require additional review and approval prior to construction. This could include additional environmental analysis and a new decision if there were major changes in facilities or unforeseen impacts. These facilities would likely be constructed during the final 10 years of the permit.

Phase I would include the following:

- the construction of an approximately 3,500 square foot education center with two telescope domes, including a new 20 inch telescope and the existing 15 inch telescope, and an approximately 3,500 square foot outdoor amphitheater;
- a new storage shed;
- an auxiliary generator building;
- a new parking lot to replace the current lot;
- handicapped parking adjacent to the proposed education building;
- extension of the existing road above the cistern approximately 50 to 75 feet to provide access to the education building;
- approximately 120 feet of trail connecting the new parking lot with the education building;
- obliterate and revegetate approximately 75 feet of existing trails and approximately 150 feet of existing access road; and
- construct a new 1,500 gallon septic system to handle the expected use of the education building.

Existing utilities, water, telephone and T1, and electrical, would be upgraded during this period.

A vegetation management plan would be developed to prescribe management treatments to be implemented by the observatory that would allow for the timely removal of trees than encroach on telescope views, while maintaining desired vegetative cover and protecting areas where trees do not impede telescope views.

Approximately one quarter (0.25) acre, located between Road 2017 and the new parking area and between the parking area and the researcher's quarters and education building would be planted with trees to help screen the observatory from the road and reduce visual pollution from vehicles.

The permit area would be expanded from the current approximately four (4) acres to approximately nine (9) acres to insure adequate area for the development and expansion of proposed facilities over the 20 year span of the permit. The permit area would be located within the M9 – Scenic Views management allocation

Phase II would include the construction of the following structures and improvements:

- upgrade the existing researcher's quarters by removing the existing structure and replacing it with a 2-story structure;
- upgrade the existing resident manager's residence with either a new modular or stick built structure with a new deck on the existing footprint;
- construct new maintenance garage and shop northeast of the site manager's residence;
- extend site manager's residence access road approximately 105 feet to the proposed maintenance shop and garage; and
- construct parking for 10 vehicles adjacent to the researcher's quarters.

Vegetation management activities prescribed in the vegetation management plan, primarily the removal of trees that encroach upon telescope views, would continue during this phase.

Phase III identifies additional structures and improvements visualized to be needed for future teaching and research. This phase would approve, conceptually, the location, estimated size and probable use of each structure and improvement. It recognizes the uncertainty of future needs and changes in research and teaching requirements and direction, but also the need for long-range planning to bring such facilities on-line in a reasonable fashion. Facilities proposed in Phase III would be approved in concept, but would require additional Forest Service review and approval prior to construction. This could include additional environmental analysis and a new decision if there were major changes in facilities or unforeseen impacts.

Phase III proposes the following structures and/or improvements:

- two (2) new research telescopes, 40 to 100 inch in diameter, located upslope from the existing 24 and 32 inch telescopes;
- additional researcher housing and instrument shop;
- extension of the site manager's access road an additional approximately 200 feet to reach the new quarters and instrument shop with nine (9) parking spaces opposite the new structure; and
- extension of the main access road by approximately 100 to 150 feet to one of the new telescopes.

In all phases, all roads and trails would be surfaced with pavement or dust abatement materials to reduce or eliminate dust generated by vehicle and foot traffic.

All facilities would be constructed and maintained by funds raised or provided by the University of Oregon.

Management Areas

The permit area and observatory facilities are located entirely within the boundaries of the MA-9, Scenic Views, land allocation of the Deschutes National Forest Land and Resource Management Plan (LRMP) (1990). The goal of this allocation is to provide "… Forest visitors with high quality scenery that represents the natural character of Central Oregon." (LRMP page 4-121).

There are no Forest-wide Standards and Guidelines specific to this special use. The Forest-wide goal for special uses is "To provide for the use and occupancy of the National Forest System by individuals or federal, state, and local governments when such use will not detract from specific management area direction, is in the public interest, and cannot reasonably be served by development on non-National Forest System Land." (LRMP page 4-74)

There are no management area standards and guidelines that are specific to this particular special use. MA9-83 specifically discusses mineral developments, utilities and electronic sites that may be located and developed within this allocation "if … are located, designed and maintained to blend with the characteristic landscape. … when viewed from travel routes, recreation areas, and other sensitive viewer locations, Visual Quality Objectives should be met." (LRMP page 4-130)

MA9-84 states that "Trees may be removed within the Scenic Views Management Area where necessary to permit access to … electronic sites, utilities, and other special use sites." (LRMP page 4-130)

In addition to the management direction provided by the Deschutes LRMP, as amended, the Pine Mountain Observatory Project would comply with all laws and agency policy applicable to the project planning.

Decision to be Made and the Responsible Official

Based on existing authorities, the Forest Supervisor may make multiple decisions to implement the selected alternative. The Forest Supervisor will decide whether or not to issue a new special use permit to the University of Oregon allowing the University to continue to operate the observatory and under what conditions operations would be allowed to continue.

If the decision is to issue a new special use permit to the University, the Forest Supervisor will decide whether or not to expand the permit boundaries to incorporate all existing improvements associated with the observatory and proposed additional facilities. She will also decide the size of the permit area. Finally, she will decide what new facilities would be approved during the permit period.

No decisions would be made until a 30-day public review and comment period for this environmental analysis has been completed. After the 30-day public review and comment period and after an analysis of comments received is completed, a Decision Notice would be issued. A 45-day appeal period would begin after issuance of the Decision Notice.

Scoping Process

The Pine Mountain Observatory Master Plan Project was originally scoped as part of the larger Opine Project. The Opine Project originally included approximately 21,197 acres of fuel reduction treatments including tree thinning, mowing, and prescribe fire; several off-highway vehicle (OHV) improvements and changes; assorted range improvements; road improvements; and expansion of the Pine Mountain Observatory and issuance of a new special use permit. The original scoping letter was mailed to Confederated Tribes of Warm Springs, Burns Paiute Tribe and Klamath Tribes, other agencies, organizations, and members of the public who had previously expressed interest in being informed of projects like the Pine Mountain Observatory Master Plan Project on March 15, 2002. A supplemental scoping letter was mailed May 17, 2002 to the same mail list. This letter identified approximately 14 miles of existing system roads for closure. A total of 123 responses were received from 116 individuals or organizations. This included four letters written in response to another project, the Cinder Hill Range EA, which overlaps the Pine Mountain Observatory Master Plan Project Area.

Approximately 90 percent of the responses related to OHV use on Pine Mountain. Approximately 50 percent opposed OHV use on Pine Mountain because of noise, dust, safety concerns or environmental impacts. The other approximately 50 percent supported OHV use on Pine Mountain.

Approximately 10 to 15 percent of the respondents provided substantive comments relative to proposed vegetation treatments.

Approximately 25 percent of the respondents supported the proposed plans for the expansion of the observatory. No comments were received that specifically opposed the proposed plans. One respondent did oppose development of the "visitor's center" assuming that the development was a Forest Service facility and not owned and operated by the University of Oregon.

During the summer of 2002, the decision was made to separate the Opine Project into three separate projects with separate analyses and decisions: Opine Vegetation Management EA; Opine Access Management EA; and Pine Mountain Observatory Master Plan Project EA.

As a result of this division, comments received during scoping were also divided and assigned to the appropriate analysis. Approximately 30 percent of the respondents had comments specific to actions proposed in the Pine Mountain Observatory Master Plan Project. The Pine Mountain Observatory Master Plan Project analyzes the development (master plan) proposed by the University of Oregon, issuance of a new 20-year special use permit, and expansion of the permit area boundaries.

Issues

After analyzing information provided by the public input, and data from resource inventories, several issues were recognized and utilized to identify opportunities, formulate alternatives, and recommend mitigation measures.

Key Issues

From the list of issues identified through initial scoping, three issues were identified for detailed analysis. These served as the basis for alternative development. This section presents a brief discussion of the key issues identified by the Interdisciplinary Team (IDT).

Based on a review of preliminary issues and concerns raised during the scoping process, three issues were determined to be key issues. Five others were considered issue, but not key issues. The issues were used to develop alternatives to the proposed action and are discussed in the environmental consequences section.

Key Issue 1: Expand Existing Permit Area Boundary

The current permit was issued in 1967 and included approximately 2.7 acres. Two subsequent additions increased the permit area to approximately 3.55 acres. The existing parking lot, access road to the caretaker's residence and at least the drain field of the septic system servicing the caretaker's residence are outside the existing permit boundaries. The proposed new parking lot and at least some proposed facilities would also be outside of the existing permit boundaries.

Measurement Standards

Acres within permit area boundary.
Acres with observatory structures and infrastructure outside permit area boundaries.

Key Issue 2: The lack of dedicated research and educational facilities restricts research efforts by limiting telescope use by researchers and limits educational opportunities because of conflicts with research needs and requirements.

Measurement Standards

Number of telescopes dedicated to research.
Number of telescopes dedicated to public use and educational programs.

Key Issue 3: Development of new facilities may impact portions of an existing population of green tinged paintbrush.

Green tinged paintbrush habitat and individuals are located upslope and adjacent to the 24 and 32 inch telescopes. Proposed development could encroach on habitat and affect portions of the existing population. Development may also create habitat for noxious weeds or other invasive plants that could invade and eliminate all or portions of the existing population.

Measurement Standards

Acres of soil disturbance associated with new construction.
Acres of soil disturbance within known or suspected green tinged paintbrush (***Castilleja chlorotica***) habitat.

Other Concerns

The following concerns were identified during the scoping process. The discussion following describes how they are addressed in each alternative.

Tree encroachment and growth into the telescope views of the three existing telescopes has greatly reduced or eliminated views to the lower night skies (views to within 10 degrees of the horizon). Encroachment and growth of trees will continue to affect future views.

The purpose of this project is to authorize and issue a new special use permit, authorize the construction of needed research and educational facilities to continue and advance the goals and objectives of the observatory, and to expand the permit area to include all existing and potential future facilities. Management of vegetation, including vegetation within the observatory permit boundaries, is proposed under the Opine Vegetation Management EA.

It is a concern because the observatory has a need to maintain views to the lower night sky from all the observatory telescopes. This requires periodic removal of trees that encroach into those views and block all or portions of the lower horizon.

The special use permit contains conditions that the permittee, the University of Oregon, must meet to continue to operate. Historically, the observatory has identified trees that affect operations of the facilities or have the potential to affect safety of the staff and users and requested the Forest Service to approve the removal of the identified tree or trees. Incorporating a vegetation management plan into the special use permit allows the observatory to identify and remove identified trees using specific guidelines that do not require additional review or decision. This is addressed in both Alternatives 2 and 3 with the inclusion of a vegetation management in the special use permit.

Condition and structure of vegetation, within and adjacent to the permit area, provide an increased risk of wildfire and threat to facilities and people using the observatory.

This is a long-term concern with the permittee for a need to protect the observatory facilities from damage or destruction associated with wildfire. It is addressed in Alternatives 2 and 3 by requiring the establishment and maintenance of defensible spaces around all structures. Both alternatives also provide for the development and implementation of a vegetation management plan to govern how those spaces would be maintained. The vegetation management plan would also prescribe actions that the observatory would take as part of on-going maintenance to keep fuel loadings and fire risks reduced without requiring additional oversight and decisions from the Forest Service.

The purpose of this project is to authorize and issue a new special use permit, authorize the construction of needed research and educational facilities to continue and advance the goals and objectives of the observatory, and to expand the permit area to include all existing and potential future facilities. Management of vegetation, including vegetation within the observatory permit boundaries, is proposed under the Opine Vegetation Management EA.

Motorized vehicle traffic creates dust, noise and light pollution that affect observatory operations, researchers and other visitors and users to the observatory.

It is outside the scope because it deals with motorized vehicles and where they can travel; decisions beyond the scope of this project. This is being addressed in the Opine Access Management EA.

It is a concern for this project because a new parking lot is proposed. Vehicles entering and/or leaving the new lot could direct white light in the direction of the telescopes and affecting their use at night. Those vehicles also generate noise and dust that potentially would affect delicate instrumentation, telescope view quality, and the ability of researchers to sleep during non-research periods. This concern is addressed in Alternatives 2 and 3 through the design of the parking lot, paving or using dust abating materials on the parking lot, and the planting of additional trees between Road 2017 and the parking lot and between the parking lot and the telescopes.

Expansion of facilities may increase the number of on-site visitors beyond the 3,000 to 5,000 visitors that the observatory expects to handle.

The observatory currently experiences approximately 2,500 to 3,000 visitors each year, primarily Fridays and Saturdays between Memorial Day and the last weekend in September. Their stated goal is to maintain these levels at much as possible, but not exceed 5,000 visitors per year. This is addressed in Alternatives 2 and 3 through the development of the educational building, continuation and expansion of the distance-learning program, and by continuing limited public viewing dates.

Location, operation and facility development may violate LRMP standards and guides for the Scenic Views management allocation. I

All alternatives would meet standards and guides for Scenic Views as described in the Deschutes National Forest LRMP.

OHVs have, on occasion, driven into and through the observatory complex and up the hiking trail to the viewpoint.

Decisions on OHV use are not related to or being made under this proposal. This concern is being addressed under both the Opine Vegetation Manage and Opine Access Management EAs.

Astronomic research, specifically of the night skies, requires dark skies and clear nights. Central Oregon, including Pine Mountain, is the only area in the Pacific Northwest that is not experiencing significant light pollution.

Light pollution associated with residential or industrial development is a policy decision made at local, county, regional or state government levels.

One respondent voiced a strong concern about the Forest Service spending scarce funds on a "visitor's center" and charging people to visit.

No federal dollars would be involved in the construction or maintenance of any of the proposed facilities. The University of Oregon would provide all the monies to construct and maintain the facilities. There has been no discussion of any fees being charged to visit or use the facilities.

2.0 Alternative Descriptions, including the Proposed Action

This chapter describes each of the alternatives and any alternatives developed, but dropped from further analysis. It also describes required mitigation measures and any monitoring. This section provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on issues raised by the public and other agencies. This discussion includes mitigation measures and any monitoring needed or required.

Four alternatives were identified during scoping. Alternative 1 (No Action), maintains current management and conditions. The observatory would remain as it is today. The permit area would not be expanded. No vegetation management plan would be implemented. This alternative is required by regulation.

Two action alternatives were developed. Alternative 2 (proposed action) would authorize additional development of the observatory through three phases. It would issue a new 20 year special use permit. It would expand the current permit area and implement a vegetation management plan as part of the special use permit.

Alternative 3 is the same as Alternative 2 except that only two phases of development would be authorized.

Alternatives Considered but Dropped From Further Consideration

A fourth alternative was considered. This would terminate the special use permit, close the observatory and require all facilities to be removed and the site restored. This was dropped from further consideration because it did not meet the purpose and need.

Alternative 1 – No Action

Under this alternative, a new special use permit would not be issued. Existing operations would continue using existing facilities (Figure 2-1 – Pine Mountain Observatory Existing Permit Area).

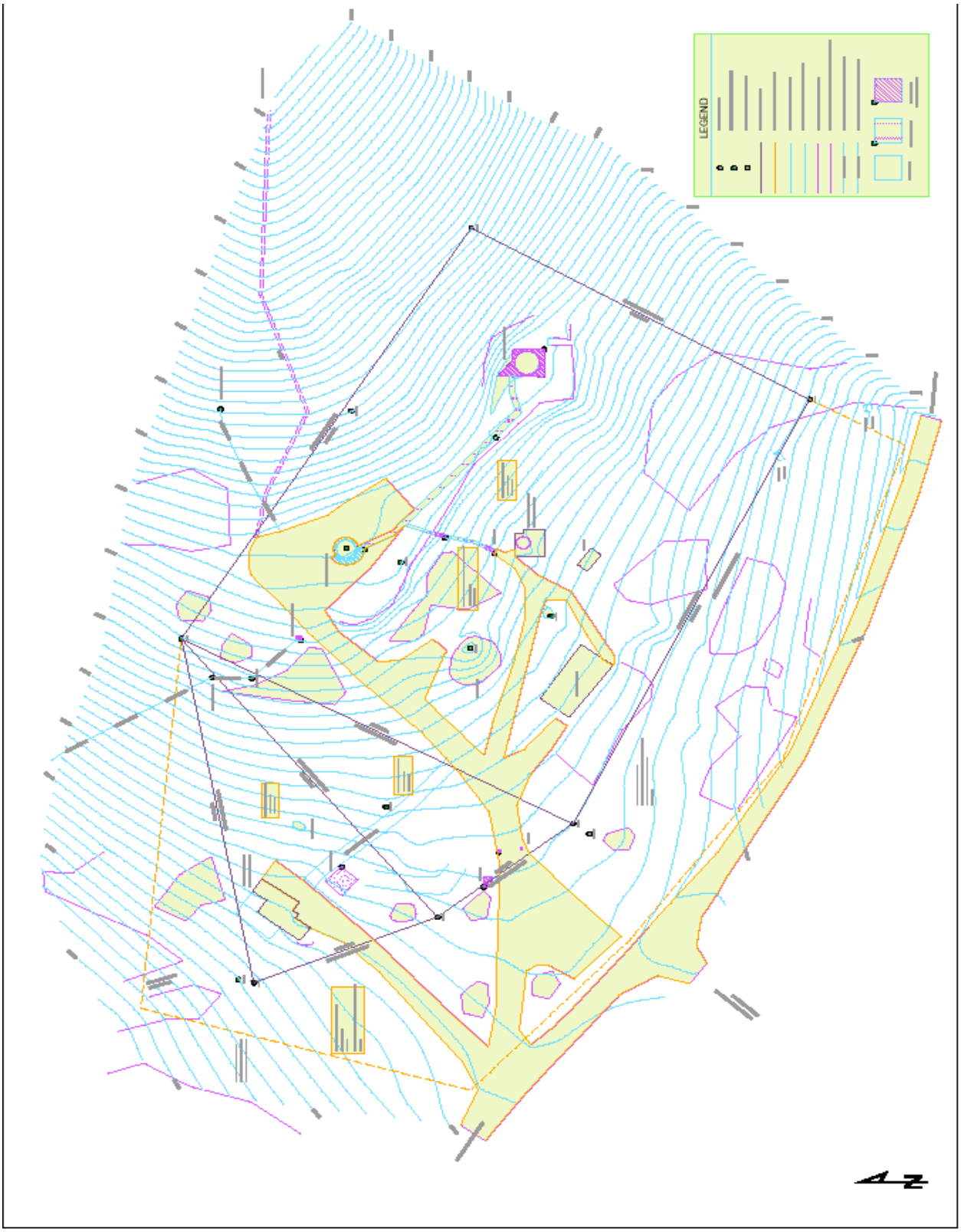
The permit area would not increase in size. The parking lot, the access road from Road 2017 to the gate, at least some of the septic system servicing the resident manager's residence, and the access road to approximately the resident manager's residence would remain outside the permit boundaries.

The following structures and improvements would not be made:

- The education building would not be constructed.
- The existing storage shed south of the 15-inch telescope would remain; a new shed would not be constructed adjacent to the resident manager's residence.
- The auxiliary generator building would not be constructed.
- The current parking lot would remain; handicapped specific parking would remain unavailable.
- The short spur road above the cistern would not be extended and the access road to the 15-inch telescope would remain.
- Approximately 120 feet of new hard surface trail would not be constructed; the trail and steps connecting the 15 and 24-inch telescopes would remain.
- The amphitheater/viewing area would not be constructed.

- Because the education building would not be constructed, a new septic system would not be constructed.
- Neither the existing researcher's quarters nor the existing resident manager's residence would be upgraded.
- A new maintenance garage and shop would not be constructed and the resident manager's residence access road would not be extended.

Figure 2-1 Pine Mountain Observatory Existing Permit Area.



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- Two additional research telescopes would not be constructed.
- Additional researcher housing, an instrument shop and associated parking would not be constructed.
- Additional parking at the researcher's quarters would not be constructed.
- Access roads would not be paved or surfaced with dust abatement materials. The main access road to the 24-inch telescope would not be extended.
- There would be no upgrade of utility lines (water, electrical, telephone or T1).
- A vegetation management plan to address management within the permit boundaries would not be developed.
- No tree planting would occur to reduce light pollution and screen the observatory from Road 2017.

This alternative directly addresses issue 2. No green tinged paintbrush plants or populations would be damaged or destroyed.

It does not address any of the other issues.

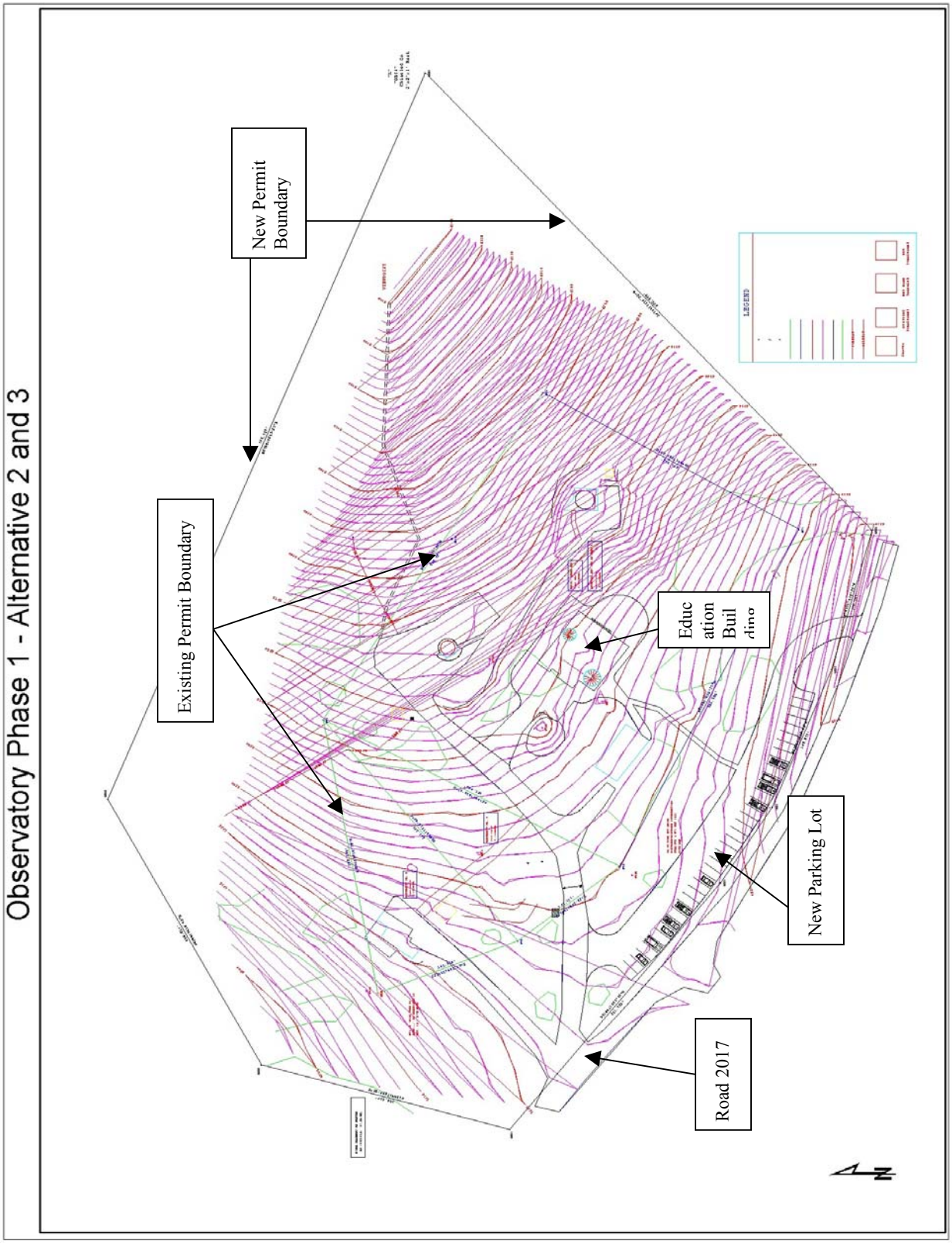
Alternative 2 – Proposed Action

This alternative would authorize the reissuance of the special use permit to the University of Oregon for a period of 20 years.

It would permit the construction of new facilities in two phases (Phase I and II) and conceptually approve additional facilities during the last phase (Phase III). During Phase I, (Figure 2-2 - Phase I Map) the following structures and improvements would be constructed:

- an approximately 3500 square foot, two story educational center , approximately 60 feet x 66 feet. In addition to classroom facilities, it would include restrooms, storage areas, a gift shop, kitchen, gallery, elevator and two telescopes; the existing 15-inch and a proposed 20-inch telescope. The upper level would include an observation deck with external stairs to the amphitheater/viewing area and provide access to the dome areas of both telescopes. This would require removal of the existing 15-inch telescope building and an existing storage shed located south of the 15-inch telescope's current location.
- a new storage shed, approximately 16 feet x 16 feet x 12 feet in height on an existing pad adjacent to the resident manager's driveway and southeast of the resident manager's residence. It would replace the existing storage shed currently located near the 15-inch telescope.
- an auxiliary generator building, approximately 10 feet x 12 feet x 12 feet in height, located immediately north of the transformer location. This building would house a 250KW generator powered by either propane or diesel fuel.
- a new parking lot, approximately 330 feet in length by 45 feet wide with parking for 37 vehicles. It would use the current parking lot entrance but require a new exit on the south end onto Road 2017.
- a two space handicapped parking area adjacent to the proposed educational building on the northwest side.
- extension of the existing stub road above the cistern approximately 50 to 75 feet to the southeast to provide vehicle access to the education building and handicapped parking spaces.
- construct approximately 120 feet of new walking trail connecting the new parking lot with the current trail that connects the researcher's residence with the 15-inch telescope building and either pave or surface with dust abating materials.
- obliterate approximately 75 feet of existing trail and steps that currently connect the 15-inch and 24-inch telescopes.

Figure 2-2 Phase I Site Map, Alternatives 2 and 3.



- obliterate by subsoiling and revegetate with native vegetation, approximately 150 feet of existing access road that provides access to the 15-inch telescope.
- construct an amphitheater/viewing area, approximately 3500 square feet (50x70 feet), on the southeast side of the education building and either pave or surface with dust abating materials; and
- construct a new 1,500 gallon septic system to handle the expected use of the education building. The new system would locate the septic tank approximately 20 to 30 feet either south or east of the education building and with a pipe extending approximately 20 to 30 feet from the building to the tank and another pipe extending approximately 50 to 100 feet from the tank to the drainfield. The drainfield would include between three (3) and six (6) lines ranging from 55 to 110 feet in length and spaced approximately 10 feet apart. The drainfield of this size would cover an area of less than 0.1 acres. A backup or reserve field of similar size and configuration would also constructed adjacent to this new field. Depending upon the location of the tank, construction would require the digging of approximately 400 to 500 feet of trenches with each trench being approximately two (2) feet wide and up to eight (8) feet in depth. Construction of the drainfield would also require the clearing of less than one half (0.5) acre of existing tree and shrub vegetation. The 1500 gallon septic tank, approximately 7 ft. wide by 9 ft long feet by 5 ½ ft. deep, would require a hole approximately 8 feet wide by 10 ft. long by 8 ft deep.

Existing utilities, water, telephone and T1, and electrical, would be upgraded during this period. These upgrades would be in trenches approximately three and one half (3.5) feet deep and approximately two (2) feet wide. Approximately 415 feet of trench would be needed for water lines, including approximately 110 feet from the cistern to the education building, approximately 235 feet to the resident manager's residence and approximately 80 feet to the researcher's quarters; approximately 120 feet for a telephone and T1 line from the 24-inch telescope to the education building; and approximately 195 feet for electrical lines from the backup generator to the resident manager's residence. All are proposed for placement in or near the location of the existing systems.

A vegetation management plan would be developed prescribing management practices to be implemented by the observatory that would allow for the timely removal of trees than encroach on telescope views while also maintaining desired vegetative cover and protecting areas where trees do not impede telescope views. It also would address the establishment and maintenance of defensible spaces around new and existing structures by the observatory by managing vegetation through thinning and pruning.

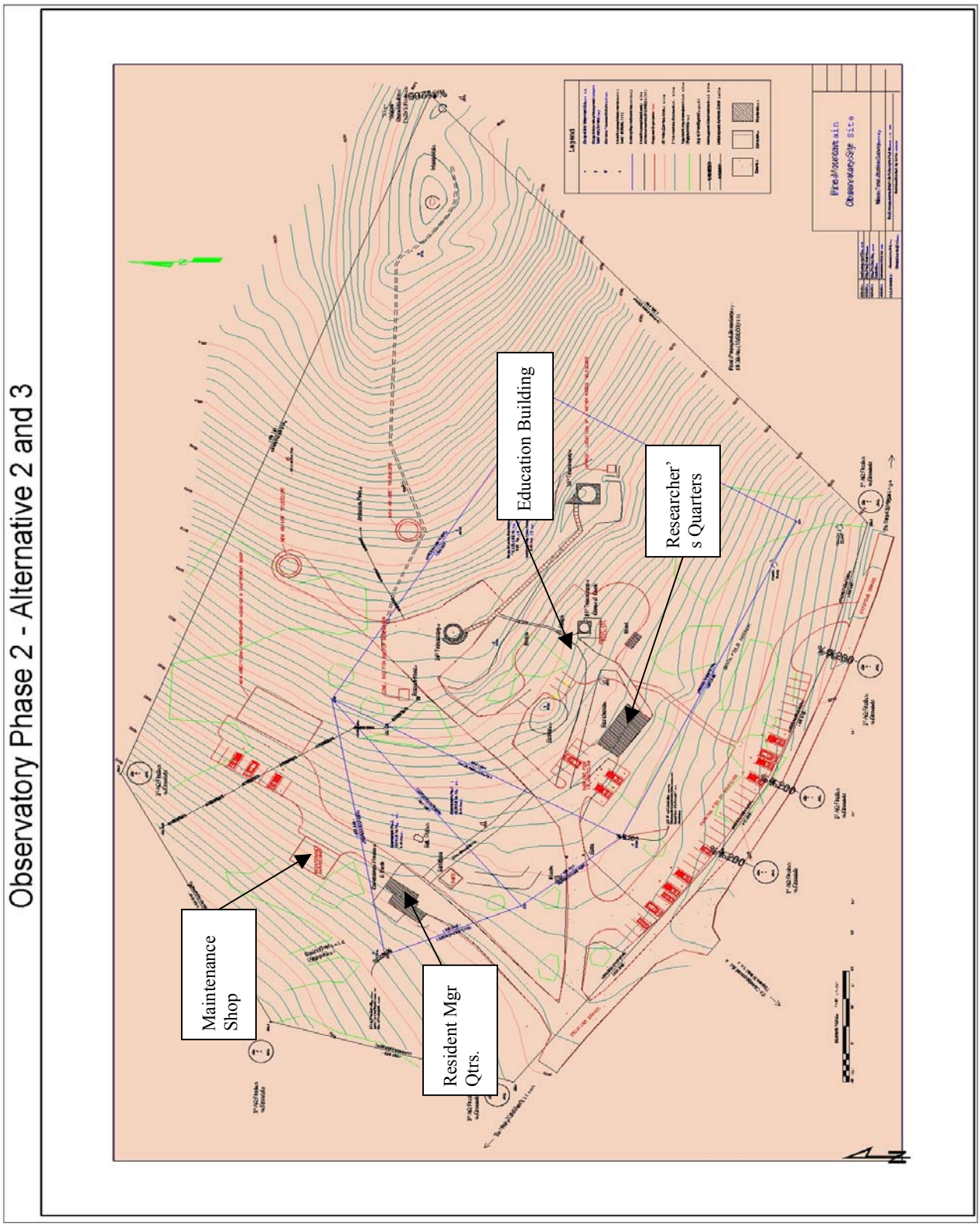
Approximately one quarter (0.25) acre, located between Road 2017 and the new parking area and between the parking area and the researcher's quarters and education building would be planted with trees to help screen the observatory from the road and reduce light pollution from vehicles.

The permit area would be expanded from the current approximately four (4) acres to approximately nine (9) acres to insure adequate area for the development and expansion of proposed facilities over the 20 year span of the permit. The permit area would be located within the M9 – Scenic Views management allocation

Phase II (Figure 2-3 - Phase II Map) would include the construction of the following structures and improvements:

- upgrade the existing researcher's quarters on the existing footprint (approximately 54 feet x 27 feet) by removing the existing structure and replacing it with a 2-story structure.
- upgrade the existing resident manager's residence (approximately 1000 square feet) with either a new modular or stick built structure on the existing footprint and with a new deck.
- construct new maintenance garage and shop, approximately 30 feet by 40 feet by 18 feet tall, northeast of the resident manager's residence.

Figure 2-3 Phase II Site Map, Alternatives 2 and 3.



- extend resident manager's residence access road approximately 105 feet to provide access to the proposed maintenance shop and garage; pave or surface with dust abatement material.
- construct parking for 10 vehicles adjacent to the researcher's quarters; pave or surface packing area and access road with dust abatement material; and
- pave or surface the main access road from the entrance to the and around the 24-inch telescope with dust abatement material.

Vegetation management activities prescribed in the vegetation management plan, primarily the removal of trees that encroach upon telescope views and to maintain defensible spaces around structures, would continue during this phase.

Phase III identifies additional structures and improvements visualized to be needed for future teaching and research. This alternative would conceptually approve the location, estimated size and probable use of each structure and improvement. It recognizes the uncertainty of future needs and changes in research and teaching requirements and direction but also the need for long-range planning to bring such facilities on-line in a reasonable time. Under this alternative, final approval for the location, size and construction for specific structures and improvements could require additional analysis and an additional decision.

This phase (Figure 2-4 - Phase III Site Map) proposes the following structures and/or improvements:

- two (2) new research telescopes, 40 to 100 inch in diameter, to be located upslope from the existing 24 and 32 inch telescopes.
- additional research housing and instrument shop, approximately 40 foot x 80 foot and possibly two stories in height.
- the resident manager's access road would be extended an additional approximately 200 feet to reach the new quarters and instrument shop; it would include parking lot with an estimated nine (9) spaces opposite the quarters/instrument shop for researcher parking and would be either paved or surfaced with dust abatement materials.
- the main access road to the 24-inch telescope would be extended approximately 100-150 feet to one of the proposed new telescopes and either paved or surfaced with dust abatement materials. A temporary road would be constructed to the second telescope at the time of construction and obliterated and/or converted to a hard surface trail after construction was completed.

Native materials used to surface trails, roads, parking areas, walkways, and other similar travel areas in all phases would be obtained from sources certified to be free of noxious weeds.

This alternative addresses all the issues. This alternative also recognizes the uncertainty involved in predicting the type and location of facilities that would be proposed more than 10 years in the future. It does provide the permittee the flexibility to plan for future developments with some degree of certainty they would be allowed if they meet the conditions described and analyzed in this document and subsequent decision.

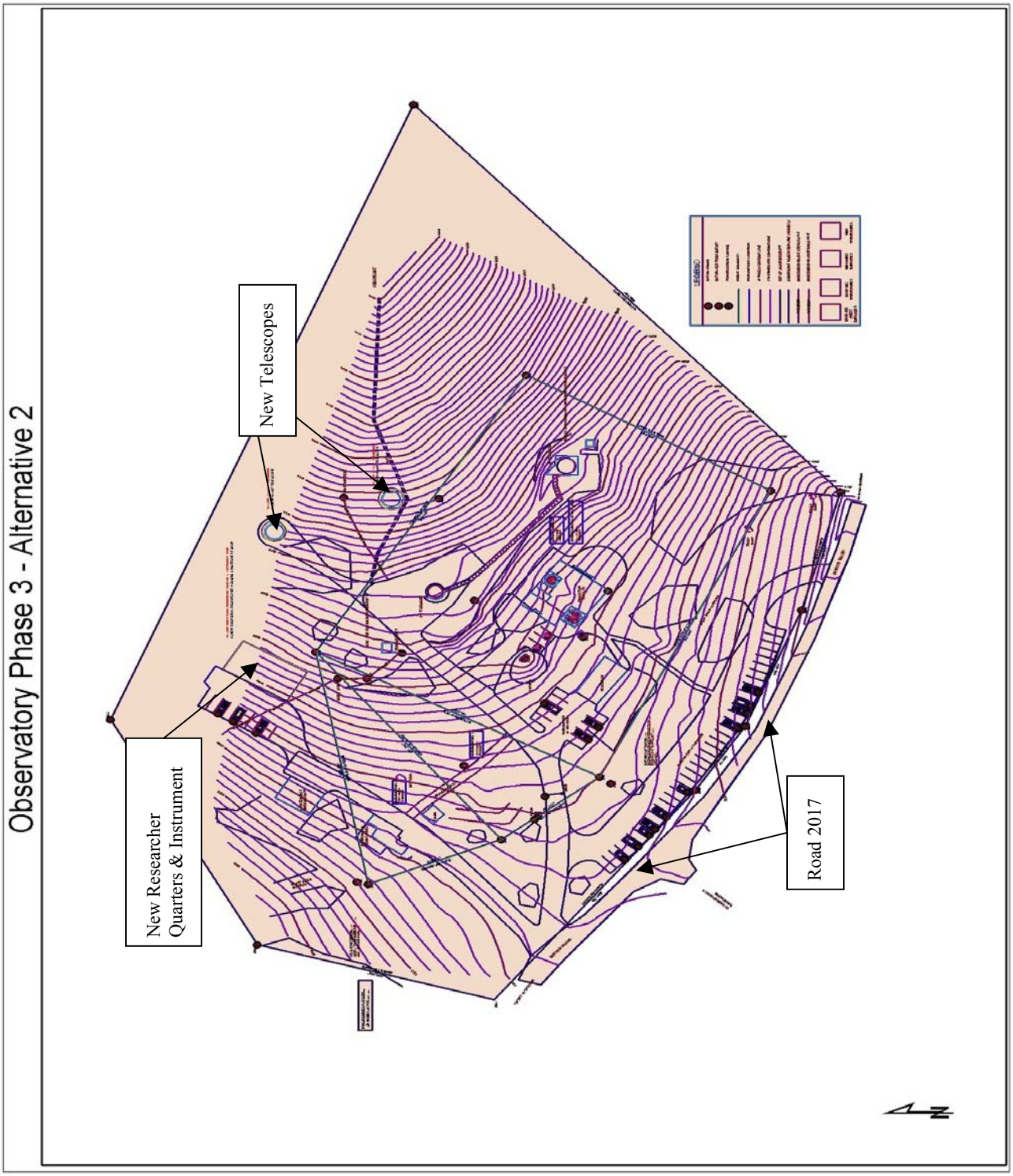
Alternative 3 – Modified Action

This alternative is identical to Alternative 2 except that developments proposed under Phase III would not be approved. The development of additional facilities beyond those approved under Phases I and II would require additional environmental analysis and subsequent decision.

This alternative would authorize the reissuance of the special use permit to the University of Oregon for a period of 20 years.

The permit area would be expanded to approximately nine (9) acres.

Figure 2-4 Phase III Site Map, Alternative 2.



Existing utilities would be upgraded as described in Alternative 2.

A vegetation management plan as described under Alternative 2 would be developed and included in the new special use permit.

Approximately one quarter located between Road 2017 and the new parking lot and between the parking lot and the new education building and researcher's quarters would be planted with trees to help screen the observatory facilities from the road and reduce light pollution from vehicles.

Native materials used to surface trails, roads, parking areas, walkways, and other similar travel areas in all phases would be obtained from sources certified to be free of noxious weeds.

This alternative also addresses all the issues. It also recognizes the uncertainty involved in predicting the need for, the types of, and the location of new facilities, especially those expected to be constructed more than 10 years in the future. It provides greater flexibility to the permittee to propose changes in the number, type and location of new facilities.

Management Requirements Common to Alternatives 2 and 3

All construction activities will follow Best Management Practices to prevent the introduction and spread of noxious weeds. This would include washing equipment prior to entry onto National Forest lands and prior to moving to a new site.

All contracts, force account work, and operating plans would include contract language requiring the cleaning of all equipment before entering onto National Forest lands and before moving to a new site.

Mitigation Measures Common to Alternatives 2 and 3

No mitigation measures were identified.

Monitoring – Alternatives 2 and 3

No monitoring needs were identified.

ALTERNATIVE COMPARISON

Table 2-1 displays and compares the actions proposed under each alternative.

Table 2-1 Alternative Comparison, Pine Mountain Observatory Master Plan

ACTIVITY	ALTERNATIVE		
	ALT 1	ALT 2	ALT3
PHASE 1			
Parking Lot[1]	Existing	New – 37 vehicles 330 ft long x 45 ft wide	New – 37 vehicles 330 ft long x 45 ft wide
Handicapped Parking	No	New – 2 vehicles Approx. 30 ft x 20 ft	New – 2 vehicles Approx. 30 ft x 20 ft
New Septic System – 1500 Gal capacity[2]	No	Yes	Yes
Drainfield Area/Area Cleared	0	<0.25 ac	<0.25
Lineal Ft of Line	0	400-500	400-500
Education Facility – Approx 66' x 60.5' (3500 Sq. ft)[3]	No	Yes	Yes
Storage Shed – approx 16' x 16' x 12'	No	Yes	Yes
Aux. Generator Building – Approx 10' x 12' x 12'	No	Yes	Yes
Amphitheater/Viewing Area[4]	No	Approx. 3500 sq ft Approx. 50x70 feet	Approx. 3500 sq ft Approx. 50x70 feet
Utility Upgrades[5]			
Telephone/T1 Lines (Linear Feet)[6]	0	120	120
Water Lines[7]	0	415	415
Electrical[8]	0	195	195
Road/Trail Upgrades – Ed. Facility Rd & trails to Parking lot and Astron. Residence[9]	No	Approx 200 Feet	Approx 200 Feet
PERMIT AREA[10]	3.55 ACRES	Approx 9	Approx 9
Acres outside permit area	1.90	0	0
LONG-TERM VEGT MGMT PLAN	NO	YES	YES
PHASE 2			
Upgrade Researcher's Qtrs –	No	Yes	Yes
Upgrade Manager's Residence	No	Yes	Yes
Upgrade/ expand Staff	No	10 Spaces, Pave Approx. 45 ft x 20 ft[11]	10 Spaces, Pave Approx. 45 ft x 20 ft[11]

[1] Parking lot would be either paved or covered with surface materials to reduce or limit dust from vehicles.
[2] Septic tank would be approximately 7x9x5.5 ft and require a hole approximately 8x10x8 feet deep. Septic lines would be buried to a depth of up to approximately 8 feet and require a trench approximately 2 feet wide. Construction would clear an area approximately 2 feet wide to dig the trench. Equipment to be used is expected to be a wheeled backed
[3] The education building would be approximately 26 feet to the top of the telescope domes. Construction would require excavating to a depth of approximately 6 feet. Excavated material would be used as fill to level the site for the education building.
[4] The amphitheater/viewing area would be either paved or covered with surface material to reduce or eliminate dust.
[5] Utility trenches would be dug with a backhoe and would be approximately two (2) feet in width and approximately three and one half (3.5) feet in depth.
[6] Trench for T1 line would run from the 24-inch telescope to the education building.
[7] This would include approximately 110 feet of new line to the education building; approximately 235 feet of upgraded line to the resident manager's residence; and approximately 80 feet of upgraded line to the researcher's residence.
[8] Backup electrical line from the backup generator to the resident manager's residence would also follow existing electrical line.
[9] Trails from the parking lot and researcher's residence would either be paved or covered with surface materials to reduce or eliminate dust and to provide better handicapped access. The area around the proposed education building would also be surfaced. Road widths are approximately 20 feet; trail widths vary from approximately 4 to 8 feet.
[10] Includes only area within current permit boundaries. Inclusion of the access road to the resident manager's residence, the parking lot and the caretaker residence septic system, currently located either completely or mostly outside the permit boundary, adds approximately 1.90 acres.

ACTIVITY	ALTERNATIVE		
	ALT 1	ALT 2	ALT3
Parking			
Shop/Garage Building – Approx 30' x 40' x 18'	No	Yes	Yes
Residence Access Rd Extension	No	Approx 105 feet	Approx 105 feet
Complete Road/Trail Upgrades (Caretaker & Telescope Access Roads)[12]	No	Approx 795 feet	Approx 795 feet
PHASE 3			
Construct 2 40-100 inch Telescopes	No	Yes	No
Construct Additional Housing/Instrument Shop; Approx 40' x 80'	No	Yes	No
Caretaker Access Road Extension[12]	No	Approx 200 Feet	No
Additional Parking	No	9 Spaces, Pave Approx. 100 ft x 20 ft	No
Telescope Access Road Extension[13]	No	Approx 100 Feet	No
Area Committed to Improvements including Buildings, Roads, Trails, etc.	0.5 acre	1.7 Acres	1.4 Acres

[11] Size indicated is for one half of the proposed parking area. Five (5) spaces are proposed for each side of the road with each portion approximately 45 feet x 20 feet.
[12] Road width is approximately 20 feet.
[13] Road width is variable from approximately 10 to 20 feet.

3.0 Affected Environment (Existing Condition) and Environmental Consequences

This section provides a detailed description of the affected resources within the project area. These existing conditions are the baseline against which the affects of each alternative are measured. It also describes the environmental effects of implementing the proposed action and other alternatives.

The analysis is organized by resource area. Within each section, the affected environment is described first followed by the effects of each of the alternatives. The No Action Alternative, which provides a baseline for evaluation and comparison of the other alternatives, is discussed first with the other alternatives following.

This section includes a discussion of the affected environment and environmental consequences relating to the key issues. The existing/current condition for the analysis can be identified by references to the affected environment. This section compares the alternatives by issue and describe the environmental effects and consequences.

Environmental effects can be direct, indirect, and cumulative. They can be qualitative, short or long in duration, adverse or beneficial. Combinations of effects occurring together over time can produce cumulative effects. The effect of elements common to all action alternatives will be analyzed.

Mitigation measures are identified and described by resource.
Key Issues and Related Resources

Included in this chapter is a discussion of the consequences of implementing the Alternatives described in Chapter 2. Disclosed are the direct, indirect, and cumulative environmental consequences of implementing each of the alternatives, including the No Action Alternative.

3..1 Analysis area:

The analysis area was selected by resource specialist based on the expected geographic scope of cumulative effects. For most resources, the analysis area was either the existing or expanded permit area boundary.

3..2 Timeframes

Effects on resources vary by alternative and by resource in both the short and long term. For all resources, the effects of each alternative were analyzed:
As they exist today (assuming no action or change in management or use);
After the proposed actions, including any connected actions, were implemented (short term); and
Ten years after the proposed and any connected actions were implemented (long term).

3..3 Past Activities

Past activities include harvests, thinning, prescribed burning (under burning), or wild fire that have occurred in the Pine Mountain Observatory Master Plan analysis area prior to 2004. These events/activities created the conditions present within and adjacent to the project area. They are considered "similar" past activities and are included in the cumulative effects analyses. Other activities considered in cumulative effects analyses include the past improvements that have been made at the observatory.

3..4 Reasonably Foreseeable Future Actions

Reasonably foreseeable future actions are considered to be those actions or activities occurring within or adjacent to the project or analysis area that would be reasonably considered to affect or be affected by the proposed action. These would include, but not be limited to, vegetation management projects such as commercial and non-commercial timber harvest, fuel reduction projects such as prescribe burning or mowing, grazing, and recreational activities including camping, off-highway vehicle (OHV) use, etc. They could be located on adjacent National Forest lands or lands owned and managed by other federal or state agencies, or private individuals, companies, or organizations.

2.2 Affected Environment (Existing Condition) and Effects Relating to Key Issues

3..1 Existing Condition

The Pine Mountain Observatory site was originally identified in 1965 by the University of Oregon. Securing permits and funding was initiated in 1966. The original special use permit was issued by the Deschutes National Forest in 1967. The original permit site was approximately three (3) acres in area. Two subsequent expansions increased the permit area to the current approximately 3.6 acres.

The University of Oregon (U of O) established Pine Mountain Observatory in 1967. The first building to house a telescope was built at that time. Subsequently, two more buildings to house telescopes have been constructed along with a bunkhouse, site manager's residence, storage shed, kiosk and water cistern. These facilities are an authorized use National Forest system lands through a special use permit issued to the University of Oregon.

A portion of the infrastructure that serves the site is included under the terms of the permit issued to U of O. This includes water lines, two septic systems and roads.

There is no well on site; all water is hauled from a well located on a private ranch just north of the Forest Boundary.

The powerline and telephone line that serve the site are authorized and issued under separate special use permits to the respective utility companies responsible for providing those services. Power was brought to the site by underground (buried) cable in 1967. The powerline that serves the observatory has been in place approximately 37 years. Outages along this line are infrequent, but are beginning to occur more often due to the age of the line. Central Electric Cooperative has no plans to replace the line at this time due to the expense involved.

The University installed a T-1 data line in 1995 to provide access to the Internet. This link is utilized to provide distance-learning opportunities to Kindergarten through 12th grade students around the State of Oregon as well as to provide information to the general public.

3..2 Key Issue 1: Expand Existing Permit Area Boundary

The current permit was issued in 1967 and included approximately 2.7 acres. Two subsequent additions increased the permit area to approximately 3.55 acres. The existing parking lot, access road to the caretaker's residence and at least the drain field of the septic system servicing the caretaker's residence are outside the existing permit boundaries. The proposed new parking lot and at least some proposed facilities would also be outside of the existing permit boundaries.

Measurement Standards

Acres within permit area boundary.
Acres with observatory structures and infrastructure outside permit area boundaries.

3..2.3 Alternative 1 – No Action (Current Management)

3.4.6.2.1 Direct and Indirect Effects

The permit area would remain at approximately 3.6 acres. Facilities outside of the permit boundary, primarily the parking lot, access roads, and at least a portion of the residence manager's residence septic system totaling approximately 1.9 acres, would remain outside the boundary. Repair or improvement would remain outside the permit requirements and conditions and would result in additional work and oversight by Agency personnel.

There would be no measurable short or long-term effects on scenic resource values. There would be no increase in the permit area within the Scenic Views resource allocation.

There would be no measurable effect on heritage resources. None are present within the current permit area.

There would be no measurable effect on the green tinged paintbrush or its habitat. The permit area would not expand into known or suspected habitat of this species.

There would be no measurable effect on timber, soils, or wildlife habitat or species. No boundaries would be changed.

3..2.3 Alternative 2 – Proposed Action and Alternative 3 – Modified Proposed Action

3.4.6.2.1 Direct and Indirect Effects

Under both alternatives, the special use permit area would be expanded from the current approximately 3.6 acres to approximately nine (9) acres. All existing facilities, including access roads, the existing parking lot, and the drainfield associated with the resident manager's residence would be within the permit area boundaries. The university would be responsible for all maintenance and repairs associated with all facilities and infrastructure within the boundaries.

All new facilities proposed under Phases I, II, and III of Alternative 2 and Phases I and II of Alternative 3 would be located within the expanded permit boundaries. Development of additional facilities beyond Phase II of Alternative 3, if approved by future analysis and decisions, would be expected to occur within the expanded permit boundary.

3..2.3 Cumulative Effects – All Alternatives

There are no identified or measurable cumulative effects associated with this issue under any of the alternatives.

The Opine Vegetation Management EA would close National Forest lands to off road vehicle use except on designated roads and trails or where posted open. This would eliminate OHV use from areas within and adjacent to both the existing permit boundary and the proposed expanded boundary. OHV access would continue on Road 2017 to the south of the observatory area but end immediately east of the junction with Road 2017500. Road 2017 from that point north to the Forest Boundary would remain closed to non-street legal OHV use.

The Opine Access Management EA would designate roads and trails for OHV use. It would provide OHV access to the observatory area using Road 2017 on the south side of Pine Mountain. A parking area for OHVs would be constructed east of the 2017500 road junction allowing riders to park and walk to the observatory. No OHV access to the observatory area would be provided from the north, west or east; all designated OHV routes would keep non-street legal OHVs at least one quarter to one half mile distant.

The Cinder Hill Range EA continues grazing on National Forest lands adjacent to the observatory permit area. The permit area is not currently fenced and would not be under any of the proposed alternatives. Livestock would continue to graze within the permit area boundaries under all alternatives. There have been no reported instances of livestock causing problems or damage to facilities or affecting observatory operations. This would not be expected to change under any of the alternatives.

The Bureau of Land Management's (BLM) Upper Deschutes Resource Management Plan and Environmental Assessment (EIS) identifies a number of resource management activities to be continued or implemented on BLM lands to the north and northwest of the Pine Mountain area and the Forest Boundary. None of these proposed actions would be expected to have a measurable or cumulative effect on the boundary of the Pine Mountain Observatory special use permit boundary.

Activities on BLM lands to the east and south of Pine Mountain, primarily OHV use and grazing, would also not be expected to have measurable or cumulative effects on the permit area boundary.

Continued use of the Antelope Electronic site, approximately four miles northeast of the observatory, and the Pine Mountain Electronic site, approximately one quarter mile west of the observatory permit area at the end of the 2017500 spur, would have no measurable cumulative effects on the permit boundary.

3..3 Key Issue 2: The lack of dedicated research and educational facilities restricts research efforts by limiting telescope use by researchers and limits educational opportunities because of conflicts with research needs and requirements.

Measurement Standards

Number of telescopes dedicated to research.

Number of telescopes dedicated to public use and educational programs.

3..2.3 Existing Condition

The Pine Mountain site was to be a permanent replacement for a site located on Cache Mountain where a 15-inch Cassigrain telescope was originally sited in 1963. The first telescope, the 24-inch, was installed in 1967; the 15-inch, moved from the Cache Mountain site, was installed the following year (1968) at a location lower on the slope below the 24-inch. The 32-inch telescope was added to the site in 1977. During the summer of 2003, a four (4) meter radio telescope was installed adjacent to the 15-inch telescope. A 10-inch optical telescope and associated building was also donated and is being located on the large rocked area adjacent to the 24-inch telescope building.

Observatory facilities are currently open to public use on Friday and Saturday nights for a 16-week period between Memorial Day and the end of September each year. During the remainder of the week and the year, the facilities are available by appointment only. Visitors may utilize both the 15 and 24-inch telescopes to view the night skies. Lectures and other similar events are limited to the building housing the 32-inch telescope as it is the largest with the most room for people. However, seating is limited to approximately 20 to 25 people, requiring two or more sessions for larger groups.

3..2.3 Alternative 1 – No Action (Current Management)

3.4.6.2.1 Direct and Indirect Effects

No telescopes would be dedicated to specifically research activities and no telescopes would be dedicated specifically to educational activities. Research activities would continue, but there would be continuing conflicts between research needs and public use during summer public use times. Public use of the 32-inch telescope building for lectures and other similar events would limit the availability of that telescope to researchers. Research priorities would likely increasingly limit public use of the building.

Scheduling conflicts between researchers and the distance education program would also likely increase. The number of classes and students that would be able to use the telescopes and facilities would continue to be limited. The number of student proposed and implemented research projects would be limited.

The type of research to be conducted would be limited because no new telescopes would be constructed. This could result in the observatory ceasing to be considered to be a premier astronomic facility.

Without the construction of facilities to deal specifically with educational programs, including both on-site and distance learning, conflicts over the scheduling and use of telescopes and facilities would increase. The observatory is primarily a research facility; priorities would favor research over education thereby limiting or ultimately eliminating public education programs and efforts.

There would be no opportunities to expand distance-learning opportunities. Competition for limited numbers of visitor slots would increase. Pressure to increase visitor numbers would increase which would place additional pressure on the facilities and further increase conflicts with research needs and priorities.

3..2.3 Alternative 2 – Proposed Action and Alternative 3 – Modified Proposed Action

3.4.6.2.1 Direct and Indirect effects

Phases I and II under both alternatives would result in the construction of the education building which would have two telescopes, the current 15 inch and a new approximately 20 inch, dedicated to education and educational programs. This would require the destruction of the 15-inch telescope building and relocation of the telescope to the new telescope building. Construction of the education building and the two telescope buildings would require approximately two years during which time the 15-inch telescope would be unavailable for use by the public, researchers, or for distance learning programs. Depending on funding, construction schedules and the availability of instruments, it is expected that the education building would be completed within five years of the issuance of a new special use permit.

Increasing competition between researchers, educators, and the public for telescope use on the 24 and 32-inch telescopes would be expected to increase while the education building was constructed. As a research facility, priority would be given to research over public or educational viewing and projects. Public programs involving large numbers of people would continue to require the use of the 32-inch telescope building until the education building was completed. This would restrict or eliminate research opportunities at those times. Conversely, research priorities could be expected to restrict or eliminate opportunities for public or educational viewing or programs during some periods during the public use season.

Upon completion of the education building, the 24 and 32-inch telescopes would be dedicated to research projects. The 24-inch would remain available for public and education use contingent upon research priorities.

Completion of the education building would allow public and educational programs to be held in the proposed classroom area and eliminating the need to use the 32-inch telescope building. Research requiring the use of that telescope and building would not be disrupted or delayed by other uses and demands. Equipment currently in that building currently associated with distance learning programs would be moved to the educational building freeing space for additional research equipment for use with the 32-inch telescope.

Dedication of two telescopes to educational and public viewing would increase the ability and opportunity for the observatory to expand its distance-learning program. More schools could become involved. More student driven research could be performed. The additional outreach that would be provided would help to keep the number of visitors/users to the observatory to within targeted levels of no more than 5,000 visitors per year.

The education building would also allow for the presentation of programs to larger groups of people without requiring multiple sessions.

Two additional, large diameter, optical research telescopes would be constructed during Phase III under Alternative 2. These telescopes, with 40 to 100 inch mirrors, would improve the research capabilities of the observatory. They would allow the observatory to expand research into areas currently unavailable to the smaller telescopes. Construction of these telescopes, if approved, would be expected to occur 11 to 20 years after the issuance of a new special use permit. They would be expected to be operational within two years after initiation of construction.

It is uncertain if these telescopes would be constructed. Over the next decade, research priorities and needs could change. Improvements in instrumentation and development of new instruments could change how and what research is needed. The size, type, or even the number of telescopes could change. This alternative would provide a basis for the observatory and university to initiate planning with some degree of certainty regarding the possibility of constructing additional research facilities. Additional analysis and decisions could be required if proposed facilities would likely result in additional impacts to other resources.

Alternative III would not authorize additional research telescopes. There would be no opportunity for the observatory to expand its research capability under the auspices of this analysis and decision. This alternative does not preclude the observatory and university from proposing additional facilities beyond those identified in Phases I and II. This alternative provides the observatory and university more flexibility in planning future facilities without limiting them to specifics. Proposed developments would be expected to be more responsive to research needs and priorities, advances in instrument technologies, etc. Such additions would require additional analysis and decisions.

3..2.3 Cumulative Effects – All Alternatives

There are no identified or measurable cumulative effects associated with this issue under any alternative from reasonable and foreseeable actions associated with the Opine Vegetation Management EA, the Opine Access Management EA, The Cinder Hill Range Analysis EA, or the BLM Upper Deschutes Resource Management Plan and EIS.

3..4 Key Issue 3: Development of new facilities may impact portions of an existing population of green tinged paintbrush.

3..2.3 Existing Condition

3.4.6.2.1 Threatened and Endangered Species

The Biological Evaluation (Appendix A) documents the review and review findings of Forest Service planned programs and activities for possible effects on species (1) listed or proposed for listing by the USDI Fish and Wildlife Service (USFWS) as Endangered or Threatened; (2) designated by the Pacific Northwest Regional Forester as Sensitive. It is prepared in compliance with the requirements of Forest Service Manual (FSM) 2630.3, FSM 2672.4, FSM 10/89 R-6 Supplement 47 2670.44, and the Endangered Species Act (ESA) of 1973 (Subpart B; 402.12, Section 7 Consultation).

Proposed, Endangered, Threatened, or Sensitive (PETS) species considered in this evaluation are those listed in FSM 2670.4 Region 6 list dated April 1999 as suspected or documented to occur on the Deschutes National Forest.

The Regional Forester's Sensitive Species List lists 25 species for the Deschutes National Forest. Of those 25, only one (1), ***Arabis suffrutescens var. horizontalis*** (Crater Lake rockcress) is neither suspected nor documented on the Bend-Fort Rock Ranger District. Of the other 24 species, six (6) are documented. The remaining 18 are suspected to occur on the Bend-Fort Rock Ranger District, Deschutes County, Oregon (Biological Evaluation for – Proposed, Endangered, Threatened, and Sensitive plants for Pine Mountain Observatory Master Plan).

Soils on Pine Mountain are mainly comprised of volcanic ash and some pumice lapilli over loamy colluvium and residual soils, as well as sandy volcanic ash and sandy to loamy residual soil on the ridgetops.

The plant associations that dominate Pine Mountain are big sagebrush-bitterbrush/bunchgrass, ponderosa pine/bitterbrush-manzanita/fescue, and ponderosa pine/bitterbrush/fescue.

Elevation at the project area is about 6500 feet on Pine Mountain. Average annual precipitation ranges from approximately 15 to 20 inches.

The potential for sensitive plant species' habitat to occur in the project area was evaluated using the preceding information. Resources used to identify potential sensitive plant habitat were aerial photo interpretation, vegetation map information, as well as personal knowledge of the project area. Based on the preceding information, a comparison with the habitat requirements of Bend/Ft. Rock Ranger District potential sensitive species indicates that the green tinged paintbrush (***Castilleja chlorotica*** or CACH***)*** is known to exist within the project area and that additional unsurveyed habitat also existed prior to survey. The probability of occurrence is high.

No habitat for threatened or endangered plant species appears to exist within the project area.

3.4.6.2.1 Surveys

Proposed, Endangered, Threatened, and Sensitive (PETS) plant surveys have been conducted over 100 percent of the project area in Phase I and II that contains PETS habitat. Green-tinged paintbrush CACH) was found in the area immediately east of the existing buildings.

The construction of the observatory itself most likely removed an unknown amount of CACH and its habitat. Many of the pines that are present now on-site were not there when it was established in 1967. The project area was a more open area and suggesting that good CACH habitat conditions existed (Figures 1-3 to 1-7).

A survey in 2001 located approximately 1,000 CACH plants on the slope on the east side of the observatory. This population is unusual in that it is growing in a density not seen elsewhere on the Forest (there are more plants per square meter than elsewhere) and suggesting a strong preference for the site. The plants are growing in an exemplary plant community, one that apparently has not been disturbed since 1914. This population occurs from the edge of the buildings up to the top of the slope, and grades into more known plants (not included in this count) as the slope shifts to a southern exposure. There are almost certainly more plants on the north side of the population as well. These populations occur within a context of a much larger population on Pine Mountain, which at last count (1997) numbered roughly 20,000 individuals (Botany BE, page 6, Appendix A).

The last known fire to run through this population was in 1914. The presence of CACH in this area, where fire has not occurred for almost a century, is consistent with the observations made by botanists/ecologists from three units charged with its management (Botany BE pages 7-8, Appendix A). CACH often occurs in areas where the natural fire return interval has been suppressed, causing the shrubs to proliferate, providing conditions that this species prefers.

CACH is not a fire-tolerant species, contrary to what might be intuitively concluded about a Central Oregon endemic plant. This species has been observed to die when exposed to fire. It has not been found in early seral habitats. Fire has been identified as the biggest threat to this species. It can take 20 years or more for a population to re-establish itself once it has been extirpated from an area because of fire. It is dependent upon a host plant, usually a shrub, to re-establish. It has rarely been found with the common post-fire, early-seral shrubs, green or gray rabbit brush (***Chrysothamnus viscidiflorus*** or ***C. nauseosus***) but rather with the later seral sagebrushes (*Artemisia* spp.) or bitterbrush (***Purshia tridentata***). This is not a case, as it is in other areas, where CACH occurs in dense, high-fuel stands of shrubs; the shrubs tend to be small. Although CACH is often in the situation of depending upon a shrub system that offers it life, and which could also be the instrument contributing to its demise, the wildfire threat is not quite as pronounced at this site.

There is a user-created trail from the 24-inch telescope up to the top of the knob above the permit area. A large area at the top of the knob has been denuded of vegetation, most likely because of this activity over a period of many years. Visitors get to the top and some like to build rock cairns and other structures, pulling them out of the substrate to do so. The CACH population occurs at the edge of this bare area

where the shrubs are present. This suggests that CACH also occurred at the top, as it does on similar open rocky ridgelines elsewhere on Pine Mountain, where human visitation is far less concentrated. It also suggests that an unknown number of CACH plants have likely been extirpated from this bare area.

3..2.3 Alternative 1 – No Action (Current Management)

3.4.6.2.1 Direct and Indirect Effects

There would be no measurable effect on individual plants, the population, or the habitat for CACH under this alternative. No construction would occur so no existing individuals or habitat would be lost.

There would be no measurable change in the quantity or quality of CACH habitat within the existing permit area in the short term. Also, there would be no measurable change in the quality or quantity of habitat or in population numbers or distribution in existing CACH areas outside of the existing permit area in the short term. Long term, continued encroachment and expansion of ponderosa pine within the permit area and in CACH habitat outside the permit area would result in decreases in habitat quality, quantity, and distribution. Decreases would also be expected in population numbers.

There would be no additional risk of noxious weeds or other non-native invasive plants expanding into existing CACH habitat or populations. No construction would occur that would create additional habitat for those species. No equipment would be present to introduce new species or spread existing populations.

Expansion of noxious weeds into the existing CACH population would not be expected. No construction would occur, therefore, there would be no chance for equipment to introduce or spread noxious weeds. No disturbed sites would be created so no additional habitat for noxious weeds would be created. The existing knapweed population would continue to be treated by pulling.

3..2.3 Alternative 2 – Proposed Action and Alternative 3 – Modified Proposed Action

3.4.6.2.1 Direct and Indirect Effects

The permit boundary would be expanded under both alternatives and would encompass two to three acres of historic or existing CACH habitat to the east and south of the existing permit boundary. Expansion of the boundary in and of itself would be expected to have no measurable effect on the quantity or quality of CACH habitat or the numbers and distribution of individual plants or populations.

Phases I and II, under both alternatives, would result in approximately three quarters (3/4) of an acre of historic habitat being lost to the construction of new facilities and infrastructure (buildings, roads and trails, utilities, etc.). This historic habitat would be lost as long as the facilities and infrastructure remained. No plants are currently know to exist in the areas proposed for construction due to either existing structures or infrastructure or because of the presence of relatively dense pockets of second growth ponderosa pine. Construction of new facilities and infrastructure would therefore not affect individual plants or the population of CACH.

Implementation of a vegetation management plant would have no short-term effect on CACH populations or habitat within the expanded permit area. Full implementation would not occur until after completion of the proposed Opine Vegetation Management EA actions within the permit area. One or two decades could pass before the observatory would need to implement activities to control tree encroachment on telescope views, reduce tree stocking levels, or reduce ladder fuels. Long term, controlling tree stocking levels to maintain telescope views, maintain defensible spaces, and reduce ladder fuels would help to maintain more open stand conditions resulting in increased light levels to the forest floor. This would help to maintain understory vegetation, including sagebrush and other shrubs. This would result in

improved habitat conditions for CACH would be expected to result in at least limited increases in CACH numbers and distribution within the permit area.

Removal of trees would be expected to be limited in both numbers and time. Once the initial removals are completed through work proposed under the Opine Vegetation Management EA, future removals would likely be limited and subject to regeneration and subsequent growth rates. This would likely to be less than 10 larger trees per decade.

The vegetation management plan would also help to reduce the loss of habitat and reductions in numbers and distribution in existing habitat located upslope from the 24 and 32-inch telescopes. Telescope views are more severely restricted when viewing upslope; smaller trees block views much sooner than similar sized trees downslope from the telescopes. Removal of the smaller trees would reduce the risk of existing individuals and habitat being lost by shading and other competition from trees.

Removal of smaller trees could result in individual plants being damaged by trampling. Felling of the trees by chainsaws and disposing of the resultant slash by lopping and scattering or hand piling. Such actions would not be expected to result in measurable damage to individual plants.

Construction of facilities and infrastructure, approximately three quarters (3/4) of an acres under each alternative, would create additional suitable habitat for noxious weeds and other invasive non-native species. Risks would be minimized by utilizing best management practices, including requiring the washing of equipment prior to entering the site or before moving to a new site; avoiding parking or moving equipment through the existing knapweed population, and requiring rapid revegetation of disturbed areas upon completion of work. This would reduce or eliminate the risk of noxious weeds or other non-native invasives encroaching upon and taking over existing or historic CACH habitat.

The fact that the weed population and CACH population have resided side by side since about 1990 without the knapweed moving into the area inhabited by CACH (Botany BE page * - Appendix A) also suggests that the risk is limited. Use of best management practices would help to keep the risk low.

CACH habitat, individuals, and populations would be impacted by the construction of facilities and infrastructure proposed under Phase III of Alternative 2. Approximately one half (1/2) acre of historic or existing habitat would be lost to new roads, structures, and other infrastructure construction. Most or all of the losses would be associated with existing habitat and individuals located to the north and east of the 24 and 32-inch telescopes. Habitat and individuals in those locations would be lost for as long as the facilities and infrastructure remained. Additional analysis would be necessary prior to approval for construction to determine specific impacts to individuals, the habitat, and the population to determine if the effects of the proposed construction would be materially different than discussed here.

Alternative 3 would not implement Phase III. There would be no measurable effects on existing or historic habitat or individuals or the population under this alternative.

Both alternatives would be expected to impact individuals or habitat but would not be expected to result in the species or its habitat being moved toward listing as a threatened or endangered species.

3..2.3 Cumulative Effects Common to All Alternatives

The Opine Vegetation Management EA would implement vegetation management activities within and adjacent to the observatory permit area. These activities would reduce fuel loadings through tree thinning and the mowing of shrubs. This would reduce the threat of wildfire, reduce the rate of spread and intensity of any fire that did get started and make control easier. This would reduce but not eliminate the threat of a fire starting in the observatory area and moving upslope into the CACH population where a fire would likely kill plants.

Long term, under Alternative 1, tree growth and additional tree regeneration would begin to return treated areas to conditions similar to those existing prior to treatment. Because no vegetation management plan would be implemented, fire intensities would begin to increase due to increased fuel loadings. The ability to control a fire would also decline, increasing the risk of a fire entering into habitat and/or populations. This would increase the risk of loss or damage to individual plants, all or parts of existing populations, and habitat.

Alternatives 2 and 3 would implement a vegetation management plan. This would help to keep fuel loadings reduced, resulting in lower intensity wildfires and making control of those fires easier. This would reduce the risk of major damage to populations or habitat although damage or loss of individuals would be expected.

The Opine Vegetation Management EA would also authorize the removal of approximately 300 trees greater than four (4) inches dbh (diameter breast height) to restore telescope views to the lower horizon. This would occur under all three alternatives. This would result in the removal of approximately five (5) trees currently located within the CACH population. There is the potential of some damage or loss to individual plants during the process of falling and removing the trees. Because the trees would be felled and removed by hand and the slash piled and burned in already disturbed areas, the impact would limited to relatively few individuals. There would be no measurable effect on the population. If 20 individuals were impacted, this would be approximately 0.2 percent of the local population and approximately 0.01 percent of the population on Pine Mountain.

The effects of tree the tree removal would likely be eliminated over time as other, new CACH plants come in to colonize the areas that were previously too shaded or contained too much litterfall from the trees for CACH to grow. Recolonization would depend upon the presence of a host plant; the presence of bare ground could require up to 20 years for regeneration to occur. Given the limited number of trees and the current quantity and distribution of plants, the effect would be limited.

Fuels treatments proposed by the Opine Vegetation EA would reduce the risk of a wildfire burning through the permit area or into and through the CACH population. Fuels treatments, particularly prescribe fire and mechanical mowing are not proposed in this population so treatments would have no direct effect on individuals or the population. Treatments adjacent to the population would increase the ease of control, reduce fire intensity, and the rate of spread, increasing the potential of protecting the existing population.

Mechanical treatment of shrubs within the permit area would result in a short-term reduction in habitat for the population and would potentially damage or destroy individual plants. This would be expected to be a short term effect. A minimum of 6 to 8 inches of shrub height would be retained after mowing. Little or no soil would be exposed. The sagebrush and bitterbrush required by CACH for regeneration would be retained.

The Opine Vegetation Management EA also proposes to close the Pine Mountain area to OHV use except on designated roads and trails or where posted open. This would close the observatory permit area and surrounding lands to OHV use. This would eliminate the potential of OHV activity damaging or destroying individual plants or habitat under all three alternatives. There would be no measurable effect under any of the alternatives; there is no evidence or data to identify the use or impacts of OHV use on CACH in this area.

This closure would also reduce the risk of human caused wildfire by restricting OHVs to designated routes and avoiding vegetation that could be ignited by hot mufflers and other equipment.

Visitors and other users would continue to hike to the top of ridge. Activities along the trail and at the ridgeline would continue to disturb the vegetation there. Such use has the potential to expand the existing bare area and reduce both the numbers and area of the CACH population under all three alternatives. Including the trail and the area at the top of the ridge within the permit area under Alternatives 2 and 3 would provide additional opportunity for the observatory to manage use. No such opportunity would be provided under Alternative 1 as the area would remain outside the permit area.

The Cinder Hill Range EA would continue domestic livestock grazing on Pine Mountain, including through the observatory area. Livestock have not been documented to grazed green tinged paintbrush. There would be no cumulative effects on the species.

The Opine Access Management EA would have no additional cumulative effect on CACH beyond that described above under the Opine Vegetation Management EA. The Access EA would establish a designated OHV route system, including roads and trails, on Pine Mountain. No routes or trails would be established within or adjacent to the observatory permit area with the exception of using Road 2017 from the south to provide access to the observatory.

The Opine Access Management EA would also help to reduce the risk of human caused fires by establishing a designated OHV system using designated roads and trails. No OHV use would be permitted within the existing population although Road 2017 to the south would be a designated route.

The BLM's Upper Deschutes Management Plan and EIS would have no measurable effect on CACH or its habitat under any alternative. No actions or activities are proposed that would affect the population or habitat of this species on Pine Mountain.

The management of BLM lands to the south and east of Pine Mountain, particularly grazing and OHV use, would also have no measurable cumulative effect on CACH or its habitat. Access for OHV use from BLM lands would be limited to designated routes (Opine Vegetation Management and Access Management EA discussions above). Grazing has not been documented to occur on CACH (Cinder Hill EA discussion above).

3..2.3 Comparison of Alternatives

Alternative 1, No Action, has the least impact on the green tinged paintbrush. No habitat or individuals would be disturbed, damaged or destroyed. Approximately one half (0.5) acre of historic habitat would remain lost due to existing structures and infrastructure. There would be no increase in the risk of noxious weeds being introduced or spread.

Alternative 2, Proposed Action, would pose the greatest risk to individual plants. New construction proposed in Phase III would locate two new telescopes and access roads and trails in high quality habitat where the species is suspected to currently exist. Approximately 1.7 acres of historic or existing habitat would be lost to structures and infrastructure. Construction in all three phases would create additional habitat for the establishment of new noxious weed populations. Equipment would provide avenues for the introduction of new weed species or populations or the spread of existing ones. Use of BMPs would reduce, but not eliminate the risk of introduction or spread of species or populations. There would be a greater risk of noxious weeds invading and potentially supplanting the CACH population.

Alternative 3 the modified action poses a level of risk between Alternatives 1 and 3. Because Phase III construction is not approved, the level of impact to individual plants and the local population would be similar to Alternative 1. Approximately 1.4 acres of historic habitat would be lost to existing or new structures and infrastructure. No construction would occur within known or suspected populations or habitats.

The risk of invasion by noxious weeds would be similar to, but less than Alternative 2. Authorized construction in Phases I and II occur in areas outside of known or suspected habitats and populations. Phase III is not authorized; therefore, there would be opportunities for noxious weeds to become established within known or suspected habitats and populations.

Tree removals proposed by the Opine Vegetation Management EA would have similar effects under all Alternatives. Future removals performed under the vegetation management plan in Alternatives 2 and 3 would have similar effects to those expected under the Opine Vegetation Management EA.

2.2 Visuals

3..1 Existing Condition

Rising out of the high desert, views to Pine Mountain are relatively unobstructed from Bend and other surrounding areas. Pine Mountain is especially visible from Highway 20. During winter months and early spring, it has the appearance of a snow covered island in the middle of sagebrush flats and areas of open range. Dense mottled stands of mixed conifer and old growth ponderosa pine create contrasting patterns of dark and light. Several vantage points at the highest elevations on Pine Mountain provide excellent views to the surrounding expanse of high desert landscape.

Located on the north and northeast sides of Pine Mountain overlooking Highway 20, Forest Road 2017, and the tiny town of Millican, the Scenic Views Management Areas are mostly classified as having a **Scenic Integrity Level of Moderate (Partial Retention).** The other Scenic Views Management Areas located on the south facing slopes of Pine Mountain below the observatory also have a **Scenic Integrity Level of Moderate (Partial Retention).** The Old Growth Management Areas adjacent to the project area have scenic values with characteristics such as large ponderosa pine in more open and park-like settings. An important recreation experience for visitors coming to Pine Mountain is seeing and enjoying the old growth forests up close and viewing contrasting changes in topography and vegetation within a relatively short distance from Highway 20.

The views towards the sky from the Pine Mountain Observatory have a great deal of value for those who visit for educational and research purposes. Maintaining an unobstructed view of this scenic viewshed to the night sky is a priority for the future use of the Pine Mountain Observatory.

3..2 Scenic Values

Scenic values are often measured by the way people relate or react when viewing a particular landscape. These values can be the result of memories stemming from experiences within a certain setting. The anticipation of viewing a memorable landscape can often trigger emotional responses that enhance the experience and provide a stronger connection or attachment to a special place. The local knowledge of an area's unique characteristics and stories, cultural heritage, and history is key to understanding the connections people have to a place over time.

When describing the physical and biological aspects of landscape character, it is also important to explore the cultural and social aspects that often communicate the values instilled upon a place by those who are either an integral and active part of the surrounding community or are visitors who have a strong attraction to the area. Those visiting the area often have some definite expectations of the scenic views and other sensory experiences. These expectations of viewing the landscape are mostly based upon aesthetics that have value and meaning to both residents and visitors. These values can be expressed through their reactions to changes in the landscape and to patterns of land use that have become or are becoming traditions over time.

The degree of reaction to proposed changes in the landscape or within scenic viewsheds is mostly tied to the connections people have developed over time to familiar views and experiences in places they have either visited or seen from their vehicles. Visible and perceptible changes in noise levels, presence of illumination at night, additional structures such as buildings, utilities, signs, and site development such as additional paving, concrete and metal, road widening or surfacing, grade changes, and the removal of native vegetation are especially noticeable in areas that are relatively undeveloped. In an environment and setting that is mostly volcanic and forested, lava rock and native vegetation are the materials that are most commonly visible in areas adjacent to and surrounding the proposed project area.

Recent changes in the population and growth of development in the Bend area has resulted in additional pressure on surrounding areas that have had less use and fewer threats to scenic quality and to the visitor's recreation experience. Light pollution from adjacent urban areas, more dust and erosion resulting from increased use on forest roads, and higher density recreation activities have increased enough to threaten the quality of the experience and use of the Pine Mountain Observatory project area.

3..3 Scenery Management Objectives (Scenic Integrity Levels)

Scenery Management Objectives are defined in terms of Scenic Integrity Levels which are used to describe the existing conditions and whether the landscape is visually perceived to be "complete" or not. The most complete or highest rating for Scenic Integrity Levels means having little or no deviation from the landscape character that makes it appealing and attractive to visitors and local residents.

In addition to describing existing conditions, Scenic Integrity Levels also describe the level of development allowed and ways to mitigate deviations from the area's landscape character.

The proposed project is within a scenic viewshed area classified in the Scenery Management System as having a **Scenic Integrity Level of Moderate** which refers to landscapes where the valued landscape character "appears slightly altered." Noticeable deviations must remain visually subordinate to the landscape character being viewed. This is the same as **Partial Retention**, the term previously used to describe and determine visual quality in the Visual Management System.

Usually the most effective way to meet Scenic Integrity Levels is to repeat visual form, line, color, texture, pattern, and scale common to the scenic values of the landscape character being viewed. In natural and natural appearing landscapes, deviations such as created openings can sometimes be visually enhanced through repetition of size, shape, spacing, surface color, edge effect, and pattern of natural openings common to the existing landscape character. Adding structures or additions to existing structures in the landscape can often be accomplished by repeating architectural form, line, color, texture, pattern, and scale that visually relates to the surrounding site features. When repetition is designed to be accurate and well placed, the deviation may blend so well that change is not evident.

The desired future condition (DFC) of stands in this scenic allocation and area is one of single-story, open, park-like ponderosa pine stands with scattered pockets or islands of regeneration and younger, smaller trees. There is a sense of visual diversity and depth as the visitor looks through the landscape.

3..4 Environmental Effects

3..2.3 Alternative 1– No Action (Current Management)

3.4.6.2.1 Direct and Indirect Effects

There would be no measurable direct or indirect effects under this alternative. There would be no construction of new facilities or upgrading of existing infrastructure. No vegetation management plan would be written or implemented.

3..2.3 Alternative 2 – Proposed Action and Alternative 3 – Modified Proposed Action

3.4.6.2.1 Direct and Indirect Effects

There would be no measurable effects on scenic resources under this alternative. The permit is currently developed and fairly open. New development is primarily proposed in existing openings. The only new openings that would be created would be associated with the new septic system (including the drainfield) and the proposed garage/maintenance shop and associated parking area.

Planting trees on approximately one quarter acre between Road 2017 and the new parking lot and the parking lot and the remainder of the permit area would provide additional screening from the road and campground in the long-term. There are no viewpoints that provide views into the permit area.

New telescopes proposed in Phase III of Alternative 2 that would be located upslope in the shrub-steppe portion of the permit area would be expected to be screened from Road 2017 by existing vegetation. Alternative 3 would not implement Phase III and therefore no screening would be required.

Proposed vegetation treatments would not remove existing trees greater than 21 inches dbh in the areas below the proposed education building.

Visitors to the area would see no obvious changes in scenic resources.

3..2.3 Cumulative Effects – All Alternatives

There would be limited effects on scenic resources resulting from the implementation of the Opine Vegetation Management EA. Thinning of approximately 300 trees to restore telescope views and removing approximately 90 percent of the trees four (4) inches diameter-at-breast-height (dbh) and smaller would open existing stands and approach the more open conditions characteristic at the time the observatory was constructed in 1967. These activities would meet scenery management objectives prescribed for this area.

No large diameter, mature and old growth aged trees would be removed. Existing visual characteristics associated with such stands would be retained. Thinning understory trees (Opine Vegetation Management EA) would assist in restoring characteristics of single-storied, open park-like ponderosa pine stands.

There would be no measurable cumulative effects on scenery resource values within the implementation of proposed actions under the Opine Access EA. Proposed OHV routes and new trails would not enter or approach the permit area. The proposed OHV parking area below the observatory on Road 2017 would not be visible from the observatory. The proposed hiking trail would link to the observatory but would not result in the readily observable or measurable changes in vegetation because construction would require the removal of limited numbers of trees and other vegetation.

There would be no measurable cumulative effects on visual resource values associated with the implementation of the Cinder Hill EA. There would be changes in structure, form, color, shape or other factors.

There would be no measurable cumulative effects on visual resource values associated with actions proposed under the BLM's Upper Deschutes Management Plan and EIS or with continuing activities associated with BLM managed lands east and south of Pine Mountain.

2.2 Wildlife

3..1 Existing Condition

Pine Mountain is a high desert habitat that is partly ponderosa pine forest and partly open, xeric shrub community. The vicinity of the Observatory was historically open conifer forest adjacent to xeric shrubland.

Historically, there was potential sage grouse habitat within what is now the permit area. The area is now considered non-habitat due to the increase in coniferous cover and subsequent decrease in xeric shrubs.

The entire permit area is summer range for mule deer. The permit area is surrounded by biological winter range, but snow depth prevents winter use of the permit area by deer in all but the mildest winters.

Vegetation within the permit area currently does not provide adequate cover for mule deer; hiding cover is generally deficient throughout the Opine Planning Area.

Current use of the permit area by birds is probably greater than historic use, due to food and water provided by users of the facility. There is no natural water source near the permit area.

The permit area and its vicinity are currently used by a variety of wildlife, including many songbirds, woodpeckers and other cavity nesters, goshawks, golden eagles, deer, mountain lions, and several species of small mammals.

3..2 Available Data

Wildlife data is available from surveys completed as part of the Opine planning process, historic wildlife records available from Bend-Ft. Rock District files, and historic bird observation records kept by the Observatory staff. Additional pertinent information is available from District fire history and vegetation history records.

3..3 Current Guidance

The project area is subject to management guidance described in the LRMP as amended, which provides general Standards and Guidelines (S & Gs) for the management of wildlife habitat across the Forest and specific S & Gs for management within MA-9, Scenic Views.

3..4 Desired Future Condition

The desired future condition (DFC) in the MA-9, Scenic Views is to manage vegetation to provide visual and structural diversity in ponderosa pine forest. Where consistent with the Desired Visual Condition, management will focus on opportunities for watchable wildlife (M9-81) (LRMP page 4-130). Standard and Guideline M9-79 (LRMP page 4-130) states that within foreground areas, wildlife snags and snag replacement only where they contribute toward the Desired Visual Condition for the tree species (ponderosa pine).

General wildlife guidelines as described in the LRMP require that habitat is provided for viable populations of all vertebrate species. As noted previously, the Opine Project area, including the observatory permit area and adjacent areas, is deficit in both snag and CWM habitat.

The LRMP also states that hiding areas for mule deer must be provided over at least 30 percent of National Forest land within each implementation unit (WL-54, LRMP page 4-58). It also states that to be suitable as a hiding area, the stand must meet one of three conditions:

Six (6) acre or large stand capable of hiding 90 percent of an adult deer from view of a human at a distance of 200 feet;
Six (6) acre or larger stand with an average height of six (6) feet and not thinned within the previous 15 years; and
Residual clumps of one half acre or larger stands within units of advanced regeneration (trees up to seven (7) inches dbh and at least 12 trees greater than seven (7) inches dbh remaining after harvest. … Only the clumps will be considered when quantifying habitat.

The current permit area is approximately 3.6 acres and is bisected by a primary access road and several short spurs providing access to various buildings. Within the existing permit area, vegetation is limited to small separated pockets between roads and buildings and less than one half acre in area. The permit area does not current contain either hiding or thermal cover and is not expected to in the future.

Although the permit area does not currently provide hiding cover for mule deer, there is an adjacent corridor of hiding cover, the quality of which ranges from good to marginal. There is an opportunity to improve hiding cover in the permit area wherever it does not interfere with project objectives.

It is desirable to provide snag and CWM habitat within the constraints of project objectives and uses so that they do not present or create hazards to people or property. The limited size of the existing and proposed permit area may limit opportunities to provide such habitat.

3..5 Concerns

A number of concerns were identified during scoping and analysis of this project. The following concerns are relevant to this project.

Location, operation and facility development may violate LRMP S & Gs for the Scenic Views Management Allocation.
Vegetation management in and around the permit area may violate LRMP S & Gs for Scenic Views and general wildlife management.

Measurements to determine effects will include number of snags, logs, and live snag replacement trees retained in the project area and amount of deer cover provided.

3..2.3 Cavity Nesters

According to records kept by the Observatory staff, common flickers, hairy woodpeckers, white-headed woodpeckers, black-backed woodpeckers, mountain chickadees, white-breasted, red-breasted, and pygmy nuthatches, and mountain bluebirds use the permit area. All require snag habitat.

Within the greater Opine project area, both snag and coarse woody material (CWM) greater than 21 inches dbh is very limited (Wildlife Report - Opine Vegetation Management EA, page 14). The Observatory permit area is located within the Opine project area.

The upper slope area, generally the area above the 24 and 32-inch telescopes is xeric shrubland and is not expected to provide habitat, specifically snags and CWM, for cavity nesters. Historically, periodic fire retained stands of xeric shrubs and limited or prevented the establishment and growth of ponderosa pine and thereby resulting in the development of no snags or CWM.

The lower slope area, generally between the 24 and 32-inch telescopes and the area west and north of the parking lot and the resident manager's residence, is predominately second growth ponderosa pine established after the advent of fire suppression and after establishment of the observatory in 1967. Similar to the upper slope xeric shrubland, this portion of the permit area has historically had little or no

opportunity to develop either snag or CWM. The need to maintain telescope views, public safety issues, and risks associated with wildfire greatly limit or preclude opportunities to develop and maintain desired snag and CWM levels.

Scattered mature and old growth aged ponderosa pine are present, particularly near Road 2017 and north and northwest of the resident managers residence. Safety concerns for staff and visitors limit the retention of snags near structures and public use areas. Existing trees provide existing and potential green snag and potential CWM habitat is areas lacking public safety concerns.

Landscape level snag and CWM levels are addressed as part of the Opine Vegetation Management EA. Operational requirements and safety concerns within the special use permit area limit or preclude establishing or maintaining desired snag and CWM levels in either the short or long term within the permit area boundary.

3.4.6.2.1 Environmental Effects

3..5.1..1 Alternative 1 – No Action (Current Management)

3..5.1..1.1 Direct and Indirect Effects

This alternative would have no measurable effect on cavity nesters or their habitat. No mature or old growth aged trees would be removed. No potential snag or CWM would be removed due to the construction of new facilities or infrastructure.

3..5.1..2 Alternative 2 – Proposed Action and Alternative 3 – Modified Proposed Action

3..5.1..2.1 Direct and Indirect Effects

Neither alternative would be expected to have a measurable effect on cavity nesters or their habitat. No mature or old growth aged trees would be removed under either alternative.

Approximately 1.4 (Alternative 2) and 0.9 (Alternative 3) acres of existing vegetation would be removed to construct new facilities and infrastructure. This includes up to 10 second growth ponderosa pine greater than 21 inches dbh. Future snag and CWM habitat would be eliminated from those areas.

Implementation of a vegetation management plan to manage telescope views and maintain reduced fuel loadings would reduce or eliminate the development of snags and snag habitat in areas around the telescopes under both alternatives. CWM numbers could be enhanced or maintained by retaining the boles of trees felled to maintain views or to reduce fuel loadings on site.

Future tree and/or snag removals to maintain views or reduced fuel loadings, could directly harm or kill individual cavity nesters, their young, or eggs if work is done during nesting season.

3.4.6.2.1 Cumulative Effects – All Alternatives

The Proposed Action in the Opine Vegetation Management EA would remove approximately 300 trees that currently impede telescopic views, or are expected to do so in the near future. It would also thin stands in areas where telescopic view impedance and disturbance to the observatory are not issues. It is expected that after treatments, residual tree numbers would be reduced to levels that would minimize or preclude insect-related tree mortality, and that mortality rates would be reduced to 1 percent per decade or less than 5 per acre. Combined with the ongoing tree removal proposed as part of the Pine Mountain Observatory Master Plan project, this could result in the area in and around the Observatory boundary continuing to not meet minimum levels for snags, live snag replacements, and CWM.

Vegetation treatments proposed under the Opine Vegetation Management EA would be expected to result in an increase, in both the short and long term, of both snag and CWM numbers across the Opine project area. This would be accomplished through retention of existing snags and CWM, leaving additional logs on site during harvest operations, and the creation of snags where feasible. Thinning dense second growth stands would result in increased diameter growth in the residual trees and result in greater numbers of larger diameter CWM and snags in the longer term. No trees greater than 21 inches dbh would be harvested in units designated for commercial harvest. This would retain existing future snag and CWM sources.

No cumulative effects were identified for the Opine Access EA or the Cinder Hill Range EA. Neither proposes activities that would affect cavity nesters or their habitat.

3..2.3 Raptors

Lands around the project area provides habitat for northern goshawks and golden eagles. While goshawks are occasionally seen within the observatory area (usually at or near water provided by the observatory staff), there is no nest within the permit area boundary. The nearest goshawk and eagle nests to the project area are more than ¼ mile away.

There is one active golden eagle nest within the larger Opine project area but outside the observatory permit area. The Opine project area contains a number of historic golden eagle nests.

3.4.6.2.1 Environmental Effects

3..5.2..1 Alternative 1 No Action; 2 Proposed Action; and 3 Modified Proposed Action

3..5.2..1.1 Direct and Indirect Effects

No direct or indirect effects to northern goshawks or golden eagles were identified under any of the alternatives. The existing and proposed expanded permit areas do not currently provide nesting habitat and would not be expected to do so in the future.

No mature or old growth aged ponderosa pine would be removed under any alternative.

3..5.2..1.2 Cumulative Effects

Neither the Opine Vegetation Management EA nor Opine Access EA would result in measurable cumulative effects under any of the alternatives. No mature or old growth aged ponderosa pine would be removed.

Thinning and fuel treatments proposed under the Opine Vegetation Management EA would potentially result in limited increases in foraging habitat in the area of the observatory because of improved habitat conditions for the prey bases of these species. The size of the permit area relative to the size of the habitat for these species precludes measurable increases in habitat.

3..2.3 Migratory Birds

Migratory birds are protected under the Migratory Bird Treaty Act (MBTA). In 2001, the President of the United States issued an executive order describing the responsibilities of federal agencies to protect migratory birds. Subsequently, the USDA Forest Service and the USDI Fish and Wildlife Service entered into a Memorandum of Understanding (MOU) to strengthen migratory bird conservation. Among other things, the MOU directs that both parties shall:

Incorporate migratory bird habitat and population management objectives and recommendations into agency planning processes, in cooperation with other governments, state and federal agencies, and non-federal partners.
Strive to protect, restore, enhance, and manage habitat of migratory birds, and prevent the further loss or degradation of remaining habitats on National Forest System lands.

Species protected under the MBTA that have visited the project area and its vicinity include turkey vulture, Cooper's hawk, northern goshawk, red-tailed hawk, American kestrel, common nighthawk, calliope hummingbird, rufous hummingbird, hairy woodpecker, white-headed woodpecker, black-backed woodpecker, northern flicker, olive-sided flycatcher, western wood-pewee, ruby-crowned kinglet, mountain bluebird, American robin, solitary vireo, yellow-rumped warbler, western tanager, green-tailed towhee, spotted towhee, chipping sparrow, lark sparrow, fox sparrow, dark-eyed junco, Brewer's blackbird, brown-headed cowbird, purple finch, house finch, red crossbill, and evening grosbeak. This list includes species that nest in trees, in cavities, and on the ground. Nesting season varies for these species and is likely dependent upon the timing of migration in any given year, but could start as early as March 1 and would generally end by August 31.

3.4.6.2.1 Environmental Effects

3.4.6.2.1 Alternative 1 – No Action (Current Management)

3..5.3..1 Direct and Indirect Effects

There are no measurable direct or indirect effects of this alternative on migratory birds. No existing habitat would be damaged or lost because no new facilities would be constructed.

3.4.6.2.1 Alternative 2 – Proposed Action and Alternative 3 – Modified Proposed Action

3..5.3..1 Direct and Indirect Effects

Short-term disturbance associated with the construction of new facilities and infrastructure may cause birds to avoid the project area temporarily.

Construction of new facilities and infrastructure could disrupt or remove nesting or foraging habitat for some species. Alternative 2 would remove approximately 1.4 acres of existing vegetation and habitat; Alternative 3, approximately 0.9 acres.

Depending on the timing, construction may directly harm or kill individual nesting birds, their young, or their eggs.

Implementation of a vegetation management plan to maintain reduced fuel loadings and the future removal of trees encroaching on telescope views would also be expected to result in injury or harm to nesting birds, nests, eggs, or young if conducted during nesting season. Impacts are expected to be immeasurable due to the relatively small size of trees and the limited numbers of trees likely to be removed in future years.

3.4.6.2.1 Cumulative Effects – All Alternatives

Tree and/or ground vegetation removal associated with the Opine Vegetation Management EA may remove nesting habitat from in and around the Observatory permit area. Depending on the timing, removal may directly harm or kill individual nesting birds, their young, or their eggs.

The Opine Vegetation Management EA would also close all areas on Pine Mountain to OHV use except on designated roads and trails. This would eliminate the risk of nests or eggs being destroyed, birds being disturbed or young being injured or killed by OHV use. Due to the small size of the permit area, the effects would be limited and immeasurable.

The Opine Access EA would designate an OHV trail system on Pine Mountain. It would eliminate direct access to the observatory permit area. There would be no measurable change in cumulative effects to migratory birds above those described under the Opine Vegetation Management EA.

3..2.3 Threatened and Endangered Species

There are no direct, indirect, or cumulative effects under any of the alternatives on threatened or endangered species. No threatened or endangered species or their habitats are present within or adjacent to the project area.

3..2.3 Management Indicator Species

3.4.6.2.1 Mule Deer

3..5.5..1 Alternative 1– No Action (Current Management)

3..5.5..1.1 Direct and Indirect Effects

There would be no measurable effect on hiding or thermal cover. The permit area does not provide hiding or thermal cover and would not in the future.

There would be no change in the amount of forage available in the short term under this alternative. No new facilities would be constructed; therefore, there would be no loss of existing vegetation. Long term, continued tree encroachment would be expected to continue to reduce the quality, quantity, and distribution of forage within the permit area.

3..5.5..2 Alternative 2 – Proposed Action and Alternative 3 – Modified Proposed Action

3..5.5..2.1 Direct and Indirect Effects

There would be no effects on hiding or thermal cover under either alternative. The permit area currently does not provide either hiding or thermal cover.

Construction activities would be expected to disturb mule deer causing them to avoid the area. Under Alternative 2, construction activity would be expected through the entire period of the new special use permit, 20 years. Under Alternative 3, construction activity would be limited to approximately the first 10 years of the permit (Phases I and II).

Alternative 2 would result in approximately 1.4 acres of existing vegetation to be converted to structures and infrastructure. No forage or browse material would be available for mule deer from those areas. Alternative 3 would result in approximately 0.9 acres being converted to structures and infrastructure and unavailable for deer forage and browse.

3..5.5..3 Cumulative Effects – All Alternatives

The Opine Vegetation Management EA would reduce hiding cover in the short term in areas surrounding the observatory permit area under all alternatives. Long term, hiding cover would be expected to return to pre-treatment levels.

Alternatives 2 and 3 would remove approximately 1.4 and 0.9 acres of existing vegetation, trees and shrubs, due to the construction of new facilities and infrastructure. As the permit area currently does not provide hiding cover for mule deer, the loss of this vegetation combined with projected reductions in cover associated with proposed vegetation treatments, would have n o measurable cumulative short or long effect on hiding cover.

Vegetation treatments would be expected to result in some increase in forage and browse availability due to increased availability of resources – light, moisture, nutrients, etc. The loss of existing and/or potential forage and browse associated with the construction of new facilities and infrastructure would result in in no measurable change in forage or browse availability given the small area affected under each alternative (1.4 and 0.9 acres).

Thinning and fuels treatments proposed under the Opine Vegetation Management EA coupled with the loss of vegetation associated with the construction of new facilities and infrastructure proposed under Alternatives 2 and 3 would have no measurable effect on thermal cover within the expanded permit area. The existing permit area does not provide thermal cover; vegetation management activities to reduce and maintain lower fuel loadings, maintain defensible spaces around structures, and to maintain telescope views would not be expected to result in the development of the multi-storied stand structures that provide thermal cover.

Proposed thinning and fuels treatments within an adjacent to the observatory would reduce the susceptibility of those areas to wildfire. This would in turn help to protect and maintain hiding cover, forage and browse for longer periods into the future.

The Opine Vegetation Management EA would also close the area to OHV use except on designated roads and trails or where otherwise posted as open. This would eliminate cross-country motorized use resulting in improved cover, decreased habitat fragmentation, and decreased disturbance of deer.

The Opine Access EA would identify and implement a designated route and trail system on Pine Mountain. This would result in additional improvements in cover, decreased habitat fragmentation, and further decrease disturbance of deer across the larger Opine project area. There would be no measurable effect on the observatory permit area due to the small area and the lack of habitat.

The Cinder Hill Range EA would have no measurable cumulative effect under any alternative. There would be no measurable change in acres available for grazing. Construction of new facilities and infrastructure under Alternatives 2 and 3 would not result in a measurable change in the amount of forage or browse available for deer or change the level of competition for available forage and browse between deer and livestock.

Activities proposed by the BLM under the Upper Deschutes Resource Management Plan and EIS would have no measurable effect on deer or their habitat under any alternative. Current management activities on BLM lands east and south of Pine Mountain would also not be expected to have measurable effects on deer or their habitat.

3..6 Summary

No measurable direct, indirect, or cumulative effects on wildlife were identified under Alternative 1 – No Action. The permit area would not be expanded and no new facilities or infrastructure would be constructed or upgraded.

Limited and minor effects due to disturbance would be expected to any wildlife in the vicinity of the project area under Alternatives 2 and 3, including woodpeckers and secondary cavity nesters, mule deer, raptors, and neotropical migratory birds. Habitat for woodpeckers, mule deer, and migratory birds may

be adversely affected within the Observatory permit area due to the loss of habitat associated with the construction of new facilities, but since this area does not currently provide much habitat, effects would be limited. All effects would be mitigated either by design criteria or mitigation measures in this document or management mitigations and recommendations implemented under the Opine Vegetation Management EA.

2.2 Silviculture

3..1 Existing Condition

The Pine Mountain Observatory is located in T20S, R15E, Section 33, Willamette Meridian, Oregon. Elevation at the observatory is 6,500 feet. The plant association is CP-S2-12. Road access is the 2017 road. The observatory site is located in the Scenic Views land allocation of the Deschutes National and Resource Management Plan (LRMP, 1990). The observatory does not have a unique allocation in the LRMP. The current total observatory site occupies a total of approximately 3.6 acres.

The University of Oregon has used Pine Mountain as an observatory site since the initial telescope installations took place in 1967 and 1968. The observatory site was characterized by relatively open mature and old growth ponderosa pine stands over an open understory of sagebrush, bitterbrush, grasses and forbs. There were no trees to block the views from the telescopes. Small trees, including regeneration, seedlings, and saplings were few and widely scattered. The height growth of trees since then has reduced near-horizon viewing conditions. When the telescopes were installed in 1967 and 1968, astronomical views were unobstructed to within approximately 10 degrees of the horizon in all directions; trees now hide areas of the sky that were initially visible when the observatory was constructed. Growth of the trees remaining after construction, coupled with the regeneration and growth of trees established since 1967, has reduced the viewable portion of the night sky. Astronomers either attempt to view around increasingly dense tree crowns and forest canopy or they forgo viewing large portions of the near-horizon skies (Figures 3-1 through 3-6).

During the past 30 plus years, tree growth and encroachment has increased greatly. Views to the lower horizon from all three telescopes have largely disappeared. Views are generally now limited to that portion of the sky approximately 20 degrees above the horizon and higher. Figures 3-1 through 3-6 illustrate viewing conditions as currently viewed from each of the three primary telescopes.

Figure 3-1 Tree growth and encroachment viewed from the 15-inch telescope (1992).

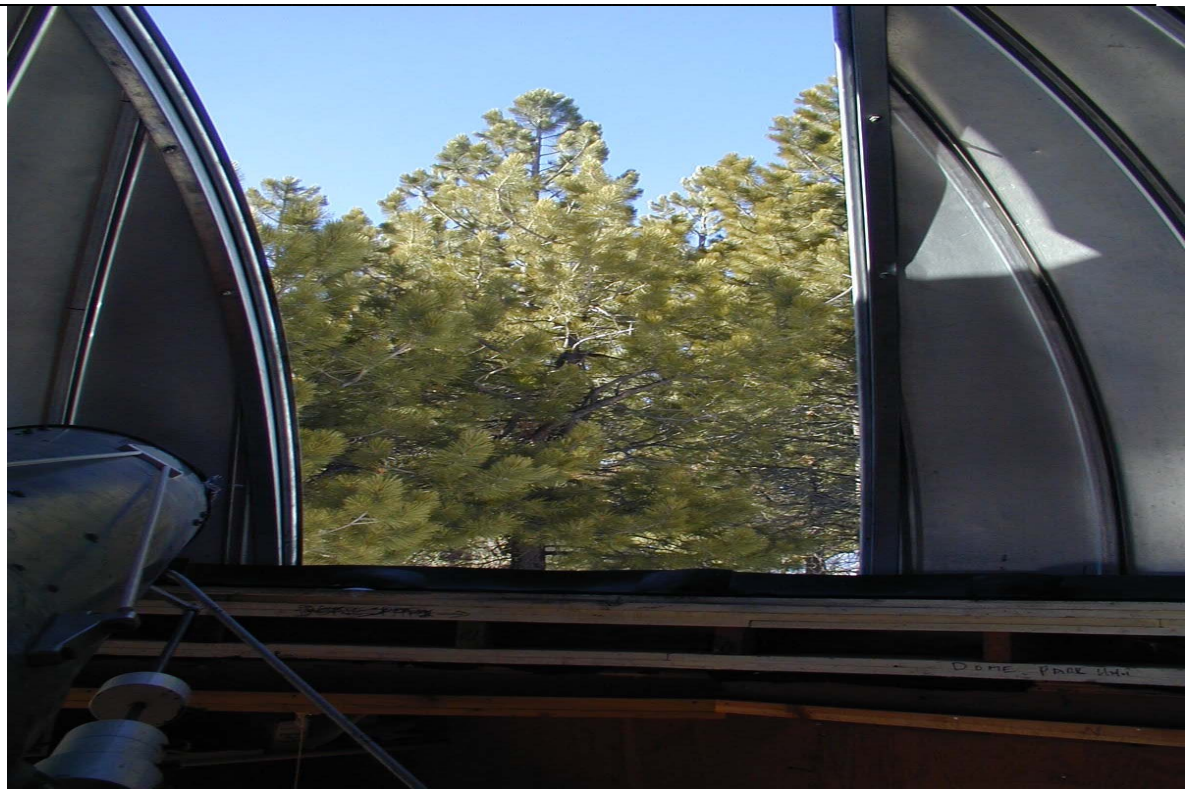


Figure 3-2 Tree growth and encroachment viewed from the deck of the 15-inch telescope toward the southeast (1992). The 32-inch telescope building is visible along the left center edge of the photo.

Figure 3-3 Tree growth and encroachment viewed from the 24-inch telescope (1992).

Figure 3-4 View from the 24-inch telescope to the northwest (1992).

Figure 3-5 View from the 32-inch telescope to the southeast (1992).

Figure 3-6 View from the 32-inch telescope to the southwest (1992).

In all cases, the trees blocking the views of the lower skies have all grown in since the observatory was established in 1967. Mature and old growth trees present today do not impede or block views of the skies from any of the telescopes.

Ladder fuels composed of shrubs and small diameter trees have increased as a result of fire exclusion. Horizontal fuels are more continuous than they have been under historical conditions. During the past 36 years, trees have increased in both height and numbers. This buildup of both vertical and horizontal fuel continuities in the vicinity of the Pine Mountain Observatory has resulted in an increased risk to the

facilities from wildfire. Observatory employee and visitor safety is compromised due to this increased wildfire risk.

The increase in tree numbers also places the existing stand at an increasing risk of pine beetle-caused tree mortality. Given the high number of visitor-days at the observatory (currently between 2,500 and 3,000 visitors per year), the dead trees created by pine beetles could pose a safety hazard to observatory users and guests.

Activities analyzed under both the Pine Mountain Observatory Master Plan Project EA and the Opine Vegetation Management EA are inter-related. The Purpose and Need for both areas relate to the activities proposed for the Observatory site.

The Purpose of the Pine Mountain Observatory Master Plan Project EA is to 1) to issue a new 20-year master plan for the Pine Mountain Observatory; and 2) to develop a new master plan to address current and projected future research and educational needs and requirements.

This results in a need to: 1) issue a new special use permit; 2) develop a master plan to guide development and management of facilities and resources within the permit area; 3) reduce conflicts between research and educational uses of facilities and instruments; 4) identify new facilities and/or facility upgrades to meet existing and projected research needs and requirements over the term of the special use permit; 5) identify new facilities to meet existing and projected educational needs and requirements for both on-site and distance based educational programs over the term of the special use permit; and 6) limit on-site usage to a maximum of 5,000 visitors per year.

The purpose of the surrounding Opine Vegetation Management EA and relevant to the Master Plan EA is to:
provide an environment of reduced fire risk for forest users;
transition toward more stable vegetative ecosystems by creating conditions that are more resilient and resistant to disturbance;
balance recreation access and use with natural resource objectives;
protect and enhance range and wildlife habitat; and
maintain or enhance scenic views.

This results in a need to 1) protect range and wildlife improvements from damage or destruction from wildfire; and 2) reduce the risk and impact of wildfires adjacent to the Pine Mountain Observatory in addition to other developed facilities.

3..2 Desired Future Condition

The Desired Future Condition (DFC) for vegetation in the Opine planning area is to have stands of trees that provide both resiliency and resistance to disturbance. Such stands would be relatively open and free-to-grow, contain discontinuous fuels both vertically and horizontally, and would also maintain or enhance scenic views while protecting and enhancing wildlife habitat. Stand conditions at the observatory site would allow unobstructed astronomical viewing similar to that which existed in 1967 and also provide for user and visitor safety. Vegetation, particularly trees, would create natural barriers to limit light pollution from visitors, vehicles, the campground and other facilities while reducing the risk of wildfire.

3..3 Opportunities and Objectives

Entry into the area at this time provides an opportunity to move toward DFC. Fuel amounts and arrangement would be altered to better protect site improvements and visitors. Astronomical viewing conditions would be improved and light pollution would be reduced. With an objective of reducing stand

densities to sustainable levels, stands that are resilient and resistant to disturbance would be better able to meet the DFC.

3..4 Environmental Effects

3..2.3 Alternative 1 – No Action (Current Management)

3.4.6.2.1 Direct and Indirect Effects

Under this alternative, there would be no measurable direct or indirect effects. No new facilities would be authorized or constructed. No trees would be removed to construct new buildings or new infrastructure.

There would be no removal of trees or other vegetation; therefore there would be no reduction in either vertical or horizontal distribution of fuels.

No vegetation management plan would be implemented. Control of stocking levels to maintain low fuel loadings and limit the amount and distribution of ladder fuels would not occur. This would result in a higher risk of damage or loss of facilities from wildfire.

The lack of a vegetation management plan would also limit the ability of the university to remove trees encroaching into telescope views. Removal would require additional review and approval prior to removal. This would likely result in some increase in costs to both the university and the Forest Service.

3..2.3 Alternative 2 – Proposed Action and Alternative 3 – Modified Proposed Action

3.4.6.2.1 Direct and Indirect Effects

Under these alternatives, construction of new facilities would result in the removal of approximately one to two (1 to 2) acres of tree vegetation. Phase I would remove less than one half acre of second growth forest to construct the proposed educational building, the new parking lot, and the new septic system. Phase II would remove less than one half acre to reconstruct the researcher's quarters, build the adjacent parking lot, and build the proposed maintenance shop/garage and associated parking lot. Phase III (Alternative 2 only) would remove approximately one half acre to construct additional researcher quarter and instrument shop with the associated parking lot.

Construction of the proposed two new telescopes would not require removal of any additional treed areas. Proposed sites are currently shrub-steppe with scattered smaller trees; most or all of which would be removed to restore views from the existing telescopes under the Opine Vegetation Management EA.

Implementation of the proposed vegetation management plan would provide a means for the observatory to maintain views to the lower horizon while maintaining tree cover. It would allow the observatory to remove trees in a timely manner without additional review or oversight. It would specify requirements for residual spacing and retention of trees that do not block telescope views. Residual trees would provide additional screening to block or reduce light pollution from vehicles, reduce noise levels from Road 2017 and the campground, and help to filter dust generated by vehicles and other activities.

Implementation of the vegetation management plan would also permit the observatory to manage vegetation to minimize the risk of wildfire. Continuity of both vertical (ladder) and horizontal fuels would continue to broken up by controlling the spacing of trees, pruning of lower branches, and creating and maintaining defensible spaces around buildings. Fires entering into the permit area would be more easily controlled. The risk of crown fires would be reduced. The potential for major damage or destruction of facilities would be reduced.

Thinning and pruning required or permitted under the vegetation management plan would not change the amount of light reaching the telescopes. The telescopes are located higher on the slopes above both Road 2017 and the parking lot. Residual tree boles and lower crowns would block all light from those locations.

Light pollution associated with vehicles on Road 2017 and entering and leaving the proposed parking lot would also be reduced or eliminated by the parking lot redesign and by planting trees between the road and the parking lot. The greatest reduction in light levels would come from the redesign of the parking area and requiring vehicles to park facing the road. The planting of seedlings would not result in a further decrease in the short term, at least 5 to 10 years. At that time, the combination of tree height, 5 to 6 feet or higher, and crown size and width, would be expected to result in an additional drop in the amount of light entering in the main portion of the permit area and reaching the telescopes.

The additional trees would also provide additional visual screening of the observatory facilities from Road 2017. Additionally, these trees would be expected to provide additional filtering of dust from the air resulting from vehicle traffic on Road 2017.

3..2.3 Cumulative Effects – All Alternatives

The Opine Vegetation Management EA would implement tree thinning and fuel reduction treatments in areas adjacent to and within the existing and proposed permit boundaries. Approximately 300 trees four (4) inches dbh and larger would be removed from within the existing boundary, including up to 10 second growth ponderosa pine greater than 21 inches dbh. Trees would be felled primarily by hand (chainsaws) and would either be removed using ground based equipment or be piled and burned on site. This would restore telescope views to within 10 degrees of the horizon, reduce horizontal and vertical fuel loadings and ladder fuels, and create defensible spaces around existing structures. It would reduce the risk to people and facilities for one to two decades.

The effects of this thinning would be extended into the future under Alternatives 2 and 3 of the master plan with the implementation of a vegetation management plan. The management plan would allow the observatory to remove trees that affected telescope views. It would also require continued thinning to maintain specified stocking levels and pruning to reduce ladder fuels. The observatory would also be responsible for maintaining defensible spaces around buildings but would not be responsible for management of understory shrub, grass and forb vegetation. No vegetation management plan would be implemented under Alternative 1. The risk to structures and people from wildfire would increase after one to two decades.

Thinning from below would retain the larger trees on site. Trees that die after treatment would be removed if they pose a hazard to user or visitor safety. Because residual tree numbers would be reduced to levels that minimize the likelihood of insect-caused tree mortality, few trees would be expected to die due to insects over the next two decades. Assuming mortality rates of 1 percent per decade, background levels of tree mortality would be expected to be approximately 0.5 trees per acre per decade. This would result in the expected loss of approximately four (4) trees over the next 20 years (0.5 trees/decade x 4 acres x 2 decades) under Alternative 1 and approximately nine (9) trees under Alternatives 2 and 3.

Trees that currently impact near-horizon visibility, as well as trees that are likely to impact it within the next 20 years, would be removed. Assuming an estimated height growth of nine (9) inches per year, trees having tops within 15 feet of the horizon are expected to grow into the near-horizon field of view within the next 20 years. To retain desired residual tree numbers, larger trees that would be expected to affect future views would be removed and, smaller trees that would not obstruct near horizon views during the next 20 years would be retained.

The reduction of ladder fuels, the increased distance to the live crown, and the reduction in crown bulk density would reduce the likelihood of a crown fire is thus reduced as a result of the discontinuous fuels created by vegetation treatment. A post-treatment wildfire would be more likely to remain a surface fire. Control would be easier than a more intense crown fire. Site improvements would be easier to protect and damage less severe.

Planned reductions in tree densities would also reduce the potential for insect outbreaks that could create snags and thereby threaten the safety of observatory users and visitors.

There would be little or no measurable impact to green tinged paintbrush plants or populations. Usable material created by tree thinning would be removed by hand from sites with plants. Slash would be piled by hand and burned. Piles would be located in areas with few or no plants.

There would be no measurable impacts on soils. Deschutes National Forest BMPs would be followed.

Soils would not be detrimentally impacted as a result of vegetation management activities. Equipment used to remove usable material would be limited to existing roads and trails; merchantable logs would be winched to the equipment rather than driving the equipment to the log.

Vegetation treatments within the Pine Mountain Observatory permit area would move existing stands toward the DFC of single story ponderosa pine. Thinning from below would target small trees for removal and moving the current multi-strata, large tree stand structure towards a single strata, large tree structure. This would enhance scenic values because of the more open character of the post-treatment stands. This would also result in a slight increase in the acreage of late and old structure (LOS) stands (approximately three acres).

There would be no reduction in light pollution, dust, or noise associated within vehicles driving Road 2017 or entering and parking in the parking lot for at least 10 years. Planted trees would take at least that long to reach a height where they would act as an effective barrier to block vehicle lights, noise, and help to trap airborne dust.

There would be no measurable change in the amount of noise or dust reaching telescopes or residences due to thinning. A small, immeasurable increase would be expected immediately after thinning but this would be expected to return to pre-treatment levels within several years as residual tree crowns expanded.

Closures of the observatory permit area and surrounding areas to OHV use except on designated roads and trails would have no measurable effect under any of the alternatives. There is currently little or no OHV use within or immediately adjacent to the existing permit area.

The Opine Access Management EA would have no measurable effect under any of the alternatives. It would eliminate non-street legal OHVs from direct access to the observatory permit area by designating roads and trails for OHV use but would not otherwise affect silvicultural resources.

The Cinder Hill Range EA would have no measurable cumulative effect under any of the alternatives. Livestock would continue to have access to the permit area under all alternatives. Seedlings planted under Alternatives 2 and 3 may be subjected to grazing or trampling slowing their growth or resulting in mortality. In the short term, this would have no measurable effect on light from vehicles affecting the telescopes because the trees would be too small to provide measurable reduction in light levels. Long term, the loss of trees could result in an immeasurable increase in light and dust pollution.

2.2 Fire and Fuels

3..1 Existing Condition

Pine Mountain has a history of large fires. District GIS records a number of fires dating from 1908 to the present that occurred on various portions of the mountain. The largest fire, the Pine Mountain Fire in 1914 burned approximately 8,022 acres over much of the western half of the mountain including the current observatory site. More recently, the 1968 Pine Mountain Fire burned approximately 351 acres on the upper slopes east of the observatory site and the 1977 Pine Mountain Fire burned an additional approximately 722 acres on the lower southeastern flanks of the mountain. There have been no fires within the observatory permit boundaries since the special use permit was issued and observatory constructed in 1967.

Ladder fuels, composed of shrubs, low branches and small diameter trees, have increased as a result of fire suppression. Horizontal fuels are more continuous than they were historically and trees have increased in both height and numbers. The vertical and horizontal fuel build-up in the observatory permit area has resulted in increased risk of wildfire with employee/visitor safety and threat to improvements being compromised. The observatory currently receives 2,500 to 3,000 visitors per year with almost all visiting during the 16-week season between Memorial Day and end of September. This period corresponds with the fire season when hot and drier conditions exist. Visitor use is expected to increase as more people seek recreational opportunities away from the Bend area.

Existing vegetation within and adjacent to the observatory is characterized by thickets of second growth ponderosa pine interspersed with openings dominated by shrubs such as bitterbrush, big sage and grasses. Upper slopes tend to be dominated by xeric shrub communities with scattered encroaching ponderosa pine. Lower slopes, particularly to the west and north are dominated by larger diameter ponderosa pine including scattered old growth aged individuals overtopping smaller and younger pine thickets (Figures 1-2 through 1-4).

Fuel conditions within the special use area are predominately shrub fields with patches of multi-aged ponderosa pines. Continued fire control and suppression has also allowed the establishment and growth of smaller, younger ponderosa pine. The existing forest is characterized by scattered large diameter, older ponderosa pine above dense thickets of smaller, younger ponderosa pine with little or no understory vegetation. Sagebrush and bitterbrush is largely limited to openings or the edges of the pine thickets. This is resulting in increased fuel loadings and the risk of damage to facilities associated with wildfire.

Figures 3-7 and 3-8 illustrate current vegetation conditions.

Improvements currently existing at Pine Mountain Observatory are three telescopes, a crew quarters building, a site manager's residence, access roads, pathways, two septic systems, a small storage building and a parking lot.

Adjacent to and shading the two residences are second growth ponderosa pine which pose a threat should a fire approach the observatory. A similar scenario exists around the three (3) telescopes currently located within the permit area. Regenerating ponderosa pines are encroaching around and adjacent to the telescopes (Figure 3-8).

Fire behavior fuel models and their arrangement across the landscape help to describe and interpret fire behavior potential. Fuel Models (FM) 2, 6 and 9 are present within the observatory permit area.

Figure 3-7 Pine Mountain Observatory from the east, 1997. The three telescope buildings are visible in the center of the photo.

Figure 3-8 Pine Mountain Observatory, 1997. The 32-inch telescope is visible in the top center of the photo; the resident manager's residence in the bottom center; and Road 2017 along the right side of the photo. Compare this photo with Figure 1-3 taken n 1968.

Typical average summer conditions include temperatures of 85 degrees Fahrenheit, a relative humidity between 12 to 15 percent, fuel moistures of 3 to 4 percent in 1 hour fuels, 5 to 6 percent in 10 hour fuels and 6 to 7 percent in 100 hour fuels and mid-flame winds averaging 4 to 6 MPH. Fires burning under these conditions can be expected to burn actively. The rate of spread and intensity of fires would increase with the increased slope and/or greater wind. The following examples are for flat terrain.

FM2 is a grass fuel model with fire being spread primarily through fine herbaceous fuels. Fires in this model are surface fires where herbaceous material, litter, and dead and down stem wood from shrubs contribute to fire intensity. In this model, fire has a rapid rate of spread of approximately 100 acres in 1 hour (60 Ft. per minute rate of spread) but has less intensity. Fire line intensity would limit direct attack if mid-flame winds go above 3 miles per hour. A 6 mph mid-flame wind speed would create 7-foot flame lengths. Spotting could occur up to 1/3 of a mile away from the main fire. Retardant is usually very effective on this fuel model due to the open or sparse timber allowing application to the light ground fuels. Mortality would occur in ponderosa pine from scorch but would primarily affect less than 60 to 70 feet in height. Large open grown ponderosa pine should survive. This model characterizes the upper slope areas around the 24 and 32-inch telescopes within the permit area.

Fuel Model 6 (FM6) is characterized by open, shrubby vegetation with few, scattered trees. Under this model, a wildfire could burn approximately 100 acres in 1 hour (60 Ft. per minute rate of spread), similar to that in FM2. The fireline intensity would be so great that direct attack with ground forces would be impossible, even with a light wind. Embers of burning debris could start spot fires outside of the main fire by being carried up in the smoke column and dropping to the ground outside of the fire. Wind speed and direction, the intensity of the fire and smoke column height all dictate the distance spot fires may be from the main fire. Spotting can occur 0.5 miles or more from the main fire. The presence of torching or crowning timber could result in greater spotting distances. The probability of a spot fire starting from a hot ember would be 80 to 90 percent. Timber that didn't torch or crown out from the fire would still have a high degree of morality from the intense heat scorching the live foliage 60 to 80 feet from the ground.

Pine needles that naturally fall from the trees and hang-up in the shrubs add to the flammability of this fuel model. Ponderosa pine, with its long three needle bundles, creates the most flammable condition when its needles drop onto the shrubs. With heavy needle accumulations in the shrubs, this fuel model can be extremely flammable even when the shrubs are not dormant. A FM6 with ponderosa pine overstory would have greater fire behavior than described above.

FM6 characterizes the lower slope portion of the permit area. This includes the areas around the residences, the 15-inch telescope, and the parking lot.

Retardant is fairly effective in a pure FM6, but is less effective when timber is present.

FM9 is characterized by open pine stands with scattered trees over an understory dominated by herbaceous vegetation or pine needle litter. Shrubs are scattered or non-existent and dense thickets of trees may be present. Needle cast and pine thickets influence fire behavior. This model doesn't have the needle drape on shrubs nor the presence of understory pine that add intensity to a fire. Single-storied, open pine stands characteristic of this model keep fire on the ground and limit spotting distances should crowning and torching occur.

FM9 is the desired condition for the observatory area. It occurs in combination with FM6 in the lower slopes of the permit area

3..2 Desired Future Condition

The Desired Future Condition (DFC) is a site characterized by large diameter old growth aged ponderosa pine interspersed with individual and small clumps of small younger pines with a diverse shrub understory characterized by a range of species, ages and structures. Improvements and visitors are protected by vegetation management practices that break horizontal and vertical fuel continuity and which limit fuel build-up on and adjacent to structures. They maintain and enhance scenic views while minimizing the hazard of a large high intensity fire.

3..3 Objectives

The objectives for fuel conditions in the Pine Mountain Observatory permit area are to:
obtain vegetation conditions which are comparable to historic conditions;
should an ignition start, create conditions where only low intensity ground fire occurs: and
protect structures, other improvements and people from wildfire.

3..4 Environmental Effects

3..2.3 Alternative 1 – No Action (Current Management)

3.4.6.2.1 Direct and Indirect Effects

There would be no measurable short-term direct or indirect effects under this alternative. No new buildings would be constructed. The permit area would not be expanded. No vegetation management plan would be implemented.

Because no vegetation management plan would be implemented, fuel loadings would continue to increase over the long term. Fuel continuity, both vertical and horizontal, would remain and increase. Assuming that treatments proposed under the Opine Vegetation Ea are implemented and fuel loadings are reduced and fuel continuities broken up, lack of a vegetation management plan would still result in increased fuel loadings and restoration of fuel continuities over time. Retreatment within the permit boundaries would be required within 1 to 2 decades to reduce fuel loadings and continue the fragmentation of fuel continuity. Risks to existing structures from fire would rise and fall depending on time since treatment.

No defensible spaces would be created around structures. Even with vegetation treatments, risks to structures from wildfires would remain relatively high.

3..2.3 Alternative 2 – Proposed Action and Alternative 3 – Modified Proposed Action

3.4.6.2.1 Direct and Indirect Effects

Construction of new buildings and infrastructure (roads and utilities) would permanently remove or change existing vegetation patterns and structures. Horizontal and to a more limited extend, vertical fuel continuities would be disrupted. Fuel loadings would be reduced or eliminated because of the construction. These factors would reduce the intensity and severity of any fire burning within the permit boundary.

A vegetation management would be implemented to manage vegetation within the permit area to retain views from telescopes, meet scenic objectives, reduce fuel loadings, and minimize the risk of wildfire. After initial vegetation treatments proposed by the Opine Vegetation Management EA are completed, subsequent vegetation treatments would maintain desired vegetation characteristics. This would maintain breaks in fuel continuity by periodic thinning and pruning of trees. This would help to keep fires on the ground, minimize the risk of a crown fire, and reduce fire intensity and rate of spread. This would result

in easier control that would reduce the risk of damage or destruction of structures. It would also improve safety for visitors and staff at the observatory and allow for safer egress from the area should a fire occur.

Ongoing and periodic treatment of vegetation would be expected to reduce future treatment needs and costs.

Structures would also be better protected by the implementation of defensible spaces around each structure. Removal of all flammable vegetation within 15 feet of any structure would eliminate all fuels immediately adjacent to the structure. This would reduce or eliminate the potential for a fire to directly approach the structure on the ground or drop onto the structure from vegetation overhead.

Managing vegetation within the next 100 feet around each structure would reduce horizontal and vertical fuel continuity by maintaining lower tree densities through periodic thinning and by pruning residual trees to either 50 percent of the tree height or a maximum height of 16 feet. Fires would be more likely to remain on the ground. The risk of crown fires would be reduced because ladder fires would be reduced or eliminate. Fire intensity and rates of spread would be reduced. Fires would be more easily controlled. Safety for visitors, staff, and firefighters would be enhanced.

Expansion of the permit boundary would have no measurable effects on the risk of fire or fuel loadings. The university would incur increased costs associated with both the increased responsibility for vegetation management within the permit boundaries and the increased permit area. This would not prohibit or prevent the Forest Service from designing and implementing vegetation management activities within the permit area.

Expansion of facilities farther upslope into the shrub-steppe vegetation would result in a limited but immeasurable increase in risk of damage from fires. Controlling a fire would be more difficult because of the slopes involved, the relatively limited and more difficult access, and the characteristics of the fuels and fire behavior – highly flammable fuels, rapid rates of spread, etc.

3.4.6.2.1 Cumulative Effects -All Alternatives

The Opine Vegetation Management EA would reduce existing fuel loadings under all three alternatives. This would reduce the risk of a wildfire damaging or destroying structures. Risks to observatory staff and the public would be reduced. These effects would be expected to last one to two decades before regrowth of vegetation would be expected to again increase the risk of wildfire and to the staff and public. Under Alternative 1, these risks would continue to increase without additional treatment

Implementation of the vegetation management plan under Alternatives 2 and 3 would extend the effectiveness of the treatments proposed by the Opine Vegetation Management EA. Ongoing vegetation management activities to control stocking levels and ladder fuels would be expected to reduce both the cost and intensity of future fuels management projects within the permit area. .

Implementation of the vegetation management plan would continue the effectiveness of defensible spaces established around structures. Structures would not be at risk from flammable vegetation within 15 feet of the structure or from being overtopped. Controlling stocking levels and ladder fuels for an additional 100 feet would increase the probability of control before a fire would reach a structure. It would also greatly reduce the risk of a crown fire. Risks to staff and the public would remain lower than under Alternative 1

Fuel loadings would be reduced and maintained at lower levels. The area of FM9 would increase and FM6 would be expected to decrease under all alternatives in the short term, one to two decades. Because Alternative 1 would not implement a vegetation management plan to help maintain reduced fuel loadings, the area of FM6 would begin to increase and the area of FM9 decrease in the longer term. Alternatives 2

and 3, with the implementation of the vegetation management plan, would retain the FM9 areas for longer periods, resulting in a slower increase in the area of FM6 areas.

Lower fuel loadings would result in less risk to public health associated with smoke and particulate production. Lower fuel loadings associated with FM2 and FM9 areas would result in reduced levels of smoke and particulate production associated with a wildfire.

The Opine Vegetation Management EA would reduce the risk of wildfire on much of Pine Mountain by reducing fuel loadings through the thinning of trees and the mechanical mowing and/or burning of shrubs. Treatments proposed outside the observatory permit area would reduce fire intensities and rates of spread. Fires would be more likely to remain on the ground making them easier to control. The risk of crown fires would be reduced. This would increase the probability of controlling a wildfire before it reaches the observatory permit area.

Fuels treatments within the permit area would also help to reduce fire intensities and rates of spread. Thinning and the removal of understory trees would reduce ladder fuels thereby reducing the potential for crown fires. Fires entering into the permit boundary would be easier and more likely to be controlled which would reduce the risk and potential for damage or destruction of improvements.

Reduced fire intensities coupled within higher probabilities of control would increase the probability of retaining tree cover and therefore retaining scenic values. Lower intensity fires are less likely to kill larger diameter trees. They would continue to remove smaller diameter trees thereby reducing the intensity of future fires by further reducing fuel loadings.

Easier control would likely decrease the area burned and/or the degree of damage experienced. Fewer trees would be likely to succumb to the effects of the fire.

The Opine Vegetation Management EA would also close the Pine Mountain area to off-road vehicle (OHVs, four wheel drive, etc) except on designated roads and trails. This would reduce or eliminate much of the risk of fires being ignited by such vehicles. Coupled with fuels treatments, the risk to users of the observatory and to the observatory facilities would be further reduced.

The Opine Access EA, coupled with the area closure proposed as part of the Opine Vegetation Management EA, would implement a designated OHV route system on Pine Mountain. This combination would also serve to reduce the risk of wildfire associated with vehicle use by limiting where non-street legal OHVs are allowed to travel.

Implementation of the proposed actions in the Cinder Hill Range EA would have limited affects on this Alternative. Livestock would reduce the levels of fine fuels but would have little or no effect on large fuels, including ladder fuels. There would be no measurable change in the risk to observatory structures or users from the continuation of grazing.

2.2 Noxious Weeds/Invasive Plants

3..1 Existing Condition

Forest Service Manual (FSM) direction requires that Noxious Weed Risk Assessments be prepared for all projects involving ground-disturbing activities. For projects that have a moderate to high risk of introducing or spreading noxious weeds, Forest Service policy requires that decision documents must identify noxious weed control measures that will be undertaken during project implementation (FSM 2081.03, 29 November 1995).

Aggressive non-native plants, including noxious weeds, can invade and displace native plant communities causing long-lasting management problems. Noxious weeds can displace native vegetation, increase fire hazards, reduce the quality of recreational experiences, poison livestock, and replace wildlife forage. By simplifying complex plant communities, weeds reduce biological diversity and threaten rare habitats. Potential and known weeds for the Deschutes National Forest are listed in Appendix A of the **Noxious Weed Risk Assessment for Pine Mountain Observatory Long-Range Master Plan Project** (Appendix A)

In addition to noxious weeds, which are designated by the State, there is a group of non-native plants that are also aggressive but are not officially termed "noxious". These species are also included in this assessment.

There is a known population of spotted knapweed (***Centaurea maculosa***) located within the observatory permit area. Spotted knapweed is a very invasive plant that grows along most major highways in Central Oregon**.** It is a perennial forb in the sunflower family that lives for 3 to 5 years. It is very competitive on disturbed dry to mesic sites because it is able to germinate in a wide range of conditions and it grows early in the spring before many native plants. Seeds may be dispersed on animals and humans, and by being caught up in vehicles. Distribution over large areas is linked to transportation systems.

No other noxious weeds or non-native invasive plants are located within or adjacent to the project area.

3..2 Environmental Effects

3..2.3 Alternative 1 – No Action (Current Management)

3.4.6.2.1 Direct and Indirect Effects

There would also be no increase in the risk of the invasion of invasive plants, including noxious weeds, because there would be no disturbed sites created. This alternative has a LOW risk ranking. There is a known spotted knapweed (*Centaurea maculosa*) population at the Observatory. There would be no heavy equipment or gravel brought in, either of which would increase the likelihood of the population being spread or new weeds being brought in.

There is also the possibility that privately owned, state, and government agency vehicles could bring in noxious weeds. Overtime if noxious weeds were identified in the project area, steps to eradicate weeds would occur.

3..2.3 Alternative 2 – Proposed Action and Alternative 3 – Modified Proposed Action

3.4.6.2.1 Direct and Indirect Effects

Both alternatives have a HIGH risk ranking because of the known spotted knapweed population, heavy equipment would be working there, and gravel would be imported to the site.

There is also the possibility that privately owned, state, and government agency vehicles could bring in noxious weeds. Overtime, if noxious weeds were identified in the project area, steps to eradicate weeds would occur.

3.4.6.2.1 Cumulative Effects –All Alternatives

Grazing would continue as authorized by the Cinder Hill Range EA. Livestock have been identified as vectors of noxious weed spread and introduction. There is no documented evidence or known occurrence

of noxious weed spread or introduction directly associated with livestock grazing in this area. There would be no measurable effect under Alternative 1 because no ground disturbing activities would occur.

Alternatives 2 and 3 would create approximately 1.4 and 0.9 acres of disturbed ground during the construction of new buildings and infrastructure. Use of best management practices and quick revegetation after construction would limit the potential for the introduction or spread of noxious weeds by livestock.

Off-highway vehicle use is unrestricted on Pine Mountain. The Opine Vegetation Management EA would close Pine Mountain and the observatory area to OHV use except on designated roads and trails. The Opine Access Management EA would establish an OHV system with designated roads and trails. Proposed routes avoid all known noxious weed populations, including the knapweed population at the observatory. This would reduce the risk of introducing new populations or species and would avoid opportunities to spread existing populations to new sites.

The Opine Access EA would also construct an approximately two mile hiking trail around the observatory. Some soil disturbance would be expected; use of Best Management Practices (BMPs) would limit the risk of introduction of new species or spread of existing populations.

2.2 Soils

3..1 Existing Condition

The observatory site is located on Landtype 91. This landtype is generally characterized as stable, smooth-to-moderately dissected mountain slopes that range from 25 to 60 percent (Soils Report page 4). However, this special use area is situated near the mountain summit on gentle to moderately sloping terrain (5 to 25 percent slopes) associated with the ridge top. Elevations within the permit area boundaries range from approximately 6,210 to 6,295 feet. Annual precipitation is estimated at 10 to 20 inches.

Ash deposits range from 6 to 24 inches deep and cover an older, residual soil on andesite bedrock. Dominant soils are shallow (less than 20 inches) to moderately deep (20 to 40 inches) with sandy loam surface textures and very cobbly loam subsoils. These soils are well drained and have rapid to moderate infiltration rates. The surface erosion potential is moderate on these gentle to moderate slopes. There are no perennial streams or other bodies of water.

Criteria for identifying sensitive soils to management is listed in the Deschutes Land and Resource Management Plan (LRMP) (Appendix 14, Objective 5, page 14-2). These criteria include slopes over 30 percent, frost pockets, seasonal or year-long high water tables, extremely rocky areas, and soils that have high or extreme erosion hazard ratings. There are no sensitive soils within the project area.

The current condition of the soil resource has mainly been influenced by the transportation system and existing facilities which have converted approximately 0.5 acres of the soil resource to a non-productive condition. Therefore, approximately 14 percent of the permit area of 3.6 acres is currently in developments that preclude other uses of the soil for as long as these facilities remain in use.

The concentration of human activity in and around developed sites can reduce vegetative cover, compact the soil surface, and accelerate erosion. However, most human traffic around this site occurs on existing roads, trails and parking areas where soils have already been impacted by their construction and use. There is little or no evidence of soil resource damage in random locations away from existing facilities.

3..2 Management Direction

The LRMP specifies that management activities are prescribed to promote maintenance or enhancement of soil productivity by leaving a minimum of 80 percent of an activity area, in a condition of acceptable productivity potential following land management activities (LRMP, page 4-70, SL-1 and SL-3). This is accomplished by following Forest-wide standards and guidelines to ensure that soils are managed to provide sustained yields of managed vegetation without impairment of the productivity of the land.

Standard and Guideline (SL-4) directs the use of rehabilitation measures when the cumulative impacts of management activities are expected to cause damage exceeding soil quality standards and guidelines on more than 20 percent of an activity area.

Standard and Guideline (SL-5) limits the use of mechanical equipment in sensitive soil areas.

Guideline (SL-6) provides ground cover objectives to minimize soil erosion by water and wind.

Management Area MA-9, Scenic Views, does not contain specific standards and guidelines for the soil resource. Forest-wide standards and guidelines apply to this project proposal.

The Pacific Northwest Region developed soil quality standards and guidelines that limit detrimental soil disturbances associated with management activities (FSM 2520, R-6 Supplement No. 2500-98-1). A detrimental soil condition occurs when soil-hydrologic function and site productivity are adversely affected by ground disturbances that reduce the soils ability to supply nutrients, moisture, and air that support soil microorganisms and the growth of vegetation. This Regional guidance supplements Forest Plan standards and guidelines, which are designed to protect or maintain soil productivity. Detrimental soil impacts are those that meet the criteria described in the Soil Quality Standards listed below.

Detrimental Compaction in volcanic ash/pumice soils is an increase in soil bulk density of 20 percent, or more, over the undisturbed level.

Detrimental Puddling occurs when the depth of ruts or imprints is six inches or more.

Detrimental Displacement is the removal of more than 50 percent of the A horizon from an area greater than 100 square feet, which is at least 5 feet in width.

Severely Burned soils are considered to be detrimentally disturbed when the mineral soil surface has been significantly changed in color, oxidized to a reddish color, and the next one-half inch blackened from organic matter charring by heat conducted through the top layer.

3..3 Scope of the Analysis

The soil resource may be directly, indirectly, and cumulatively affected with the activity area, which is considered to be the area within the permit boundaries for the observatory site. An activity area is defined as “the total area of ground impacted activity, and is a feasible unit for sampling and evaluating” (FSM 2520 and Forest Plan, page 4-71).

The primary objective is to plan and conduct management activities so that on-site loss of soil productivity is minimized on lands which are not officially dedicated to permanent facilities necessary to achieve other land management objectives. The discussion of soil effects will be focused on management facilities needed to accommodate research and educational opportunities on this use site.

The proposed vegetation and fuel reduction treatments are related actions that would occur within the permit boundaries to achieve a purpose and need that is not associated with timber production. A

qualitative assessment of potential soil impacts from these activities was conducted to ensure that acceptable soil productivity is maintained for the growth of desired vegetation on undeveloped portions of the permit area.

3..4 Soil Productivity Issues or Concerns regarding the Proposed Actions

There were no scoping comments received from the public or other agencies regarding soil productivity issues associated with this project proposal. There are no soil-related issues or extraordinary circumstances because the development of new structures and upgrades to existing facilities preclude other uses of the soil for as long as these facilities remain in use.

3..5 Environmental Effects

3..2.3 Alternative 1 – No Action (Current Management)

3.4.6.2.1 Direct and Indirect Effects

There would be no measurable effects on soils under this alternative. No additional mineral soil would be exposed because no new construction would occur. No site-specific erosion control measures would be required.

Surface erosion on existing roads and facilities would continue at current levels. Erosion rates would not change appreciably unless catastrophic wild land fires occur in dense stands of trees within the permit area.

3..2.3 Alternative 2 – Proposed Action and Alternative 3 – Modified Proposed Action

3.4.6.2.1 Direct and Indirect Effects

Under Alternative 2, the construction proposed in Phases I, II, and III, including the amphitheater/viewing area, education facility, access roads, trails, new telescopes, shops, garage, and parking areas would convert approximately 1.4 acres of additional soil to a non-productive condition for a total of approximately 1.7 acres under Alternative 2. This would be approximately 19 percent of the expanded permit area versus approximately 14 percent of the current permit area.

Under Alternative 3, construction proposed under Phases I and II would convert approximately 0.9 acres of additional soil to a non-productive condition for a total of approximately 1.4 acres. This would be approximately 16 percent of the expanded permit area versus approximately 14 percent of the current permit area.

The planned locations for construction activities would not disturb sensitive soils with a high hazard for surface erosion under either alternative. Soils are sufficiently resistant to erosion to permit limited and temporary exposure of bare soil during development or use with the application of Best Management Practices (BMPs). Potential soil loss is not expected to exceed tolerable limits because access trails and the areas around new structures would either be paved or covered with surface material to effectively reduce dust and protect the soil surface from erosion.

Planting approximately one quarter acre with trees would intercept raindrop impact and reduce the potential for erosion by water or wind under both alternatives.

Mechanical disturbance would not occur in areas with sensitive soils under either alternative.

Future removal of specific trees that encroach the viewing area or those removed to maintain lower fuel

loadings, would be hand felled and bucked on-site. These materials would likely be used as firewood and removed by hand and not using heavy equipment.

3..2.3 Cumulative Effects

There would be no measurable impacts on soils from the removal of approximately 300 trees proposed under the Opine Vegetation Management EA to restore telescope views to the lower horizon skies under any alternative. The small amount of commercially useable material could be skidded and removed off-site or chipped and used as mulch on-site. Some or all of these trees could also be hand felled and used as firewood by observatory staff and campers in the adjacent campground (Pine Mountain Campground).

The use of tracked equipment for thinning trees, reducing fuel accumulations and constructing new facilities would potentially cause some new soil disturbance on and adjacent to existing facilities and planned construction sites. Skidding equipment would most likely be used to remove the medium and larger diameter trees that may have some commercial value. The use of ground-based equipment would be limited to designated areas and/or planned construction sites (Alternatives 2 and 3). There would be no additional compaction when skidding equipment is restricted to designated areas or trees are removed with specialized equipment over frozen ground or a sufficient amount of compacted snow. This would effectively prevent detrimental soil impacts in undisturbed areas that would not become dedicated to future facilities.

Hand-felled trees would be directionally felled toward these designated areas. Operators would be required to winch logs to skidders equipped with a swinging grapple and at least 75 feet of bull line. Mechanical harvesters would only be authorized when equipment can be operated over frozen ground or a sufficient amount of compacted snow. There would be no additional compaction when skidding equipment is restricted to designated areas or specialized machinery is operated during favorable winter conditions.

Mechanical disturbance would not occur in areas with sensitive soils; no sensitive soils were identified within the existing or proposed expanded permit area.

Slash generated by the tree removal would either be piled and burned on previously disturbed sites (such as roads, trails, and parking areas) or on planned construction sites that would eventually convert the soil to a non-productive condition (Alternatives 2 and 3). Broadcast underburning would not likely be used to reduce fuels due to existing structures and the presence of green-tinged paintbrush (***Castilleja chlorotica***) within the permit area. Therefore, the burning of slash would not cause additional soil impacts. Broadcast underburning would not likely be used because of existing structures and the presence of green-tinged paintbrush (Castilleja chlorotica) in portions of the permit area.

Existing facilities and surrounding areas would continue to be maintained to prevent or minimize soil erosion problems. Road maintenance activities would reduce accelerated erosion on road surfaces where improvements are necessary to correct road drainage problems.

Fuel reduction treatments proposed by the Opine Vegetation Management EA would reduce the risk for wild land fires and the potential for adverse effects to existing structures and site productivity.

The Opine Vegetation Management EA would also close non-designated lands, roads, and trails to OHV use. This would eliminate the potential for additional detrimental soil impacts – rutting, erosion, compaction, etc. – within and adjacent to the permit area under all alternatives. It would also reduce the amount of dust generated by such vehicles that would affect the telescope viewing and sensitive instruments.

The Opine Access EA would designate specific roads and trails for OHV use. There would be no measurable effect on soils within or adjacent to the observatory permit area. No trails or roads would be designated for OHV use within the permit area. Road 2017 south of the observatory would be a designated OHV route and permit non-street legal OHV access within walking distance of the permit area. An OHV parking area would be created southwest of the permit area would prevent non-street legal OHVs from entering or passing the permit area. This would reduce also help to reduce dust levels and maintain quality telescope viewing and reduce damage to sensitive instruments.

The Cinder Hill Range EA would continue grazing within and adjacent to the observatory permit area. Grazing does increase soil compaction; however, the amount of rock present in the soil limits the amount and distribution. The amount of increase in compaction is immeasurable. Natural processes such as freeze/thaw cycles help to restore local soils to pre-grazing levels prior to the following grazing season.

The combined effects of current and future activities would maintain acceptable soil productivity for the growth of desired vegetation on undeveloped portions of the permit area.

3..2.3 Summary

Management requirements, mitigation and project design built into the action alternatives ensure that acceptable soil productivity would be maintained for the growth of desired vegetation on undeveloped portions of the permit area. The cumulative amount of detrimentally disturbed soil within the management allocation boundaries for this special use site (activity area) would be within allowable Forest Plan limits for maintaining soil productivity.

3.4.6.2.1 Forest Plan Consistency

Under both action Alternatives, the percentage of soil dedicated to structural facilities and other develpments would be less than 20 percent percent of the permit area. The cumulative amount of detrimentally disturbed soil from the construction of new facilities would remain within allowable limits set by LRMP standards and guidelines for maintaining soil productivity.

The proposed vegetation and fuel reduction treatments would cause some new soil disturbance in undisturbed areas of this special use site which would not become dedicated to future facilities. It is expected that only minor amounts would actually qualify as a detrimental soil condition because the management requirements and project design criteria built into the action alternatives are designed to avoid or minimize potentially adverse impacts to the soil resource. These mitigation measures and operational guidelines would be implemented during and following project activities to meet objectives for protecting and maintaining soil productivity.

Mechanical disturbance would not occur in areas with sensitive soils. No sensitive soils were identified within the existing or proposed expanded permit area.

The burning of slash would not cause additional soil impacts because these materials would either be piled and burned on previously disturbed sites or on sites planned for future development.

Therefore, the combined effects of these proposed activities would maintain acceptable soil productivity in undeveloped portions of the permit area.

3.4.6.2.1 Irreversible and Irretrievable Commitments of Resources

The action Alternatives are not expected to create any impacts that would cause irreversible damage to soil productivity. There is low risk for construction activities to cause soil mass failures (landslides) due to the inherent stability of dominant soils and the lack of seasonally wet soils on steep slopes.

Soils dedicated to structures and management facilities are considered an irretrievable loss of soil productivity until their functions have been served and disturbed sites are returned back to a productive capacity. Under the action alternatives, the amount of additional land dedicated to facilities would be limited to the minimum necessary for management needs.

2.2 Heritage Resource

3..1 Existing Condition

Management direction for cultural resources is found in the Deschutes National Forest Resource Management Plan as amended (LRMP), in the Forest Service Manual section 2360, in Federal Regulations 36 Code of Federal Regulations (CFR) 64 and 36 CFR 800, and in various federal laws including the National Historic Preservation Act (NHPA) of 1966 as amended, the National Environmental Policy Act (NEPA), and the National Forest Management Act (NFMA). The existing management direction directs the Forest to consider the effects on cultural resources when considering projects that fall within the Forest's jurisdiction. Further direction directs that the Forest determine what cultural resources are present on the forest, evaluate each resource for eligibility to the National Register of Historic Places (Register) and protect or mitigate effects to resources that are eligible.

Relevant LRMP Standards and Guides include:
CR-2 states that cultural resource properties located during inventory will be evaluated for eligibility to the Register (LRMP page 4-34).
CR-3 states that in concert with inventories and evaluations the Forest will develop thematic Register nominations and management plans for various classes of cultural resources (LRMP page 4-34).
CR-4 indicates that project level inventories or the intent to conduct such shall be documented through environmental analysis for the project (LRMP page 4-34).

The proposed expanded permit area, including the current permit area, was inventoried on April 11, 2002. No resources were identified that are historic in age or potentially eligible for the National Register of Historic Places. One dump of debris near Road 2017is recent of origin. It contains flip top soda or beer cans and bottles with aluminum screw on tops. This deposit is estimated to originate in the 1960s or 1970s.

3..2 Desired Condition

The desired condition is not clearly stated in the LRMP, but can be derived from the implied goals of the Standards and Guides and the Monitoring Plan. It would be desired to know the location and extent of all cultural resources, have evaluated each one for eligibility to the Register, and have developed management plans for eligible properties that would provide protection or mitigate effects that will occur to the resource.

3..3 Environmental Effects

3..4 Alternative 1 - No Action (Current Management), Alternative 2 - Proposed Action, and Alternative 3 - Modified Proposed Action

3.4.6.2.1 Direct and Indirect Effects

There would be no direct or indirect effects on historic properties or resources. No properties or resources were identified within the proposed permit area.

3.4.6.2.1 Cumulative Effects

There would be no cumulative effects on historic properties or resources. No properties or resources were identified within the proposed permit area.

4.0 LIST OF PREPARERS

This section identifies the Forest Service personnel who participated in the analysis and the preparation of the EA.

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5.0 LIST OF AGENCIES AND PERSONS CONSULTED

This section provides a list of preparers and agencies consulted during the development of the environmental assessment.

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