environmental assessment

draft visitor use and general development plans

july 1977

CRATER LAKE

NATIONAL PARK / OREGON

UNITED STATES
Department of the Interior
National Park Service

NEGATIVE DECLARATION

Crater Lake National Park, Oregon

Pacific Northwest Region

In compliance with the National Environmental Policy Act of 1969, the National Park Service has prepared an environmental assessment on the following proposed project:

General Management Plan
Crater Lake National Park

The assessment process did not indicate a significant environmental impact from the proposed action. Consequently, an environmental statement will not be prepared.

The environmental assessment is on file at the above park and at the Pacific Northwest Regional Office, Fourth and Pike Building, Seattle, Washington 98101, and will be available for public review upon request.

6-6-77
Date

Russell E Dickenson
Regional Director
Pacific Northwest Region

UNITED STATES DEPARTMENT OF THE INTERIOR

ENVIRONMENTAL ASSESSMENT

DRAFT VISITOR USE and GENERAL DEVELOPMENT PLANS PARTS III & IV OF THE GENERAL MANAGEMENT PLAN

CRATER LAKE NATIONAL PARK

Prepared by

Denver Service Center
National Park Service
Department of the Interior

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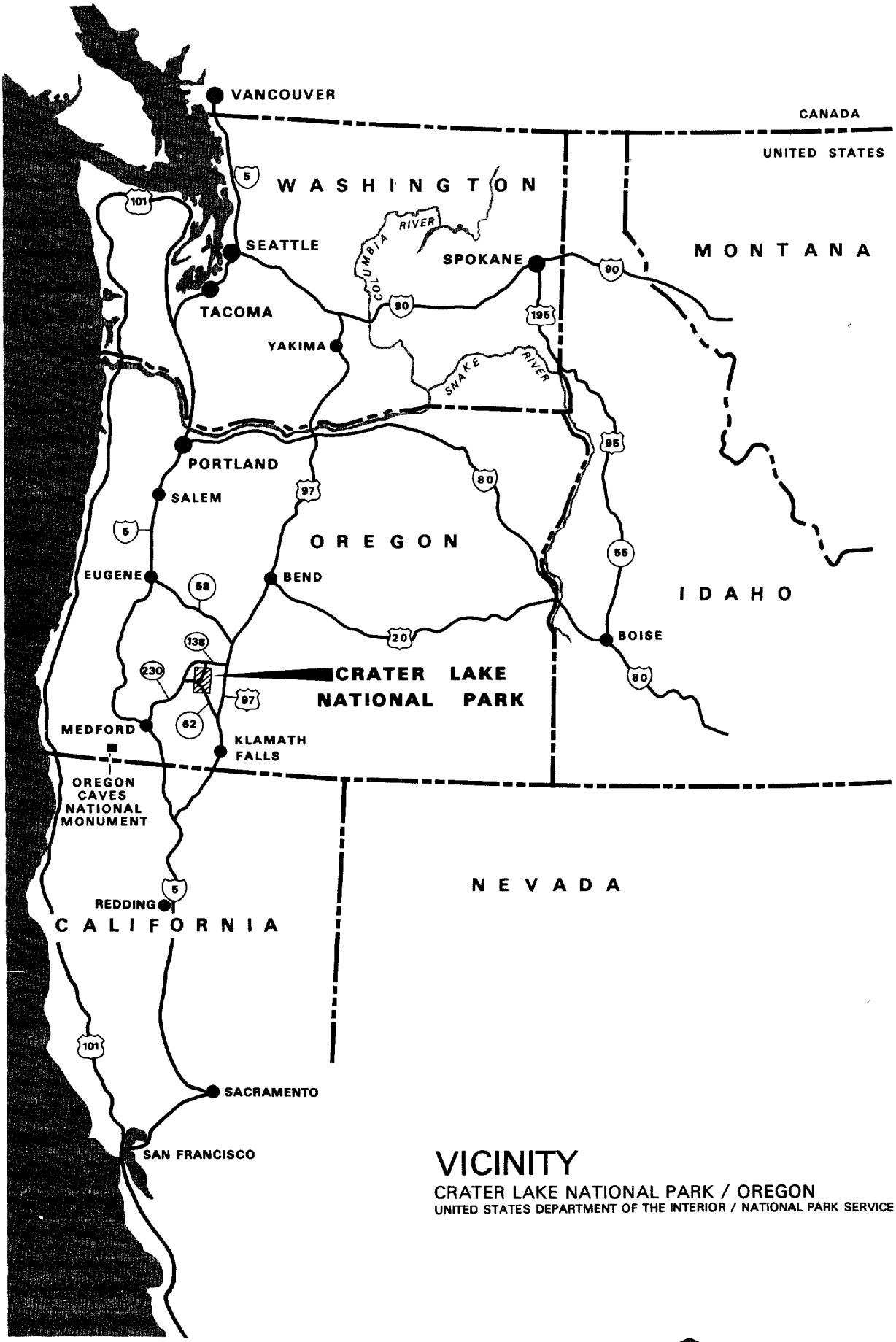
A. INTRODUCTION

Crater Lake lies within the collapsed volcanic crater of Mount Mazama, near the crest of the High Cascades of southern Oregon, some 65 miles north of the California border. The volcano's evergreen-mantled outer slopes sweep upward to the caldera rim, break abruptly, and plunge nearly treeless to the edge of the Earth's seventh deepest lake, 500 to 2,000 feet below. Few natural wonders of the American Northwest produce more profound and lasting impressions than the clean, blue waters of Crater Lake in its forested setting.

Crater Lake National Park was established on May 22, 1902 to insure the permanent natural condition of Crater Lake and 250 square miles of forests, streams, and mountain peaks surrounding it. Although the park is shrouded in snow for nine months of the year, more than half a million visitors are attracted to the park - geologists, who find a rich history in its craters, canyons, and lava flows; biologists, studying its plants and wildlife; and most of all, those who find solace and inspiration in camping or traveling through the wilderness of its mountains and forests to see the lake. The majority of visitors spend their few hours in the park viewing the lake from overlooks along the caldera rim road system.

B. GENERAL MANAGEMENT PLAN

The National Park Service is developing a General Management Plan to provide a rational basis for developing the best future for this park



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which is in keeping with the intent of the establishment act for the park and which is within its own Congressional mandate. The General Management Plan contains the long-range strategy for resource management, development, and visitor use within the park and assures awareness and compliance with a wide variety of legislative and executive requirements, management policies, and procedures. In order to ensure that park use is compatible with long-term resource conservation, the General Management Plan will establish general capacities for particular uses which are based upon the ability of park resources to absorb impact, the desired quality experience for park visitors, and the physical capacity of park developments.

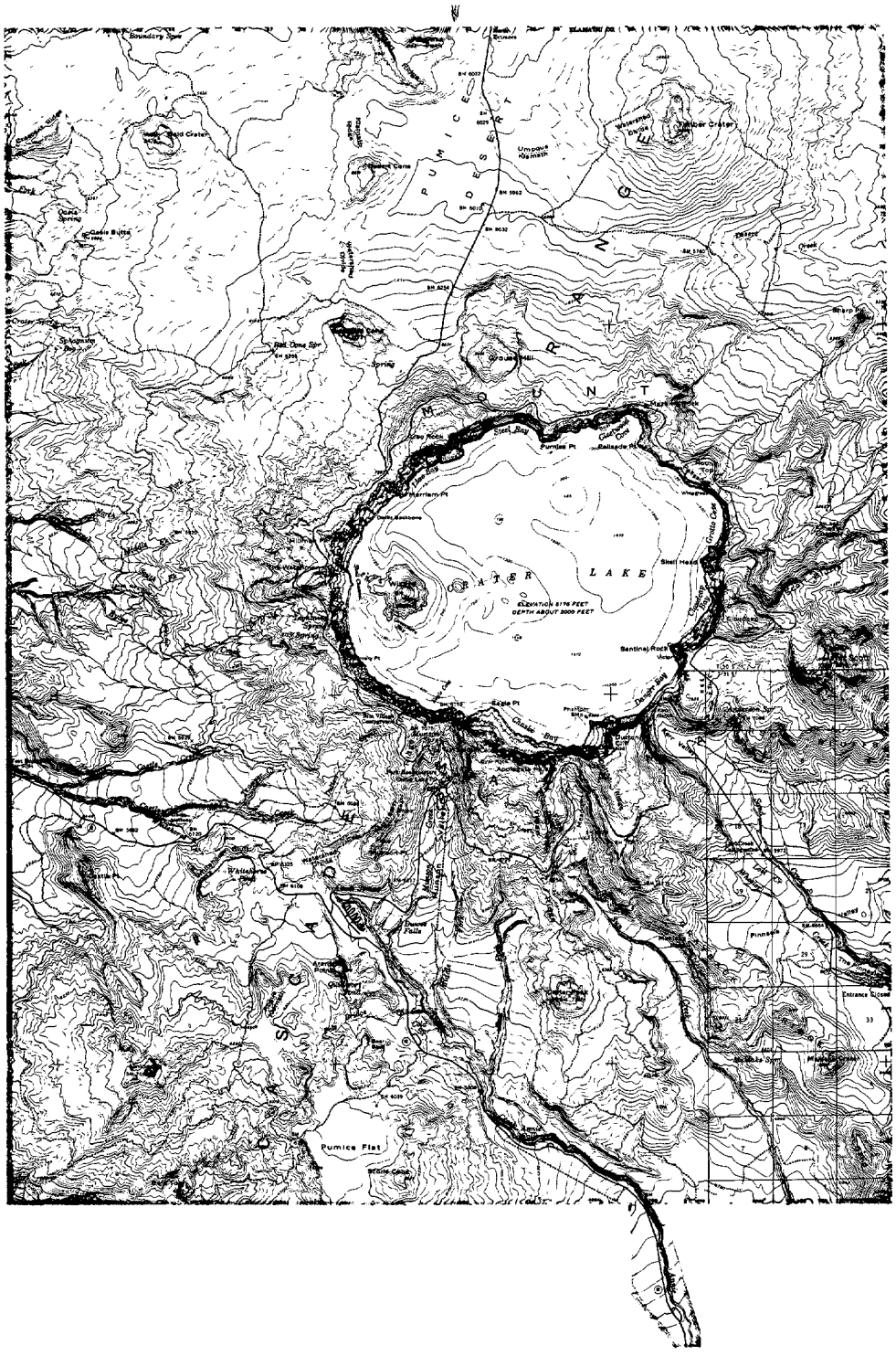
The General Management Plan for Crater Lake National Park consists of the following interrelated planning documents:

1. Statement for Management

This document defines the purpose of the park, lists constraints and influences on park management, indicates land classification, and gives management objectives envisioning the desired future condition of the park. The Statement for Management has been approved and now provides the direction for all other planning and management efforts at the park.

2. Resources Management Plan

The Resources Management Plan for the park outlines the strategies for protecting, perpetuating, and preserving natural and cultural resources. This plan is being developed concurrently with the Visitor Use and General



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Development Plans to incorporate the results of recent resource investigations and to evaluate current and future resource needs and proposals.

3. Visitor Use Plan

This plan outlines strategies for interpreting park resources, for providing for visitor use and safety, and for supplying information and support services. The plan evolves, to a large extent, from the Interpretive Prospectus for the park (approved May 1972). The Visitor Use Plan and its impact on the park and park visitor are evaluated in this environmental assessment.

4. General Development Plan

This document outlines the development necessary to accomplish the Visitor Use Plan and the Resources Management Plan, and to obtain the conditions stated as Management Objectives in the Statement for Management. The General Development Plan and its impact on the park and park visitor are evaluated in this environmental assessment.

5. Subsidiary Plans

Subsidiary implementation plans are often required within a park to deal with specific sites, subjects, or actions. As these plans are completed and approved, they become a part of the General Management Plan for the park. Depending upon their nature, these subsidiary plans may require further environmental analysis or environmental impact statement preparation.

C. VISITOR USE AND GENERAL DEVELOPMENT PROPOSALS

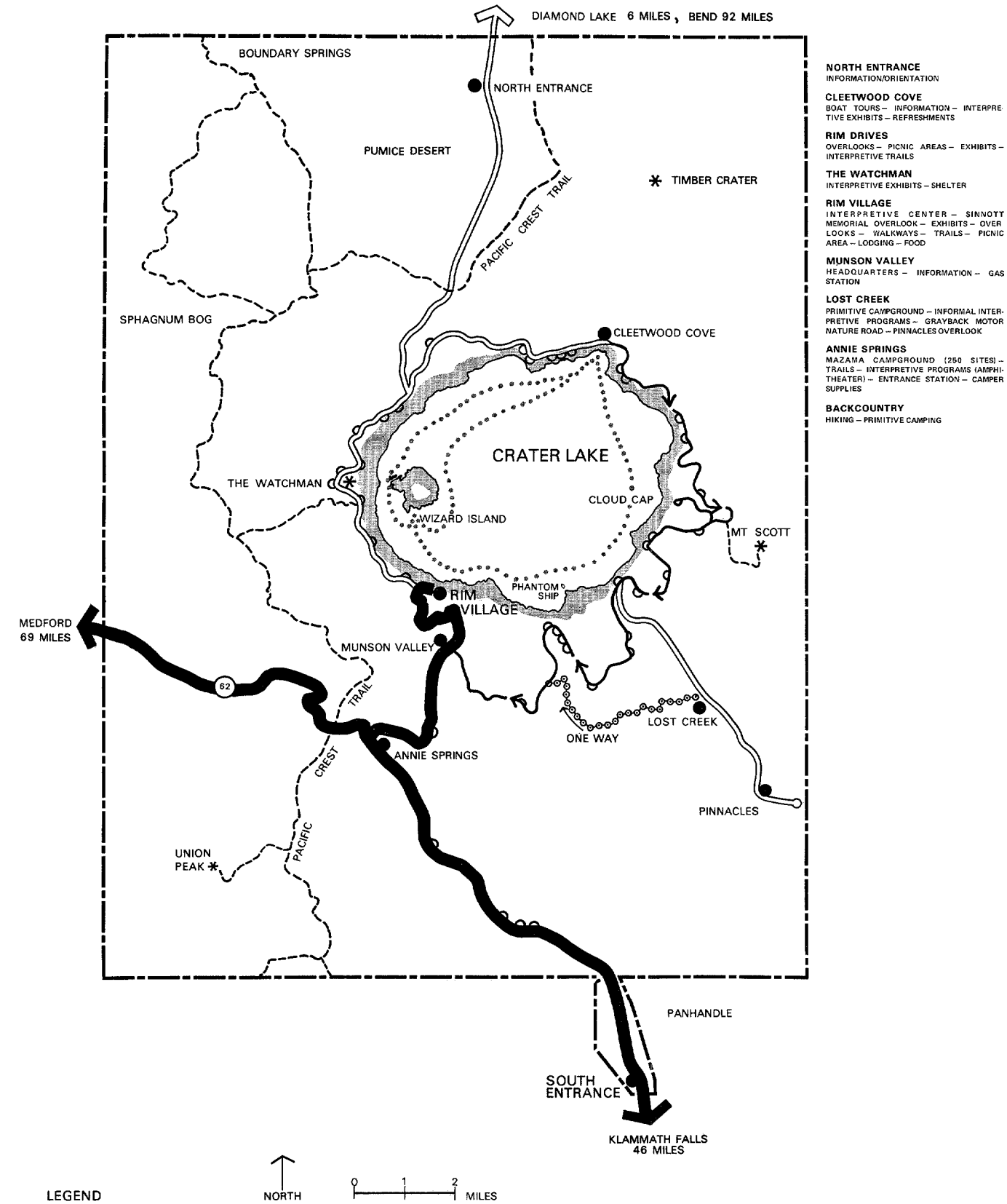
Crater Lake National Park lacks adequate interpretive facilities, has had a confusing and time consuming one-way road system, and has a high level of automobile and pedestrian congestion at major viewing areas and visitor-use facilities. Old and obsolete facilities used by park visitors, concessioner, and park management contribute to operational inefficiencies. Eating, shopping, and lodging activities and facilities combine with automobile traffic and parking at the Rim Village to detract and distract from a quality interpretive viewing experience and inhibit the park visitor from enjoying an informative visit to the park.

Crater Lake National Park is managed in accordance with approved National Park Service policies for natural areas of the National Park System. Within the bounds of these policies, and with due regard for the effect of visitor use on existing ecosystems, the park's Visitor Use Plan is designed to provide for the needs and interests of both the visiting public who stay in the park for only a few hours and those few who remain a number of days to enjoy the park more fully. The actions of the park's General Development Plan provide the structure for the interaction of the visitor use goals and concepts which follow.

1. Visitor Use Plan

a. Capacity

Crater Lake National Park is principally a day-use area with only 15 percent of the visitors remaining overnight. Approximately two-thirds of the visiting public stay less than four hours within the park. The



NORTH ENTRANCE
INFORMATION/ORIENTATION

CLEETWOOD COVE
BOAT TOURS – INFORMATION – INTERPRETIVE EXHIBITS – REFRESHMENTS

RIM DRIVES
OVERLOOKS – PICNIC AREAS – EXHIBITS – INTERPRETIVE TRAILS

THE WATCHMAN
INTERPRETIVE EXHIBITS – SHELTER

RIM VILLAGE
INTERPRETIVE CENTER – SINNOTT MEMORIAL OVERLOOK – EXHIBITS – OVERLOOKS – WALKWAYS – TRAILS – PICNIC AREA – LODGING – FOOD

MUNSON VALLEY
HEADQUARTERS – INFORMATION – GAS STATION

LOST CREEK
PRIMITIVE CAMPGROUND – INFORMAL INTERPRETIVE PROGRAMS – GRAYBACK MOTOR NATURE ROAD – PINNACLES OVERLOOK

ANNIE SPRINGS
MAZAMA CAMPGROUND (250 SITES) – TRAILS – INTERPRETIVE PROGRAMS (AMPHITHEATER) – ENTRANCE STATION – CAMPER SUPPLIES

BACKCOUNTRY
HIKING – PRIMITIVE CAMPING

LEGEND

- PARK BOUNDARY
- ROADS OPEN ALL YEAR
- ROADS OPEN SUMMER ONLY
- FOCAL POINT/DEVELOPED AREA
- OVERLOOK/PARKING
- BOAT TOUR ROUTE
- GRAYBACK RIDGE MOTOR NATURE ROAD
- TRAIL

VISITOR USE CONCEPTS (SUMMER)

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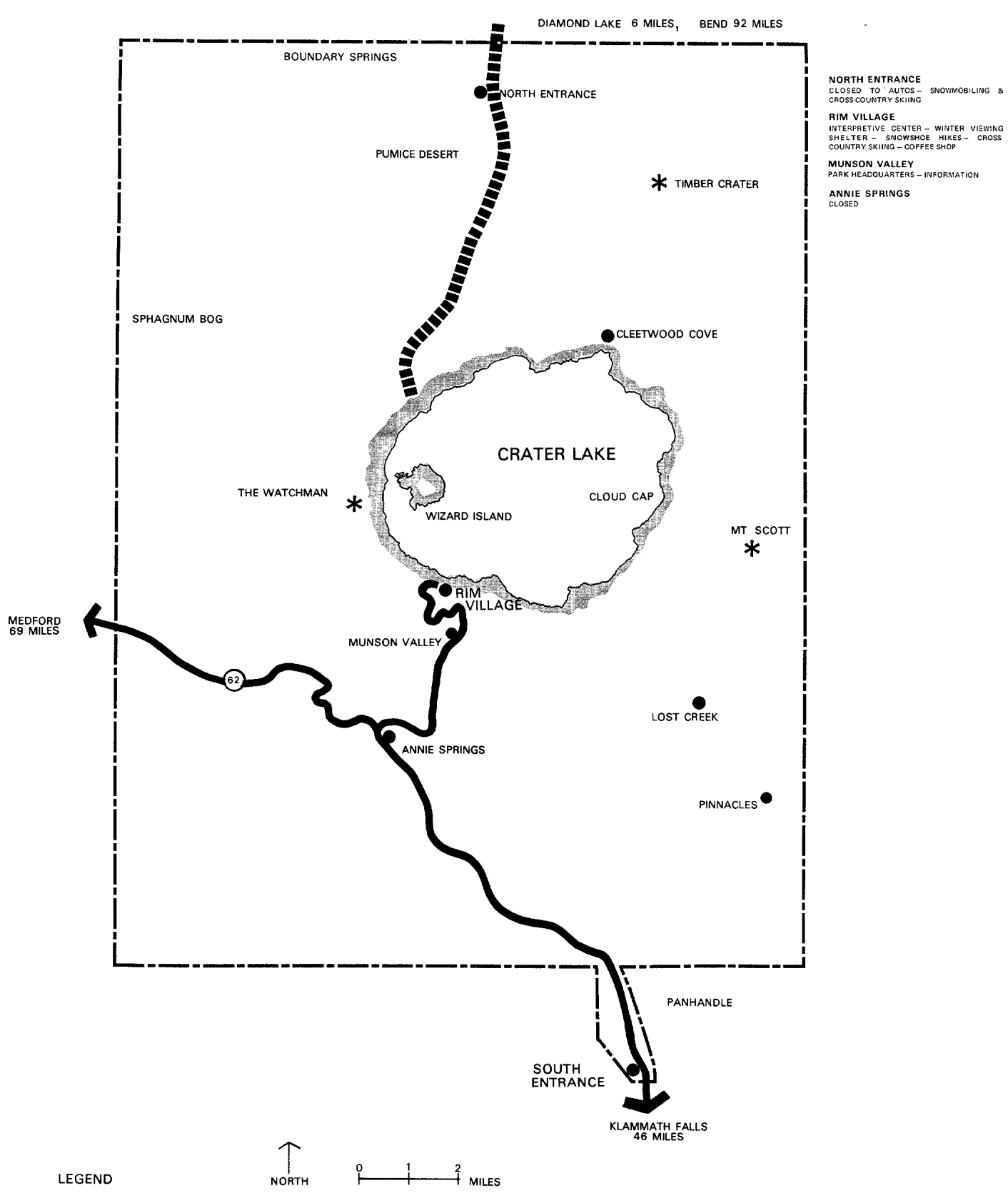
typical visitor stops at the park as a part of a trip that includes visits to other areas. At this time, there is no apparent need to limit day use within the park; greater dispersal of day use visitors will allow the park to accommodate an increasing number of visitors. Overnight use will be limited as described in the following sections. The park will continue to be managed primarily for day use with the majority of park facilities, services, programs and interpretive efforts oriented toward this major segment of park visitors. The proposals in these plans are designed to reduce congestion which now exists in some areas and, through improved information and orientation services, allow an increasing number of visitors to utilize their time more effectively.

b. Summer Use

Approximately 75 percent of the park's annual visitation occurs between Memorial Day and Labor Day. Because of climatic and vacation patterns, this ratio is expected to continue in the future. However, park visitors will be encouraged to come to the park at either end of this busy season for a less crowded and more leisurely paced park experience. The primary thrust of park operations will continue to be oriented toward the summer-use visitor (see Figure 3). No limit on visitation is proposed.

c. Winter Use

Although relatively few in number, winter visitors to the park can obtain a far different, yet equally rewarding, experience to that of summer visitors. To encourage the use of the park during the winter months, information, orientation, and interpretation will be available



VISITOR USE CONCEPT - WINTER

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throughout the year and a safe, sheltered place to view the lake will be available during the winter months. Concessioner-operated visitor services will be made available as the demand warrants. The proposed and continuing winter uses of the park are shown in Figure 4.

Special winter-oriented activities such as snowshoe hikes, cross-country skiing, and winter camping will be encouraged by establishing and marking trails, zoning to eliminate conflicts between winter activities, and by providing some guided trips. Snowmobile use will be limited to the North Entrance Road between the entrance station and the caldera rim.

d. Access and Circulation

Although highways leading to the park are being upgraded, access to the park will remain unchanged and it is assumed that the majority of park visitors will continue to approach the caldera rim from the south through Annie Springs. The park's roadways will be brought up to adequate standards for a safe and uncongested transit of the park and a circuit of the caldera rim during the summer months. The circulation system will lead visitors to the best vantage points, though not in any sequential order, and allow the visitor a variety of options dependent upon the time they have available (see Figure 3). Bicycle use will be encouraged by providing safe lanes along some of the park roads. Access to the lake by trail at Cleetwood Cove will be retained.

e. Lake Use

The concession-operated boat trips around the lake perimeter and to Wizard Island provide an added dimension to a visitor's experience at

Crater Lake National Park. These boat excursions will continue along the present designated routes, but the number of boats and trips will not be increased above the current level which accommodates approximately 500 people per day.

A small interpretive exhibit will be located at the Cleetwood Cove trailhead. The exhibit will stress the difficulty of the hike to the lake and point out that easy access has purposely not been provided to keep the lake free from the pollutants concomittant with large numbers of visitors. The exhibit will also point out that Crater Lake is a closed, nearly self-regulating, natural system and that the lake is continually monitored to detect pollutants and protect the aquatic ecosystem from alteration. Information on the boat trips will also be available at the trailhead.

Refreshments will remain available at Cleetwood Cove in a less conspicuous area at the parking lot. The trail, waiting areas, and docking facilities require improvement to assure visitor safety and comfort.

f. Overnight Use

Overnight use of the park offers a worthwhile outdoor experience to the park visitor and campgrounds provide a needed service. Of the 15 percent of the park visitors who remain in the park overnight, about two-thirds camp in Mazama Campground. Tent campers are presently mixed along with the recreational vehicle campers. A separate area is proposed for tent camping to provide an option for those campers wishing a more primitive camping experience away from vehicular campers. Fifty-two sites are

proposed for this camping section, which would bring the total number of sites at Mazama Campground to 250.

The 12-site primitive campground on Lost Creek will continue to serve visitors desiring a camping experience in a rustic setting. The Lost Creek Campground will be expanded to no more than 25 sites. This is the limit of sanitary facilities at the campground and more sites would violate the ecological integrity of the primitive campground setting.

Crater Lake Lodge will continue to provide overnight accommodations to a limited number of visitors. The lodge will be maintained to retain and restore the historic character which represents an early era in park development. The 18 rental cabins and two fourplexes behind the cafeteria will be removed.

g. Backcountry Use

Backcountry use of the park is minimal due to a short season and snow on the trails late into the summer. Most of the backcountry trails are former fire roads which require little improvement but must be well maintained. The Pacific Crest Trail runs the length of the park and receives the heaviest hiking and backcountry use. Wilderness designation has been recommended for 122,400 acres of the park's backcountry, and a Backcountry Use and Operations Plan, subject to occasional updating, will guide management and use of the park's backcountry resources. Trails will be maintained and improved by nonmechanized means, additional directional markers will be provided, and trail information will be updated and provided to interested park visitors.

h. Support Facilities

Visitor support facilities will be provided at convenient locations but not where they will detract from the scenic or ecological resources of the park. Campers and other visitors will have access to food, gasoline, and other needed provisions and services located at reasonable distances from centers of activity and campgrounds. Picnic areas are located at several points along the caldera rim where they do not detract from the scenic attraction of the lake. The largest picnic area is located in the former campground area of the Rim Village close to the largest single concentration of park visitors.

i. Information and Orientation

Informational and directional assistance are necessary for safe, compatible, and enjoyable use of the park's resources and will be provided to the park visitor early, prominently, and conveniently. This visitor assistance is now provided at the park's entrance stations and at the park's administrative headquarters in Munson Valley. Since most visitors enter the park from the south, the park's main information and orientation center will be provided in the proposed Interpretive Center in the Rim Village. A smaller information and orientation facility will be located along the North Entrance Road, north of the entrance station, to be convenient for visitors entering the park from that direction.

j. Interpretation

Interpretive concepts are based on the 1972 Interpretive Prospectus. The visitor's total experience with the park resources is augmented or

diminished by all aspects of use and services. Pivotal to making the visit to the park satisfying as well as enjoyable is the interpretation of the park's natural resources. Viewing the lake and understanding the meaning and effects of its creation will continue to be the primary reason for visitor use of the park. Interpretation is the means by which the visitor perceives the park and should provide the visitors with the opportunity to experience the park and learn its story on a variety of interpretive levels.

At a primary level is the pure sensory response to the size and beauty of the lake in its natural setting. Little or no interpretation is required for this response and it is sufficient that the visitor be provided with suitable and relatively easy access to the best vantage points along the caldera rim and to the lake surface. The landscape should contribute to the atmosphere and mood and be as natural and free from man's activities, structures, and vehicles as is possible. The visitor should be allowed to respond to the beauty and pristine nature of the setting with a minimum of intrusion of automobiles, noise, and congestion.

To facilitate this primary response to the lake, functions and facilities which are not directly related to the visitor enjoyment and understanding of this natural wonder will be removed, wherever feasible, from the caldera rim area. This refers primarily to the Rim Village area which will be modified to provide for an uncongested, pedestrian-oriented, interpretive and viewing experience. Visitor information services, and in-depth interpretation which <u>is not directly related</u>

to the viewing experience, will be accomplished in the Interpretive Center.

At a secondary level of interpretation, the visitor responds to the story of the geologic forces which have formed the landscape of today. Having experienced the initial visual impact from the caldera rim, the visitor will become inquisitive about the lake's creation and responsive to geologic interpretation at this level. At this time the story of plant and animal life as agents of change and changing with the landscape will be told as will the story of early man and legends concerning the collapse of Mount Mazama.

Because of its location within and below the rim and its panoramic view of the crater and lake, the Sinnott Memorial is an ideal location for the secondary level of interpretation on the geologic history of the lake. Both the memorial (if feasible) and the year-round viewing structure on the rim adjacent to the Interpretive Center will be made accessible to handicapped persons. Emphasis at Sinnott Memorial will be on personal contact interpretation, but during times of very light or very heavy use, a series of panels will depict Mount Mazama's geologic history and a brief audiophone interpretation of the crater geology will be provided.

The interpretive means used within the park will be imaginative and various, while recognizing that the park's story extends beyond the lake's focal point of interest. The Rim Drive provides numerous points where the visitor will be confronted with evidence of the mountain's geologic past. At these points the interpretive emphasis will be on the specific natural features exposed. The wayside exhibits serving this

function will be unified in concept and possibly reduced from the existing number (Interpretive Prospectus, 1972).

Because it offers a high point where one can obtain an unobscured view of the lake and its surroundings, The Watchman Parapet is one of the most popular visitor destinations along the caldera rim. The lower level of this unused fire tower will be used as a lounge area, with interpretation accomplished through personal contact and outside exhibits.

The Grayback Ridge Motor Nature Road is well suited for interpreting the evolution of a landscape. The obsolete wayside exhibits along the road have been replaced by an illustrated brochure available at the beginning of the drive. Interpretation along other trails is presently accomplished by guided walks on Garfield Peak and Annie Creek Canyon trails, and by self-guiding walks on the Godfrey Glen trail. Guided walks will be extended to these other trails as they are well suited to illustrate ecologic truths and the subtheme of plant and animal life in the park.

Early morning or evening interpretive activities will be encouraged. Because many of the park's animals are most active during the twilight hours, the wildlife viewing opportunities are especially good at that time. Moonlight walks or hikes can reveal a different mood of Crater Lake and create a new set of responses in the park visitor to this environment. Traditional personal interpretation provided by the evening programs at Mazama Campground will continue and an informal campfire circle will be provided at Lost Creek Campground for evening talks.

Although it can only be experienced by a limited number of visitors, the boat trips on the lake will be continued as will personal interpretation

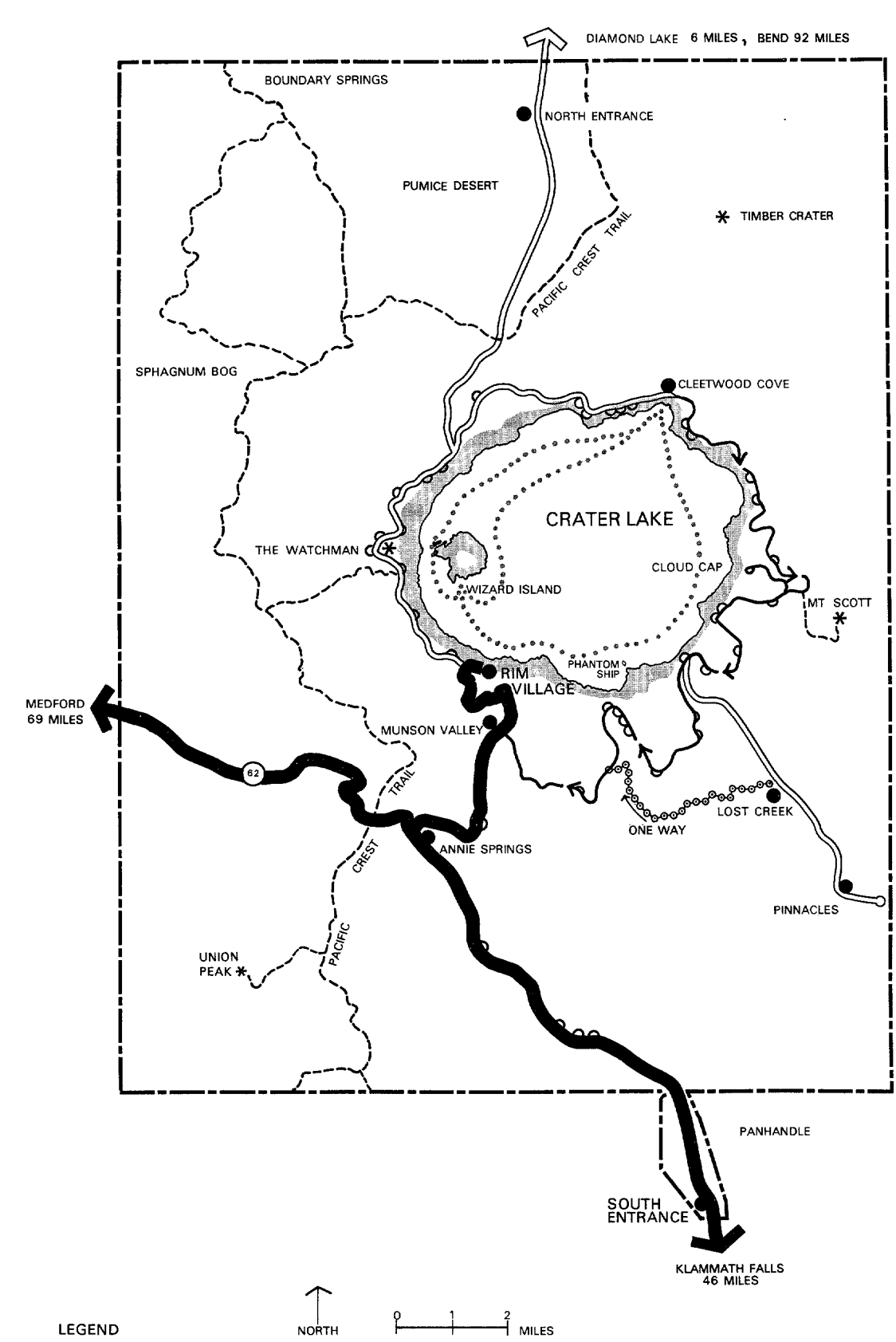
of the lake and its geologic surroundings.

The visitor's response to the park will eventually evolve to the conceptual level of understanding and a reflection on the implication of this story in terms of today's human experience. If the park visitor's experience reaches this level of understanding it will assume a more lasting quality as the diverse elements become a meaningful whole. The conceptual theme of the park is that of change and should point out man's progression from being a witness to change in the natural world to perpetrating it.

This intellectual involvement with the resource is less dependent on physical reference than the emotional response of the senses or the bare bones of fact. It can be brought into interpretation as a point of introduction to a story and an invitation to seek evidence in the natural setting of the park, or it can act as a summary which draws together the previously experienced diverse elements and impressions into an understandable whole. This conceptual involvement can be handled by audio-visual means in the proposed Interpretive Center facility adjacent to the rim and convenient to the normal flow of visitor use. This level of involvement will permeate all park interpretation, especially in evening programs and at the Interpretive Center. (See Interpretive Prospectus for further information on these proposals.)

2. General Development Plan

The concepts and proposed actions in the General Development Plan component of the park's General Management Plan are being proposed as a means of providing an improved visitor experience as outlined in the Visitor Use Plan and as a means for economy and efficiency in park operations. In



NORTH ENTRANCE
REPLACE OBSOLETE SEASONAL RESIDENCE WITH SEASONAL (WINTERIZED) APARTMENTS – DEVELOP WATER & SEWER SYSTEMS – DEVELOP INFORMATION/ORIENTATION FACILITY

CLEETWOOD COVE
RETAIN & IMPROVE EXISTING DEVELOPMENT AT COVE & WIZARD ISLAND – DEVELOP INFORMATION & EXHIBIT FACILITIES AT TRAILHEAD – IMPROVE REFRESHMENT FACILITIES – RETAIN WINTER PATROL CABIN

RIM DRIVES/PARK ROADS
WIDEN NORTH ENTRANCE AND WEST RIM ROADS FOR TWO-WAY STANDARD – RESTRIPE EAST RIM ROAD FOR ONE-WAY TRAFFIC – ADD BICYCLE LANE – REHABILITATE OVERLOOKS, EXHIBITS, PICNIC AREAS – IMPROVE TOILET FACILITIES

THE WATCHMAN
RENOVATE THE LOOKOUT FOR EXHIBITS/REST AREA

RIM VILLAGE
PHASE OUT CABINS – RELOCATE PARKING & ROADS – DEVELOP INTERPRETIVE CENTER/WINTER VIEWING SHELTER, PEDESTRIAN WALKWAYS, LANDSCAPING – REHABILITATE PICNIC AREA – REPLACE OBSOLETE COMFORT STATIONS – MAINTAIN/RESTORE HISTORIC LODGE – REMOVE OBSOLETE STRUCTURES

MUNSON VALLEY
PARK HEADQUARTERS – REMOVE OBSOLETE STRUCTURES – CONSTRUCT NEW HOUSING – RENOVATE OLDER HOUSING

LOST CREEK
EXPAND CAMPGROUND TO 25 SITES – REPLACE COMFORT STATION – DEVELOP INFORMAL CAMPFIRE CIRCLE

ANNIE SPRINGS
ADD 52 TENT SITES TO MAZAMA CAMPGROUND, INCLUDING ROADS, PARKING, COMFORT STATIONS & UTILITY EXTENSIONS – REMOVE SEASONAL RESIDENCE – RETAIN ENTRANCE STATION – DEVELOP CAMPER SERVICES FACILITY (CONCESSIONER)

SOUTH ENTRANCE/PANHANDLE
MAINTENANCE/STORAGE AREA

BACKCOUNTRY
IMPROVE DIRECTIONAL SIGNS – POSSIBLE MINOR ADDITIONS TO TRAIL SYSTEM

LEGEND

- PARK BOUNDARY
- ROADS OPEN SUMMER ONLY
- ROADS OPEN ALL YEAR
- BOAT TOUR ROUTE
- FOCAL POINT/DEVELOPED AREA
- GRAYBACK RIDGE MOTOR NATURE ROAD
- OVERLOOK/PARKING
- TRAILS

GENERAL DEVELOPMENT CONCEPT

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broad terms, the proposals are for restoration of the rim of the caldera to an interpretive zone providing only those facilities which contribute directly to the visitor enjoyment and understanding of this natural wonder. Obsolete facilities will be eliminated, and new facilities provided for more efficient management operations and interpretive functions.

The present system of traffic flow on the park's roadways will be retained for optimum efficiency and reduction of congestion.

The concession services provided at Crater Lake Lodge will continue throughout the useful life of the building. The rental cabins behind the cafeteria will be removed. The services provided at the cafeteria/curio shop will continue in that location.

Camping facilities at Annie Springs and Lost Creek will be expanded on a modest scale. Interpretive programs and facilities will be upgraded.

Table 1 gives the phasing of the various proposed actions in the General Development Plan. The scope of these actions is as follows:

a. Redevelopment of the Rim Village

The following development concept drawing illustrates the broad concepts for redevelopment of the Rim Village to return a major portion of the rim area to an interpretive/pedestrian zone; to reduce the movement of vehicles adjacent to the viewing areas; and to provide year-long interpretive and viewing facilities. The existing picnic area, lodge, and cafeteria-store will remain to provide essential visitor services.

The following facilities will be removed from the Rim Village:

- Concessioner rental cabins (20 units)
- Comfort stations (4 units)
- Rim parking areas and roads (±185 spaces between main parking area and lodge - ±10 acres)
- Exhibit building
- Community building
- Campground roads not required for picnic area

The following facilities will be provided in the village to facilitate interpretation and the development of a landscaped pedestrian viewing area:

- Parking area (180-200 cars) to replace spaces removed from the rim (8-10 acres)
- Access road to Crater Lake Lodge (2 acres)
- Interpretive Center with winter viewing area
- New and improved walkways, paths, landscaping (8 acres)
- Picnic area rest rooms (2 units replacing existing units)

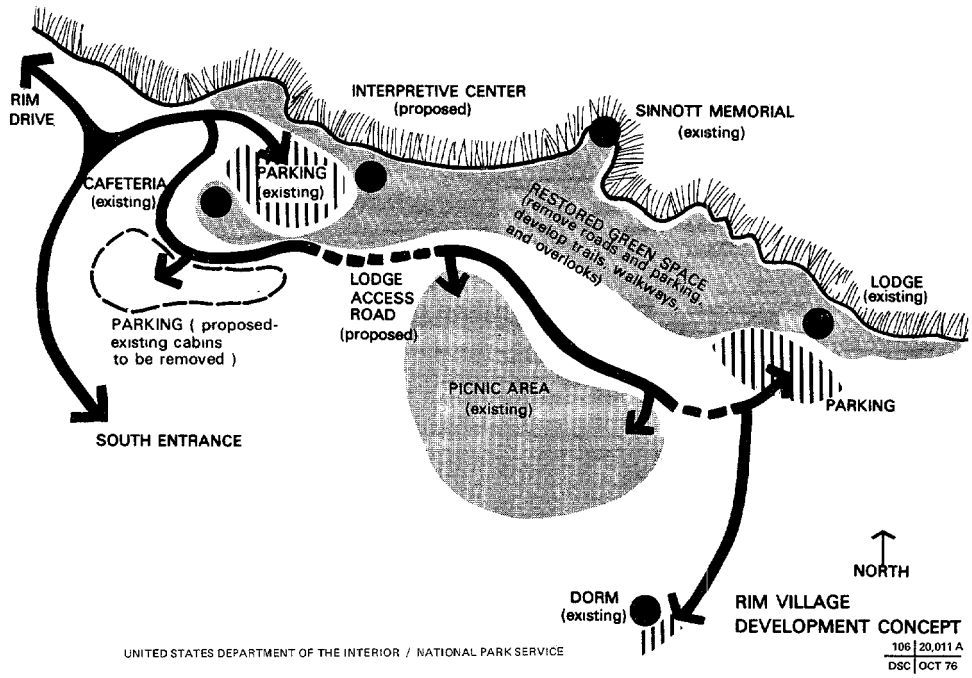
The following facilities will be retained:

- Sinnott Memorial
- Crater Lake Lodge
- Cafeteria/curio shop
- Employee dormitory
- Picnic area
- Rim walkways and paths

Redevelopment will occur in several phases. The replacement of obsolete comfort stations and removal of excess roads in the picnic area are independent projects which could be accomplished at any time.

Prior to any major actions, a comprehensive design will be prepared for the Rim Village area. This design would determine the location of the Interpretive Center, pedestrian areas, relocated and reorganized parking areas, access to the lodge, picnic area and employee dormitory, and the excess roads to be removed in the picnic area. Preliminary studies

indicate that the cabin-service area of approximately 8 acres behind the cafeteria is the most feasible location for replacement of parking removed from the rim. As indicated in the concept drawing, the lodge access road would cross approximately 2 acres of relatively undisturbed land. Expanded parking at the lodge is expected to be contained within the present parking areas but organized for more efficient use of the available space. With the exception of the lodge access road, new



development will occur where existing facilities are removed; 10 to 14 acres of heavily developed land will be returned to a more natural condition for pedestrian use. The key to implementing the plan for the Rim Village lies in the removal of the rental cabins. When this is accomplished, other successional elements of adjustments of the rim facilities can begin.

Following the relocation of a portion of the Rim Village parking area, approximately 8 acres of the former parking areas will be landscaped with native vegetation and walkways, providing an area for leisurely viewing and interpretive activities. An enclosed winter viewing shelter would be sited on the rim just north of the cafeteria/curio shop and west of Sinnott Memorial to provide safe and comfortable viewing of the lake. The shelter will be connected to the Interpretive Center which will be constructed on approximately 2 acres of the former parking areas and adjacent disturbed area and sited to allow easy snowplow access. The winter viewing shelter and connecting link will be designed so that walls may be removed to provide an unhampered, open view of the lake and free-flowing pedestrian movement during the summer season. The structures will be designed and sited to serve as the focal point for the Rim Village but will be low profile to minimize their visibility from other points around the rim. The community building and exhibit building (on the List of Classified Structures) will be removed when the Interpretive Center is completed unless further studies indicate they should be retained. The comfort station will be removed.

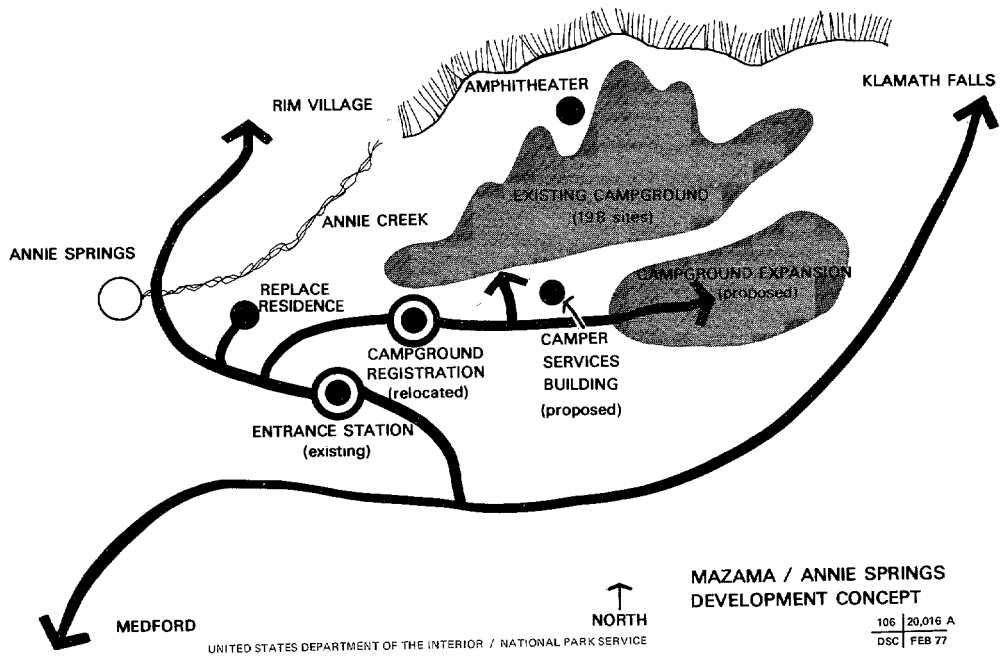
Crater Lake Lodge, a historic structure, will be maintained as a first-class lodge. Refurbishing and maintenance will be done in a manner that retains its historic character. A maintenance/refurbishing program will be developed with the concessioner to guide all future work on the structure.

The required utility changes in the Rim Village area will be minimal. The new comfort stations and the Interpretive Center will be connected

to the Munson Valley sewage treatment system by means of a lift station and a new sewer line to connect with the existing sewer line near the employee dormitory, or they can be connected to the septic system which serves the present comfort stations if the new sewer line would be environmentally or economically unfeasible. A few telephone and power lines may have to be relocated.

b. Campgrounds

Mazama Campground - The Mazama Campground will be expanded to a total of 250 sites. The 52 new campsites, clustered close to small, central parking spaces, will be for tent camping. A minimum of two new rest room facilities will be required to serve the additional campers and the existing road in the campground will need to be modified to provide



parking spaces. A camper services building providing groceries, camping supplies, and other basic services will be provided in the parking area

near the present campground entrance. The campground registration kiosk will be relocated along the campground entrance road to serve both the present campground and the additions. The obsolete ranger residence will be replaced with new employee quarters. Between 12-15 acres will be required for the campground expansion.

Lost Creek Campground - The Lost Creek Campground has 12 sites and will be expanded to a maximum of 25 sites. This expansion is based upon the use capacity of the sewage treatment system and the desire to retain the informal and primitive camping experience of this campground. The existing single toilet rest room will be replaced with a new comfort station to handle the increased number of users. The general character of the campground will remain primitive and the informal campsites will be retained. An informal campfire circle will be provided to accommodate evening interpretive programs and additional parking spaces and short extensions of the campground roads will be made. Four to five acres will be required for the campground expansion.

c. Munson Valley

Numerous studies for the relocation of the Munson Valley functions have been conducted. At one time, some employees moved to Medford during the winter, thus isolating them from the day-to-day operations of the park. During the course of this planning effort, it was recognized that Munson Valley is the logical location for administrative, maintenance, and residential functions in both summer and winter. Serious consideration was given to a new location for these functions (see Alternative C, Section VIII). The cost of building new facilities, the cost of main-

taining both the new facilities and the remaining facilities needed for summer operations in Munson Valley, and the marginal benefits for employees, all weighed against further consideration of a move out of Munson Valley.

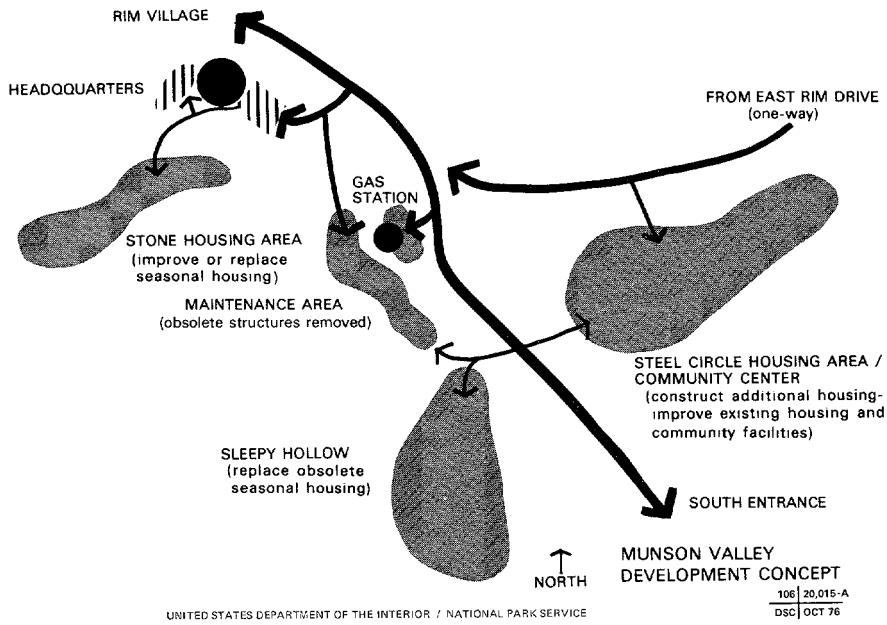
Administrative, maintenance, and employee housing facilities will remain in Munson Valley. Obsolete housing will be replaced or extensively renovated and other remaining housing will continue to be improved to make these units more energy efficient.

The harsh and confining winter environment at Munson Valley and the distance to schools, shopping and medical facilities will be made clear to prospective employees; hopefully, only those who can tolerate or enjoy these living conditions will apply for positions on the park staff.

Park management will actively pursue a program for the improvement of community educational and recreational programs and facilities which will offer amenities during the confining winter months.

The obsolete cabins and trailers in the Sleepy Hollow area will be removed and replaced with 22 new housing units. These units would be used primarily for summer seasonal housing but would be built to full winter standards since heat must be maintained when they are not in use. The housing would also be available for year-round use should staffing needs change. Other housing, particularly in the Stone Housing area, will be extensively remodeled or replaced as these units become obsolete, and, when needed, additional housing for permanent employees will be

built in the Steel Circle area. The number of housing units to be built, the space requirements, and the renovation of other units would be considered in a comprehensive housing study to be completed prior to any major construction projects. It is not anticipated that any additional undisturbed land will be needed for replacement of existing facilities.



The Panhandle area will remain a maintenance sub-area, primarily for storage. Some of the obsolete storage structures in Munson Valley will be replaced or supplemented with storage structures in the Panhandle. No water or sewage treatment systems are proposed for the Panhandle site; chemical toilets will be used, if needed. Electricity, if needed, can be brought into the site from the nearby primary line now serving the park. No additional undisturbed land will be required for the storage structures.

d. Road System

The present combination of one-way and two-way roads was implemented in 1976 after several years of experimenting with various seasonal one-way systems. This present circulation pattern will be retained (see Figure 3).

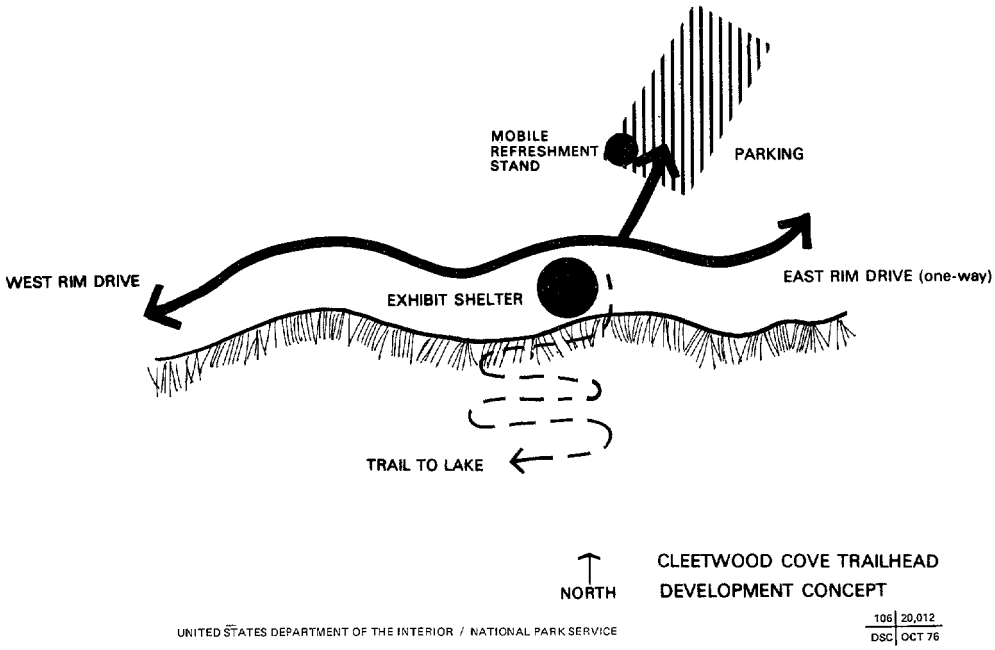
The North Entrance Road and the West Rim Drive will be widened to 20 feet to meet minimum standards for two-way traffic. Portions of the West Rim Drive, where widening would have substantial impact, will remain at the present 18 foot width. Pullouts and overlooks will be renovated as part of this road improvement project.

The East Rim Drive will be continued as a one-way road and will be restriped and signed for one-way travel. A bicycle lane will be added to the East Rim Drive at this time.

The combination of one-way and two-way roads will provide options for the visitor to enjoy a leisurely visit or see more features in a shorter time period.

e. Boat Tours

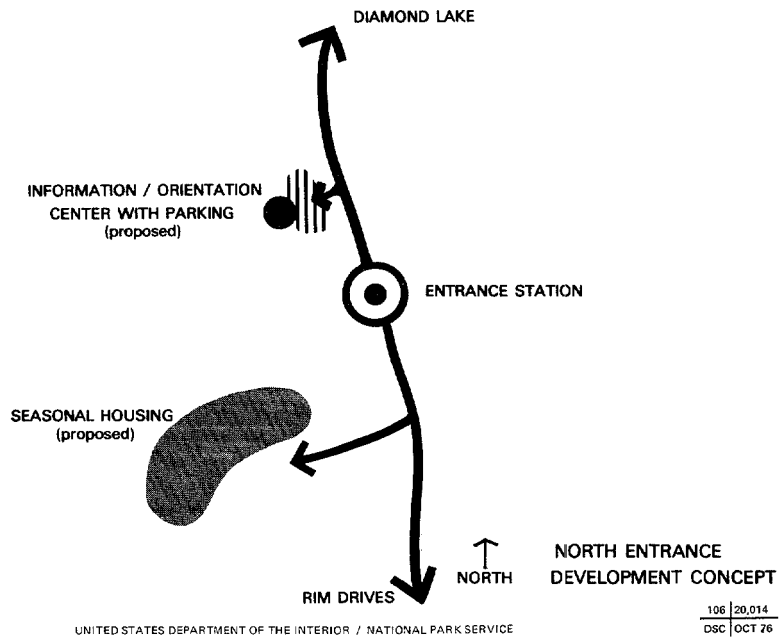
Concession-operated boat tours will continue on the lake at the present level of operation, and along the present routes of travel (see Figure 5). Minor upgrading of the facilities will be permitted as part of routine maintenance, for visitor safety, and employee comfort. The mobile refreshment stand will be relocated to an area adjacent to the Cleetwood Cove parking area.



The feasibility of converting the tour boats to electric power will be explored. Conversion to electrically powered craft would require either an extension of an underground power line from the Rim Village to Cleetwood Cove, or the development of a power source at Cleetwood Cove.

f. North Entrance

The obsolete seasonal cabin and pit toilet at the north entrance will be removed. A winterized, seasonal apartment building will be provided on the site to house employees in the summer and to serve as a base for periodic patrols in the winter.



A small information/orientation structure will be developed for the north entrance. A small parking area will be developed adjacent to the information/orientation facility.

Past attempts to develop a reliable water source for the north entrance have failed. Preliminary studies indicate that it is feasible to develop a catchment system to collect rainwater and snowmelt to provide water through the summer. A sewage treatment system will also be developed to serve the new facilities. The use of self-contained or recycling toilets will be considered as a means to reduce water and wastewater treatment requirements. An additional 2-4 acres will be required for the new facilities.

g. Interpretation/Information Facilities

The proposed Rim Village Interpretive Center was previously discussed under the Redevelopment of the Rim Village. This center will contain spaces for information/orientation as well as spaces and facilities for interpretation, staff work and public/employee rest rooms. As the focal point for interpretation, the year-round operation of the center will provide visitor services which are not presently available during the off-season.

The Sinnott Memorial will be retained to continue its function as an interpretive facility in the summer. It is here that the story of Mount Mazama and Crater Lake can best be told.

Interpretive facilities will be upgraded at all levels. Wayside exhibits at overlooks and turnouts will be redesigned to improve text and theme continuity. Some exhibits will be replaced, removed, or relocated, and the total number will be reduced (Interpretive Prospectus, 1972). Backcountry directional signs will be improved. Minor improvements to The Watchman fire lookout will provide exhibit space and a rest area. A wayside exhibit structure will be provided at the Cleetwood Cove trailhead.

Information will remain available at the entrance stations and at the administration building, but visitors will be directed to the Interpretive Center in the Rim Village or the north entrance information/orientation facility for detailed information and orientation.

h. Resource Protection

All activities related to alteration, removal or obliteration of existing development within the park and all activities connected with construction of new facilities will be done in strict compliance with contract specifications. These specifications will require that such activities be conducted in as small an area as possible to minimize environmental damage to the park. All construction and obliteration activities will be conducted under environmental standards to minimize a degradation of environmental quality from noise, air pollution, and litter. Contract supervision by on-site Service personnel will insure that all impacts on the natural environment are kept as small as possible.

Campground design will be based on on-site knowledge to preserve vegetation screens between campsites for privacy. Road construction contracts and other contracts involving areas of heavy visitor use will be designed to complete the projects in the least time possible to avoid degrading the park visitor's experience any longer than is necessary.

All sites where disturbance has occurred will be returned to a natural contour and revegetated or landscaped upon completion of the land-disturbing project. All unnatural materials remaining as waste following construction or obliteration projects, and which cannot be salvaged, will be removed from the park.

D. HISTORIC AND ARCHEOLOGICAL PRESERVATION

The proposals have been developed in compliance with the "Procedures" of the Advisory Council on Historic Preservation (36 CFR Part 800), National

Park Service management policies, and other National Park Service historic preservation policies and procedures.

Should any cultural resources not identified in previous surveys be discovered during construction, work will cease and the Regional Archeologist notified immediately so appropriate action may be initiated in accordance with Advisory Council procedures.

Should Crater Lake Lodge be placed on the National Register of Historic Places and, in the long range, prove unfeasible to operate and maintain, the removal of the lodge would require a "Historic Structures Report: Feasibility Study for Removing Crater Lake Lodge." Prior to implementation of the removal, the procedures of the Advisory Council on Historic Preservation will be followed. These procedures include consultation with the Council prior to implementing the action. The entire structure will be measured, existing drawings evaluated, detailed drawings prepared and photographic documentation completed. Until such time as the eligibility of the structure for placement on the National Register has been determined and these recording and documenting procedures can be completed, the lodge will be maintained and preserved in a manner that will insure its historic integrity. Other structures on the List of Classified Structures will be treated in a similar manner until their status is determined.

E. INTERRELATIONSHIP TO OTHER PLANS AND PROPOSALS

The interrelationship of the Visitor Use and General Development plans within the scope of the National Park Service planning process has been

described above in the section on the General Management Plan. The lands within Crater Lake National Park have been studied and recommendations have been made to the Congress for inclusion of five units in the park in the National Wilderness Preservation System. The park's wilderness plan proposes that 122,400 acres of park land be placed in wilderness. A final environmental impact statement (FES-74-33) dated June 13, 1974 was completed for this plan.

The Natural and Cultural Resources Management Plan for the park is currently being rewritten. An Interpretive Prospectus was prepared for the park in 1972 which outlines the interpretive concepts for the park and gives direction to park interpretation. The park's Master Plan which was being revised in 1973 is evolving into the General Management Plan for the park under current Service planning direction. The Visitor Use and General Development plans are part of that document. A Backcountry Use and Operations Plan has been developed to guide resource use and protection in the backcountry of Crater Lake.

All lands within Crater Lake National Park have been classified to designate where various strategies for management and use will best fulfill management objectives and achieve the purpose of the park. This Land Classification is part of the park's Statement for Management. Since the proposals in this document do not alter the existing land classification, a land classification map has not been included in this document. A Fire Management Plan is being developed for the park for the control and management of natural, man-caused, and prescribed fires.

Planning for the park is consistent with the provisions of the National Environmental Policy Act of 1969 (83 Stat. 852), and environmental assessments or statements are prepared in conjunction with all park plans which will have a significant impact upon the human environment or which may be controversial.

The development of Lost Creek Reservoir on the Rogue River approximately 30 miles southwest of the park will undoubtedly attract more visitors to this area. An expansion of resorts, motels, camping facilities, and other visitor services can be anticipated. It is assumed that some of the reservoir users will become day visitors in Crater Lake National Park but, at this time, it is impossible to predict what effect this will have on overall visitation. There are no other known proposals which would have a direct impact on the park.

TABLE 1 DEVELOPMENT PROGRAM / PHASING / CONSTRUCTION COST

	Phase I	Phase II	Phase III	Construction Cost*
RIM VILLAGE				
Construct interpretive center.		▮▮▮▮▮▮▮▮		1,000,000
Provide pedestrian walkways – landscaping.	▮▮▮▮▮▮▮▮	▮▮▮▮▮▮▮▮		82,000
Remove exhibit building and community building. Restore sites.		▮▮▮▮▮▮▮▮		10,000
Redevelop picnic area. Remove excess roads.	▮▮▮▮▮▮▮▮			40,000
Remove 20 cabins.	▮▮▮▮▮▮▮▮			40,000
Construct 2 comfort stations. Remove 4.	▮▮▮▮▮▮▮▮	▮▮▮▮▮▮▮▮		44,000
Develop lodge access road, new parking areas, reorganize old parking areas.		▮▮▮▮▮▮▮▮		418,000
ANNIE SPRINGS				
Construct 52 campsites, parking utilities, and 2 comfort stations.		▮▮▮▮▮▮▮▮		144,000
Concessioner construct camper service facilities.	▮▮▮▮▮▮▮▮			160,000
Replace seasonal quarters.	▮▮▮▮▮▮▮▮			80,000
ROADS/OVERLOOKS				
Improve West Rim Drive.	▮▮▮▮▮▮▮▮			1,020,000
Sign and stripe East Rim Drive for one-way.	▮▮▮▮▮▮▮▮			10,000
Improve North Entrance Road.	▮▮▮▮▮▮▮▮			1,240,000
Improve overlooks, pullouts.	▮▮▮▮▮▮▮▮	▮▮▮▮▮▮▮▮		252,000
MUNSON VALLEY				
Remove Sleepy Hollow cabins.		▮▮▮▮▮▮▮▮		30,000
Construct new employee residences – renovate others.		▮▮▮▮▮▮▮▮		900,000
Remove obsolete maintenance buildings.			▮▮▮▮▮▮▮▮	30,000

	Phase I	Phase II	Phase III	Construction Cost*
PANHANDLE				
Construct storage sheds.		▮▮▮▮▮▮▮▮		45,000
LOST CREEK				
Add 13 campsites, including roads and water.	▮▮▮▮▮▮▮▮			84,000
Construct comfort station	▮▮▮▮▮▮▮▮			40,000
Construct campfire circle	▮▮▮▮▮▮▮▮			10,000
CLEETWOOD COVE				
Improve docking and visitor use facilities.	▮▮▮▮▮▮▮▮			40,000
Provide electric power supply – if feasible.	▮▮▮▮▮▮▮▮			360,000
INFORMATION/ORIENTATION/INTERPRETATION				
Improve wayside exhibits.	▮▮▮▮▮▮▮▮	▮▮▮▮▮▮▮▮		30,000
Construct exhibit structure at Cleetwood Cove trailhead	▮▮▮▮▮▮▮▮			10,000
Construct information/orientation facility at north entrance, including parking.		▮▮▮▮▮▮▮▮		170,000
Improve backcountry directional signs.	▮▮▮▮▮▮▮▮			5,000
NORTH ENTRANCE RESIDENTIAL AREA				
Construct duplex apartment and utility systems.		▮▮▮▮▮▮▮▮		320,000
Remove seasonal cabin and pit toilet at north entrance		▮▮▮▮▮▮▮▮		2,000

*Construction cost in 1976 dollars. Preliminary cost estimates are based on conceptual ideas in this document and will be revised as specific requirements are developed. The costs of planning, design and supervision are not included in the estimates.

SUMMARY OF CONSTRUCTION COST BY AREA AND PHASES	PHASE I	PHASE II	PHASE III	SUBTOTAL
RIM VILLAGE	114,000	1,520,000	– 0 –	1,634,000
ANNIE SPRINGS	240,000	144,000	– 0 –	384,000
ROADS/OVERLOOKS	2,422,000	100,000	– 0 –	2,522,000
MUNSON VALLEY	– 0 –	930,000	30,000	960,000
PANHANDLE	– 0 –	45,000	– 0 –	45,000
LOST CREEK	134,000	– 0 –	– 0 –	134,000
CLEETWOOD COVE	400,000	– 0 –	– 0 –	400,000
INFORMATION/ORIENTATION/INTERPRETATION	30,000	185,000	– 0 –	215,000
NORTH ENTRANCE RESIDENTIAL AREA	– 0 –	322,000	– 0 –	322,000
TOTALS	3,340,000	3,246,000	30,000	6,616,000

Table 1a. Summary of Major Proposals.

	Existing	Proposed	Type of Change
CAPACITY	Day Use: No limitation	No limitation at present time	No change
	Lodging: 80 room lodge; 18 cabins, 2 fourplex cabins	Retain lodge, remove cabins and fourplexes	Decrease lodging by 24 units
	Camping: Mazama campground - 198 drive-in sites Lost Creek - 12 primitive sites	Mazama - increase to 250 sites Lost Creek - increase to 25 sites	Increase by 65 sites
	Boat Tours: Four 60 passenger launches - scheduled tours accommodating ±500 people per day	No change	No change
	Winter Use: Rim Village and headquarters open - snowmobile trail on North Entrance Road - no limitation on use	No change	No change
ACCESS AND CIRCULATION	±85 miles paved road, 4 miles unpaved motor nature road - one-way traffic on East Rim Drive	Widen ±14 miles of North Entrance Road and West Rim Drive from 18' to 20' minimum - repair overlooks - add bicycle lane on one-way road	Minimum safety improvements + bicycle lanes
RIM VILLAGE	Lodge, cafeteria-store, rental cabins, community building, exhibit building, Sinnott Memorial overlook, employee dormitory, picnic area, 4 comfort stations, walks, trails, 371 parking spaces	Remove rental cabins, relocate ±185 parking spaces from rim to cabin area, restore rim parking area (±8 acres) to pedestrian green space, construct new lodge access road and reorganize lodge parking (±2 acres), construct all-season interpretive center, remove exhibit and community building, replace 4 obsolete comfort stations with 2 new ones, remove excess roads in picnic area - all new development (except lodge access road) to occur on presently developed land - remove 10-14 acres of development, 8-12 developed	No change in functions - restore part of Rim Village to pedestrian use - provide all-season interpretive facilities - remove/replace obsolete facilities - reduce developed area

Table 1a (Continued)

	Existing	Proposed	Type of Change
RIM VILLAGE (cont.)		acres returned to more natural state, 2 acres new development (access road) on partially disturbed land	
CAMPGROUNDS	Mazama Campground: 198 drive-in sites, 7 comfort stations,, registration kiosk, sanitary dump station, 500 seat amphitheater, employee cabin, south entrance station	Add 52 walk-in sites, central parking and 2 comfort stations (12-15 acres partially disturbed land), relocate registration kiosk, replace cabin with employee residence, construct camper services building	Increase capacity, provide separation for RV/tent campers, relocate camper services from Rim Village to campground, replace obsolete residence
MUNSON VALLEY	Park administrative and maintenance facilities, employee housing, community building, public gas station	Replace obsolete employee housing, remove obsolete maintenance structures - replacement of facilities to occur on presently impacted (developed) sites - probable decrease in total land use with removal of some maintenance structures	No change in functions - obsolete facilities replaced
PANHANDLE	Maintenance storage area	Add storage structures - no increase in land use	No change in function
UTILITIES	Present water and sewage treatment systems meet all standards and are designed to meet present and future needs	Add water collection/storage system and sewage treatment facilities at North Entrance - provide electric power at Cleetwood Cove	Continued upgrading of facilities

Table 1a (Continued)

	Existing	Proposed	Type of Change
NORTH ENTRANCE	Entrance station, seasonal employee cabin	Replace cabin with multi-unit employee residence, develop water/sewage treatment system, construct information/ orientation station with parking - ±2-4 additional acres required for development	Provide visitor information/ orientation facilities, replace obsolete employee facilities

SUMMARY OF LAND USE CHANGES: New or replacement development will occur on 20-26 acres of land partially disturbed by previous use and/or development. Between 8-12 acres of intensively developed land will be returned to a more natural condition with pedestrian use. Widening of ±14 miles of road will affect an undetermined amount of adjacent land.

SUMMARY OF FUNCTIONAL CHANGES: Existing use patterns will remain essentially unchanged; improved information, orientation and interpretation facilities will allow better utilization of the visitors' time. Lodging facilities will decrease; camping sites will increase. Obsolete visitor and management facilities will be replaced or removed. Intrusion of vehicle traffic on viewing experience in Rim Village will be substantially reduced.

II. DESCRIPTION OF THE ENVIRONMENT

A. SETTING

Crater Lake National Park is in southwestern Oregon on the divide of the High Cascades (Figure 1). It lies in an area with a long history of volcanic and glacial activity, extending from Lassen Peak in northern California northward into Canada. Crater Lake occupies the collapsed crater, or caldera, of the once majestic Mount Mazama, a volcano of hypersthene basalts.

The lake is 4.5 to 6.0 miles across, has 20 miles of shoreline, a surface area of 21.5 miles, and with a depth of 1,932 feet at its deepest point, is the deepest lake in the United States. The landscape surrounding the rim of the caldera slopes downward and outward toward the boundaries of the park and is covered by volcanic debris of various ages and glacial detritus. Streams originating on the slopes of the caldera either join the Rogue River drainage to the west or the Klamath River drainage to the south and east.

The rectangular park surrounding Crater Lake has a varied topography which rises from 4,400 feet in the Panhandle at the south entrance to 8,926 feet at the summit of Mount Scott (see topographic map - Figure 2). Mount Scott is a parasitic scoria cone on the eastern flank of what remains of Mount Mazama. Other topographic high points are Union Peak, an old, glacially eroded shield volcano; Hilman Peak, the highest point on the caldera rim; and Timber Crater, a young, unglaciated shield

volcano in the northeast corner of the park. There are numerous scoria cones in the park which were fed from vents radiating outward from Mount Mazama. Many treeless and pumice-covered flats are reminders of the cataclysmic events which led to the collapse of Mount Mazama. Except for these flats, the park is heavily timbered. However, there is little understory of trees or brush and the terrain is open and park-like except in the southeastern portion where dense stands of ceanothus make travel difficult. Steep-walled canyons cut in pumice, such as at Annie, Castle, and Sun Creeks, also contribute to the ruggedness of the terrain.

The park's 160,290 acres are bounded on the north, south, and east by the Winema National Forest, on the north by Umpqua National Forest, and on the north and west by the Rogue River National Forest. A number of major transportation routes transect the immediate region and provide access to the park. The north-south route of Interstate 5 passes through Willamette Valley to the west of the park, and the high plateau route of U.S. Highway 97 parallels the east side of the Cascade mountain range east of the park.

More than 2.5 million people live within a 200-mile radius of the park. Portland and Eugene, Oregon have a combined population of more than 1.1 million people and are Oregon's primary industrial centers. Medford, Klamath Falls, Bend, and Grants Pass are the major towns within a three-hour drive of Crater Lake National Park. Within a 100-mile radius are 33 state parks and 64 private and Oregon State campgrounds with more than 3,000 camping sites. Private resorts and motels within the region have overnight accommodations for more than 12,000 lodgers.

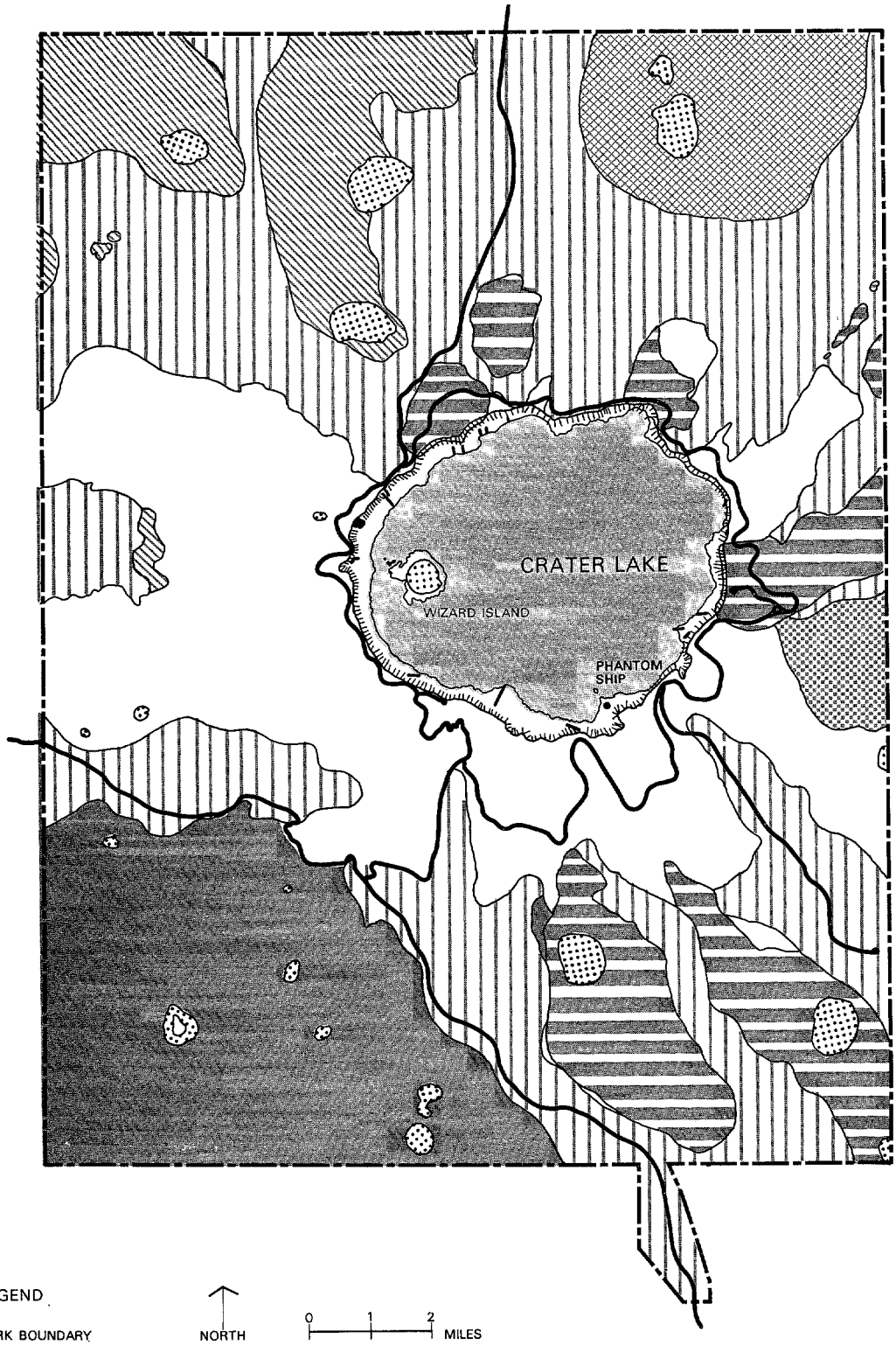
B. GEOLOGY

1. Geologic History

Volcanic activity in the region of the Cascades began some 50 million years ago, but it was not until 10 million years ago that uplifting began which was to produce the Cascade Range. During and following this uplift, wide-spreading flows of fluid basalt issued from north-trending fissures to form a chain of coalescing shield volcanoes extending from Mount Shasta in northern California to Mount Baker just south of the Canadian border. By the close of the Pliocene, about 2 million years ago, the crest of the Cascade Range had become a high plateau capped by these overlapping shield volcanoes occasionally capped by a towering composite cone.

During the Pleistocene most of the Cascade Range volcanoes became more explosive in nature. The lavas being erupted changed from a basaltic composition to andesitic and were less fluid than the earlier lavas. Earlier volcanic cones were covered by the steeper flows of the more recent volcanoes. Some of these later cones were deeply eroded by glaciers, and the harder rocks of their central pipes now stand out as summit pinnacles.

Mount Mazama was birthed about a million years ago on a base 5,000 to 6,000 feet in elevation in the depression formed between the dying volcanoes of Union Peak and Desert Ridge. The attitude of various lava flows indicate that the central cone rose to a height of over 12,000 feet. At no time was Mazama merely a single cone; there were always



LEGEND

- PARK BOUNDARY
- CRATER RIM
- DIKES AND VENTS ON CALDERA WALL
- MOUNT SCOTT LAVA
- UNION PEAK LAVA
- TIMBER CRATER LAVA
- PARASITIC CINDER CONE
- GLOWING AVALANCHE DEPOSIT
- PRE-MAZAMA LAVA
- MOUNT MAZAMA ANDESITES
- MOUNT MAZAMA DACITES

NORTH

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GEOLOGY

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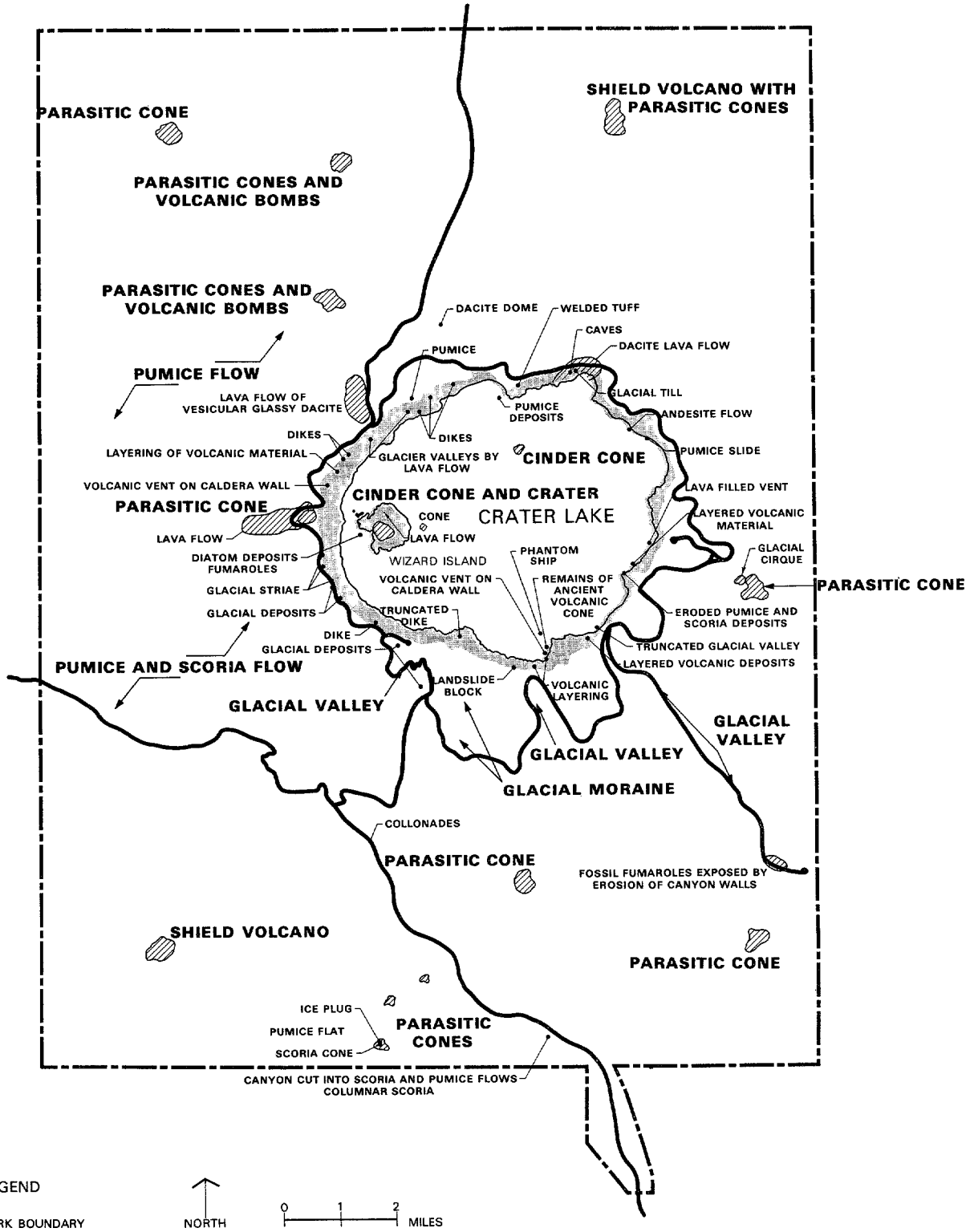
lesser parasitic cones on its flanks. The volcano grew almost entirely by eruption of andesitic lavas and ashes and closely spaced vents, and while it grew, glaciers advanced and retreated several times as evidenced by glacial moraines and tills interbedded with the lava flows.

Evidence of glaciation can be observed on the caldera walls, particularly on the north wall and on the east wall near Redcloud Cliff, where layers of volcanic rock alternate with layers of glacial debris. The last of the glaciers advanced slowly down the slopes, scratched and polished the lava surfaces, and formed the typical U-shaped valleys of Sun and Kerr Notches and Munson Valley.

The glaciers reached their maximum size some 25,000 years ago at the end of the Pleistocene Epoch, obtaining a depth of 1,000 feet and extending 10 to 17 miles from the summit.

During the final retreat, when the glaciers were confined to the canyon bottoms of the upper slopes, a semicircular line of parasitic volcanoes developed on the northern slope of the mountain, about 5,000 feet below the summit, what is now the rim of caldera. Known as the Northern Arc of Vents, these cones issued great amounts of andesite lava and formed the mountains of Watchman and Hilman Peaks. Also formed at this time were the glassy dacites of the Llao Rock, the Cleetwood Cone Flow, and the V-shaped Redcloud Cliff. Several domes of andesite and dacite evolved close to the eastern slope of Mount Mazama (see Figure 13).

A long period of quiescence followed. At the same time, glaciers were retreating farther up the slopes with only three tongues of ice remaining



GEOLOGIC FEATURES

CRATER LAKE NATIONAL PARK / OREGON

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below the present rim at Sun and Kerr Notches and Munson Valley.

During the initial climatic eruption of Mount Mazama, the greatest gas pressure was released, forming the dacite magmas into sand size and smaller particles of frothy white pumice which appeared by two different forms of deposition. The major portion appeared as wind deposited pumice. As eruptions continued and gas diminished, particles increased in size, so that as the shifting wind patterns turned from the east to the northwest, 350,000 square miles of the surrounding countryside were covered with Mount Mazama pumice; at least 5,000 square miles were buried under six inches or more of pumice. The duration of the gaseous eruptions lasted perhaps as long as two months. The magma then changed drastically, becoming more viscous. Pasty dacite lavas were forced upward through numerous cracks, rarely flowing more than a few hundred yards with deposits several hundred feet thick. A second method of pumice deposition was the Nuée ardente, a glowing avalanche which burst through the cone, spreading out in wide sheets extending to the Klamath Marsh on the east and north to Chemult, Oregon, distances of 25 miles. Some avalanches had velocities of 50 miles per hour and reached 35 miles into the Rogue River Valley. Some stream channels filled to depths of 300 feet by this frothy, semi-molten pumice which later fused to form hard, dense dacite.

When the activity ceased, a towering 12,000-foot mountain was replaced by a caldera 4,000 feet deep and six miles in diameter. The final explosions occurred about 6,600 years ago, according to carbon-14 dating

of ten specimens of carbonized wood found in the Mount Mazama pumice (Fryxell, 1965, p. 1,288).

The elapsed time between the initial climatic eruptions and the collapse of the cone is believed to have been only a few days. Seventeen cubic miles of material had disappeared; only 10 to 12 cubic miles, mostly fresh magma, had been ejected from the volcano. It is probable that the remainder of magma drained by injection into cracks in the wall or by other withdrawal means, leaving only a shell of a mountain. Unable to support itself, the mountain collapsed.

After an undetermined period of time, new eruptions occurred, but were confined to the caldera floor and limited to three cones. Wizard Island, the last of the three cones to develop, is the only cone rising above the lake surface (800 feet). It is estimated that Wizard Island last erupted 1,000 years ago (Williams, 1942).

2. Mineral Resources

The geologic history of the park indicates that there is little potential for metallic mineral deposits in the area. Some limited amounts of sulphur and alunite occur within the park but not in sufficient amount to be economically feasible for mining. Pumice and volcanic rock for construction purposes do occur in the park in mineable amounts, but larger and more accessible deposits of such nonmetallic materials are readily and more economically available within the region and outside of the park. At this time there are no legally held mining claims, leases, or mineral rights within the park. Public Law 92-429, signed by the

President on September 28, 1976, closes Crater Lake to future expiration of minerals under the mining laws of 1872.

3. Geothermal Energy

Because of its recent volcanic history, the region of the park is considered to hold a potential for geothermal energy production. A large volume of heated silicic rock may still exist at depth beneath the region, but further exploration and measuring of heat flow will have to be done before its geothermal potential can be determined with any adequacy.

In nearby Klamath Falls, hot water from wells provides heating for some homes and commercial buildings, the Oregon Institute of Technology campus, the municipal swimming pool, and even one section of a city street.

4. Geologic Hazards

Barring a reactivation of volcanic processes, there are few geologic hazards within Crater Lake National Park. The area is seismically active, but the tremors and microquakes are sensible only to delicate instruments.

The topography around the caldera rim is precipitous in many locations. Unconsolidated volcanic and glacial material on steep slopes, such as along the inner crater, is subject to rockfalls and cavitation caused by wind and water erosion. The rock along some sections of the rim road, especially in deep cuts, is susceptible to slides and rockfalls.

C. SOILS

Although soil surveys have been conducted up to the park boundaries and in the Panhandle area (McNeil, 1975), little is known about the precise characteristics of soils within the park. Much of the soil has developed on Mazama pumice, alluvium, and glacial debris and in general can be considered as regosols with poorly defined soil horizons. Precipitation, and not soil type, is the major influence that determines vegetation types in the park, and thus vegetation type does not indicate soil type.

Two Typic Cryorthents, the Maklak and Lapine series, and a Typic Cryopsamment, the Steiger series, make up the major named soils within the park. The physical properties of these soils are given in Table 2 and their suitability for various uses is given in Table 3.

The Maklak series is the major soil found in the park. It consists of excessively drained, cindery soils formed in pumiceous and scoriacious cinders and ash. These soils occur on slopes of up to 15 percent at elevations of 4,400 to 7,000 feet on plateaus and in canyons of the park.

Typically, a thin needle mat rests on a surface layer of dark brown, loamy, coarse sand about 4 inches thick. Below this is about a 5-inch layer of dark brown, gravelly, loamy, coarse sand overlying dark brown and reddish brown, very gravelly, loamy, coarse sand to depths of 60 inches or more.

ESTIMATED SOIL PROPERTIES

SOIL	DEPTH FROM SURFACE (in.)	CLASSIFICATION			COARSE FRACT. OVER 3 IN.	% OF MATERIAL PASSING SIEVE				LIQUID LIMIT	PLASTICITY INDEX	PERMEABILITY (in/hr)	AVAIL. WATER CAP. (in/in)	SOIL REACTION (pH)	SHRINK SWELL POTENTIAL	CORROSIVITY	
		USDA TEXTURE	UNIFIED	AASHO		#4	#10	#40	#200							STEEL	CONCRETE
MAKLAK	0-60	Very gravelly loamy coarse sand	GM, SM, GW-GM SW-SM	A-1, A-3	15-25	35-80	20-75	10-55	5-20	Nonplastic		6.0-20	.20-.40	5.6-6.5	Low	Low	Moderate
LAPINE	0-72	Very gravelly coarse sand	(SP)	(A-1)	0	60-95	15-65	0-55	0-5	Nonplastic		>20	.20-.40	5.6-7.3	Low	Low	Moderate
STEIGER	0-60	Gravelly loamy coarse sand	SM	A-1-b, A-2	0-5	75-100	70-95	35-70	10-30	Nonplastic		6.0-20	.20-.40	5.6-6.5	Low	Low	Moderate

Table 2. Physical Properties of Major Soils at Crater Lake National Park

Table 3. Soil Suitability Chart.

USE	SOIL	USE CAPABILITY*	UNDESIRABLE FACTORS
CAMPGROUNDS TRAILS & PATHS PICNIC AREAS	MAKLAK LAPINE STEIGER	Moderate Moderate to Severe Moderate to Severe	Pebbles, too sandy, slope Pebbles, dusty, slope Pebbles, too sandy, slope
MAIN OVERLOOK AREAS	MAKLAK LAPINE STEIGER	Severe Severe Severe	Pebbles, slope Pebbles, dusty, slope Pebbles, too sandy, slope
SEPTIC TANK ABSORPTION FIELDS	MAKLAK LAPINE STEIGER	Slight to Moderate Moderate Moderate	Slope Slope Slope
SEWAGE LAGOON	MAKLAK LAPINE STEIGER	Severe Severe Severe	Cobbles, pebbles, slope Pebbles, seepage, slope Seepage, slope
SANITARY LANDFILL TRENCH	MAKLAK LAPINE STEIGER	Severe Severe Severe	Seepage Seepage, too sandy Seepage, slope
SANITARY LANDFILL COVER	MAKLAK LAPINE STEIGER	Poor Poor Poor to Fair	Cobbles, pebbles, packing Pebbles, too sandy, slope Pebbles, too sandy, slope
SHALLOW EXCAVATIONS	MAKLAK LAPINE STEIGER	Severe Poor Severe	Caving, cobbles, pebbles Pebbles, too sandy Too sandy, slope
ROADWAYS	MAKLAK LAPINE STEIGER	Slight to Moderate Moderate to Severe Slight to Severe	Slope Slope, low strength Slope
ROADFILL	MAKLAK LAPINE STEIGER	Fair Poor to Fair Poor to Fair	Cobbles, low strength Low strength, slope Low strength, slope
TOPSOIL	MAKLAK LAPINE STEIGER	Poor Poor Poor	Cobbles, pebbles, too sandy Pebbles, too sandy, slope Pebbles, too sandy, slope
SAND	MAKLAK LAPINE STEIGER	Fair Poor Poor	Excessive pumice gravel Excessive pumice gravel Excessive ashy fines
GRAVEL	MAKLAK LAPINE STEIGER	Fair Poor Unsuited	Excessive pumice sand Excessive pumice sand Excessive ashy sand

*Capability for specified use because of limiting undesirable factors

Lapine soils are not as extensive in the park as the Maklak soils. These soils are gravelly and sandy and like the Maklak soils are excessively drained. The Lapine soils are found on slopes up to 55 percent at elevations of 4,400 to 6,000 feet on tablelands, ridges, and cinder cones.

Typically, the surface mineral layer of Lapine soils consists of about 2 inches of dark brown, gravelly, loamy coarse sand about a 9-inch layer of yellowish-brown, gravelly, loamy coarse sand. Loamy buried soils and bedrock normally occur at depths of 40 to 70 inches.

The Steiger series soils consist of somewhat excessively drained, gravelly, loamy, coarse sand developed from ash and cinders. These soils are found on slopes up to 40 percent on terraces, ridges, and cinder cones at elevations of 4,400 to 6,000 feet within the park.

Typically, the surface layer of Steiger series soils is a very dark brown, gravelly, loamy, coarse sand about 2 inches thick. The subsurface layer is dark brown, gravelly, loamy coarse sand about 7 inches thick. Underlying layers are dark yellowish-brown and dark brown gravelly, loamy, coarse sand to depths of more than 60 inches.

Permeability in all three series is very rapid to rapid, runoff is slow to very slow, and consequently the erosion hazard is slight. The effective rooting depth is more than 60 inches, the water-holding capacity varies from 8 to 24 inches, and the water supplying capacity ranges from 17 to 19 inches. Soils in the park range from neutral to medium acidity.

D. CLIMATE

Crater Lake National Park is near the midpoint of the Sierra-Cascade Mountain Province of the Pacific Mountain System. The climate of this province is characterized by cool summers and moist winters with heavy snowfall. The park lies astride the backbone of the Cascade Mountains near the southern extremity of their higher elevations with the general topography dropping 1,000 to 1,500 feet a short distance to the south. The crest of the mountains acts as a barrier to the prevailing frontal systems which approach the area from the North Pacific Coast.

The park is slightly south of the main storm track for these fronts, but still well within their belt of influence. These storms, together with the normal eastward movement of air across the region, are constantly bringing in a fresh supply of nearly saturated air whose temperatures closely approach those of the Pacific Ocean over which it has been traveling.

From late fall until early spring, the land masses become much colder than the ocean. Incoming air masses cool rapidly as they move up the slopes of the Cascade Mountains because of the colder ground and the increasing elevations. As the air cools, great amounts of precipitation are released. From late spring through early fall this situation is reversed, with the land being warmer than the overlying and incoming air mass. Due to ground heating, and despite the cooling caused by increased elevations, the temperatures at the crest of the range are considerably higher than the air crossing the coastline. As a direct result, the air

Climate

Station	Elevation	Latitude	Longitude	Temperature			Precipitation		
				Average January	Average July	Average annual	Average annual	June through August	Average annual snowfall
	Feet			Degrees F.			Inches		
Medford Airport	1312	42°22'	122°52'	36.7	71.9	52.2	20.46	1.40	7.5
Trail 14 NE	1885	42°47'	122°40'	35.6	65.4	51.3	47.22	2.46	
Prospect 2 SW	2482	42°44'	122°31'	35.5	66.7	50.1	42.87	2.38	
Klamath Falls 2	4098	42°12'	121°47'	29.5	68.1	47.9	14.18	1.67	41.0
Fort Klamath 7SW	4160	42°37'	122°05'	27.0	60.4	43.3	39.19	1.79	
Chiloquin	4220	42°35'	121°52'	26.4	59.1	42.8	18.34	1.81	
Chemult	4760	43°13'	121°47'	25.2	60.0	41.8	26.40	2.35	160.0
CRATER LAKE HQ.	6475	42°54'	122°08'	24.8	53.3	37.7	69.74	3.99	590.0

(Data covers period 1941-1975)

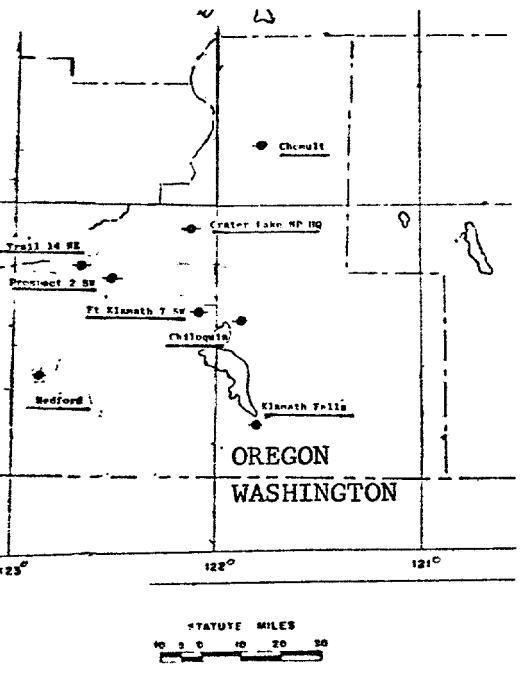


Table 4. Comparative Climatic Data Crater Lake Region.

becomes drier as it moves inland and up the west flank of the Cascades. This dry air situation is further exacerbated by a nearly total absence of large-scale moisture-laden storms during this time of year.

Rainfall, snowfall, and temperatures within the region of the park vary significantly with differences in elevation and are strongly modified by the rain shadow configuration of the Cascade crest and the distance of the recording area from it. Table 4 shows comparative climatic data for the Crater Lake region. There is a steady decline in the mean annual temperature for all stations at higher elevations. Precipitation increases with increasing elevation but the total amounts are strongly influenced by the station's relationship to the morphology of the Cascade crest.

There is a greater range in mean annual totals of precipitation in the area of the park than there is in the entire northeastern quarter of the United States. The most rapid change in precipitation amounts within the park takes place down the eastern flank, where the heavy precipitation of the High Cascades gives way to the semiarid high plateau country of central Oregon. Topographic lows in the Cascade crest allow greater amounts of precipitation to fall at Fort Klamath on the south flank of the park, but Chemult, Chiloquin, and Klamath Falls to the east remain relatively dry.

Warm, clear days characterize the summer months in the area of Crater Lake National Park. At the rim of the caldera the daytime summer temperatures are very moderate. They average 60° to 70°F and seldom exceed 85°F. Since 1926, the record high temperature at park headquarters in

Munson Valley has only been 91°F. Evenings are crisp, with the temperature dropping into the 40's and 50's on most nights, and taking an occasional plunge to freezing during any of the summer months. Daytime temperatures in the Panhandle area during the summer are often 10 or more degrees warmer than those at the caldera rim because of the elevation difference.

Only about 6 percent of the annual precipitation falls from June through August, and on the average, only about five days during this period will have precipitation greater than 0.10 inch. Summer thunderstorms seldom strike with enough force or volume to produce damaging rains or accompanying hail. Traces of snow have fallen in the park during all of the summer months.

Soils throughout the park are at their field capacity for water retention shortly after the melting of the heavy winter snows. Because of the dry summers, the soil moisture progressively declines so that maximum moisture stress on vegetation depends upon the length of rainless periods and upon the evapotranspiration rate during the warmer season.

As is true for most of Oregon, the park has a very definite heavy bias toward winter precipitation. Approximately 70 percent of the annual precipitation falls from November through March in the park, and practically all of it falls as snow. Snow depths of 100 to 200 inches on the ground are common at park headquarters, and the annual total snowfall is nearly 600 inches. In about half of the winters, the first measurable snowfall in Munson Valley can be expected by the end of September, and

at the park's lower elevations by the end of October. The greatest snow depth ever recorded in Oregon was 242 inches and that was in the rim area of Crater Lake at an elevation of 7,086 feet. Snow loads may reach 500 pounds per square foot on structures in Munson Valley and be only slightly less in the vicinity of Annie Springs. Measurable snowfall can be expected in Munson Valley on about 100 days each year, and up to 37 inches of snow have fallen in one 24-hour period (Sternes, 1963).

Daytime temperatures during the winter months average only slightly above freezing in Munson Valley and throughout much of the park, with nighttime temperatures dropping to between 17° and 20°F. Maximum temperatures of 50° to 60° and minimums of 0° or lower may both be expected occasionally during the winter months. The lowest minimum temperature recorded in the headquarters area of Munson Valley since 1926 has been -21°F.

On the lower eastern slopes of the park, the annual snowfall drops to 25 to 65 inches. These lower eastern elevations also receive the lowest winter temperatures due to the stagnant pooling of cold air, the invasion of Arctic fronts from the northeast, and the comparatively warm marine air of higher elevations gliding over the colder air mass instead of pushing it away.

E. LIMNOLOGY AND HYDROLOGY

With a depth of 1,932 feet, Crater Lake is the deepest lake in the United States. It covers an area of 21.5 square miles and has a shoreline of about 20 miles. It is estimated that if present climatic

conditions had prevailed at the time of the volcano's collapse and continued to the present that it would have taken only 800 years for the lake to reach its present depth. However, evidence indicates (Phillips, 1968, p. 9) that the climate was warmer and dryer then so that the lake probably took 2,500 years or more to reach its present depth.

The lake is in balance so that the variations between precipitation and drainage into the lake and losses from seepage and evaporation cause only minor fluctuations of one to three feet per year in the lake's level. Precipitation falling directly into the lake accounts for about 78 percent of the total water entering the lake (Phillips, 1968). No perennial inflowing streams feed the lake; however, where lava rests on glacial debris such as at Dutton Cliff, Sentinel Point and Grotto Cove, copious springs discharge down the caldera walls into the lake (Williams, 1942).

Only 30 percent of the lake's water loss is due to evaporation. The remaining 70 percent is lost through seepage, primarily through glacial materials and volcanic agglomerates. No direct outlets are known to exist; however, large springs occur at lower elevations throughout the surrounding area, and it is assumed some of the seepage eventually must reappear in the Klamath and Rogue River basins.

Surface temperatures of Crater Lake vary from 32° to 65° with usual summer temperatures ranging from 50° to 58°. Below 200 feet, the temperatures approach 39.2° at maximum density (Nelson, 1961, p. 31-45). Most of the lake does not undergo the annual thermal turnover common to

shallow lakes (Phillips, 1968, p. 11). Nor is there conclusive evidence indicating the existence of circulation (Nelson, 1961, p. 45-52).

Crater Lake is considered a youthful lake in an extremely oligotrophic state, with a water purity level of only 79 particles per million. This purity can be attributed to its relative youthful stage in an alpine environment, and the absence of inflowing streams introducing minerals and debris. The basin-forming rock is relatively insoluble and seepage of dissolved material may occur through the basin and walls.

Light penetration has been measured at the bottom of the lake, although blue light is the only illuminate below 350 feet. According to secchi disc reading of up to 40 meters, light penetration in Crater Lake exceeds the usual maximum of 20 to 25 meters for alpine lakes (Nelson, 1961, p. 51).

Oxygen saturation does occur to the bottom of the lake due to a small biotic population and absence of life in the lower three-quarters of the lake. Oxygen saturation is not indicative of circulation.

The lack of a wide range of dissolved minerals greatly restricts the growth of any aquatic biota. Absence of sufficient calcium carbonates inhibits the development of large shelled animals. A well-developed diatom flora does exist due to the high silica content and high alkalinity of the water (Nelson, 1961).

The clarity of the water enables a moss, Depanocladus adunous, to grow at depths of 60 to 425 feet, a unique condition found nowhere else.

Studies of fauna found in Crater Lake show that most are cosmopolitan and thus are very adaptable and common. These include bluegreen algaes Calothrix, Oscillatoria, and Nostoc; green algaes Spirogyra, Ulothrix, and Cladophora; zooplankton Daphinia, Cladocera, and rotifera; and the marsh and water plants Fontinalis, Ranunculus, Juncus, and Potomogeton (Nelson, 1961).

The concessioner operates four 60-passenger gas-powered boats on the lake. Pollution from petroleum products is a potential if not an actual threat. The possibility of waste products from the rim area also exists. This pollution potential is also magnified by the fact that the lake has no outflowing streams to "flush" the lake of any contaminates.

Crater Lake is monitored by the National Park Service and U.S. Geological Survey to insure the lake ecosystem remains in as natural a state as possible. The waters are analyzed for any contamination, such as hydrocarbons or any introduced inorganic materials. Tests are conducted in the spring prior to any recreational use and in late fall with the termination of the boat concession operation. Checkpoints are the center of the lake, proximal to Wizard Island, and at Cleetwood Cove. The lake was designated as a Hydrological Benchmark Station by the U.S. Geological Survey in 1962, and water level measurements as well as purity checks are recorded at this station in Cleetwood Cove.

The dendritic drainage patterns of tributaries commonly found on youthful geologic terrains are absent in the park. Even on steep slopes, the runoff channels are broad and poorly defined with the rounded contours

of a mature drainage system. This is because the surface runoff in the park from rain and melting snow is negligible. Water sinks almost immediately into the porous volcanic soils and glacial debris and is released only slowly through evaporation, plant use, seeps, and a few springs. The pumice deposits alone are capable of holding water in amounts equaling 30 percent of their volume. Permanent stream beds in the park are in youthful appearing, sharp steep-sided channels. The erosion caused by running water in the park is at a minimum and its effects on the topography are probably equaled by those of wind deflation and gravitational mass movement.

F. BIOTIC RESOURCES

1. Vegetation

a. Plant Communities

The flora of the 250.4-square-mile Crater Lake National Park is typical of the vegetation found throughout the southern High Cascades (Farner, 1952). Generally, the vegetation of the region reflects a mosaic of forested areas and open nonforested areas. Climate, topography, soil development, and fire history all affect the composition and distribution of existing plant communities. Approximately 570 plant species, making up four general vegetation communities, are exhibited within the boundaries of the park (see vegetation map - Figure 14).

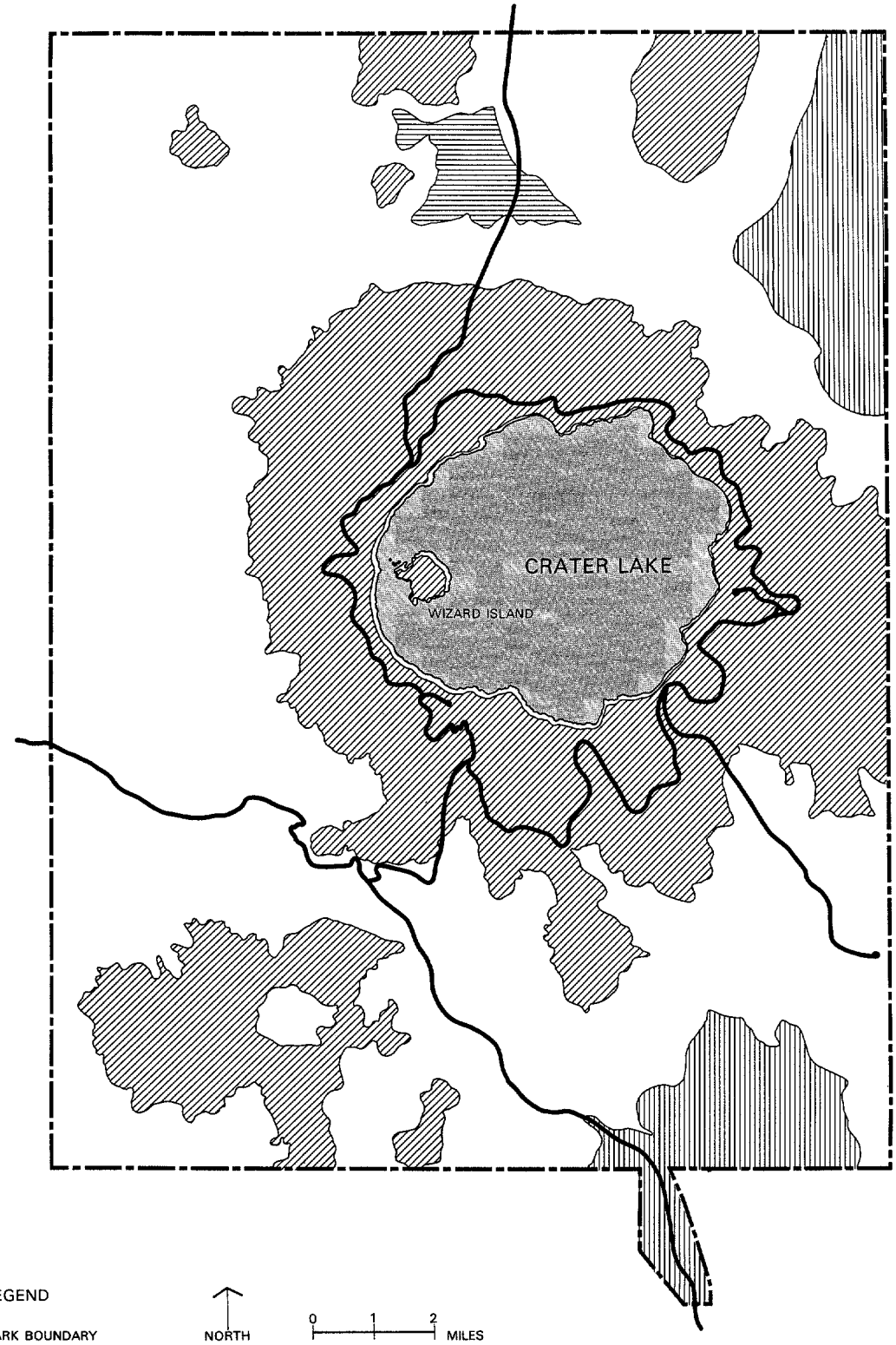
Ponderosa Pine Forest - The Ponderosa pine forest covers 31.4 square miles of the park, or 12 percent of the total park area. The soil

consists of fine, well-drained volcanic dust, over ash and cinders which reach a depth of 200 to 300 feet. It is a zone of thick underbrush, the dominant species being snowbrush (Ceanothus velutinus), bitter cherry (Prunus emarginata) and willow (Salix sitchensis and Salix scouleriana) (Wynd, 1941).

The pine forest Transition Zone extends to elevations of 5,500 feet, so that the majority of the zone on the east, west, and north slopes of Mount Mazama lies outside the park. On the drier, east slope of Mount Mazama, almost pure open stands of ponderosa pine (Pinus ponderosa) occur, whereas on the moister, west slopes, considerable mixtures of Douglas-fir (Pseudotsuga menziesii), sugar pine (Pinus lambertiana), and white fir (Abies concolor) are found. A small area of ponderosa pine is established within the north rim of the caldera from Cleetwood Cove to Wineglass. Another relatively pure stand of ponderosa pine occurs in the northeast corner, extending southeastward of Timber Crater in an open, park habitat.

Douglas-fir replaces ponderosa pine along the south boundary, westward into the Red Blanket Creek Canyon. Also occurring in the area is white fir. Sugar pine is found on level areas along the canyons. These species are also represented in Annie Creek Canyon and Castle Creek.

Ponderosa and sugar pine were logged in the Yawkey and Gladstone tracts prior to their acquisition in 1941 and 1942, respectively. Both tracts are in the extreme southeast corner of the park. In these tracts, dense growths of chaparral, primarily manzanita and ceanothus species, are now locally dominant.



LEGEND

PARK BOUNDARY

NORTH

0 1 2 MILES

MOUNTAIN HEMLOCK FOREST

PONDEROSA PINE FOREST

LODGEPOLE PINE FOREST

PUMICE DESERT

VEGETATION

CRATER LAKE NATIONAL PARK / OREGON

UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

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Ponderosa pine, a species dependent on fire for its propagation, has been altered through fire control practices since the early 1900's and in some areas, such as the Panhandle, the pine is being replaced by white fir as the dominant species at the younger forest level.

Seeding programs have been suggested to reintroduce ponderosa pine growth. Prescription burning is also proposed in the Resource Management Plan (1970); some test burning was accomplished in 1976.

Lodgepole Pine Forest - The lodgepole pine forest corresponds to the Canadian Life Zone, covering 102.7 square miles at elevations from 5,500 to 6,500 feet, depending on exposure, drainage, and humidity (Farner, 1952). Because of more than 70 years of past fire control history in the park, the lodgepole pine (Pinus contorta) is being replaced by other species. Shasta red fir (Abies magnifica) occurs frequently and occasionally in considerable abundance. Other species include noble fir (Abies procera) and mountain hemlock (Tsuga mertensiana). Shasta red fir is found scattered throughout the lodgepole pine forest with a pure stand occurring on the lower north slope of Bald Peak.

White pine is also a codominant species and considered an indicator species of the Canadian Life Zone, though not as frequent as lodgepole pine. White pine are found in considerable numbers along streams and canyons of the park. Both white pine and lodgepole pine are common on Wizard Island.

Shrubs commonly occurring in association with the lodgepole forest are squaw and sticky currants (Ribes) and sedge (Carex concennoids).

Many exposed slopes within the ponderosa and lodgepole pine communities maintain a dense coverage of manzanita (Arctostaphylos patula or A. nevadensis), snowbrush (Ceanothus velutinus), and squaw carpet (Ceanothus prostratus). Also occurring frequently is squaw currant (Ribes cereum).

Chaparral habitats are found on the upper slopes of Red Blanket Canyon, Baldtop Mountain, Red Cove, Grayback Ridge, lower Dutton Ridge, Desert Ridge, Bald Crater, and along Sun Creek.

Mountain Hemlock Forest - Mountain hemlock forests are characteristic of the upper elevations (5,500 to over 8,000 feet), occurring in either pure stands or in association with Shasta red or noble firs complex. It is the primary indicator species of the Hudsonian Life Zone covering 91.5 square miles, or 36.5 percent of the park.

Mountain hemlock (Tsuga mertensiana) generally occurs in open park-like meadows. The scanty underbrush consists principally of wood-rush (Luzula glabrata). At upper elevations, mountain hemlock tends to grow in isolated stands or clusters. Also associated with mountain hemlock beginning at approximately 6,200 feet and occurring in the same park-like manner, is whitebark pine (Pinus albicaulus). At the highest elevations of Mount Scott and Cloudcap, mountain hemlock gives way to pure stands of whitebark pine.

Oregon grapefern (Botrychium pumicola), considered a rare species because of its limited occurrence, is found in the park along the flanks of

Cloudcap and on the Llao Rock, the largest site in existence. Only a few other sites exist in Oregon and possibly one in California.

Montane meadows are interspersed throughout the forest zone, though confined to wet localities along streams or around the immediate vicinity springs. Characteristic flora include thickets of willow bordered by subalpine fir and/or mountain hemlock. An abundance of flowering plants and sedges is also present.

Despite a higher frequency of fire than in the previous two forest zones, fires and/or fire suppression have had the least modifying influence in this zone.

The mountain hemlock forest surrounding the entire caldera rim receives the greatest visitor concentrations and impacts. The major visitor use developments, the Crater Lake Lodge, store and cafeteria and approximately 35 miles of roadways are located in this forest community.

The Pumice Desert - The Pumice Desert, a distinct desert-like environment covering about 3.1 square miles at an elevation of 6,000 feet near the northern boundary of the park, is actually part of the lodgepole pine forest (Wynd, 1941); but because of poor soil development, plant succession, composition and distribution have been significantly inhibited. Soil infertility is now regarded as the primary limiting factor in the rate of succession, not a lack of water as was previously thought (Mueller, 1961).

All but one of the 14 plant species of the desert are small herbaceous or woody-stemmed plants, the exception being lodgepole pine, which is

invading the area and beginning to establish itself (Mueller, 1966, p. 29-42).

Due to the poor soil development, the desert is an extremely fragile environment. A small automobile turnout was built along the North Entrance Road at the southern edge of the desert in 1958. Since its construction, an area of compaction is evident, having a radius of over 100 yards. Compaction of vegetation is a result of walking and, although rarely seen, evidence indicates this area is driven over by a few sightseers. Use in the Pumice Desert, if not limited to trails and wildlife observation along the developed roadway, could result in rapid deterioration of plant life. The Pacific Crest Trail has been rerouted out of the Pumice Desert.

Other small open pumice areas within the park are restricted to slopes of the higher peaks, including Garfield, Applegate, Dutton Cliff, Cloudcap, and Llao Rock. Total acreage of these pumice areas is considerable.

b. Fragile Environments

Several areas within the park, including Sphagnum Bog, Boundary Springs, the east flank of Mount Scott, and the Sand Creek Canyon/Pinnacles site, contain extremely important ecological communities. Two areas, Sphagnum Bog and Boundary Springs, are especially significant and are currently managed as Outstanding Natural Features Area by the Park Service. Because of the proximity of these unique areas to U.S. Forest Service lands, the Rogue River National Forest, in August of 1970, designated "buffer" zones on their lands as Scenic Areas.

Sphagnum Bog - Sphagnum Bog, fed by Crater Springs, is located in the northwest section of the park, only half a mile from the west boundary. The bog supports a flora of delicate mosses and herbs, several species of which are found nowhere else in the park. Included are two species of bladderworts (Utricularia intermedia and U. vulgaris) and two species of sundews (Drosera rotundifolia and D. longifolia), all insectivorous plants. This flora is dependent on ample amounts of water; any change in the flow of Crater Springs would have a profound influence on the existing balance. Eight hundred and thirty acres of Forest Service land have been designated as a protective buffer zone in which logging is prohibited.

Camping is also prohibited in the area and access to the bog is by hiking only. It has been suggested that the area be investigated and considered for classification as a Research Natural Area.

Boundary Springs - Boundary Springs is also located in the northwest corner of the park, and is approximately 1/8 mile from the north boundary. It is one of the headwater sources of the Rogue River.

Producing a reliable, year-round flow in an otherwise arid area, the springs exhibit a lush moss and herb flora (Applegate, 1936).

Recognizing the vital and delicate nature of the springs, and their location along the park-boundary, the Forest Service established 320 acres proximal to the springs as a scenic area, thus prohibiting logging. A park trail now extends into the area but camping is not permitted within a mile of the springs.

Mount Scott - Mount Scott, a two-peaked mountain rising approximately 8,926 feet above sea level (the highest point in the park), is located in the east-central portion of Crater Lake National Park. The moderately timbered mountain (whitebark pine, Shasta red and noble fir, and mountain hemlock forests) is currently being managed as Class V - Primitive Area land by the National Park Service.

Sand Creek/Pinnacles Area: The Sand Creek/Pinnacles area begins in the southeast corner of Crater Lake National Park and extends on into the Winema National Forest east of the park. The entire site is of unique geological importance with Sand Creek passing through a wide canyon with sloping walls of scoria and pumice. Along those walls are numerous pinnacle formations, many 50 feet or more in elevation.

That portion of the Sand Creek/Pinnacles area within Crater Lake National Park is currently being managed as Class V - Primitive Area land by the National Park Service. The U.S. Forest Service has declared the segment of the Sand Creek/Pinnacles area situated in the Winema National Forest as the Sand Creek Unusual Interest Area (Geological) through approval of a special zoning plan passed on April 18, 1967.

Thousand Springs - Although located in the Rogue River National Forest approximately 1½ miles southwest of the west entrance of Crater Lake National Park, Thousand Springs is another ecological system located within the region worthy of protection and preservation. The Thousand Springs site is a unique complex of freshwater springs that flow west into Union Creek and eventually out into the Rogue River.

c. Insects and Disease

Several species of forest insects which cause damage to trees within the region are commonly found in Crater Lake National Park. These species include the mountain pine beetle in ponderosa and lodgepole pine, the western pine beetle on ponderosa pine, and the balsam wooley aphid on subalpine and other true firs. White pine blister rust is occasionally found on whitebark pine within the park. Mistletoe infects a substantial portion of ponderosa pine and lodgepole pine.

Between 1923 and 1933, there was an extensive outbreak of the mountain pine beetle (Dendroctonus monticolae) in the lodgepole pine forests of the park. The outbreak moved from north to south, and by 1925 the beetles were killing an estimated 200,000 trees north of the park. These attacks often speeded the succession to forests of fir and hemlock. Limited bark beetle buildups occurred in 1946, 1947, 1948, and 1957 within the park.

Limited chemical control of beetles in the ponderosa forests along roadways was done by the National Park Service during the 1960's. At present, insects are not considered a serious threat to the park's forests and no control measures are in effect. A cooperative program with the U.S. Forest Service utilizes infrared aerial photography to monitor insect populations and infestation trends within the park.

d. Fire History

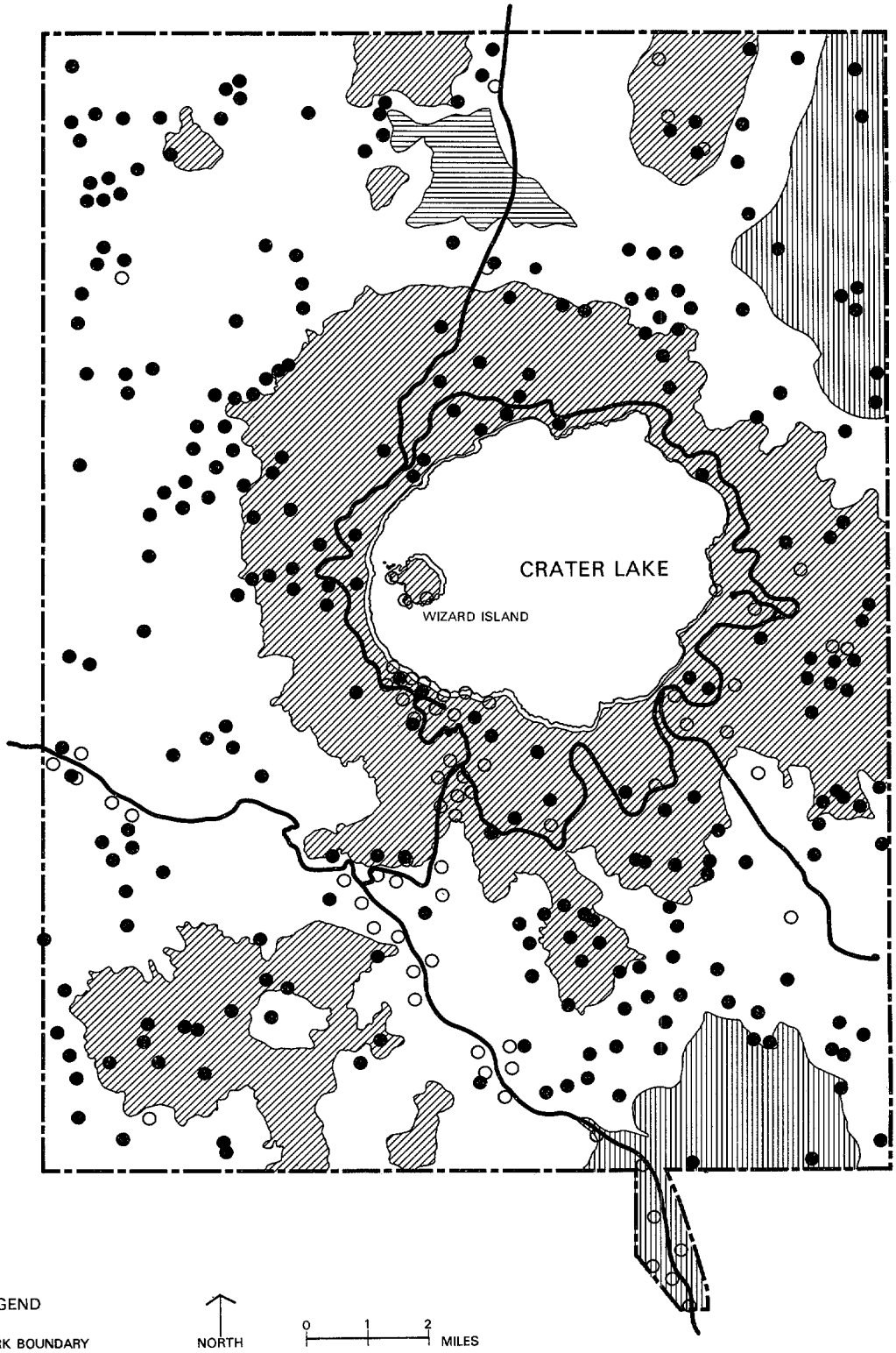
Summer storms often seem to have as much lightning as rain. Most of the natural fires caused by lightning are set by storms that cover a wide

area on a single day and set multiple fires. Lightning fires are equally likely to occur at any altitude with equal frequency of storms and equal fuel conditions (see Figure 15). As lightning strikes areas of high topography with greater frequency than low areas, lightning-set fires are more likely to be set along and near the tops of ridges. The prevailing summer storm systems strike the park from the south and east, but only a slight increase in fire frequency can be attributed to this factor in these portions of the park.

Forest fires have always played an integral role in the normal growth and natural development of forests.

In Crater Lake National Park, the normal fire cycle was altered with the advent of forest fire control and protection policies more than 70 years ago. Lodgepole pine is an early invader of fire-devastated areas. With fire suppression, the lodgepole is being replaced by mountain hemlock, Shasta red and noble firs. For the same reason, the ponderosa pine in the Panhandle and elsewhere in the park is being invaded and replaced by white fir.

Fires in the park average two to four per year and are generally of .25 acres or less in size. Of the total of 385 fires since 1931, 84 have been man-caused and the rest lightning-set. Man-caused fires are most frequent in the Munson Valley and Annie Springs areas and along the park's major roadways. The highest fire frequency is from the first of August to mid-September when the forest is driest, lightning storms most frequent, and visitor use the heaviest.



LEGEND

PARK BOUNDARY

NORTH

0 1 2 MILES

MOUNTAIN HEMLOCK FOREST

PONDEROSA PINE FOREST

LODGEPOLE PINE FOREST

PUMICE DESERT

MAN CAUSED FIRE

LIGHTNING CAUSED FIRES

FIRE LOCATION

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Approximately 130 miles of fire roads were built in the early 1930's and used until 1970 when all roads were closed to motorized vehicles. All fires are now reached by hiking, and if essential to prevent a serious fire situation from developing, helicopters are available. Two lookout towers, one at Mount Scott and another on Watchman Peak, are no longer manned. Improvements in aerial detection have made this action feasible. Forest Service lookouts outside the park also aid in detection.

e. Timber Resources

The southern tip of the Panhandle was logged in 1909, 1910, 1911, and 1917, and the part of the Panhandle east of Annie Creek was logged in 1923 and 1927. Ponderosa and sugar pine were logged from the extreme southeastern corner of the park on the Yawkey and Gladstone tracts. These areas now have dense growths of chaparral, of which manzanita and ceanothus species are dominant. The remainder of the park has not been logged since its establishment.

f. Grazing

Prior to the establishment of the park, the entire region was open to grazing, primarily by sheep. The effects of this grazing have gradually diminished until little, if any, impact from it can be detected today.

The park is not fenced and trespass grazing is occurring from adjacent National Forest lands. Sheep trespass has occurred along the east boundary of the park and cattle trespass is common along the west and north boundaries. Although such trespass is normally light and the

damage to the park's vegetation minor, both cattle and sheep have penetrated to all parts of the park at one time or another.

The fragile ecosystems at Sphagnum Bog and Boundary Springs are within one-half mile of the park boundary. Trespass grazing by cattle is impacting both of these unique areas, as the cattle are attracted by these two sources of water. The extent of the effect of the cattle upon the integrity of these two ecosystems has not been evaluated at this time.

2. Animals

The animal species living in the park are typical of the diversity of animals found in the southern High Cascades. A listing of the species which are known from the park area is given in Appendix A. The western and southern portions of the park contain the largest animal populations because of the presence of permanent streams. The animal populations in the northern section of the park are severely limited by a lack of available water.

a. Mammals

The most frequently seen animals in the park are the small mammals such as squirrels, chipmunks, pikas, marmot, and hares. Deer, black bear, pine marten, porcupine, and red fox are also seen with some regularity by park visitors and employees.

Black Bears - The black bear (Ursus americanus) ranges throughout the park, principally in the lodgepole and ponderosa pine forests. They are

typically found in open meadows and near streams where they can obtain their food supply of berries, nuts, roots, insects, small game, and fish.

Prior to 1973, a few black bears were becoming pests in visitor-use areas of the park. Open dumps were closed and trash removed to areas outside of the park. Bear-proof garbage cans were installed and stubborn nuisance bears were trapped and transplanted to other areas of the park. Nuisance bears are not now a problem and the parkwide bear population seems to have stabilized at from 40 to 50 animals.

Grizzly bear (Ursus klamathensis) were exterminated in the region by 1895, and reintroduction efforts on their behalf have not been made.

Wolves and Coyotes - Wolves (Canus lupus) do not seem to have ever been common in the southern Cascade region and are now gone from the area. In the early 1900's, predator control programs largely exterminated this species in the region and the last recorded wolf kill in the State of Oregon was in 1927 east of Fort Klamath by Biological Survey predatory animal hunters.

The coyote (Canus latrans) has also been heavily persecuted by man. Because of its adaptability to man, as well as its capability to survive in a wide variety of habitats, the coyote still persists in the region. The coyote is considered rare within the park, as it prefers the open country of the arid sagebrush areas found in the Upper Sonoran Life Zone. They are considered as permanent residents within the park and

are apparently maintaining a stable population, although they are rarely seen because of their twilight and nocturnal habits.

Fox - The red fox (Vulpes fulva) has an estimated population of 40 individuals within the park and is one of the more commonly seen mammals. The red fox is commonly found in open meadows or park-like areas where the greatest concentrations of rodents are found. Dens are typically located in rocky areas. They are commonly observed in the village area in the wintertime.

The gray fox (Urocyon cinereoaxgenteus) prefers the chaparral-covered hills south and west of the park, but is an infrequent visitor to the ponderosa pine forests within the park.

Mountain Lion - The mountain lion (Felis concolor) has not been seen within the park since about 1950. Prior to this time, the cat was considered an infrequent visitor to the park and not a permanent resident. Man's encroachment into the cat's territory, hunting pressures from the public, and the elimination or reduction in numbers of prey species are the primary reasons for the elimination of this species from the region of the park.

Bobcats and Lynx - The bobcat (Lynx rufus) is an infrequent inhabitant of all of the life zones within the park. Its population within the park is only about 10 individuals, so sightings are rare. The lynx (Lynx canadensis) is native to the park but has not been reported for many years. It prefers the Canadian and Hudsonian forest habitats.

Elk - The Roosevelt elk (Cervus canadensis roosevelti) once ranged the valleys and open areas from the Cascades westward to the Pacific Coast. With the advance of civilization, the Roosevelt elk withdrew to the higher, forested mountain areas, and by 1917 was on the brink of extinction in the area of Crater Lake National Park. Fifteen Rocky Mountain elk (C. canadensis nelsoni) were brought to the park from Yellowstone National Park in that year, and interbreeding may have diluted any subspecies differentiation by now.

Elk have been seen in all areas of the park but are concentrated in two small herds in the western and southwestern parts of the park. The western herd concentrates around the Sphagnum Bog area and ranges southward to Bybee Creek and possibly as far as the Castle Creek drainage area. Their winter migration begins at the first snows and is westward into the Rogue River drainage area.

The southwestern herd centers around Union Peak and their winter migration is south to Red Blanket Creek and then westward until the lower elevations are reached where dense thickets of ceanothus offer plentiful browse and ample protection from hunting pressures. Exceptionally heavy snowfalls may force the herd further south to Bessie Creek and the Middle Fork of the Rogue River. This is the larger of the two herds. The total number of elk in the park is approximately 140 to 200 animals.

The elk within the park are part of a larger population of elk which range on adjacent lands. General trends for the region indicate that elk populations are increasing. A study of the elk herds within the

park was begun in 1973 to determine their population, calving success, and migration routes.

Deer - From 200 to 300 mule deer (Odocoileus hemiones hemiones) live within the park during the snow-free period of summer. They inhabit the east-central area of the park down to the southeast corner and up to the crest of the Cascades just west of the lake. Mule deer prefer the drier eastern slopes and the open forest and mountainous terrain. Their principal browse is mountain mahogany, bitterbrush, and wild rose.

Winter movement is toward the south to the Sun Mountain area and then eastward across the Wood River Valley into the lower Red Blanket Creek area. In the spring they follow the creek drainages back into the park, advancing against the retreating snowline.

The blacktailed deer (Odocoileus hemiones columbianus) typically inhabit areas west of the Cascade crest, as they prefer denser forests than the mule deer. In the park these deer are principally in the west-central section and possibly range as far north as the Sphagnum Bog area. They move to lower elevations to the west at the commencement of winter.

Within recent years the whitetail deer (Odocoileus virginianus ochrounus) has apparently developed a resident population of about 30 animals within the park. Occasional sightings are made where the whitetail frequents stream margins, ponds, permanent potholes, and open wet meadows in the west-central portions of the park.

Mule deer and blacktailed deer integrate along the summit area in the park and some hybridization does occur. Most of the deer sightings in

the Annie Springs and Sun Creek area have apparently been blacktail deer, even though this is a mule deer habitat. These may be hybrids. The resident whitetail deer may also be in fact hybrids of blacktail and mule deer.

Pronghorn - In 1896 the Oregon Biological Survey reported abundant pronghorn (Antilocapra americana) in the Pumice Desert area of what was to become Crater Lake National Park. In 1915 the population was estimated at only 10 and pronghorn have been considered absent from the park until as recently as 1973. The Pumice Desert provides the only habitat in the park for this animal of the open plains, and in 1973, three separate sightings of individual pronghorn or small groups of them were made in this area. The pronghorn thus is present but transient within the park.

Exotic Species - The muskrat (Ondatra zibethicus) is present within the park as a result of its introduction into the surrounding region by man.

b. Birds

About 175 species of birds have been recorded within Crater Lake National Park. Several of these recorded species were identified on only a few observations and need to be verified. Among the most common species seen by the park visitor are Clark's nutcracker, the gray jay, and Steller's jay. Aquatic bird species are appearing in fewer numbers each year and may be a result of the draining of nearby Klamath Lake.

The golden eagle (Aquila chrysaetos) was once common within the park.

It breeds within the park and is considered a permanent resident. It is considered rare, but appears to be maintaining a stable population.

Historically the bald eagle (Haliaectus leucocephalus) was more numerous than the golden eagle. In recent years the population declined to a single breeding pair which nested on the north slope of Wizard Island. They too appear to be gone from the park and the bald eagle may be extinct within the park.

Other infrequently sighted, or rare birds, within the park include two species of falcons. The peregrine falcon (Falco peregrinus) was never common in great numbers but was a regular summer resident. Its population is considered to be static and its occurrence rare. The prairie falcon (Falco mexicanus) is an occasional summer resident and has been known to nest within the park.

c. Reptiles and Amphibians

Seven species of reptiles and amphibians are found in the park. Although they are widespread through the park at elevations below 7,000 feet, their numbers are few. The valley garter snake is the only species of snake which occurs naturally in the park. It is relatively uncommon and generally inhabits the shores of Crater Lake, Wizard Island, and other watercourses and bogs within the park.

The Crater Lake newt (Taricha granulosa mazama) is the only amphibian in the park that is considered to be rare. It is a subspecies of the rough-skinned newt and is found only within the shoreline ecosystem of Crater Lake.

d. Fish

With the exception of Dolly Varden trout (Salvelinus malma) in Sun Creek, all of the fish found within Crater Lake National Park are planted exotics. A number of rainbow trout (Salmo gairdnerii iridus) were introduced into the lake as early as 1888. Other species introduced into the lake are the Coho, or silver salmon (Oncorhynchus kisutch); the landlocked sockeye salmon (kokanee) (Oncorhynchus nerka); the German brown trout (Salmo trutta); the brook trout (Salvelinus fontinalis); cutthroat trout (Salmo clarkii); and steelhead trout (Salmo gairdnerii gairdnerii). Only the rainbow and kokanee have been able to adapt and survive in the lake's environment. The kokanee is the best adapted of the two and the most numerous, with fish averaging 9 to 18 inches in length. While less abundant, the rainbows are the larger, measuring 12 to 24 inches in length. Neither of the fish are abundant and their numbers seem to be declining.

Freshwater shrimp and crayfish found in the lake are exotic species which have been introduced as a food source for the fish populations.

Four species of trout are found in the park's streams, although only brook trout and rainbow have been planted officially. Large numbers of rainbow have been stocked, but the survivors are few and scattered. Rainbow have been found in Munson, Annie, Bybee, Sun, and Castle Creeks. Brook trout plantings have been far more successful and this trout is the most abundant and firmly established fish in the park's streams.

A single specimen of brown trout has been recovered in Sand Creek from above the falls, which appear to form an effective barrier to upstream fish migration. It is probable that this fish is a survivor of an unrecorded or unauthorized planting in this creek. Dolly Varden are found in Sun Creek, and are considered the only native trout in the park, having entered Sun Creek from the Wood River and become well distributed in the lower portions of the creek.

3. Rare, Endangered, or Threatened Species

The American peregrine falcon (Falco peregrinus anatum) is the only animal found within Crater Lake National Park that is listed as endangered with extinction on the United States List of Endangered Fauna, maintained by the Secretary of the Interior. The prairie falcon (Falco mexicanus) was considered for the threatened species category by the U.S. Fish and Wildlife Service but has not yet been placed on the List of Endangered Species as "Threatened."

A number of endangered or threatened species of plants grow in Crater Lake National Park. Species endemic to the area, or species much diminished in range or habitat and listed as Endangered in House Document 94-51, "Report on Endangered and Threatened Plant Species of the United States," are as follows: Botrychium pumicola, Collomia mazama, Polygonum cascadense, and Penstemon cinicola. Five additional species occur sufficiently close to the park that they are probably present, though as yet undiscovered. They are: Fritillaria adamantia, Dicentra formosa ssp. oregana, Lillum washingtonianum var. minus, Aster chilensis ssp. hallil, and Aster curtus.

Man's encroachment of the land, plus hunting pressures and predatory control programs, have eliminated several native species within the Crater Lake region. Other species have been so reduced in number that they are locally endangered with extinction. Extirpated species are often reported by untrained observers who, because of the natural desire to see a rare animal, turn feral dogs, black bears, and bobcats into wolves, grizzlies, and lynx.

The last known grizzly bear in the area was killed in 1895 and the last wolf was killed in 1927. Two sightings of "gray wolf" were made in the park in 1964 and one in 1975. The Canadian lynx and the wolverine inhabited the general area in the lodgepole forests but have been considered extinct in the Cascades for many years. However, recent reports indicate that at least the wolverine is present in the Crater Lake region and its population and range is slowly expanding. Mountain lions have not been sighted in the park since around 1950. The fisher (Martes pennanti) was considered extremely rare within the park for many years. However, there have been 14 sightings since 1955, indicating an increase in either its population or that of the observers.

The western gray squirrel (Sciurus griseus), mink (Mustela vison), and river otter (Lutra canadensis) were formerly reported from the park but have not been seen in recent years and may be locally extinct. The aplodontia (Aplodontia rufa) was formerly abundant near springs and seepage areas throughout the park. Its range is becoming severely restricted and it has disappeared from some localities. It is rarely

seen and observations are based upon its series of burrow entrances and piles of vegetation placed near them.

G. CULTURAL RESOURCES

1. Historic

There is little indication that Indians used the area of Crater Lake National Park for anything other than occasional hunting trips. Hudson's Bay Company trappers arrived in the region in the 1820's to trap beaver at lower elevations. John C. Fremont passed through the country east of the park in 1843 and again in 1846 when he managed to have his party of soldiers ambushed by Indians on the western side of Upper Klamath Lake.

Crater Lake was "discovered" on June 12, 1853, by John Wesley Hillman, a young prospector and member of a party on a futile search for a rumored "Lost Cabin Mine." He named it Deep Blue Lake, and reported his discovery when he returned to Jacksonville, a mining camp in the Rogue River Valley west of Medford. On October 21, 1862, Chauncey Nye "discovered" the lake while leading a party of prospectors from eastern Oregon to Jacksonville. He named it Blue Lake. In August 1865, two soldiers stationed at nearby Fort Klamath "discovered" the lake again. They named it Lake Majesty. Four years later, visitors from Jacksonville finally gave the lake the name which has stuck with it to this day.

There was no American settlement in the park's area until 1863, when the United States established Fort Klamath south of the park. The fort was manned entirely by the Oregon volunteers until after the Civil War, and

many of the soldiers became settlers after their military duty was completed. The Klamath and Modoc Indians made a treaty with the United States and the Klamath Indian Reservation was formed in 1864. In conjunction with the establishment of Fort Klamath, a road was built in 1863 and rebuilt in 1865 connecting it with Jacksonville. The road may have passed through the southern portions of the present park.

As settlers came in and settled around lakes and streams, they found that one part of the Modoc tribe was not at all content with living on a reservation. The band was led by Kientpoos, better known as Captain Jack, and in 1872 United States troops began the famous and bloody Modoc War by attempting to return Captain Jack and his followers to the reservation. With the end of the war, ranchers and cattlemen began to settle in the valleys east of the park.

The 1880's and 1890's saw the growth of towns. Fort Klamath, often called the most beautiful frontier post in America, was the social center of eastern Oregon. Large lumber companies became interested in the region's vast forests of ponderosa pine, Linkville became Klamath Falls, and the modern era was ushered in with the railroad to Klamath Falls in 1909.

For the most part, Crater Lake National Park is devoid of any significant cultural resources despite the colorful history of the region. In compliance with Section 106 of the National Historic Preservation Act of 1966 (80 Stat. 915), the National Register of Historic Places was consulted. The only property within the park which has been nominated

to the National Register is the Crater Lake Lodge, a concession facility located in the Rim Village.

The State Historic Preservation Officer for Oregon has been contacted concerning the historic resources of the park (see Appendix) and he confirmed that aside from the lodge building, there were no sites or properties within the park currently being considered for nomination to the National Register.

A survey in March of 1976 identified a number of structures which may be eligible for nomination to the National Register. These are recorded on the List of Classified Structures. To comply with Executive Order 11593, such surveys are required prior to the initiation of any construction or development in the park which may endanger undisclosed historic resources. These surveys are documented with base maps and assessments based upon professional examination to see if any sites appear to qualify for nomination to the National Register, and to make recommendations for further study if necessary to conserve and manage the historic resources of the park.

In the event that historic resources are disclosed after survey and during the implementation of any action within the park, that action will be halted pending professional examination and assessment in accordance with the Advisory Council's "Procedures for the Protection of Historic and Cultural Properties" (36 CFR Part 800) and National Park Service operating procedures and policy.

2. Archeological

An archeological survey of the park was completed by Oregon State University in 1963. No significant archeological sites were found within the park. The results of the survey were recorded by Dr. W. A. Davis in "Archeological Survey of Crater Lake National Park and Oregon Caves National Monument, Oregon" (Davis, 1964).

In the event that any archeological or paleontological resources are disclosed during the implementation of any action within the park, that action will be halted pending professional examination and assessment in accordance with the Advisory Council's "Procedures for the Protection of Historic and Cultural Properties" (36 CFR Part 800). In view of the paucity of artifacts and sites disclosed by the above-mentioned survey, such action will probably not be necessitated.

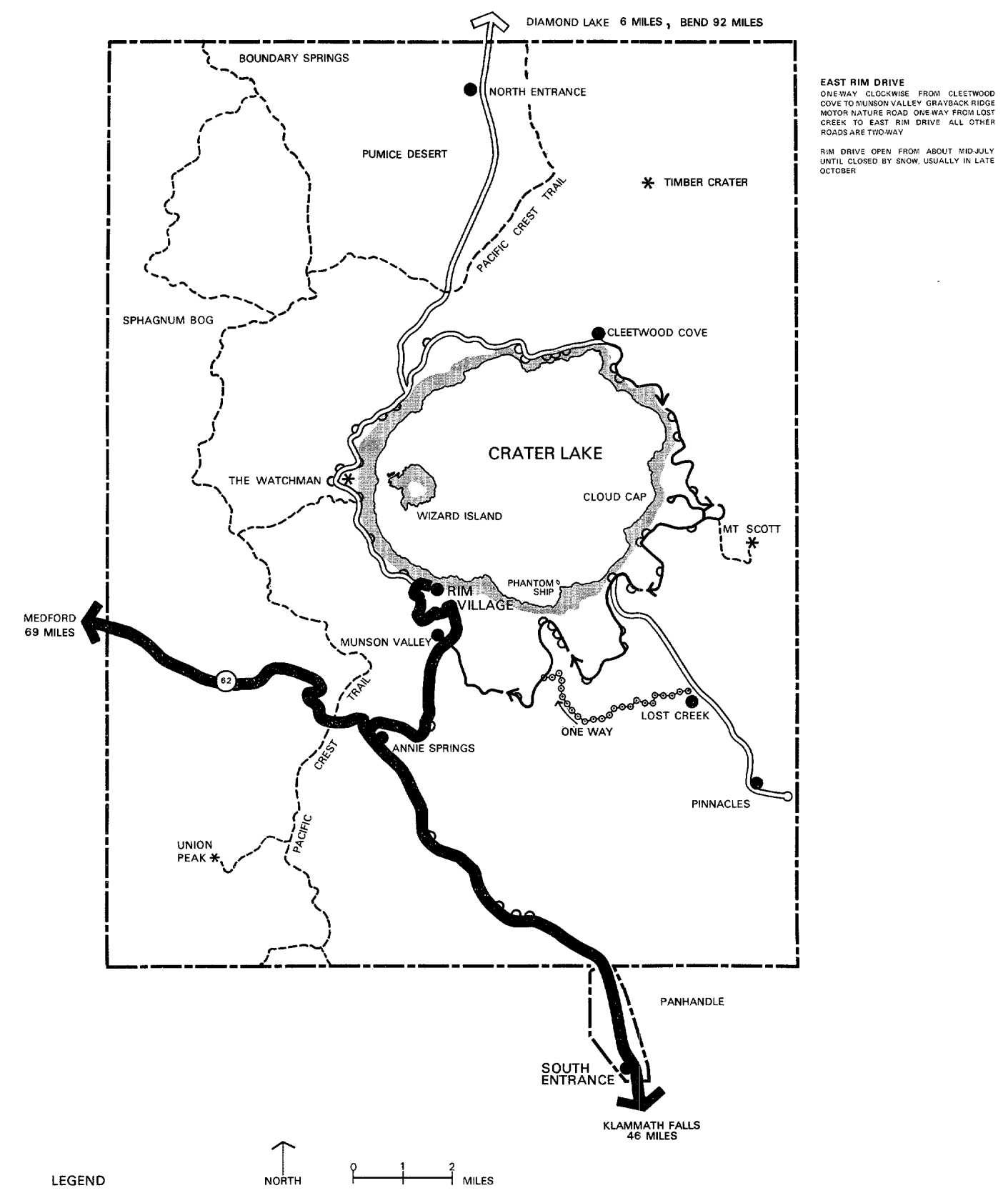
H. EXISTING DEVELOPMENT

Major developments at Crater Lake National Park are concentrated in three general areas: (1) Rim Village on the south rim of the caldera; (2) Munson Valley, about four miles south and 500 feet below the Rim Village area; and (3) the Annie Springs area near the junction of the West and South Entrance Roads. Minor developments are located around the caldera, along the approach roads, and in the Lost Creek area.

1. Visitor Use Facilities

a. Roads

The park road system consists of approximately 85 miles of paved roads,



EAST RIM DRIVE

ONE-WAY CLOCKWISE FROM CLEETWOOD COVE TO MUNSON VALLEY GRAYBACK RIDGE MOTOR NATURE ROAD ONE-WAY FROM LOST CREEK TO EAST RIM DRIVE ALL OTHER ROADS ARE TWO-WAY

RIM DRIVE OPEN FROM ABOUT MID-JULY UNTIL CLOSED BY SNOW, USUALLY IN LATE OCTOBER

ACCESS & CIRCULATION

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including the 32.6-mile Rim Drive. The four-mile-long unpaved Grayback Ridge Motor Nature Road provides the visitor with an interpretive drive offering exposure to the wide variety of natural resource experiences available in the park. In addition to parking at the main developed areas, there are 123 parking pullouts along the approach roads and at various points around the rim.

In past years, during the peak visitation periods in the summer, a one-way circulation system was implemented on portions of the Rim Drive. The changeover from one-way to two-way traffic required the changing of directional signs. Since the roads are striped for two-way traffic, the visitor became confused, even with numerous signs providing guidance. The present system of one-way and two-way roads was implemented in 1976.

During the winter, the Southeast and West Entrance Roads (State Highway 62), the park road to the Rim Village, and the roads in the Munson Valley residential areas are the only roads that remain open.

b. Trails

The park trail system of approximately 65 miles includes a 26-mile portion of the Pacific Crest Trail, utilizing for the most part former fire roads and trails. Other short but frequently used hiking trails are the 2.3-mile Mount Scott Trail, the 1.7-mile Garfield Peak Trail, the 0.8-mile trail to Watchman Peak, the Lake Trail leading 1.1 miles to Cleetwood Cove, the 1.5-mile Discovery Point Trail, the 1.2-mile trail to Wizard Island Crater, and the 0.5-mile Castle Crest Trail, which has been developed as a self-guided nature trail.

c. Picnic Areas

There are six designated picnic areas around the rim. These are provided with tables, waste receptacles, pit toilets, and parking for a total of 149 cars. A larger picnic area is available in the Rim Village, equipped with comfort stations, water, picnic tables, waste receptacles, and fire grilles. Three picnic areas are located along the south approach roads.

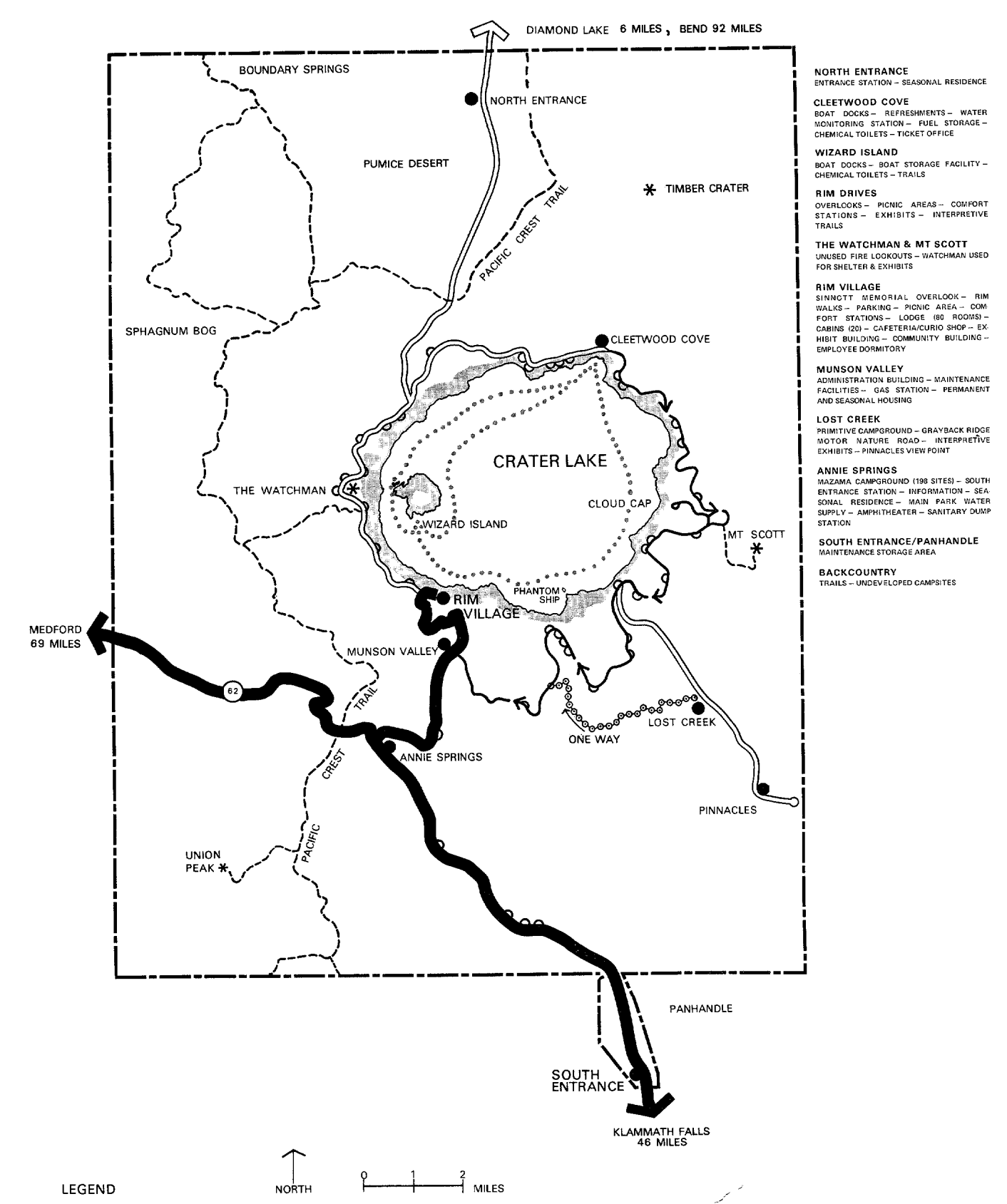
d. Campgrounds

Two campgrounds provide 210 campsites. The former Rim Village Campground has been converted to a day-use picnic area. Lost Creek Campground has 12 primitive campsites with water and a single toilet comfort station provided.

Mazama Campground, with 198 sites, is located just north of the south entrance in the Annie Springs area. There is a small, portable registration kiosk at the campground entrance. The sites are distributed around seven loops, each containing a modern comfort station. A sanitary dump station for recreation vehicles is located near the entrance to the campground. A 500-seat rear-screen projection amphitheater is used for evening interpretive programs.

e. Boat Tours

The concessioner owns and operates four 60-passenger tour launches, providing two-hour tours around the lake. Visitors may stop over on Wizard Island, taking a later boat back. The lakeshore terminus at



NORTH ENTRANCE
ENTRANCE STATION – SEASONAL RESIDENCE

CLEETWOOD COVE
BOAT DOCKS – REFRESHMENTS – WATER MONITORING STATION – FUEL STORAGE – CHEMICAL TOILETS – TICKET OFFICE

WIZARD ISLAND
BOAT DOCKS – BOAT STORAGE FACILITY – CHEMICAL TOILETS – TRAILS

RIM DRIVES
OVERLOOKS – PICNIC AREAS – COMFORT STATIONS – EXHIBITS – INTERPRETIVE TRAILS

THE WATCHMAN & MT SCOTT
UNUSED FIRE LOOKOUTS – WATCHMAN USED FOR SHELTER & EXHIBITS

RIM VILLAGE
SINNOTT MEMORIAL OVERLOOK – RIM WALKS – PARKING – PICNIC AREA – COMFORT STATIONS – LODGE (80 ROOMS) – CABINS (20) – CAFETERIA/CURIO SHOP – EXHIBIT BUILDING – COMMUNITY BUILDING – EMPLOYEE DORMITORY

MUNSON VALLEY
ADMINISTRATION BUILDING – MAINTENANCE FACILITIES – GAS STATION – PERMANENT AND SEASONAL HOUSING

LOST CREEK
PRIMITIVE CAMPGROUND – GRAYBACK RIDGE MOTOR NATURE ROAD – INTERPRETIVE EXHIBITS – PINNACLES VIEW POINT

ANNIE SPRINGS
MAZAMA CAMPGROUND (198 SITES) – SOUTH ENTRANCE STATION – INFORMATION – SEASONAL RESIDENCE – MAIN PARK WATER SUPPLY – AMPHITHEATER – SANITARY DUMP STATION

SOUTH ENTRANCE/PANHANDLE
MAINTENANCE STORAGE AREA

BACKCOUNTRY
TRAILS – UNDEVELOPED CAMPSITES

EXISTING DEVELOPMENT

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Cleetwood Cove contains a floating dock, small ticket sales stand, a manually operated gas pump and storage tank, and two chemical toilets. A USGS water gauging station is located a short distance west of the landing. There are no electrical, water, or sewage treatment facilities at Cleetwood Landing.

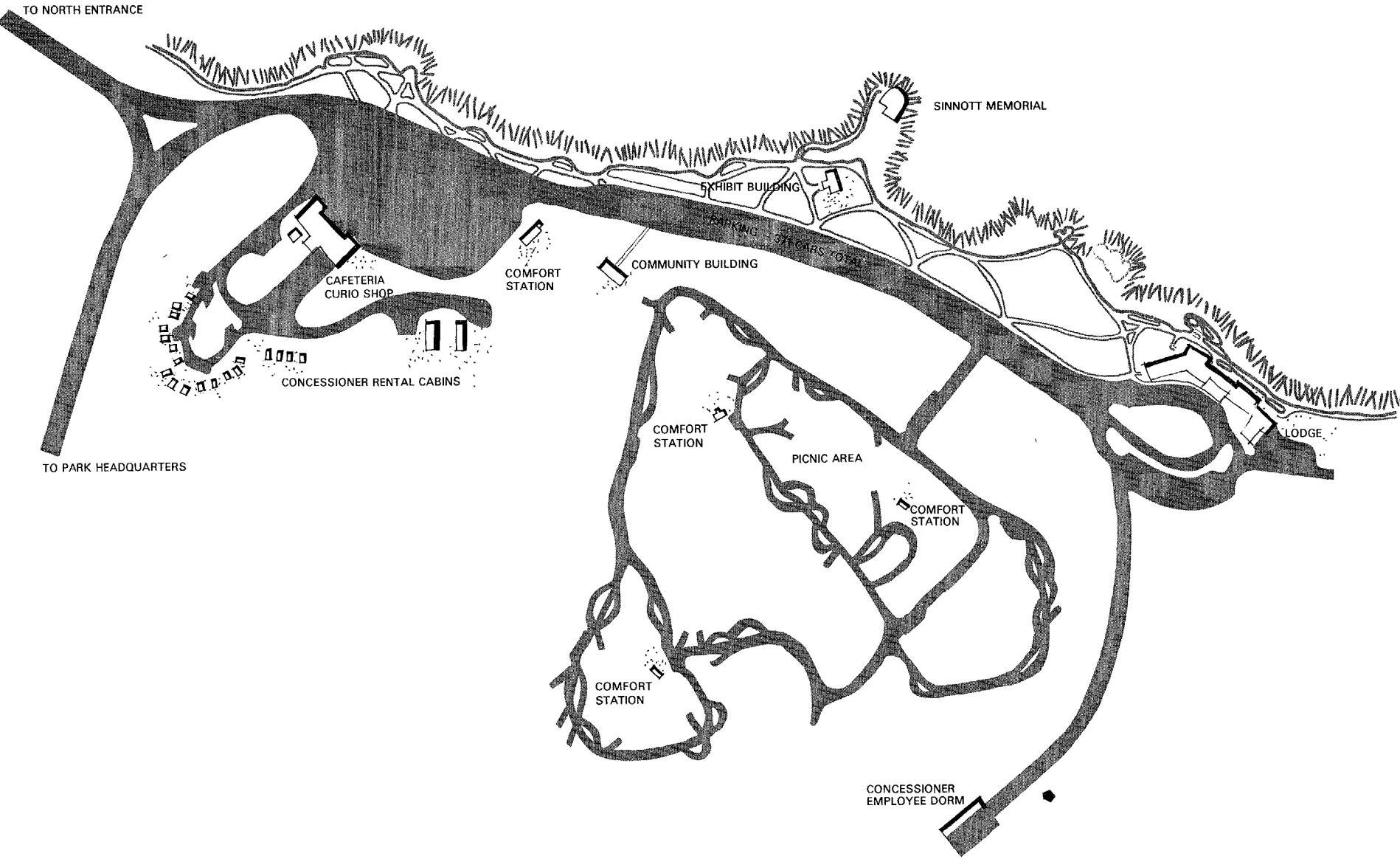
Development on Wizard Island is limited to a small boat landing, two concession-owned boat houses, two chemical toilets for visitor use, and the trail to the top of Wizard Crater. The four launches are stored in the boat houses and the floating docks are stored in a cove on the west side of the island during the winter. There are no utility systems on Wizard Island.

Parking, pit toilets, picnic tables, and a mobile refreshment stand are located at the Cleetwood Cove trailhead.

f. Rim Village

The major concentration of visitor-use facilities occurs in the Rim Village on the south rim of the caldera. The National Park Service operates the Sinnott Memorial, a stone structure on the caldera rim, where interpretive talks on the geology of the park are given; an exhibit building; a community building where indoor programs are held; the picnic area; and four comfort stations. Parking is provided for 371 cars adjacent to facilities and near the rim walkways.

Concessioner-operated facilities include the Crater Lake Lodge at the easternmost end of the developed area. The lodge has 80 operational



RIM VILLAGE
EXISTING CONDITIONS

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rooms housing a maximum of 180 overnight guests; the dining room, bar, lobby and lounge areas serve the general visitors as well as lodge guests. A gift shop occupies a corner of the lounge.

A large cafeteria and curio shop, located at the westernmost end of the developed area, is the most heavily used facility. Behind the cafeteria the concessioner operates 20 small cabins, 18 of which are cold-water units. There is a new (1973-1974) dormitory south of the lodge for concessioner employees. A portion of the third floor of the lodge is also used for employee quarters.

During the winter the cafeteria is the only facility in the Rim Village that remains open.

g. Munson Valley

The only visitor use facilities in Munson Valley are the small information counter in the park administration building, the post office, and the concessioner-operated service station, serving both the visitor and park employees. Self-service pumps are available in the winter for employees and for visitors on an emergency basis.

h. Other Facilities

The National Park Service operates two entrance stations - one near the north boundary on the North Entrance Road, and the other near Annie Springs just north of the West and South Entrance Roads junction. These entrance stations are kiosk-type temporary structures of wood frame and

glass construction, situated on a traffic island in the center of the road. While information is available at these entrance stations, the primary function is the collection of entrance fees.

A former fire lookout, a stone and wood structure situated atop The Watchman, serves as an interpretive and rest area.

There is a small comfort station at Kerr Notch, the only comfort station along the Rim Drive outside the Rim Village area.

Interpretive exhibits are located at various overlooks around the caldera and along the approach roads.

2. Management Facilities

a. Munson Valley

Currently, the hub of the National Park Service operation at Crater Lake is located at Munson Valley. The administration building houses the park's office and a small visitor information counter. Just west of the administration building is the Stone Housing area with nine employee residences, one three-unit apartment, one garage, and a ranger dormitory (used by the Youth Conservation Corps).

The park maintenance complex is located south of the administration building. It contains a warehouse, fire cache, gas house, three lumber/equipment sheds, a mechanics shop and vehicle storage building, and a large mess hall (used by the Youth Conservation Corps). The center of the maintenance area is asphalt-paved, providing parking and maneuvering

space for heavy equipment and other vehicles. Adjacent to and north of the maintenance area are a small transformer building and a paint storage building. A generator building is located north of the Steel Circle housing area.

South of the maintenance area, in an area known as Sleepy Hollow, are 14 small cottages used by seasonal employees during the summer months. A nine-car garage, used for storage, is also located at the lower end of the cottage area.

Eight trailer sites are situated south of the cottage area. Each site is provided with water, sewage and electrical connections. The trailer sites are available to summer seasonal employees who bring their own trailers and/or for NPS-provided trailers.

Across the main park road from the maintenance area is the Steel Circle employee housing area. Around Steel Circle are seven two-family, two-story housing units, one four-unit apartment building, a one-story seasonal quarters for concession employees, and a multi-purpose community building. All structures are of contemporary concrete block and frame construction.

b. Other Facilities

A large utility storage area is located a short distance inside the south boundary of the southern Panhandle of the park, just off the west side of the South Entrance Road. House trailers used in the park are stored here during the winter months. Various other construction equip-

ment and materials are also stored here for use in the park. There are no utilities in the area; a primary power line passes close to the site. The U.S. Geological Survey, in its open file report on the resources of Crater Lake, suggests that a deep well in the Panhandle would be a good risk as a water source. An intake on Annie Creek or a pipeline from Annie Springs are other water sources which have been suggested.

A small seasonal cabin is located near the South Entrance Station at Annie Springs, a wooden frame patrol cabin located east of Cleetwood Cove at an area known as the Wineglass, an unused fire lookout on top of Mount Scott, and a small cabin and pit toilet near the North Entrance Station are the only other significant structures located in the park.

3. Utilities

a. Water - Two small water systems serve minor developments in the park:

Lost Creek - spring-fed, treated, gravity water system to comfort station and faucets.

Kerr Notch - spring-fed, treated, gravity water system to comfort station and drinking fountain.

There are no water systems at the north entrance or the south entrance maintenance area.

The major developed areas - Rim Village, Munson Valley, and Mazama Campground - are supplied with water from Annie Springs. The former Rim Village-Munson Valley system, which became contaminated, has been replaced. Water is chlorinated and pumped to a storage reservoir above

the headquarters area and then distributed by gravity lines to facilities in Munson Valley. Water for Mazama Campground is pumped to a reservoir near Annie Springs and fed by gravity to the campground. To serve the Rim Village, water is pumped from Munson Valley to a storage tank on Garfield Peak east of the village and then is gravity-fed to the facilities. The water system is adequate to supply existing and proposed facilities.

b. Sewage Treatment

Small septic systems are located at Lost Creek Campground and the Kerr Notch comfort station. Pit toilets serve picnic areas around the rim and the north entrance cabin while chemical toilets are used at Cleetwood Cove and Wizard Island.

Lagoon systems providing primary and secondary treatment are located at Mazama Campground and Munson Valley. The lodge and dormitory in the Rim Village are connected by gravity sewer line to the Munson Valley lagoon system. All facilities in Munson Valley are connected to the lagoon system by gravity sewer lines.

The Rim Village cabins, cafeteria, and picnic area comfort stations are connected to a septic tank with leaching trenches located south of the cafeteria. This septic system and the Munson Valley lagoon system are operating at capacity while the Mazama Campground system is not, as it was designed to handle future expansion needs. Both the Rim Village and Munson Valley sewage treatment facilities are being improved to increase their capacity.

c. Solid Waste

During the summer solid waste is removed by commercial contract. During the winter the National Park Service collects solid waste and hauls it to a sanitary landfill near Klamath Falls. The concessioner reimburses the National Park Service for this winter service.

d. Power

Commercial power (21,000-volt overhead line) enters the park at the south entrance, paralleling the park road system to Annie Springs and Munson Valley. National Park Service-owned primary and secondary distribution in Mazama Campground, the Rim Village, and most of Munson Valley is underground. The Steel Circle area has overhead lines with underground service to individual residences. A 250 KW diesel generator in Munson Valley provides standby power. There is no power at the north entrance, Cleetwood Cove, Lost Creek, or the southern Panhandle. However, the primary line passes just west of the Panhandle maintenance area and power could be made available.

e. Telephone

Telephone service is by microwave from White City, Oregon, to a reflector on Garfield Peak and then to a receiver/transmitter located at park headquarters. Telephone switching equipment is located in the mess hall building in Munson Valley. Underground telephone lines connect the Rim Village, park headquarters, Munson Valley, and Mazama Campground.

f. Radio

The park operates a radio system from park headquarters with a solar-powered repeater located in The Watchman lookout. The repeater/antenna provides radio contact with remote facilities, vehicles, and personnel aboard boats on the lake.

I. EXISTING VISITOR USE

1. Visitor Characteristics

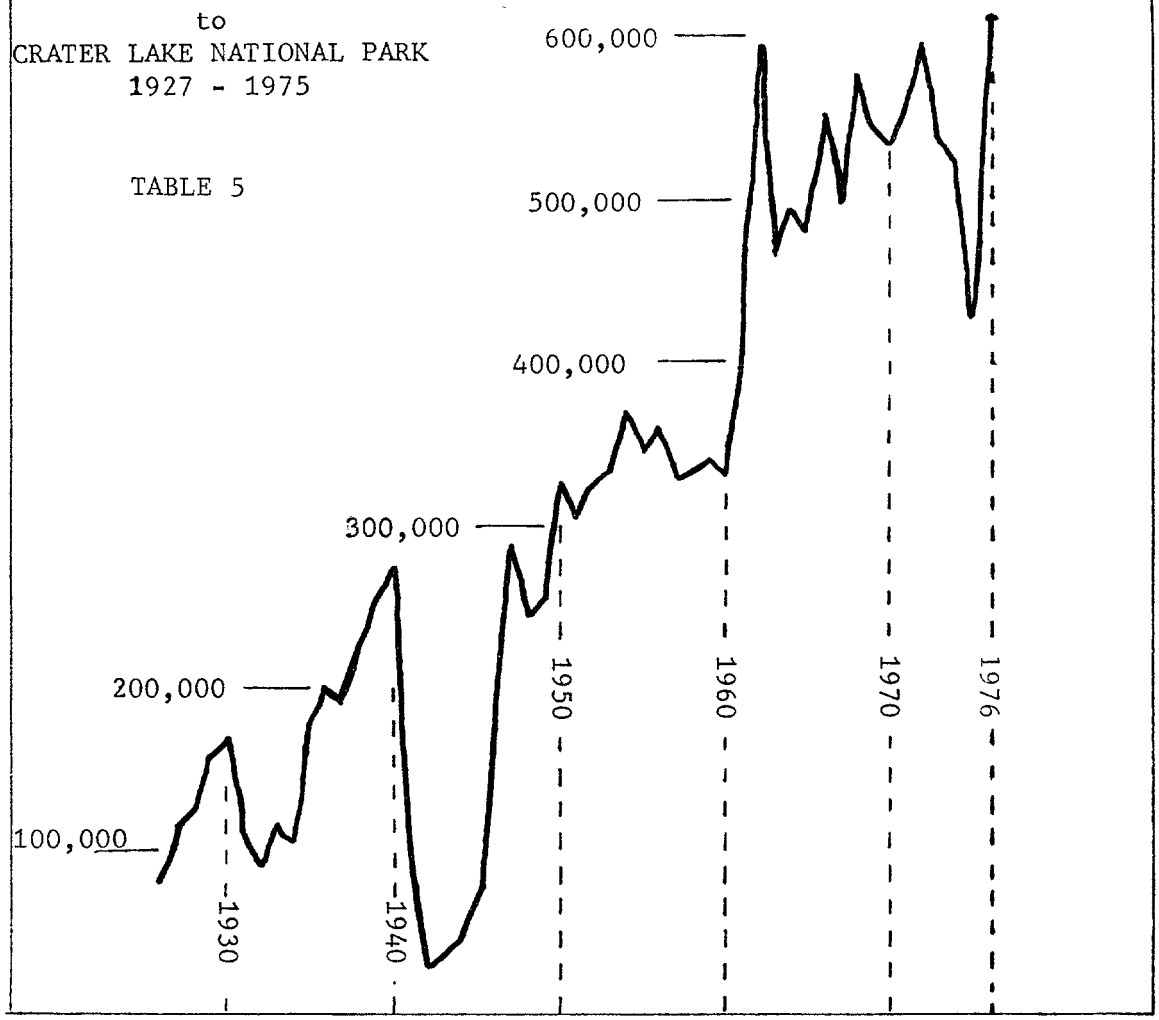
The average Pacific Coast vacationer visits most of the highlights of his trip within a ten-day period. Crater Lake National Park is an important part of many of these trips, but few regard it as a terminal destination, and once there, seeing the lake is sufficient for most visitors. Thus, the visitation to the park is concentrated between June 1 and September 15, and is predominantly day-use.

As shown in Table 5, park travel is steadily increasing despite fluctuations caused by prolonged winter snowpacks or, as occurred in 1975, a partial closure of the park prompted by sanitation problems.

During 1974, approximately 45 percent of the total summer visitors were from California, 26 percent from Oregon, 8 percent from Washington, and the remaining 21 percent from all other states combined. Eighty-five percent of the summer visitors remain in the park less than eight hours and 65 percent of these, or 56 percent of the total, remain in the park less than four hours. Seventy-five percent of the summer visitation occurs in the five hours between 10 o'clock in the morning and 3 o'clock in the afternoon.

ANNUAL VISITATION
to
CRATER LAKE NATIONAL PARK
1927 - 1975

TABLE 5



1927 - 81,155	1944 - 42,385	1961 - 415,567
1928 - 111,868	1945 - 77,864	1962 - 592,124
1929 - 127,146	1946 - 188,794	1963 - 475,684
1930 - 157,693	1947 - 289,681	1964 - 494,057
1931 - 170,284	1948 - 243,533	1965 - 480,478
1932 - 109,738	1949 - 255,610	1966 - 552,531
1933 - 90,512	1950 - 328,041	1967 - 499,357
1934 - 118,699	1951 - 306,668	1968 - 578,271
1935 - 107,701	1952 - 323,410	1969 - 544,932
1936 - 180,382	1953 - 332,835	1970 - 534,962
1937 - 202,403	1954 - 370,554	1971 - 557,958
1938 - 190,699	1955 - 343,839	1972 - 594,343
1939 - 225,101	1956 - 359,840	1973 - 539,527
1940 - 252,482	1957 - 330,499	1974 - 525,030
1941 - 273,564	1958 - 333,893	1975 - 427,252*
1942 - 100,079	1959 - 340,989	1976 - 606,636
1943 - 28,637	1960 - 330,398	

NOTE: 1927 through 1945 travel year ended in September.
* Low travel in 1975 due to closure of park for part of year

2. Automobile Sightseeing

This is the major activity of visitors to Crater Lake National Park. The Crater Rim Road is normally open by the first of July and offers the auto-borne visitor outstanding views of the lake. The park concessioner offers two-hour bus tours around the rim each day. Ample parking space exists at most of the 40 or more overlook points around the crater.

Visitors arrive at the park primarily through the south entrance in their own or rented vehicle, or by a concessioner-operated minibus from Klamath Falls. In general, park roadways are adequate for present traffic volumes, although congestion does occur at major overlooks along the West Rim Drive and in the Rim Village where conditions during peak periods are comparable to a busy suburban shopping center parking lot.

The present circulation system, implemented in 1976, allows the visitors a choice between the more direct route of the West Rim Drive and the longer, more leisurely East Rim Drive. The narrow (18 feet) West Rim Drive forces traffic to move at a relatively slow pace and, because nearly all the visitors use this road, there is some congestion at the various overlooks.

The one-way East Rim Drive provides a more leisurely pace for the visitors with more time available. These visitors may also take a side trip to the Pinnacles area and drive the Grayback Ridge Motor Nature Road.

The visitor use of picnic areas within the park is moderate and present facilities appear adequate to meet public demand.

3. Interpretive Programs and Facilities

a. Conducted Trips

Guided trips are scheduled daily to points of interest within the park. The 2.5-hour hike along the Garfield Peak trail begins at the exhibit building in Rim Village. Other walks and hikes are scheduled periodically. Naturalists accompany most scheduled concessioner-operated boat trips on Crater Lake. When naturalists are not present, the boat operators conduct the tour. The attendance on guided tours within the park and on the lake has doubled in the last 10 years.

b. Interpretive Programs

Nightly interpretive programs are given at Crater Lake Lodge and at Mazama Campground during the summer months. Short talks on the geology of Crater Lake National Park are given hourly at Sinnott Memorial during the summer. The facilities at the lodge are inadequate for interpretive programs and the space at Sinnott Memorial is generally inadequate for the number of visitors attempting to attend programs given there.

c. Attended Stations

The park has no visitor center. One room of a small photographic studio, a relic from an earlier era now called the exhibit building, is used as a contact station for the Rim Village area. Located some distance from the main parking area, the building is not readily visible to visitors arriving in the Rim Village. The Sinnott Memorial is manned as an

interpretive and observation station between the periodic geology talks and The Watchman fire lookout on the West Rim Drive is manned on a part-time basis. All of these facilities are overcrowded beyond their desired capacities and provide less than adequate individual services.

An information counter in the lobby of the headquarters administration building in Munson Valley is manned 16 hours a day during the summer and nine hours a day during the winter. General park information is also available at the park's two entrance stations.

d. Self-Guided Tours

The numerous interpretive markers and wayside exhibits along the Crater Rim Road create a 33-mile-long self-guided automobile tour which is quite effective in relating the geology of Crater Lake to the park visitor. A number of foot trails within the park are designed for self-guiding. They include the trail at Castle Crest Wildflower Garden near the park headquarters in Munson Valley, the Godfrey Glen Nature Trail near Mazama Campground, and the trail to The Watchman on the West Rim Drive.

The four-mile-long Grayback Ridge Motor Nature Road, east of the Rim Village, is self-guiding and displays the evolution of the surrounding landscape with excellent examples of glacial action and spectacular views of the Klamath Basin.

4. Lake Use

a. Boat Tours

Private boats and boating are prohibited on Crater Lake. The park concessioner maintains a four-boat fleet of 60-passenger launches. There are 10 trips of two-hour duration each day around the lake and one round trip to Wizard Island in the late afternoon which takes about 45 minutes. More than 500 people a day hike the 1.1 miles down the Cleetwood Cove Trail, as it is the only access to the lake's shore and to the docking facilities for the launch trips. The concessioner maintains facilities for docking and maintenance on Wizard Island.

b. Fishing

Fish are exotic in Crater Lake and within most of the park's streams. The fish population was planted and supplemented for many years by a stocking program. Only about one percent of the park visitors spend time fishing within the park, primarily in the lake but sometimes in the surrounding streams. Trout populations in the lake are decreasing, but kokanee salmon in the lake appear to be little affected by the light fishing pressures. Fish stocking programs have been discontinued in the park and it is expected that fishing will never become a major visitor activity.

5. Overnight Use

a. Lodging/Food Services

Lodge and cabin facilities operated by the park concessioner at Rim

Village are available from June 15 until shortly after Labor Day. These facilities can accommodate approximately 265 visitors for sleeping. The facilities are normally at capacity during July and August and demand often exceeds capacity during these months. The lodge dining room can seat 74 visitors for breakfast and dinner. The cafeteria/curio shop can seat 184 downstairs and 104 upstairs in its lounge; a small snack bar offers a limited carry-out menu. A mobile refreshment stand at Cleetwood Cove provides light snacks.

b. Camping

There are two campgrounds in the park. Mazama Campground is the largest with 198 sites, while Lost Creek Campground with only 12 sites provides more primitive camping in the eastern portion of the park. Mazama Campground is normally open by mid-June and the July and August demand for campsites is usually greater than the supply. Approximately half of the campers at Mazama are in recreation vehicles, a proportion which seems to be increasing. To meet this type of demand, a second campground designed for trailer campers was initiated a number of years ago at the Mazama Campground area. Water and sewer systems were installed, but are not now in operation.

6. Backcountry Use

About 85 percent of Crater Lake National Park can be considered as backcountry. Seventy-six percent of the total park (122,400 acres) has been proposed for preservation under the Wilderness Act of 1964. This hinter-

land receives relatively light use. During 1974 there were an estimated 1,422 overnight stays in the backcountry, 79 percent of which occurred during the period of June through September.

The light use of the park's backcountry is attributed to the immediacy and availability of many other scenic and primitive backcountry areas in the region; a lack of well-marked trail systems in the park; a general lack of water in the backcountry of the park; few trails leading into the park from outside areas; a lack of well-demarcated trailheads in the park; and primarily, to the heavy snowfall which remains on the trails well into the summer.

A 26-mile portion of the Pacific Crest National Scenic Trail, which runs from Mexico to Canada, transects Crater Lake National Park in a north-south direction. Approximately 65 miles of trails exist in the park, most of which utilize old fire roads. Because of recent shifts in trail alignment on National Forest lands north of the park, it has been necessary to relocate sections of the trail in the park as well. The changes have been accomplished by utilizing old truck roads along with about 4½ miles of newly constructed trails. With completion of the new route, more of the trail is actually on or near the crest of the Cascade range.

Though it receives only moderate use, the Pacific Crest Trail is the most heavily used trail in the park. An average of four to five horseback parties traverse the park on the Pacific Crest Trail each year. However, they seldom deviate from the trail and eventually move on to

areas outside the park, since a variety of scenic and primitive areas exist along the trail throughout the region.

Other popular hiking trails in the park backcountry include Lightning Springs Trail, the Boundary Springs-Sphagnum Bog Loop, and the Union Peak area.

Backcountry camping is concentrated at Stuart Falls, Lightning Springs, Bybee Creek, Oasis Spring, and Red Cone Spring. All major camping areas and trails are located on the west side of the park where water is most abundant. No campsite developments exist or are proposed for the backcountry.

7. Winter Use

Park visitation drops rapidly after Labor Day each year. Limited services and accommodations, including Mazama Campground, remain available until the first heavy snows in October. From October through July all roads in the park are closed except those from the south and west entrances, those in Rim Village, around the park headquarters and residence areas, and the road to Discovery Point.

Winter visitation consists mainly of local Oregon residents. The concessioner-operated cafeteria and curio shop is kept open daily and provides curios and light refreshments. In the past, to view the lake winter visitors had to climb steps cut in the snowbank in the Rim Village parking lot and walk across the snow to a roped-off viewing area. A culvert has been installed for the 1976-77 season as an experiment to provide a safe view of the lake for visitors.

As it is in the summer, sightseeing is the most popular visitor activity. The park receives light but steadily increasing use from cross-country skiers and snowshoers, with most of their activity being concentrated around the park headquarters and the Rim Village. Snow depths of up to 16 feet attract increasing numbers of snowmobilers into the park each winter and numerous snowmobiling opportunities exist at lower elevations when heavy snowfalls occur. The bulk of the snowmobiling typically takes place during weekends throughout the winter months. Winter snowmobile use in the park approximates the summer use of the backcountry, with about 1000 participants each year. Snowmobile use is restricted to the North Entrance Road, which remains unplowed throughout the winter months.

Seven alpine ski areas are located in the region and at least two more are being proposed. These areas seem to provide a sufficient outlet for this type of winter recreation and little public interest has been shown for alpine skiing within the park.

J. SOCIOECONOMIC FACTORS

1. Access

The principal access routes to the park within the region (see Figure 1) include Interstate 5 (a north-south route) to the west of the park in the Willamette Valley. East of the park, and paralleling the Cascades, is U.S. 97 across the high plateaus. Interstate 80 intersects the Cascades from the east and forms the northern regional boundary. All-

weather routes, State 62 in the south and State 230 in the west, lead directly into the park. State Route 138 enters the park from the north and is closed during the winter.

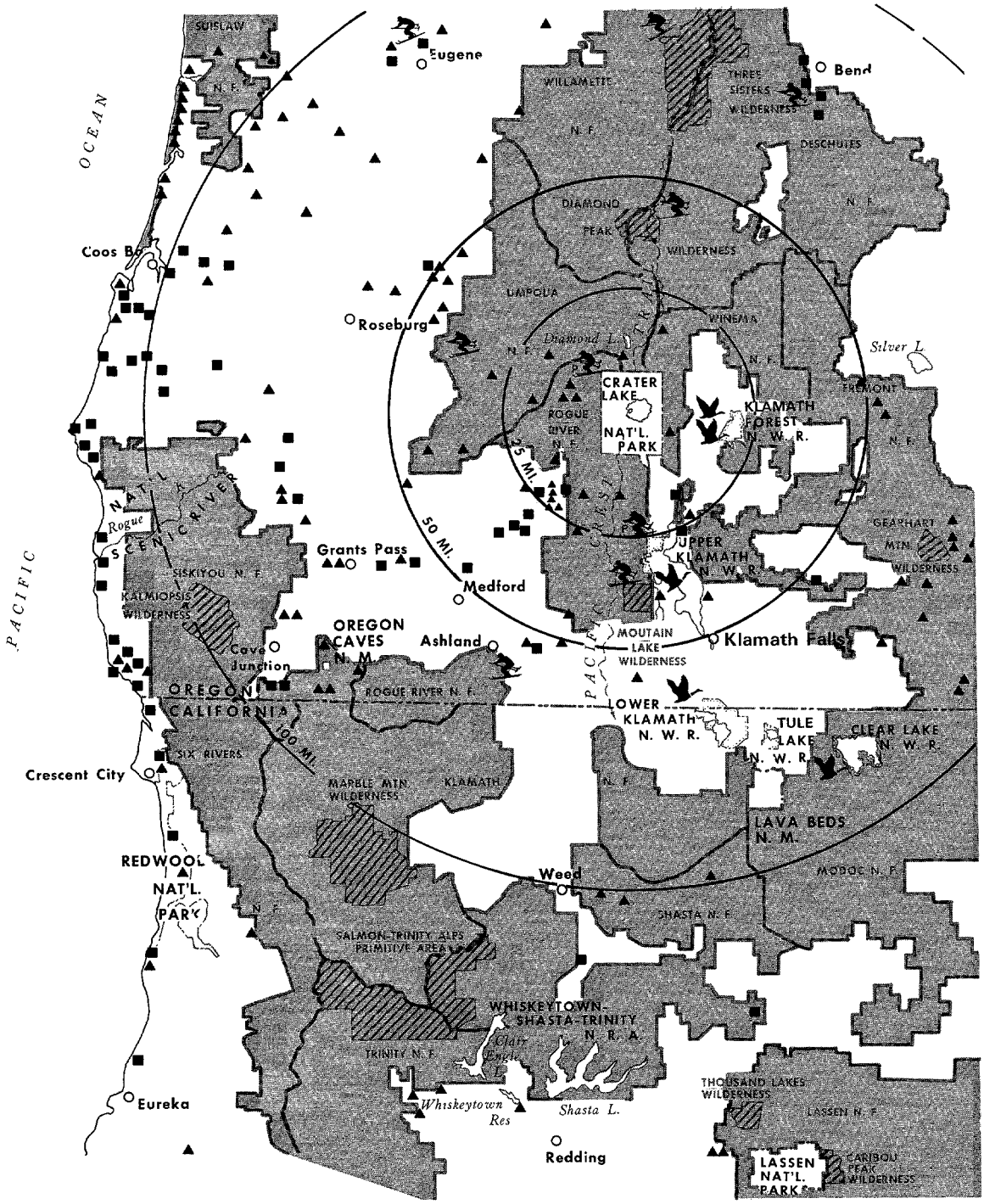
2. Regional Recreational Opportunities

Regional recreational opportunities abound in this section of the Pacific Northwest (see Figure 19). Within a 100-mile radius of the park there are 33 state parks and 64 private and state campgrounds with a total of about 3000 campsites. Other state and private resorts and motels maintain lodging facilities for nearly 13,000 overnight visitors.

A large dam/reservoir is under development approximately 30 miles southwest of the park. This development will presumably attract additional recreation users into the area.

The area contains some of the best migratory waterfowl hunting in North America on four National Wildlife Refuges, as well as excellent opportunities for both big and small game hunting. The Klamath Basin to the east of the park is on the Pacific Flyway and is a principal stopover for some 4 million ducks and geese each year. Over 100 mountain lakes and 80 streams within Klamath County alone offer fine trout fishing opportunities.

Upper Klamath Lake to the east of the park is the largest body of fresh water in Oregon and offers boating, fishing, waterfowl, and the chance to water-ski for over 30 miles in a straight line.



NORTH 0 14 28 MILES

LEGEND

- STATE PARK
- SKI AREA (EXISTING)
- SKI AREA (POTENTIAL)
- CAMPGROUND . PRIVATE & STATE
  (ONLY MAJOR FOREST SERVICE CAMPGROUNDS ARE SHOWN)
- WILDLIFE REFUGE

REGIONAL RECREATION OPPORTUNITIES

CRATER LAKE NATIONAL PARK / OREGON

UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

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DSC | OCT 76

Crater Lake National Park is surrounded by three national forests, and the forest land immediately southwest of the park is currently being administered as a primitive area. The feasibility of extending the Upper Rogue River Trail is being explored by the U.S. Forest Service and the State of Oregon. The final trail system will ultimately link the Pacific Ocean coast with the Cascade Mountains and Crater Lake, and act as a feeder trail to the Pacific Crest National Scenic Trail, which passes through the park.

Wilderness areas also offer a variety of regional recreational opportunities. Thirty miles south of the park is the 23,071-acre Mountain Lakes Wilderness Area, located in the Winema National Forest. Diamond Peak Wilderness Area (35,440 acres) lies 30 miles north of the park in Willamette and Deschutes National Forests. The 18,709-acre Gearhart Mountain Wilderness Area lies 75 miles southeast of the park in the Fremont National Forest and a 76,900-acre Kalmiopsis Wilderness Area in the Siskiyou National Forest lies 100 miles southwest of the park. The 107,900-acre Sky Lakes study zone, in the Rogue River and Winema National Forests, lies directly south of the park. The northern two-thirds of the study zone are to be retained as a limited-use area with the northern portion of that area to be considered for inclusion into the National Wilderness Preservation System.

3. Regional Population and Economic Structure

Crater Lake National Park is in Klamath County and adjacent to Jackson and Douglas Counties. Most lands proximal to the park are Federally

owned by the U.S. Forest Service or are part of Indian reservations.

Approximately 220,000 people live in the tri-county region and are divided nearly equally between rural populations and people living in urban centers with populations greater than 2,500. Forty percent of the population lives in the five urbanized areas listed in Table 6. Demographic profiles for Klamath and Douglas Counties differ significantly from Jackson County because the latter contains the region's largest city, Medford. Population densities are low for Klamath and Douglas Counties, with 8 and 14 persons per square mile, while Jackson County averages 34 persons per square mile. This latter density is at an intermediate level between Oregon and the nation (see Table 8).

Klamath and Douglas Counties grew at a 5 percent rate of population increase between 1960 and 1970. Klamath County grew at a rate of 7 percent between 1970 and 1974. Jackson County grew at a rate of 28 percent for the period 1960 to 1970, which is higher than the national or state rates of population increase.

The economic profiles for all three counties are similar. The 1970 statistics for unemployment indicate the counties had a higher rate than the nation or the state. Jackson and Douglas Counties had unemployment rates of nearly 9 percent, while Klamath County had a 6.9 percent unemployment rate.

The median family income for the three counties was comparatively low and the distribution of family income was more heavily skewed toward low-middle income brackets than either Oregon's profile or the national

TABLE 6

TRI-COUNTY COMMUNITIES WITH 5,000 OR MORE INHABITANTS - 1970*

URBANIZED AREA	COUNTY	1960 POPULATION	1970 POPULATION	% CHANGE
Altamount	Klamath	10,811	15,746	+45.6
Ashland	Jackson	9,119	12,342	+35.3
Klamath Falls	Klamath	16,949	15,775	- 6.9
Medford	Jackson	24,425	28,454	+16.5
Roseburg	Douglas	11,467	14,461	+26.1

* From "County and City Data Book" 1972. U.S. Department of Commerce, Bureau of the Census, U.S. Government Printing Office, Washington, D.C.

TABLE 7

LAND USE CRATER LAKE NATIONAL PARK REGION
KLAMATH, JACKSON & DOUGLAS COUNTIES
PERCENTAGE OF TOTAL LAND USE IN 4 CATEGORIES*

COUNTY	URBAN	AGRICULTURE	FORESTS	GRAZING
Klamath	.35	7.34	70.39	15.48
Jackson	.29	7.86	87.85	3.79
Douglas	.27	4.38	86.35	8.71
State of Oregon	.49	6.52	44.84	41.50

* Resources for Development, Oregon Department of Planning & Development, March 1969.

TABLE 8

SOCIOECONOMIC CHARACTERISTICS*

VARIABLE	NATION	OREGON	KLAMATH	DOUGLAS	JACKSON
1970 Population	203,212,877	2,091,385	50,021	71,743	94,533
% Change 1960 to 1970	13.3	18.3	5.4	4.8	27.8
Net Migration % Change 1960 to 1970	1.7	9.0	-7.1	-7.3	19.7
Population per square mile	57	22	8	14	34
% Urban	73.5	67.1	63.1	34.3	55.3
% Rural Non-Farm	22.4	26.5	29.3	56.3	36.3
% Farm	4.0	6.4	7.6	9.4	6.4
Median Family Income	9586	9487	8645	8572	8670
1969 Family Income					
% less $3000	10.3	9.2	9.7	11.7	11.1
% 3000 to 4,999	10.0	9.9	12.9	9.6	12.3
% 5,000 to 6,999	11.9	11.8	14.4	13.7	13.7
% 7,000 to 9,999	20.9	22.9	23.6	25.7	24.2
% 10,000 to 14,999	26.6	28.2	24.6	25.5	25.4
% 15,000 to 24,999	16.6	14.2	12.1	11.3	10.4
% above 25,000	4.6	3.8	2.6	1.2	2.9
1970 Unemployment Rate	4.4	7.0	6.9	8.9	8.8

* City & County Data Book 1972, U.S. Department of Commerce, Bureau of the Census

income distribution. Although this data is somewhat dated and care should be taken in the interpretation of raw income data, they do serve as relatively good indications of current economic trends in the region.

The economic structure of the region is largely tied to its resource base, forested land being the dominant land use, with the percentage of land devoted to forests ranging from 70 percent for Klamath County to 87 percent for Jackson and Douglas Counties. The commercially important species are Douglas fir in Jackson and Douglas Counties and ponderosa pine in Klamath County.

An economic base analysis was developed from census data that demonstrates the heavy dependence on forest products. In this model exports from the region are viewed as the fundamental determinants of all economic activity, since they generate flows of income into the regional economy. The relative importance of each industrial sector is measured in terms of the employment that exceeds the needs for the production of the goods and services required for consumption within the region. Table 9 demonstrates that about 65 percent of the export employment for the three counties originates in the furniture/lumber section. Klamath County's forest products industry alone has 4,000 employees and a payroll of 46 million dollars.

Other important industries include the agricultural section and the retail trade sector, with 15 percent and 13 percent of the export employment respectively. Any general economic problems that may become manifest

TABLE 9

ECONOMIC BASE - KLAMATH, JACKSON, AND DOUGLAS COUNTIES, OREGON*

SECTOR	LOCATION QUOTIENT	ACTUAL EMPLOY.	EXPORT EMPLOY	PERCENT OF EXPORT EMPLOY	SERVICE EMPLOY
Agriculture	2748	5630	2882	14.707 %	2748
Mining	610	230	0	0	263
Construction	4423	4042	0	0	4042
Furniture, Lumber	947	13520	12573	64.161	947
Primary Metal	1172	306	0	0	306
Fabricated Metal	142	306	164	0.838	142
Machinery	1926	404	0	0	404
Electrical Mach.	1842	164	0	0	164
Motor Vehicles	2069	218	0	0	218
Other Durables	1986	877	0	0	877
Non-Durable Manuf.	7832	1972	0	0	1972
Transportation	5017	4677	0	0	4677
Wholesale Trade	3031	2899	0	0	2899
Retail Trade	10873	13497	2624	13.390	10873
Finance	3713	2747	0	0	2747
Business Services	2317	1844	0	0	1844
Personal Services	3421	3520	99	0.504	3421
Entertainment	611	594	0	0	594
Professional	11945	13199	1254	6.399	11945
Public Admin.	4065	3390	0	0	3390
Total		74,057	19,596	100 %	544,61

* From "General Social and Economic Characteristics 1970" U. S. Department of Commerce, Bureau of the Census.

in the region will be greater magnified due to the relatively high dependence upon a single resource industry.

The agricultural sector is the second major export industry for the three counties. But the export employment of 15 percent is substantially less than that found in the furniture/lumber sector. Also, the percentage of land devoted to agriculture is relatively low, ranging from 4 to 8 percent for the three counties (see Table 7). Major crops in the region include wheat, barley, hay, potatoes, and onions. Apple and pear orchards represent important commodities in the Medford area. Cattle and sheep ranching are important activities in the Klamath and Tule Lake basins.

The retail trade sector is the last major export employer. Included in this sector are such industries as tourism and recreation-related activities. There is an abundance of private state and Federal facilities which promote camping, fishing, and hiking in the region. National forests contiguous to Crater Lake (Rogue River, Umpqua, and Winema) provide a wealth of recreation opportunities. For the three national forests an aggregate of available camping facilities includes 950 trailer sites and 400 tent sites. Lodging within a 20-mile radius of the park consists of 168 motel units and 16 cabins. Lodging is best characterized as cottage industries and none are franchised. The one major development at Diamond Lake has 84 units and camping services. Most of the lodging appears to be resort-type and therefore may not cater to transient accommodations. However, overnight accommodations are well developed in

TABLE 10

EMPLOYMENT BY MAIN INDUSTRIAL SECTOR (1970)*

INDUSTRY	KLAMATH COUNTY		JACKSON COUNTY		DOUGLAS COUNTY	
	People	%	People	%	People	%
Agriculture Forestry, & Fisheries	1621	10	2597	8	1341	6
Manufacturing (Furniture, lumber, and Wood Products)**	3089	18	4110	13	6321	26
Manufacturing (other)	582	3	1890	5	1763	8
Transportation, Communications, Public Services	1609	9	1922	6	1146	5
Wholesale Trade	685	4	1674	5	540	2
Retail Trade	3365	19	6315	19	3817	16
Financial	510	3	1473	5	764	3
Services	3734	21	8777	30	5526	23
Professional	1254	7	1959	6	1297	5
Total Employed (16 or older)	17,460		32,513		24,083	

* County and City Data Book, 1972. U.S. Department of Commerce, Bureau of the Census, U.S. Government Printing Office, Washington, D.C.

** General Social and Economic Characteristics: Oregon, 1970

the major urban centers of the region. Approximately 1000 motel units are available in Klamath Falls and almost 2000 units in the Medford/ Ashland area.

Agriculture is the second most important industry in the region. However, the proportion of land in agriculture is relatively small when compared to state or national averages (see Table 7). In addition, land is being taken out of agriculture and put to other purposes more rapidly in this tri-county area than in the state or nation as a whole.

Klamath County's agricultural valleys are Oregon's top cash value producers of alfalfa, cattle, and potatoes and rank second in the value of barley produced. In 1974, 44,000 acres of alfalfa produced income of $8,390,000; 8,500 acres of potatoes produced 13,000 carloads worth $10,800,000; and 24,000 acres of barley produced a crop worth $3,823,000. In recent years, Klamath Basin agricultural sales have regularly exceeded 52 million dollars. Wheat and onions are also important cash crops, and in the Medford area southwest of the park, apple and pear orchards produce significant crops.

Regional terrain and soils are generally suitable for these crops; however, rainfall is normally insufficient during the growing season and irrigation waters maintain the agricultural products of the region at a far higher level than that otherwise possible. Klamath County alone has 198,100 acres in irrigated farmland and 120,000 acres in irrigated pastureland. Cattle and sheep ranching are important economic activities in the Klamath and Tule Lake basins.

Tourism and recreation-oriented activities are important secondary industries in the region. There is an abundance of private and state facilities which promote camping, fishing, and hiking (see recreation opportunities map, Figure 16). Federal recreation facilities also are extremely abundant in the area. National forests contiguous with the park (Rogue River, Umpqua, and Winema) provide facilities and permits for boating, picnicking, hunting, hiking, camping, horseback riding, swimming, and snowmobiling. The Lost Creek Dam Recreation Area, located southwest of the park, is currently being developed by the U.S. Corps of Engineers. The area is scheduled for completion in 1977, and will provide 300 overnight campsites for public use as well as boating and fishing facilities.

Seven miles north of the park, in the Umpqua National Forest, is the Diamond Lake resort area. In the vicinity of the lake there are 535 campsites, 400 overnight units, and a trailer park with 114 sites. The area offers summer camping, picnicking, horseback riding, hiking, swimming, boating, fishing, bicycle riding, nature study programs, and during the winter there is cross-country skiing, snowshoeing, and snowmobiling.

K. PROBABLE FUTURE OF THE ENVIRONMENT WITHOUT THE PROPOSAL

Without implementation of the Visitor Use and General Development plans, the involved areas in the park would not undergo any drastic or immediate change, but would continue along the trends of the past few years. As visitation increases, congested areas will become even more crowded and

the visitor experience will continue to deteriorate. Interpretive and orientation services will continue to be inadequate in meeting visitor needs.

The West Rim Drive and North Entrance Road will remain hazardously narrow. Winter viewing of the lake will remain hazardous or inconvenient to individuals desiring that experience.

Employee housing, both seasonal and permanent, would remain expensive to operate and maintain. Obsolete facilities would remain in use, affecting employee morale and requiring considerable expenditure of funds for maintenance and operation. Both winter and backcountry use by park visitors will remain low, and most visitors will continue the pattern of seeing the lake and then moving on to other scenic points of their vacation.

III. ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION

Many of the environmental impacts implied by specific actions proposed in the General Development Plan for Crater Lake National Park are readily apparent. However, the impacts generated in the Visitor Use Plan for the park are seen far less acutely and may be far removed in time from the inception of the action which generates them.

A. IMPACT ON NATURAL RESOURCES

1. Earth Resources

The razing activities associated with the alteration, removal, obliteration, or other restructuring of developments within the park, and those activities associated with construction and renovation, will generally cause soils to be compacted or disturbed and cause changes in minor drainage patterns. These effects will be especially severe at the locus of activity and diminish rapidly in peripheral areas.

About 10-14 acres of presently developed land and 2 acres of partially disturbed land will be impacted in the Rim Village area by the proposed actions. The removal of structures, roads, and parking areas will be followed by a program of scarification, revegetation, and landscaping. New facilities will generally be constructed in presently developed areas. Approximately 2 acres of partially disturbed land will be required for the new lodge access road. Approximately 8-12 acres of presently developed land will be returned to a more natural state. The total of land to be affected by changes varies because the extent of road removal and site restoration in the picnic area has not been determined.

The reconstruction of the West Rim Drive to a 20-foot standard will terminally disturb the rock formations and soil within the widened roadway. Extra rock and soil material will have to be removed in some cuts where unstable rock dips toward the road surface. Minor and temporary increases in erosion and siltation rates and compaction of the soils at the road shoulder can be expected to accompany road construction activities.

The fine-grained, low-density material in the volcanic soils of the park is easily whipped into the air by winds. The rapid passage of vehicles used on construction jobs within the park may aggravate wind deflation along the roadside, especially in such areas as the Pumice Desert.

Construction of new housing and replacement of obsolete housing in Munson Valley and Annie Springs will occur on already disturbed sites. However, the new housing units may occupy a larger area than present units, thus enlarging the area of disturbance. Soil disruption and compaction can be expected from construction activities throughout the site. The improved facilities may require additional utilities which will result in trenching activities within and outside the development area.

Removal of obsolete maintenance structures in Munson Valley will allow a small area of land to be restored to more natural conditions. Construction of storage facilities in the Panhandle, while generally on presently disturbed land, may encroach on undisturbed areas, resulting in increased soil disruption and compaction.

Site clearing and road construction to expand the Lost Creek Campground to 25 sites will cause soil disturbance and compaction within a total area of 9 to 10 acres. Visitor use of the new campground will also cause some soil compaction and disturbance connected with camping activities and short hikes of exploration.

The Mazama Campground expansion will occur along an old highway alignment, an area of 12 to 15 acres. The campground expansion for tent camping should have minor impacts on the soil from disturbance and compaction near the tent sites and severe impact at each site and along trails connecting it with parking and the concession developments. The proposed concession development (camper service building) would have severe impacts on the soils in the construction site. Water, power, sewer, and telephone lines are already located in the immediate vicinity of the campground expansion and the potential concession development; however, additional trenching for connecting utilities would have severe, but localized, impacts upon the soils and the minor drainages in the area.

Development of the north entrance seasonal housing area and an information/orientation facility would have severe impacts due to soil compaction and disturbance in the construction sites. Development of a water collection/distribution system and a sewage system would have severe, but localized, impacts upon the soils and the minor drainages in the area. An additional 2-4 acres will be affected by the new development.

Minor impacts from soil compaction and disturbance can be expected throughout the park where small projects, such as emplacing wayside

exhibits, improving turnouts and overlooks, and trail construction, are done. However, these actions are more in the nature and scope of normal maintenance activities and should have no major effect upon the earth resources of the park.

As stated in the Description of the Environment, there are no valid mineral claims or leases extant within Crater Lake National Park. No valuable mineral deposits, metallic or nonmetallic, are known to exist within the park, and the proposed actions will not affect such resources should they exist. Geothermal energy may potentially be present within the boundaries of the park, but this possibility has yet to be thoroughly explored.

2. Biotic Resources

The razing activities associated with the proposed alteration, removal, obliteration and other restructuring of developments within the park, and those proposed actions involving construction and renovation, will destroy and/or disturb portions of the park's vegetation, animal habitat, and animal life. Construction or obliteration sites will be scalped of vegetation and the movement of men and equipment will disturb and destroy vegetation and wildlife on the periphery of the sites. The effects of the proposed actions upon vegetation and wildlife will be most severe at the locus of activity and diminish rapidly away from it. The effects upon animal habits and social behavior will reach further from the site of proposed action than will the effects upon vegetation.

The soil compaction and disturbance impacts mentioned above under Earth Resources will be interlinked with, and followed by, impacts upon vegetation and wildlife. Minor drainage changes and excessive snow loads from snowplowing activities will also affect vegetation growth and density.

The hemlock forest will be impacted in the Rim Village and at Munson Valley by the proposed actions. Other ecosystems affected by the General Development Plan's proposals will be the lodgepole pine forest at the north entrance and Lost Creek Campground, lodgepole pine and Shasta red fir in the Annie Springs-Mazama Campground area, the Pumice Desert along the North Entrance Road, and the ponderosa pine in the Panhandle area. In all of these areas the natural ecosystems have been disturbed and altered to some degree by the presence and actions of man. No species of rare, endangered, or threatened plant or animal are known to be in any area to be disrupted by proposed actions. No habitat critical to the continued existence of such species is known to be part of any area to be disturbed by the proposed actions. None of the proposed actions will affect the ecosystems in any of the fragile areas described in the section on Biotic Resources.

Once buildings, parking areas, and access roads are removed from the Rim Village, approximately 8 acres of land will be available for scarification, revegetation, and landscaping so that the rim may be restored to a more natural-appearing setting. Construction of new housing and replacement of obsolete housing in Munson Valley and Annie Springs will

require minimal removal of vegetation since the sites are presently disturbed due to past construction activities and continuing use.

The Mazama Campground expansion will occur along an old highway right-of-way and affect vegetation over an area of approximately 12 to 15 acres. The proposed camper services structure would be in a partially impacted area near the campground entrance, affecting less than one acre of vegetation. The developments and their associated visitor use would both cause wildlife disturbances, especially in the small mammal populations.

Foot trails and access roads connecting the potential camper services structure with Mazama Campground and the campground expansion would destroy small areas of ground cover vegetation. Water, power, sewer, and telephone lines are already located in the immediate area but would have to be extended to the individual structures. This would cause some additional, but minor, impact on wildlife and vegetation lying outside of the actual construction sites.

Site clearing and road construction to expand the Lost Creek Campground to 25 sites will cause vegetation removal and disturbance on a minor scale within the 9 to 10 acres of the campground. Visitor use of the campground will cause additional disruption to small mammal populations, and the normal movement of people engaged in camping and short hikes of exploration will disturb vegetation and plant distribution. Because of the low number of sites and users, these impacts should be relatively minor.

Site clearing, road and parking area construction, and utility systems construction at the north entrance will require substantial vegetation removal and disturbance along with the loss of wildlife habitat. A portion of the area where the seasonal cabin is located has already been disturbed. Depending upon the design of the proposed facilities, an additional 2-4 acres will be disturbed.

Road-widening construction activities on the West Rim Drive and on the North Entrance Road will destroy vegetation and disrupt wildlife populations within the road prism and along the road shoulders for approximately 14 miles. Stabilization along the roadside through the Pumice Desert may have a minor deleterious effect on vegetation. This should be offset by the positive effect of reducing erosion through deflation.

The impacts of visitor use along park roadways and at overlooks and wayside exhibits will increase slowly as visitation increases. Similarly, the minor impacts on vegetation and wildlife caused by winter use of the park will increase with increased use.

3. Environmental Quality

Disturbances from construction, razing, and related activities in the proposed actions will cause a degradation in the environmental quality of Crater Lake National Park and impinge directly on the quality of the visitor's experience during the lifetime of the projects. All of the impacts are of a short-term or temporary nature in any one location. However, the short snow-free construction season forces such activities to be most intense during the primary visitation period for the park.

It also causes projects to be lengthened through several summer seasons. It is thus likely that some form of environmental quality degradation will be going on from these activities somewhere in the park during any summer for the next 25 to 30 years.

a. Water Quality

The removal, alteration, and construction of facilities will cause increased rates of erosion at, and close to, the sites of activity. As water from snowmelt and rainfall sinks rapidly into the porous volcanic and glacial debris soils of the area, there should be little siltation from this slight and temporary increase in the erosion rate. The construction of replacement housing and the removal of obsolete structures in Munson Valley, and the expansion of Lost Creek and Mazama campgrounds should have no effect on perennial streams as the terrain is nearly level at the project sites and more than 1,000 feet from the streams.

Dust raised by construction and obliteration activities in the Rim Village area and along the West Rim Drive may be blown into the caldera and cause a slight temporary increase in the turbidity and siltation of Crater Lake.

Where roads and parking areas are relocated there will be minor and permanent dislocation of small-scale drainage patterns. Temporary increases in erosion and siltation rates on a local scale can be expected from reconstruction activities along the West Rim Drive. Culverts carrying runoff from the roadway may, in some instances, create permanent dislocation of small-scale drainage patterns. Unnatural snowloads

created by snowplowing will be relocated along with the relocation of the parking lots and roadways. There will thus be a change in location of the excess runoff from this source.

Storm drains provided to protect park facilities from excessive runoff will be placed so as to distribute rather than channelize water, and will drain away from the caldera. This will have the effect of reducing erosion and siltation from such runoff and improve water quality within the lake and the perennial streams of the park.

b. Visitor Experience

The noise generated from construction or obliteration activities is localized, but it is still quite disturbing and out of place in a natural setting to those in the vicinity. Dust and smoke abatement activities are never 100 percent effective, and localized air pollution will certainly occur at construction sites. Spent fuel emissions from construction equipment will add contaminants to the air and cause visual pollution as well. Visual aesthetics will be further impaired by construction, obliteration, and restoration activities and by the litter associated with these activities. Sites being worked on will have a scalped and raw appearance until natural or assisted vegetation covers them. Small amounts of vegetation and soils will show obvious damage to the park visitor where the movement of vehicles and individuals has impacted them.

Heavy slow-moving construction equipment will be on the park roadways at various times during the short construction season. This season coincides

with the periods of heaviest visitor travel to the park. Such movement will cause traffic congestion and concomitant irritation for the entrapped park visitor. Road construction on the West Rim Drive and on the North Entrance Road will cause road closures and exacerbate roadway congestion on the East Rim Drive and in the Rim Village.

The congestion along the rim caused by large numbers of automobiles in the Rim Village will be reduced by returning a large portion of this area to a pedestrian-oriented, lake-viewing, interpretive use. The noise and air pollution associated with automobiles at the Rim Village will be severely curtailed by the proposed actions. Minor air, water, and noise pollution will continue on Crater Lake from the boat tours. The boats are a visual intrusion to some park visitors but provide a sense of scale to others, making their contribution to aesthetic degration somewhat moot.

B. IMPACT ON CULTURAL RESOURCES

Despite historic and archeological surveys within the park, the proposed actions could have an effect on cultural resources which as yet have not been identified. The historic and archeological background of the park indicates that these resources are not numerous and the chance of uncovering new ones by accident is slight.

The continued use of Crater Lake Lodge will require periodic maintenance and refurbishing to retain the lodge as a first-class lodging facility. Compliance with codes to provide for the health and safety of the visitors

can also force changes within the structure. At present, there is no preservation/maintenance program designed to retain the historic character and fabric of the structure. Until such a program is developed, maintenance and renovation projects could severely affect this cultural resource.

Two structures in the Rim Village, the exhibit building and community building, are on the List of Classified Structures and may be eligible for nomination to the National Register of Historic Places. Under the proposal, these structures would be removed following recording procedures. Although they would be recorded in photographs and drawings, the loss of these potentially historic structures would be permanent.

C. IMPACT ON SOCIAL AND ECONOMIC FACTORS

1. Visitor Use

Restructuring the Rim Village to enhance the viewing and interpretive experience will significantly change the type and level of use of the area. Removal and renovation activities will detract from the rim viewing experience while underway, but the long-range effect will be to improve the quality of this experience by developing a pedestrian-oriented, natural-appearing platform from which to view the lake. The development of the Interpretive Center and the expanded interpretive programs could tend to cause visitors to remain in the Rim Village for a longer period. However, improved information/orientation services may encourage visitors to see other areas of the park, thus increasing visitor dispersal and reducing the load on facilities in the Rim Village.

The concentration of visitor services in the Rim Village will continue the level of use which now exists. With the relocation of rim parking areas, the continual movement of vehicles along the rim will be eliminated; visitors will be able to view the lake and participate in interpretive activities in a more natural setting.

The main focus of the park's interpretive program will be the Interpretive Center, providing an all-season interpretation and orientation facility for the park. However, a number of years will elapse before the facility will be available for use. Until that time, interpretive structures in the Rim Village such as the exhibit building and the community building will have to be retained and maintained during the winter months. Their removal will result in substantial savings in maintenance and operational costs as well as freeing more space on the rim for the viewing experience.

2. Park Management

Commitment to the continued use of Munson Valley as the administrative, maintenance, and employee housing center will allow the development of an orderly program for the renovation and replacement of facilities, providing improved operational and maintenance efficiency. The increased size and use of Mazama and Lost Creek Campgrounds will result in an increase in park maintenance and service operations.

An improved North Entrance Road could encourage drivers to increase their speed, lessening the park experience and possibly leading to an increase in the severity of traffic accidents. This problem is not anticipated on the West Rim Drive, which will be improved but remain a

winding, low speed road. The improved road system throughout the park will be more convenient and efficient for the movement of park maintenance and emergency vehicles and should decrease certain maintenance requirements due to the improved quality of the road.

3. Social Setting

The improvement of residential facilities in Munson Valley will provide better and more economical living conditions for park employees. Programs to select employees adaptable to the park environment and to provide educational and recreational amenities may improve employee morale. However, the enclosed feeling of hibernation caused by the excessive snow depths of Munson Valley and the isolation from schools, shopping, and medical facilities will continue to have a dominating effect on employee morale.

4. Economic Setting

Construction, replacement, and renovation of residence facilities, upgrading the West Rim Drive and the North Entrance Road, the removal of parking areas and structures in the Rim Village, and the construction of the Interpretive Center, access roads and new parking areas will involve major costs to the Federal Government. Minor, but not trivial, initial and recurring expenses will be involved in expanding the two campgrounds, developing the north entrance facilities, and all of the relocation, revegetation, and renovation projects.

Elimination of the 18 rental cabins and the two fourplexes will be a significant loss of income for the park concessioner. However, the

removal of these cabins was a condition in the present concessioner contract, thus there will be no loss of "anticipated" revenue due to their removal.

The deteriorated condition of Crater Lake Lodge will require the expenditure of significant funds to restore and refurbish the structure. Because the lodge is a historic structure, it can be assumed that renovation and maintenance expenses will be significantly higher because of the need to preserve the historic fabric of the structure. Once basic restoration has been completed, maintenance requirements should be somewhat reduced from their present levels.

The high costs of maintaining the year-round operation in Munson Valley will continue. Energy conservation measures such as increased structural insulation, replacement of windows and/or the installation of storm windows and doors, and the replacement of obsolete structures with new, more energy efficient structures will require the expenditure of significant funds. The savings in operational expenses will, initially, be small in comparison to the construction cost.

Economic impact on local communities will be beneficial in terms of increased sales and services during construction periods. The long-term effect to local businesses, however, would be insignificant since the proposal would not be expected to generate increased visitation above what would be normally expected.

IV. MITIGATING MEASURES INCLUDED IN THE PROPOSED ACTION

A. ACTIONS TO MINIMIZE IMPACTS ON NATURAL RESOURCES

All activities which impact the natural environment will be done in strict compliance with contract specifications. These specifications will require that such activities be conducted in as small an area as is necessary to perform the action to minimize the amount of environmental damage to soils and ecosystems within the park. Contract supervision will be done by on-site Service personnel to insure that all impacts on the natural environment are kept as small as possible.

All construction and obliteration activities will be conducted under environmental standards to minimize the degradation of the park's environmental quality from noise, air pollution, and litter. All contract equipment used within the park will meet or exceed Federal and state standards for emission and noise control. All unnatural materials remaining as waste following proposed actions which cannot be salvaged, will be removed from the site and from the park.

All sites where vegetation and soil disturbance has occurred as a result of proposed actions will be returned to a natural contour and revegetated or landscaped immediately following the completion of the land-disturbing project. Only plants native to the park and occurring naturally within the ecosystem of the disturbed area will be used for revegetation or landscaping.

Access and circulation patterns within the Rim Village area, the developments at the north entrance, Mazama Campground, and surrounding the Interpretive Center will be designed to both promote efficient and noncongested vehicular and foot traffic, and to minimize the impacts of use upon soil, vegetation, and wildlife. Campground design will be based upon on-site knowledge so that the minimum area is disturbed by site and access clearing and a vegetation screen remains for site privacy. Wherever possible, previously impacted sites will be used for new facilities.

Construction zones for the West Rim Drive and the North Entrance Road will be of the minimum possible width, and construction practices will be closely supervised to insure the effects of soil erosion and vegetation removal are kept to a minimum. Dust pallative actions will be taken to prevent wind-borne material from the sites of activity from drifting into Crater Lake. Lateral and cross-drainage structures will be designed to minimize local drainage disruptions.

B. ACTIONS TO MINIMIZE IMPACTS ON CULTURAL RESOURCES

Undisclosed cultural resources which are revealed during the proposed actions would be evaluated and managed in compliance with the historic preservation procedures specified in Appendix D of this document. Removal of the exhibit building and community building (on the List of Classified Structures) and the maintenance and refurbishing of Crater Lake Lodge, which has been nominated to the National Register of Historic Places, will be in compliance with the procedures of the Advisory Council

on Historic Preservation, NPS policy, and those procedures specified in Appendix D.

C. ACTIONS TO MINIMIZE IMPACTS ON THE SOCIOECONOMIC SECTOR

Road construction contracts, and those contracts for actions in areas of intense visitor concentration, will be let in segments or have time periods placed on them to avoid degrading the park visitor's experience any longer than is necessary. In line with this, cleaning up, recontouring, and revegetation activities will immediately follow site-disturbing actions as the final phase of the action rather than the beginning of a new one. This will reduce the time in which a site of activity remains unsightly and unnatural.

V. ANY ADVERSE EFFECTS WHICH CANNOT BE AVOIDED SHOULD THE PROPOSAL BE IMPLEMENTED

The disturbances to soils, vegetation, and wildlife within the construction or obliteration sites cannot be avoided if the proposed actions occur. Mitigating measures cannot completely remove the effects of these impacts. There will be some unavoidable air pollution from the operation of construction equipment that cannot be eliminated by emission control devices. The noise of construction and obliteration activities cannot be totally muffled nor can the unsightliness of these actions be completely screened from the public.

The park visitor will be inconvenienced by road construction and the movement of construction equipment along the park roadways. Visitors desiring overnight lodging on the rim of the caldera will find fewer lodging units available.

An upgraded roadway system to the park (North Entrance Road) will encourage drivers to increase their speed along it. This will lessen the park experience and could lead to an increase in the severity of traffic accidents which occur.

The costs to the National Park Service and to the park concessioner of the proposed actions are unavoidable if they are to be accomplished. Recurring costs of maintenance to new facilities and utility lines are also unavoidable.

A number of years will pass before funds are available to make major renovations or construct new employee housing; employee morale will

continue to be affected. Some aspects of interpretation will continue to suffer until funds are available for the construction of the Interpretive Center. Construction of the center could cause additional congestion in an already extensively developed area. Two structures which may be eligible for the National Register of Historic Places would be destroyed.

VI. THE RELATIONSHIP BETWEEN LOCAL, SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Upgrading the West Rim Drive and the North Entrance Road will have a short-term benefit in promoting a convenient, noncongested visitor driving experience. This will be at the expense of long-term degradation and destruction of natural resources.

The short-term benefits of constructing the Interpretive Center in the Rim Village will be large in improving visitor services. In the long-term, no significant additional area of natural environment will have to be disturbed, as it would if a visitor center were developed in a more aesthetically sensitive area along the rim of the caldera.

Maintaining a long-term quality environment on the rim of the caldera will be enhanced by the proposed actions, as will the uncongested and natural-appearing viewing experience. The short-term loss will be in the removal of some parking facilities to a more remote location.

Long-term losses to soils, vegetation, and wildlife will be made for the short-term increases in campground capacities and for the development areas at the north entrance, the Panhandle, and in Munson Valley. However, the Munson Valley improvements can also be seen as a long-term improvement in employee morale and decrease in energy consumption traded for long-term disturbance of wildlife, compaction of soils, and alteration of vegetation.

VII. ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

If cultural sites are located during the proposed actions, and archeological or historic salvage is undertaken, some loss of cultural information is inevitable and would constitute an irreversible commitment.

Developments can always be destroyed and restoration activities can attempt to undo what has been done. However, in no true sense can a disturbed area ever be returned to more than a replica of its former self. In this respect, all resources disturbed by the proposed actions are irretrievably committed.

The natural, energy, and economic resources expended upon the proposed actions will be consumed and for the most part lost as irretrievable.

VIII. ALTERNATIVES TO THE PROPOSED ACTION

During the planning process for the General Management Plan for Crater Lake National Park, a multitude of alternatives to, and variations on the proposed action were taken into consideration. The proposed action and its alternatives are the product of public as well as professional planners and park managers. The extent of this involvement is detailed in the following chapter on consultation and coordination in the planning process.

The major feasible alternatives considered are grouped under four headings as summarized below and in Table 11.

Alternative A: No Action

Alternative B: Reduced Levels of Development

- Phase out concessioner services/facilities in Rim Village - do not replace in park or partially replace in park.
- Eliminate boat tours on the lake.
- Restore Lost Creek Campground to natural condition - eliminate use.
- Retain Munson Valley facilities for administration, maintenance, and employee housing. (Similar to proposal)

Alternative C: Increased Levels of Development

- Convert park headquarters to visitor center - expand parking capacity.
- Develop all-weather access to Sinnott Memorial.
- Major renovation of Crater Lake Lodge to increase overnight capacity.

Table 11. Comparison of Major Actions in the Proposal and Alternatives.

ALTERNATIVE / ACTION	PROPOSAL	ALTERNATIVE A NO ACTION	ALTERNATIVE B REDUCED LEVELS OF DEVELOPMENT	ALTERNATIVE C INCREASED LEVELS OF DEVELOPMENT	ALTERNATIVE D RESTRUCTURING OF PRESENT SERVICES AND FACILITIES
INTERPRETIVE FACILITIES (Sinnott Memorial remains in all alternatives)	Construct all-season Interpretive Center and viewing shelter in Rim Village - improve waysides and exhibits	Lack of adequate interpretive facilities continues	*	Convert park headquarters to visitor center - construct all-weather access to Sinnott Memorial	Convert cafeteria bldg. to visitor center with added auditorium - develop winter use program and facilities
LODGING (18 cabins and 2 fourplexes removed in all alternatives)	Lodge retained and refurbished - historic character restored	Lodge continues in use	Phase out lodge - remove	Renovate lodge, increasing capacity	Remodel lodge into modern two-story structure
FOOD/CURIOS SUPPLIES	Retain in Rim Village - construct camper services bldg. at Mazama Campground	Minor improvements to existing facilities	Phase out of Rim Village - possibly provide new facilities at Annie Springs	Minor improvements to existing facilities - construct camper services bldg. at Annie Springs	*
CAMPING Mazama	Add 52 walk-in sites	Probable gradual	No change	Add full service RV-trailer campground - 100 to 350 spaces	
Lost Creek	Add 13 primitive sites	increase to meet demand	Remove sites - restore to natural condition	*	Convert to day-use picnic area
BOAT TOURS	Retain present tours - minor facilities improvements - convert boats to electric power if feasible	Same as proposal	Eliminate tours and facilities - retain trail to lake	*	Develop less visible routes and lower cost tours
RIM VILLAGE PARKING	Relocate 285 spaces away from rim - new access road to picnic area and lodge	Continue parking adjacent to rim	Reduce parking as facilities phased out	*	*
WEST RIM DRIVE and NORTH ENTRANCE ROADS	Improve to meet standards for two-way roads	Gradual safety improvements	*	Improve as in proposal - close West Rim Drive in summer and provide shuttle - develop staging area at North Junction and Rim Village	*
NORTH ENTRANCE	Upgrade housing and utility systems - construct info.-orientation station	Gradual upgrade of housing and utilities	*	*	Develop year-round facilities as part of increased winter use program
MANAGEMENT FACILITIES (administration, maintenance, employee housing)	Retain in Munson Valley - replace obsolete housing and upgrade others	Gradual replacement of obsolete facilities and improvements to housing	Same as Alternative A	Convert Headquarters to visitor center - relocate management facilities to Panhandle - retain Munson Valley for seasonal use	Same as proposal

*Alternatives are not presented as full proposals - where no action is indicated, one of the actions from another alternative or the proposal would be included to formulate a full range of actions if an alternative was selected for implementation.

Alternative C (cont.)

- Develop full service trailer/recreation vehicle campground.
- Develop summer shuttle system on West Rim Drive - no private vehicles.
- Administrative, maintenance, employee housing facilities developed in Panhandle.

Alternative D: Restructuring Present Services and Facilities

- Develop strong personal services interpretive program with no central visitor center or modest visitor center in part of cafeteria building.
- Remodel lodge into a two-story, modern facility.
- Convert Lost Creek Campground to a day-use area.
- Develop strong winter use program and related facilities.
- Develop alternate (less visible) routes and shorter (lower cost) routes for tour boats.
- Retain administrative, maintenance, and employee housing in Munson Valley, replace obsolete housing with new facilities. (Same as proposal)

A. NO ACTION

1. Alternative

The no action alternative does not place the park in a quasi, status quo, where no change will occur. It is recognized that under the no action alternative the park will continue to evolve in the foreseeable future much as it has in recent years.

Under this option, no major construction would change the configuration of functioning of the park. The park's residential, maintenance,

management, and administrative facilities would remain in their present locations and retain their present functions. Concession facilities would remain at their present levels of development. The various types of visitor use within the park would remain unchanged in emphasis, and in the main would continue to increase in numbers of participants.

Park managers would continue to upgrade and maintain facilities in the park to meet health and safety standards. Buildings which became obsolete, or which were economically beyond renovation, would be replaced by similar buildings with similar functions and located in the same area. Routine maintenance and minor improvements would continue at the discretion of the individual park manager.

Long-range planning and major actions would not take place under the no action alternative. Rather, park management would be on a day-to-day basis and respond primarily to short-term needs and pressures. Thus, many of the actions in the proposal or its alternatives could ultimately occur piecemeal throughout the park under the option of no action. The cumulative effects of these unrelated actions being taken in response to short-term pressures could have more impact upon the human environment than any single long-range plan.

2. Impacts on Natural Resources

As was mentioned above, the no action option encourages decision-making based upon an individual manager's response to short-term problems and pressures. Emphasis in management would change with changes in individual park managers. Without long-term planning, minor actions by one

park manager could conflict with those of a prior manager and create greater effect upon the environment than either action taken separately.

The ecosystems in areas of heavy visitor use and park management activities have been altered by man's presence. Under the no action alternative, vegetation deterioration, soil compaction, and minor wildlife disturbances will continue and increase apace with increased visitation and use.

Under no action, the boat tours on Crater Lake will continue at their present levels but could be increased in the future. This would increase water, air, noise, and visual pollution levels in lake environment. The trail to Cleetwood Cove, the natural environment at Wizard Island and at the concession docking facilities at Cleetwood Cove would also be severely impacted by increased levels of visitor use.

3. Impacts on the Socioeconomic Environment

No action is a beneficial alternative to large numbers of visitors who wish ready access by automobile to views of the lake from the Rim Village. Visitors who are not offended by congestion, and who wish a quick look at the lake and perhaps a quick lunch and a few curios, will have their needs met by the no action option. Within the size limitations of the Crater Lake Lodge and cabins, visitors desiring overnight lodging will also have their needs met under this alternative; obsolete lodging units will continue to be used.

The conflict between a heavy concentration of automobiles and visitors in the Rim Village would continue to degrade the desired experience of a

quiet pedestrian-oriented viewing of the lake. Nonviewing and noninterpretive activities will continue to detract from the naturalness of the rim area, and to draw visitors away from the inadequate interpretive facilities. Buildings, roads, and parking areas close to the rim will continue to be intrusions into the natural view of Crater Lake.

Interpretive programs will continue to provide relatively limited services in facilities which are outdated and frequently overcrowded. Information and orientation services to the visiting public will continue to provide limited information as to the recreational opportunities available in the park and the region. The effect on the park visitor will be to limit his experience and to restrict his options for a full range of recreational and educational activities.

Winter use of the park will probably continue to increase, but inadequate winter facilities will continue to restrict such use and make the control of visitor use less than adequate. Viewing the lake from the rim during the winter will continue to be a potentially hazardous situation because of the lack of a winter viewing facility.

The employee morale problems caused by living through the long winter season in Munson Valley would not be solved by the alternative of no action. No action would also not affect the operational problems, both administrative and maintenance, of maintaining a large number of employees and buildings in Munson Valley during the deep snows of winter.

The number of campsites within the park would not be increased under no action although there would be a tendency to add unplanned sites at both

campgrounds. If overflow demand for overnight camping is sufficient, the development of additional sites outside of the park would add to the local economy.

Under no action, the hazardous conditions caused by the narrowness of the West Rim Drive and the North Entrance Road will remain.

4. Impacts on Cultural Resources

Crater Lake Lodge has been nominated to the National Register of Historic Places. Under no action it would be maintained in its existing condition. Renovation or restoration would occur only to comply with health and safety standards of the state and Federal governments. Traditional uses of this structure would continue. The lack of a positive plan for the lodge would encourage the continued deterioration of the structure since there would be no incentive for the concessioner to expend funds on restoration.

The limited orientation and interpretive programs and facilities in the park would continue to provide the park visitor with less than optimal services with respect to cultural, historic, and archeological resources under the no action alternative.

B. REDUCED LEVELS OF DEVELOPMENT

1. Alternative

Under this alternative the major visitor service facilities and the employee dormitory in the Rim Village would be phased out. Two options were considered: (1) to not replace any of the facilities within the park, and (2) to replace the day-use facilities (food, curios, etc.) at another location within the park.

The boat concession on the lake and all related facilities at Cleetwood Cove and Wizard Island would be removed. The Cleetwood Cove Trail, overlook, and rest room facilities would remain.

Lost Creek Campground would be obliterated and the site restored to as near a natural condition as possible.

Management facilities would be retained at Munson Valley.

2. Impacts on Natural Resources

Under this alternative, the removal of the concessioner-operated facilities in the Rim Village would allow several acres of land to be returned to a natural environment. Without the attraction of these visitor services, crowds would be smaller and parking areas could be reduced. The Rim Village would remain an important viewing and interpretive site, but visitors would tend to remain a shorter time and use a smaller percentage of the area.

Relocation of a portion of the visitor services to another area within the park would require a site of approximately 10 acres for the structures and related parking. A partially disturbed site at Annie Springs was considered as the best location for this development. Although the level of development would be less than the existing development in the Rim Village, the impact on soils, vegetation, and wildlife would be substantial.

Eliminating the boat concession from the lake would also eliminate the actual and potential pollution of the lake waters, eliminate their visual intrusion in the natural scene, eliminate noise pollution of shoreline and island areas, and allow the removal of developments on Wizard Island and Cleetwood Cove related to the boat tours. Trail use at Cleetwood Cove would decline drastically and the visitor use impacts on soils, vegetation, and wildlife would be reduced in that area.

Returning Lost Creek Campground to a near natural state would eliminate the impacts on soils, vegetation, and wildlife associated with primitive campground use and allow approximately 6.1 acres of lodgepole pine forest to revert back to as natural a state as is possible.

3. Impacts on the Socioeconomic Environment

Under this alternative, the removal or relocation of concessioner-operated facilities would have substantial socioeconomic impact. Total removal of these facilities from the park would cause inconvenience to the park visitor, who would have to go outside of the park for these services. Relocation would also cause inconvenience to the visitor

since they would most likely have to retrace their routes of travel to reach the facilities. Costs to the concessioner and to the Service would be substantial in either situation.

Removal of Crater Lake Lodge would require an "Historic Structures Report" in the advanced planning phase of the rim renovation project. The entire structure will have to be measured, existing drawings evaluated and new detailed plans prepared, and photographic documentation made. This information-recovery-recordation project for a building of this size and complexity will be a significant but undetermined expense to the Federal Government.

Elimination of the Crater Lake Lodge would be a significant loss of potential income for the park concessioner. The cafeteria/curio shop and concessioner employee dormitory are relatively new structures and usable for several decades. Relocation of these and other concession facilities to Annie Springs or outside of the park would have the potential for some economic loss to the concessioner during the transition period.

The elimination of overnight lodging accommodations within the park would open the way for the development of such facilities by private enterprise in the nearby region such as in Fort Klamath and could result in a sizable economic return for the local economy. Food, curio, and other tourist-related services should also increase in Fort Klamath.

Phasing out the boat tours would result in an undetermined loss of potential revenue for the park concessioner. The opportunity for visitors to experience Crater Lake from the perspective of traveling on its

surface, and to understand its origin from interpretation on the boats, would be foregone.

Eliminating the 12 campsites at Lost Creek would place an additional burden upon Mazama Campground, and a rustic camping experience would no longer be available to visitors in the park. Management problems and costs stemming from operation and maintenance of the campground would be eliminated.

Retaining management facilities in Munson Valley would have the same impacts as the no action alternative.

4. Impacts on Cultural Resources

The impacts of this alternative on cultural resources within the park would be substantial. The removal of Crater Lake Lodge, an historic structure nominated to the National Register of Historic Places, would mean the loss of this unique structure to future generations of park visitors.

C. INCREASED LEVELS OF DEVELOPMENT

1. Alternative

Under this alternative, the present headquarters building in Munson Valley would be remodeled to serve as the main visitor/interpretive center. The exhibit building and community building in the Rim Village would be removed. The Sinnott Memorial would remain and the feasibility of an enclosed, all-weather walkway to the memorial (enabling the facility to be utilized during the winter season) would be explored. Parking at the headquarters building would be increased substantially.

Crater Lake Lodge would be retained and undergo major renovation to provide additional quality guest rooms. The unused upper floors would be renovated and returned to use and the remainder of the building would be remodeled to bring the entire structure into compliance with state and Federal health and safety standards, increasing the total overnight capacity of the rim area by approximately 40 or more pillows. Installation of an elevator would probably be required if the fourth floor is used for guest rooms. Renovation would be designed to insure the historic and architectural integrity of the building is preserved to the maximum extent possible.

A trailer/recreational vehicle campground proximal to the existing Mazama Campground would be constructed, in phases, as future needs arise. Developed sites, including water and sewage hookups, would be designed specifically for trailers and recreation vehicles. Associated

visitor-use services, including shower, laundry, and minimal grocery facilities, would be provided. The recreation vehicle campground would be operated by either Park Service or concession personnel. The existing Mazama Campground would be limited to tent camping.

Two levels of development were considered under this alternative: a large (350 site) or modest (100-150 site) campground. Impacts for the two levels of development would be essentially the same in character, varying only in magnitude.

A shuttle system would be developed along the West Rim Drive. That portion of Rim Drive from Rim Village Junction to just south of the North Entrance Road junction would be closed to regular vehicular traffic during the peak summer season. Initiation and termination of this action would vary slightly from year to year, depending on when the Rim Drive is completely free of snow.

During the summer season a shuttle system (either free or toll system) would be the only mode of transportation (other than emergency vehicles) along West Rim Drive - allowing for stops at all overlooks along that portion of the drive. The shuttle system would also be designed to provide for several trips per day to Cleetwood Cove and/or completely around Rim Drive, originating and terminating at Rim Village. The remainder of the Rim Drive roadway would be a two-way system throughout the snow-free season.

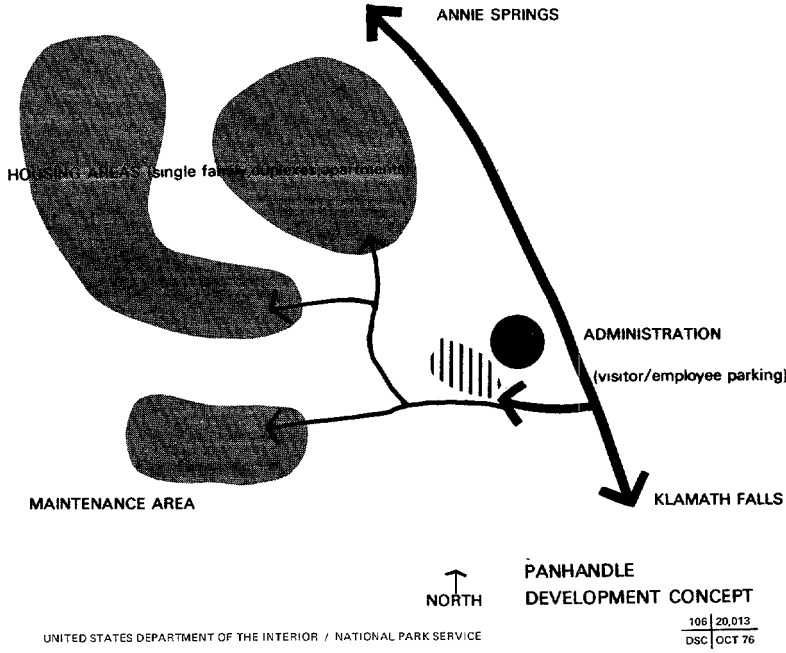
During the off-season (spring and fall) when traffic volume is minimal, private vehicles would be allowed on West Rim Drive (two-way traffic)

and the shuttle system would terminate operations. A parking area with visitor contact station would be constructed proximal to the North Junction to accommodate those visitors entering from the north who wish to use the shuttle system and view Crater Lake from West Rim Drive. Simultaneously, where necessary, the Rim Drive roadway would be upgraded to safe two-way standards for the entire Rim Drive road system.

Administrative, permanent housing, and some maintenance functions would be moved out of Munson Valley to be a new development near the south entrance of the park in an area known as the Panhandle. Existing permanent housing not required for the winter staffing of Munson Valley would be converted to quarters for summer seasonal personnel. All obsolete facilities in Munson Valley would be removed and the present headquarters building would be remodeled to serve as a year-round visitor center. The maintenance storage area in the Panhandle is considered the most suitable location for this development because the environment has already been altered and because of the reduced snowfall at that elevation. Nearby sites outside the park may also be adequate and perhaps more suitable for this type of development, but thorough studies have not been conducted.

Roads and parking areas to serve the new facilities, an administration building, residences for approximately 25 employees, and several buildings for maintenance and warehouse functions would be required. A water supply system, sewage treatment facilities, radio and telephone installations, and an electrical distribution system from primary power lines, would be required. The development would cost approximately

$4,200,000 plus additional costs for removal and remodeling of facilities in Munson Valley. (See Appendix E for operational and other costs related to the Panhandle administrative site.)



2. Impacts on Natural Resources

Air and noise pollution from construction would occur during the period of the headquarters renovation. Expansion of the parking area at the present headquarters would result in the loss of several acres of vegetation. Soil disturbance and compaction and watershed disruption would be substantial.

Removal and obliteration of the exhibit room and community building from the rim, and eventual restoration of these sites would have the same impacts as in the proposal. Construction of a winter access to the Sinnott Memorial would have minimal impact on natural resources since the enclosure would most likely follow existing walkways.

Air and noise pollution from construction and traffic congestion would occur during the periods of lodge renovation. Expansion of water, sewer, and power services which may be required to accommodate increased overnight capacity of a renovated lodge may necessitate some temporary disruption of the natural resources in the Rim Village area, including destruction of vegetation, compaction of soils, air pollution, and watershed disruptions (erosion/siltation) along any construction zones.

Gradual expansion of the Mazama Campground facility by up to 350 sites would result in a significant increase in visitor numbers in the area, causing an increase in impacts on the natural resources proximal to the campground.

Approximately 43 to 56 acres of lodgepole pine forest would be subject to significant resource impact in the form of destruction and/or disturbance of vegetation and wildlife, soil disturbance and/or compaction, and possible alteration of drainage patterns during construction of the campground.

Construction of a modest to large recreation vehicle campground in the Mazama area would result in a significant increase in demand for utilities, to include water, sewage, and power facilities. With recent construction of the Mazama sewage treatment system, however, these utility demands can be met without further increasing the size of any of the services.

Development of a modest (rather than large) campground could encourage development of additional facilities outside the park which could result in localized resource impacts, to include disruption and/or destruction

of vegetation and wildlife, soil compaction or disturbance, and disruption of watershed patterns.

Localized resource impact (i.e., destruction and/or disturbance of vegetation and wildlife, compaction of soils, and alteration of normal watershed patterns) would result where upgrading of the Rim Drive roadway is necessary to accommodate a shuttle system. These impacts would be essentially the same as those discussed under the proposal for road improvements.

The construction of a parking lot and contact station near the North Junction, from which visitors would board the shuttle to the Rim Village complex, would necessitate paving over about 1.5 acres of scattered mountain hemlock/alpine meadow vegetation, as well as disturbing wildlife in the area and potentially altering existing drainage patterns.

The 11.2-acre administrative and residence relocation site in the Panhandle is in an area where maintenance activities have already disturbed soils and vegetation. Site clearance for a maintenance facility would enlarge the area of disturbance by an additional 6 acres. Despite its already disturbed condition, major soil disruption and compaction, vegetation removal, and altering of ground water patterns can be expected from construction activities throughout the 17-acre site. The area is relatively level and the erosion potential is low. The development of sewage, water, and power facilities would result in trenching activities outside of the development area. Depending on the source of water selected, as much as 10 miles of water line (Annie Springs source) may

be required. The water table is relatively shallow in the Panhandle area and improper location or design of sewage treatment facilities could result in subsurface pollution of ground water. The development of permanent residences and other facilities would provide a continuing disturbance to wildlife populations in this portion of the Panhandle.

3. Impacts on the Socioeconomic Environment

The development of a major visitor use facility in Munson Valley would attract a large percentage of visitors to that area, creating another area of congestion within the park. The location of the visitor center would not be convenient for many park visitors; those entering from the north will have already seen the lake; those entering from the south will not have seen the lake and the interpretive message may be less effective.

Congestion in the Rim Village would not be reduced significantly since the major visitor services would remain there. Removal of the exhibit room and community buildings would make the Sinnott Memorial even more difficult to locate.

The enclosed walkway to the Sinnott Memorial, designed to withstand heavy winter snow loads, could prove to be an offensive structure, intruding on the visual scene in the Rim Village.

The enclosed walkway would provide safe access to an enclosed viewing area during the major portion of the year when the rim is inaccessible due to heavy snows. The potentially hazardous practice of viewing the lake from the top of snowbanks would be substantially reduced.

All-weather access to Sinnott Memorial would allow the interpretive programs associated with the facility to be carried out year-round. This would be especially relevant for the visitor during periods when the lake is not visible due to snow and/or fog conditions.

Renovating the Crater Lake Lodge would increase the overnight lodging capacity of the Rim Village by approximately 40 pillows, and modernize visitor use facilities.

Visitors staying overnight in the modernized interior would no longer experience the rustic style of accommodation reminiscent of the past which lends distinction to lodging in the park.

Renovation of the lodge would temporarily require closing down operations for one or more visitor seasons, resulting in significant economic losses to the concessioner as well as inconvenience to the visitor desiring first class dining facilities and accommodations in the park.

Renovation of the lodge would result in a significant economic expenditure on the part of the Federal Government and/or the concessioner.

Construction activities associated with the renovation of the lodge would cause a temporary increase in visual intrusions and physical inconvenience for the visitor. These activities would add to the congestion problems in the Rim Village area, negatively affecting the visitor experience.

A modern, renovated lodge would effectively reduce the recurring cost of upkeep as well as provide higher quality accommodations for the visitors who desire such facilities.

Renovation of the lodge would require an "Historic Structures Report" and, prior to implementation, the existing structure may have to be measured, existing drawings evaluated, detailed drawings prepared, and photographic documentation completed. These historic studies would be a significant expense to the Federal Government. Similar expenses could be incurred for other structures in the Rim Village if they are determined eligible for the National Register.

Increased accommodations of the lodge would result in a corresponding increase in utilities, including water, sewer, and power. This would probably necessitate expansion of the existing sewage lagoon system in Munson Valley and the extension of larger utility lines to the lodge.

A major initial expense to the Federal Government and/or the concessioner would occur with development of an overnight recreation vehicle campground, and recurring expenses would occur, even with proper operation and maintenance of the campground.

Inexpensive overnight recreation-vehicle camping facilities in the park would be increased significantly (more than doubled under the larger alternative).

The development of a recreation vehicle campground would help alleviate the demand for overnight recreation vehicle campsites in the park, especially during periods of heavy visitor use.

If properly managed, either the large or modest recreation-vehicle overnight campground could show an economic return.

Readily available first class recreation-vehicle camping facilities could potentially hold visitors within the park for longer periods of time.

Construction of a large recreation vehicle campground next to the existing Mazama site, even if well designed, will significantly increase the amount of development in a relatively small area - creating the illusion of a small city rather than a National Park Service campground. This large-scale campground complex would inevitably be a significant visual intrusion for some visitors, greatly detracting from their Crater Lake experience.

Development of additional overnight camping facilities outside the park (if future demands deem it necessary) could provide a source of income to the regional economy.

The increase in visitors staying in the park longer because of an attractive recreation vehicle campground would create a greater demand for utilities and commercial services, and would increase congestion in facilities and on roads and parking areas already overburdened during periods of peak use.

Development of separate facilities for recreation vehicle campers eliminates the conflict between tent campers and recreation vehicle users in the present Mazama Campground.

By removing vehicular traffic along the narrow but prime viewing corridor of the West Rim Drive during the peak visitor season, the shuttle system

would free the area for more leisurely forms of viewing - such as walking, bicycling, or a shuttle system.

By providing a free (or low cost) and quiet transportation system (shuttle) along the West Rim Drive, the visitor experience would be substantially improved.

Major, recurring expense to the Federal Government would be involved in installing and maintaining a (free) shuttle system.

Recurring expenses would result from the extra time and work required to develop and maintain the North Junction parking area and contact station.

A contact station proximal to the North Junction parking area and the north terminus of the shuttle would reduce the confusion of the visitors wishing to utilize the shuttle system or the resources along the West Rim "trail," as well as provide them with information concerning the rest of the park.

Upgrading of portions of the Rim Drive roadway would result in a major expense to the Federal Government.

Noise and delays during periods of road construction would detract from the experience of some of the visitors.

By permanently routing all traffic between the Rim Village Junction and the North Junction by way of the East Rim Drive, many extra miles of travel would be necessary to the visitor now choosing to drive directly from the Rim Village junction to the north on the West Rim Drive via the

existing one-way system. The leisurely experience offered by the East Rim Drive would be lost when it is converted to two-way traffic.

Development of the administrative and residence complex in the Panhandle would require a completely new utility system. Telephone service would be through a different system which could complicate communications within the park and increase cost. Living conditions for employees should improve; with an average snow accumulation of only five to six feet, roads will be easier to keep clear and the distance to schools, shopping, medical services and other facilities will be reduced by about 26 miles. Electrical and phone services should be less subject to outages and mail service should be improved. The enclosed feeling caused by the excessive snow depths in Munson Valley would not be present. The residents would lack a community building, as now exists in Munson Valley, but presumably there would be some space in the administration building for groups to assemble. Some employees will be further from their work stations. Employees remaining in Munson Valley during the winter will be isolated from the majority of the employees.

Splitting the park's management operations between Munson Valley and the Panhandle would result in some unavoidable costs due to the duplication of some functions such as utility systems and emergency equipment. Most structures in Munson Valley would require some heat during the winter; roads would have to be plowed to maintain access to these buildings. Private and Government vehicles would have less distance to travel to obtain services outside the park; increased travel distances to work stations in the park would somewhat offset these savings.

Relocation of approximately 20 to 25 families from Munson Valley to the Panhandle would probably result in a slight loss of revenue to Medford merchants which would be transferred to Klamath Falls merchants because of closer proximity.

4. Impacts on Cultural Resources

Careful remodeling and/or renovation of the lodge could insure that the historic and architectural integrity of the building is preserved. However, the modernization of the structure could result in a significant loss of a cultural resource if the renovation is not sensitive to the character of the historic structure.

Potential additions to the National Register would be affected by this alternative. The Sinnott Memorial would be altered through the addition of an enclosed walkway, substantially changing its architectural character. The exhibit building and community buildings would be removed. Although the design of these structures would be captured in drawings, photographs, and sketches, the structures would essentially be lost forever to future generations.

No known cultural resources exist within the area proposed for development of the new campground. Should any cultural resources be identified, they would be managed in compliance with current historic preservation procedures. This would result in significant cost to the Federal Government due to potential construction delays and the need to redesign the campground. Despite application of historic preservation procedures,

cultural resources identified in the immediate area of the new campground could be impacted adversely.

No known cultural resources exist within the area considered for development of the parking area/contact station for the bus shuttle system. Should any cultural resources be identified, they would be managed in compliance with current historic preservation procedures. The parking area/contact station probably could be sited to avoid physically impacting any potential cultural resources.

D. RESTRUCTURING PRESENT SERVICES AND FACILITIES

1. Alternative

Under this alternative the park's interpretation would be based on a strong, flexible personal services program with no central visitor center facility containing fixed exhibits or audiovisual programs. The orientation and information program in the park would be strengthened with more emphasis on cooperative regional information centers and improved services at the entrance stations.

The Sinnott Memorial would continue to operate as an on-site interpretive facility, but the exhibit room and community building in the Rim Village would be eliminated.

Another option which would be explored under the restructuring alternative is that a portion of the cafeteria and curio shop could be converted or expanded into a visitor center with lounge, exhibit space, rest rooms, and a small auditorium. This would be done in cooperation with the park concessioner, and would call for reevaluation, reorganization, and possibly removal of some of the services currently provided in that facility. Once completed, the exhibit room and community building would be removed as under the strong personal services option.

Crater Lake Lodge could be completely renovated into a more modern two-story, low-profile structure containing about 80 overnight units of high quality. Parking, food services, curio sales, and other associated

facilities could be adjusted to provide more efficient services at the "new" lodge.

The Lost Creek Campground could remain essentially as it is in design and layout but have camping prohibited and remain only for day-use by park visitors.

The present roadway circulation pattern in the park could be restructured in many different combinations of one-way or two-way sections. The ultimate decision must be based upon providing an optimum experience with options for the visitor to choose from, and reflect overall travel distances for visitors and park personnel. After the proposed actions are completed, new circulation patterns may be needed and a management decision will have to be made at that time.

The park can develop specific winter recreation programs by maintaining and refining recreation zones within the park for the exclusive use of snow machines, cross-country skiers, and other special winter snow play activities. Self-guiding interpretive tours can be developed for snowmobilers and cross-country skiers. An all-weather visitor contact station would be established at the north entrance to the park. It would contain a residence and be used for interpretation, orientation, and protection purposes. Structures in Munson Valley or in the Rim Village could be converted into a winter shelter for cross-country skiers and other winter visitors who choose to participate in snow play activities in the park.

Alternate tour routes for the boats on the lake could be established. Shorter, less expensive tours could be offered, and alternate routes might eliminate the visual intrusion of boats passing directly below the Rim Village area. The interior and exterior of the boats could be painted a less conspicuous color so that they would blend in with the lake better and be less of a visual intrusion.

Management facilities (administration, maintenance, and housing) would remain in Munson Valley as in the proposal.

2. Impacts on Natural Resources

The impacts of removing the exhibit room and community building from the Rim Village are the same as those of the proposed action. The construction necessary to add an auditorium to the cafeteria and curio shop would result in some minor impact upon the natural resources close to the shop. However, this area is already heavily impacted by visitor use and has been significantly altered by development. A visitor center in this area will tend to concentrate large numbers of visitors into a relatively small area and result in localized impacts on wildlife, vegetation, and soils.

Renovation of the Crater Lake Lodge structure would result in minor destruction of vegetation, compaction of soils, and temporary disruption of wildlife within the construction zone. The renovation activities would also cause temporary noise and air pollution in the rim viewing area.

Changing the Lost Creek Campground into a day-use area would only slightly reduce the impacts of overnight visitors upon the natural resources. Impacts such as the destruction of vegetation, disturbance of wildlife, compaction of soils, alteration of minor drainage patterns, and so forth would still continue with use.

Changing the color of the tour boats or the pattern of their trips will not alter the amount of impact they have upon the quality of the lake waters or the air above it. To the extent that increased numbers of visitors could participate in the less expensive boat tours, the presence of more people below the caldera rim would lead to more intense disturbance of vegetation, disruption of wildlife, and compaction of soils along trails and along the lake edge in viewing and loading areas.

With proper winter use zoning, those resources known to be especially vulnerable to a particular type of use could be protected. Developing a winter residence and contact station at the north entrance of the park would result in minor impacts to the soils, vegetation, and wildlife of the small construction site.

Replacement of obsolete housing in Munson Valley would have the same impacts as the proposal.

3. Impacts on the Socioeconomic Environment

A strengthened (park/region) program providing detailed information on the recreational opportunities in the park as well as on a regional scale would enable the visitors to make better use of their time, hopefully resulting in less confusion and a higher quality experience.

Even with a strengthened on-site personal interpretive program, the overall scope of interpretation/orientation in the park will remain extremely limited - an opportunity to improve visitor understanding of the park resources through centralized interpretive presentations would have been foregone.

Expanded and refined orientation/interpretation services will offer the visitor somewhat more comprehensive recreational information and better interpretive programs, generally enhancing the quality of the Crater Lake experience.

Emphasis on personal contact could limit the number of visitors receiving information and interpretation of the park's features.

Addition of a visitor center facility to the Rim Village complex will have essentially the same socioeconomic impacts of the proposed action.

Rearrangement of parking facilities in the immediate vicinity would probably have to be accomplished to accommodate the visitors using the center.

It would cost the Federal Government a substantial sum of money to purchase and convert a portion of the store/cafeteria complex into a visitor center.

Conversion of a portion of the store/cafeteria into a visitor center would potentially reduce the concessioner inventory and result in lower concession sales.

An all-weather visitor center on the rim would be made possible without the addition of another major structure to the Rim Village complex.

Winter operations would be less costly with all rim activities centered in one building.

Removal of the exhibit room and community building would slightly reduce the level of development in the Rim Village area as well as eliminate maintenance and operational costs required to maintain these outdated facilities during the winter months.

On-site interpretation of Crater Lake and its associated resources would become a year-round program. This would be especially relevant for the visitor during periods when the lake is not visible due to snow and/or fog conditions.

The development of a visitor center in the Rim Village complex would not, in itself, provide a safe area for winter viewing of the lake.

Complete reconstruction of Crater Lake Lodge could temporarily require closing down operations for one or more visitor seasons, resulting in significant economic losses to the concessioner as well as elimination of first class noncamping accommodations in the park for that period.

The actual reconstruction of Crater Lake Lodge would also result in a significant economic expenditure on the part of the Federal Government and/or concessioner.

Construction activities associated with reconstruction of Crater Lake Lodge would cause a temporary increase in visual intrusions and physical

inconvenience for the visitor. These activities would add to the congestion problems in the Rim Village complex, negatively affecting the visitor experience.

Visitors staying overnight in the modernized interior would not experience the rustic style of accommodation reminiscent of the past which lends distinction to lodging there.

A unique historic structure would be partly destroyed - its integrity lost forever to future generations.

The resultant lodge facility would be a low-profile structure, resulting in considerably less visual intrusion to the visitor experiencing the Crater Lake panorama.

A modern, renovated lodge would effectively reduce the recurring cost of upkeep as well as provide higher quality accommodations for the visitor who desires such facilities.

Renovation of the lodge would require an "Historic Structures Report: Feasibility Study for Removing Upper Portion of Lodge." This would be the advanced planning phase of the renovation project and would be a significant expense to the Federal Government.

Prior to implementation of the proposal, the structure would have to be measured, existing drawings evaluated, detailed drawings prepared, and photographic documentation completed. An information-recovery-recordation project on a building of this size and complexity would require an estimated 800 man-days with a cost of approximately $30,000.00. These

estimates would not include any project-implementation related costs (i.e., work drawings or construction data). Similar costs could be incurred for other structures in the Rim Village if they are determined eligible for the National Register.

Converting the Lost Creek Campground to day-use would mean that rustic camping experience would no longer be available to the individuals or groups (12 units nightly) who desire or would benefit from the isolation provided by Lost Creek Campground.

However, a relatively large picnic area would be available to those visitors enjoying the southeast portion of the park.

A north entrance complex would provide protective facilities and orientation/information for the winter user, thus making the visitor's winter experience potentially safer and more worthwhile.

A north entrance complex would require the development of residences, contact station, and year-round utility systems. Past attempts at locating a water source at the present north entrance have been unsuccessful and it is assumed water would have to be hauled to the complex. Construction, maintenance, and the hauling of water would result in an initial and recurring expense to the Federal Government.

Zoning the park for winter use would alleviate the potential conflicts between different types of winter activities (snow machines and skiing/snowshoeing, for example) by separating them.

By providing an all-weather shelter either at Munson Valley or on the rim, the winter user would have a place to meet and take care of their equipment.

A comparatively minor recurring expense to the Federal Government would be involved in developing and maintaining an all-weather shelter at either Munson Valley or the Rim Village.

Through efficient, controlled winter use activities, the visitor could be made more sensitive to the resources of the park in the winter.

All-weather contact points at the north entrance and proximal to the lake itself would be invaluable in properly interpreting the park in a winter setting as well as act as an information center and a ski-tour beginning point.

Allowing the boat tours to continue would provide an opportunity, for those visitors who desire such an experience, to view the lake from within the caldera itself. Even on a modified scale, these tours may still result in some visual intrusion, detracting from the visitor experience. However, to some visitors the boats provide a sense of scale by which to judge the size of the lake and the depth of the caldera. Painting the boats to blend in with the lake background would make them less conspicuous from the rim, thus reducing the visual intrusions.

Repainting the boats and altering the circulation patterns and time-tables would result in a potentially significant economic expenditure on the part of the concessioner, and despite lower fares to visitors, many

people still would not utilize the service because of the strenuous hike down to and especially back from Cleetwood Cove.

Retaining management facilities in Munson Valley would have the same impacts as the proposal.

4. Impacts on Cultural Resources

A unique historic structure, Crater Lake Lodge, would be partially destroyed with the remainder of the building completely remodeled. Although the design of the lodge would be captured in drawings, photographs, and sketches, the lodge itself would essentially be lost forever to future generations. Similarly, the removal of the exhibit building and community building would mean the loss of significant cultural resources.

IX. CONSULTATION AND COORDINATION WITH OTHERS

A. CONSULTATION AND COORDINATION IN THE DEVELOPMENT OF THE PROPOSAL AND IN THE PREPARATION OF THE ENVIRONMENTAL ASSESSMENT

1. Consultation With the Public

Consultations were held with the following public interest groups prior to the development of the draft environmental assessment on Crater Lake master planning which led directly to this Environmental Assessment on the Visitor Use and General Development plans for the park.

Audubon Society
Crater Lake National Park Study Group
Central Cascades Conservation Council
Federation of Western Outdoor Clubs
Friends of the Earth
Oregon Environmental Council
Sierra Club
Sky Lakes Study Group
Wilderness Society

An abridged statement of alternative options for the Crater Lake Master Plan was submitted to the following public interest groups for their review and comment. Individuals with an interest in the park were also asked to review the draft planning alternatives.

Automobile Club of Oregon
Conservation Foundation
Crater Lake National Park Study Group
Federation of Western Outdoor Clubs
Friends of the Earth
Izaak Walton League
National Audubon Society
National Geographic Society
National Parks Association
National Speleological Society, Inc.
National Wildlife Federation

Nordic Club of Oregon
Oregon Environmental Council
Oregon State Motor Association
Sierra Club
Sky Lakes Study Group
The Mazamas
The Mountaineers
Wilderness Society

Public workshops were held on May 12, 13, and 14, 1975, at Klamath Falls, Portland, and Medford, Oregon, respectively. Master Plan issues and alternatives were presented and discussed.

2. Consultation With Other Agencies

Consultations were held with the following Federal, state, and local governments and agencies prior to the development of the draft environmental assessment on Crater Lake master planning which led directly to this Environmental Assessment on the Visitor Use and General Development plans for the park.

Federal Agencies

Department of Agriculture
  Forest Service
    Rogue River National Forest
    Umpqua National Forest
    Winema National Forest
Department of Defense
  Corps of Engineers

State Agencies

State Historic Preservation Officer

Local Agencies

Chambers of Commerce
  City of Klamath Falls
  City of Medford
Klamath County Planning Office
Rogue Valley Council of Governments

An abridged statement of alternatives for the Crater Lake Master Plan was submitted to the following Federal, state, and local governments and agencies for their review and comment.

Federal Agencies

Department of Agriculture
  Forest Service
    Rogue River National Forest
    Umpqua National Forest
    Winema National Forest
Department of Commerce
  National Marine Fisheries Service
Department of Defense
  Corps of Engineers
Department of Interior
  Bonneville Power Administration
  Bureau of Land Management
  Fish and Wildlife Service
Department of Transportation
  Federal Highway Administration

State Agencies

Office of the Governor
State Department of Forestry
State Highway Department
State Historic Preservation Officer
State Information Center (Klamath)

Local Agencies

Chambers of Commerce
  City of Klamath Falls
  City of Medford
  City of Portland
  City of Salem
County Commissioners
  Jackson County
  Klamath County
  Lake County
Klamath County Planning Office
Klamath Lake Planning and Coordinating Council
Rogue Valley Council of Governments

B. COORDINATION IN THE REVIEW OF THE ENVIRONMENTAL ASSESSMENT

1. Copies of the environmental assessment will be sent to the following for review:

Advisory Council on Historic Preservation
Department of Agriculture
  Forest Service
Department of Commerce
  National Marine Fisheries Service
Department of Defense
  Corps of Engineers
Department of Interior
  Bonneville Power Administration
  Bureau of Indian Affairs
  Bureau of Land Management
  Bureau of Mines
  Bureau of Outdoor Recreation
  Bureau of Reclamation
  Fish and Wildlife Service
  Geological Survey
Department of Transportation
  Federal Highway Administration
Environmental Protection Agency
Federal Power Commission
Klamath Lake Planning and Coordinating Council

Oregon State Clearinghouse
State Historic Preservation Officer

2. Informational copies will be sent to the following:

State Agencies

Office of the Governor
State Department of Forestry
State Highway Department
State Information Center (Klamath)

Local Agencies

Chambers of Commerce
  City of Klamath Falls
  City of Medford
  City of Portland
  City of Salem

Local Agencies (cont'd)

County Commissioners
  Jackson County
  Klamath County
  Lake County
Klamath County Planning Office
Klamath Lake Planning and Coordinating Council
Rogue Valley Council of Governments

Private Organizations and Interest Groups

Automobile Club of Oregon
Conservation Foundation
Crater Lake National Park Study Group
Federation of Western Outdoor Clubs
Friends of the Earth
Izaak Walton League
National Audubon Society
National Geographic Society
National Parks Association
National Speleological Society, Inc.
National Wildlife Federation
Nordic Club of Oregon
Oregon Environmental Council
Oregon State Motor Association
Sierra Club
Sky Lakes Study Group
The Mazamas
The Mountaineers
Wilderness Society

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APPENDIXES

APPENDIX A

LEGISLATION

6. Crater Lake National Park

An Act Reserving from the public lands in the State of Oregon, as a public park for the benefit of the people of the United States, and for the protection and preservation of the game, fish, timber, and all other natural objects therein, a tract of land herein described, and so forth, approved May 22, 1902 (32 Stat. 202)

Public lands, Crater Lake National Park, Oreg., established.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the tract of land bounded north by the parallel forty-three degrees four minutes north latitude, south by forty-two degrees forty eight minutes north latitude, east by the meridian one hundred and twenty-two degrees west longitude, and west by the meridian one hundred and twenty-two degrees sixteen minutes west longitude, having an area of two hundred and forty-nine square miles, in the State of Oregon, and including Crater Lake, is hereby reserved and withdrawn from settlement, occupancy, or sale under the laws of the United States, and dedicated and set apart forever as a public park or pleasure ground for the benefit of the people of the United States, to be known as "Crater Lake National Park." (U.S.C., title 16, sec. 121.)

Boundaries.

Regulations, etc., by Secretary of Interior.

SEC. 2. That the reservation established by this act shall be under the control and custody of the Secretary of the Interior, whose duty it shall be to establish rules and regulations and cause adequate measures to be taken for the preservation of the natural objects within said park, and also for the protection of the timber from wanton depredation, the preservation of all kinds of game and fish, the punishment of trespassers, the removal of unlawful occupants and intruders, and the prevention and extinguishment of forest fires. (U.S.C., title 16, sec. 122.)

Settlement in, etc., prohibited.

Penalties.

Provisos.

Admission of visitors, etc.

Hotels, etc., permitted. (Amended by 39 Stat. 535, as amended. See pp. 9–12.)

SEC. 3. That it shall be unlawful for any person to establish any settlement or residence within said reserve, or to engage in any lumbering, or other enterprise or business occupation therein, or to enter therein for any speculative purpose whatever, and any person violating the provisions of this act, or the rules and regulations established thereunder, shall be punished by a fine of not more than five hundred dollars, or by imprisonment for not more than one year, and shall further be liable for all destruction of timber or other property of the United States in consequence of any such unlawful act: *Provided*, That said reservation shall be open, under such regulations as the Secretary of the Interior may prescribe, to all scientists, excursionists, and pleasure seekers and to the location of mining claims and the working of the same: *And provided further*, That restaurant and hotel keepers, upon application to the Secretary of the Interior, may be permitted by him to establish places of entertainment within the Crater Lake National Park for the accommodation of visitors, at places and under regulations fixed by the Secretary of the Interior, and not otherwise. (U.S.C., title 16, sec. 123.)

APPENDIX B

CHECKLIST OF MAMMALS

Vagrant Shrew	Sorex vagrens	Common
Northern Water Shrew	Sorex palustris	Moderately Abundant
Shrew Mole	Neurotrichus gibbsi	Common
California Mole	Scapanus latimanus	Uncommon
Little Brown Myotis	Myotis lucifugus	Common
Long Saked Myotis	Myotis evotis	Uncommon
Silver Haired Bat	Lasionycteris noctiuagans	Abundant
Big Brown Bat	Lptesicus fuscus	Common
Black Bear	Ursus americanus	Common
Raccoon	Prycyon lotor	Rare
Marten	Martes caurina	Common
Fisher	Martes pennanti	Extremely rare
Shorttail Weasel	Mustela erminea	Uncommon
Longtail Weasel	Mustela frenata	Common
Mink	Mustela vison	Absent from park
River Otter	Lutra canadensis	Rare
Wolverine	Gulo luscus	Absent from park
Badger	Taxidea taxus	Common
Striped Skunk	Mephitis mephitis	Rare
Coyote	Canis latrans	Rare

Red Fox	Vulpes fulva	Common
Gray Fox	Urocyon cinereoargenteus	Infrequent
Mountain Lion	Felis concolor	Infrequent
Bobcat	Lynx rufus	Infrequent
Aplodontia	Aplondontia rufa	Common
Yellow-Bellied Marmot	Marmota flaviventris	Common
California Ground Squirrel	Citellus beechegi	Common
Golden-Mantled Ground Squirrel	Citellus lateralis	Abundant
Townsend's Chipmunk	Sutamias townsendi	Common
Yellow-Pine Chipmunk	Sutamias amoenus	Abundant
Western Gray Squirrel	Sciurus griseus	Rare
Chickaree	Tamiasciurus douglasi	Common
Northern Flying Squirrel	Glaucomys sakrinus	Common
Sierra Pocket Gopher	Thomomys monticola	Common
Beaver	Castor canadensis	Absent from park
Deer Mouse	Peromyscus maniculatis	Abundant
Bugstail Woodrat	Neotoma cinerea	Common
Mountain Phenacomys	Phenacomys intermedius	Uncommon
California Redback Mouse	Clethrionomys occidentalis	Common
Longtail Vole	Microtus longicaudus	Frequent
Richardson Vole	Microtus richardsoni	Common
Muskrat	Ondatra zibethicus	Infrequent
Western Jumping Mouse	Zapus trinotatus	Common

Porcupine	Erethizon donsatum	Common
Pika	Ochotona princeps	Frequent
Snowshoe Hare	Lepus americanus	Frequent
Mountain Cottontail	Syluilagus nuttalli	Rare
Elk	Cervus canadensis	Locally common
Mule Deer	Odocoileus hemiones hemiones	Common
Blacktail Deer	Odocoileus hemiones columbianus	Common
Whitetail Deer	Odocoileus virginianus	Rare

CHECKLIST OF BIRDS

U - Uncommon

P - Permanent

Loons

U Common Loon

Grebes

U Red-necked Grebe

U Eared Grebe

U Western Grebe

U Pied-billed Grebe

Pelicans

U White Pelican

Cormorants

U Double-crested Cormorant

Herons and Bitterns

U Great Blue Heron

U Common Egret (American)

U Black-crowned Night Heron

Swans

U Whistling Swan

Geese

Canada Goose

U Black Brant

White-fronted Goose

U Snow Goose

Surface Feeding Ducks

U Mallard

U Gadwall

U Pintail

U Green-winged Teal

U Blue-winged Teal

U Cinnamon Teal

U American Widgeon

U Shoveler

U Wood Duck

Diving Ducks

U Redhead

U Canvasback

U Lesser Scaup

Diving Ducks (cont'd)

U Common Goldeneye

U Barrow's Goldeneye

U Bufflehead

Stiff-Tailed Ducks

U Ruddy Duck

Mergansers

U Hooded Merganser

Common Merganser

American Vultures

Turkey Vulture

Accipters or Bird Hawks

U-P Goshawk

Sharp-shinned Hawk

Cooper's Hawk

Buteos or Buzzard Hawks

P Red-tailed Hawk

Swainson's Hawk

U Rough-legged Hawk

U Ferruginous Hawk

Eagles

P Golden Eagle

P Bald Eagle

Harriers

U Marsh Hawk (Harrier)

Ospreys

U Osprey

Falcons

U Prairie Falcon

U Peregrine Falcon

U Pigeon Hawk (Merlin)

Sparrow Hawk (Kestrel)

Grouse

P Blue Grouse

P Ruffed Grouse

Quail - Partridges - Pheasants

U Mountain Quail (Plumed)

Cranes

U Sandhill Crane

Rails and Coots

U American Coot

Plovers and Turnstones

U Semipalmated Plover

U Snowy Plover

U Killdeer

Black-bellied Plover

U Ruddy Turnstone

Snipes, Sandpipers, etc.

U Common Snipe (Wilson's)

Spotted Sandpiper

U Solitary Sandpiper (Western)

U Wandering Tattler

U Greater Yellowlegs

Phalaropes

U Wilson's Phalarope

Gulls

California Gull

Ring-billed Gull

U Western Gull

Terns

U Forester's Tern

U Black Tern

Pigeons and Doves

U Band-tailed Pigeon

U Rock Dove (Domestic Pigeon)

U Mourning Dove

Owls

U Screech Owl

U Great Horned Owl

P Pygmy Owl

U Spotted Owl

U Great Gray Owl

U Long-Eared Owl

Goatsuckers

U Poor-will

Common Nighthawk

Swifts

U Vaux's Swift

U White-throated Swift

Hummingbirds

U Allen's Hummingbird

Rufous Hummingbird

Calliope Hummingbird

U Black-chinned Hummingbird

Kingfishers

U Belted Kingfisher

Woodpeckers

Red-shafted Flicker

U Pileated Woodpecker

Lewis's Woodpecker

Yellow-bellied Sapsucker

Red-breasted Sapsucker (color variety)

Williamson's Sapsucker

P Hairy Woodpecker

U Downy Woodpecker

U White-headed Woodpecker

P Black-backed 3-Toed Woodpecker (Arctic)

U Northern 3-Toed Woodpecker

Tyrant Flycatchers

U Western Kingbird

U Ash-throated Flycatcher

U Black Phoebe

U Say's Phoebe

U Traill's Flycatcher

Hammond's Flycatcher

Dusky Flycatcher

Western Flycatcher

Western Wood Pewee

Olive-sided Flycatcher

Larks

Horned Lark

Swallows

Violet-green Swallow

U Tree Swallow

U Rough-winged Swallow

U Barn Swallow

U Cliff Swallow

Jays, Magpies, Crows

P Gray Jay

P Steller's Jay

U Scrub Jay

U Black-billed Magpie

P Common Raven

U Common Crow

P Clark's Nutcracker

Titmice and Bushtits

Black-capped Chickadee

P Mountain Chickadee

P Chestnut-backed Chickadee

U Plain Titmouse (Gray)

U Common Bushtit

Nuthatches

U-P White-breasted Nuthatch

P Red-breasted Nuthatch

U Pygmy Nuthatch

Creepers

P Brown Creeper

Dippers

P Dipper (Water Ouzel)

Wrens

U House Wren (Western)

U-P Winter Wren

U Bewick's Wren

Rock Wren

Thrushes, Bluebirds, Solitaires

Robin

Varied Thrush

Hermit Thrush

Swainson's Thrush

Western Bluebird

Mountain Bluebird

Townsend's Solitaire

Kinglets

P Golden-crowned Kinglet

Ruby-crowned Kinglet

Waxwings

U Cedar Waxwing

Vireos

U Solitary Vireo (Cassin's)

U Red-eyed Vireo

Warbling Vireo (Western)

Wood Warblers

Orange-crowned Warbler

Nashville Warbler

U Yellow Warbler

U Myrtle Warbler

Audubon's Warbler

U Black-throated Gray Warbler

U Townsend's Warbler

Hermit Warbler

MacGillivray's Warbler

Wilson's Warbler (Pileolated)

Weaver Finches

U House Sparrow (English)

Meadowlarks, Blackbirds, Orioles

U Western Meadowlark

U Red-winged Blackbird

Brewer's Blackbird

U Brown-headed Cowbird

Tanagers

Western Tanager

Grosbeaks, Finches, Sparrows, Buntings

U Black-headed Grosbeak

Lazuli Bunting

Evening Grosbeak

U Purple Finch

P Cassin's Finch

U House Finch (Linnet)

P Pine Grosbeak

Gray-crowned Rosy Finch

U Common Redpoll

Pine Siskin

U American Goldfinch

Red Crossbill

U White-winged Crossbill

U Green-tailed Towhee

U Rufous-sided Towhee

U Savannah Sparrow

U Vesper Sparrow

U Lark Sparrow

U Slate-colored Junco

P Oregon Junco

U Tree Sparrow

Chipping Sparrow

Grosbeaks, Finches, Sparrows, Buntings (cont'd)

White-crowned Sparrow

Golden-crowned Sparrow

Fox Sparrow

Lincoln's Sparrow

U Song Sparrow

CHECKLIST OF AMPHIBIANS AND REPTILES

Amphibians

Northwestern Salamander	*Ambystoma gracile*
Long-toed Salamander	*A. Macrdactylum*
Rough-skinned Newt	*Talicha granulosa*
Oregon Salamander	*Insatina eschscholti oregonsis*
Tailed Frog	*Ascaphus truei*
Bozeal Toad	*Bufo boreas boreas*
Pacific Tree Frog	*Hyla regilla*
Cascade Frog	*Rana cacadae*

Reptiles

Northern Sagebrush Lizard	*Sceloporus gracious gracious*
Pygmy Horned Lizard	*Phrynosoma douglassi douglassi*
Northern Alligator Lizard	*Gerrhonotus coeruleus*
Valley Garter Snake	*Thamnophis sirtailis fitchi*

APPENDIX C

Archaeological Surveys of Crater Lake National Park and Oregon Caves National Monument, Oregon

Wilbur A. Davis

Report on an archaeological project carried out under terms of a Memorandum of Agreement, Crater Lake National Park - FY 1963 (Contract No. 14-10-0434-900), between the University of Oregon and the U.S. National Park Service.

Eugene, Oregon
January, 1964

ABSTRACT

The purpose of the project was to make archaeological surveys for evidence of aboriginal occupation and use of the regions and to do test excavations and other research to determine the significance of recorded archaeological resources.

The project developed into a study of negative evidence. The surveys determined that (1) Oregon Caves National Monument lies in an area remote from major aboriginal population centers and hence was probably rarely visited; (2) Crater Lake National Park is a sub-optimum habitat from the standpoint of aboriginal hunting and gathering economies; (3) low soil fertility is a major factor in the habitat conditions; and (4) the distribution and relative abundance of edible plants is the primary factor in determining recurrent seasonal subsistence activities which would result in durable archaeological evidence at unprotected localities.

- -

Copies of the full report are available at Crater Lake National Park, Oregon.

APPENDIX D

HISTORIC PRESERVATION COMPLIANCE

All actions proposed in the alternative that later would become part of the plan would comply with the procedures of the Advisory Council on Historic Preservation (36-CFR-Part 800), NPS Activity Standards, and NPS Historic Preservation policies and procedures.

Prior to the decision to implement any provisions of the plan, an overview of the prehistory and history of the project area would be prepared by appropriate professionals. All project areas also would be physically surveyed for archeological and historical remains by appropriate professionals, in accordance with Executive Order 11593. A Historic Studies Plan, and if necessary, a Historic Resource Study, would be prepared in compliance with NPS Activity Standards. The Pacific Northwest Regional Office would prepare these studies or arrange for their execution prior to the final approval of the plan. The State Historic Preservation Officer would be contacted to determine if he has any data regarding historical or archeological resources within the area, or on lands to be acquired. Should any cultural resources be located, these resources would be evaluated in terms of the National Register Criteria by the appropriate professionals and if they meet, or may meet the Criteria, the professionals would recommend to the Regional Director that he nominate them to the National Register and place them on the NPS List of Classified Structures. Where additional significant cultural resources are identified within an area already on the National Register, the

Region would revise the National Register forms for the area to reflect such additional resources and forward the revised forms to the National Register.

In complying with the provisions of the Advisory Council Procedures (36-CFR-Part 800), the Regional Director is the responsible Federal agency official. He would consult with the State Historic Preservation Officer concerning the National Register eligibility of any historical or archeological remains discovered, and also regarding the effect or potential adverse effect of any proposal of the plan.

All activities or developments proposed would be in accord with established National Park Service Historic Preservation policies, principally delineated in the Management Policies, 1975, and in the NPS Activity Standards. The demolition of any structures, whether historic or not, would be made in accordance with the procedures outlined in the Director's memo of January 26, 1973.

A professional archeologist would be on-site during construction to prevent damage to known cultural resources and to assist in the recognition of any new resources which might be discovered, if deemed necessary by the Regional Director. The contracting officer and/or the archeologist would have the responsibility and authority to halt any construction activities should historical, archeological, or paleontological resources be exposed. Construction activities endangering the resources would remain halted pending the investigation and evaluation of the remains,

as well as the completion of the steps required by the procedures of the Advisory Council on Historic Preservation.

In addition, the contractor would be made responsible to immediately halt construction activities and notify the contracting officer or archeologist in the event that historical, archeological, or paleontological resources were discovered during the course of such construction. The contractor would be briefed specifically on these provisions by the contracting officer prior to the start of construction. All contracts would reflect these provisions.

LIST OF CLASSIFIED STRUCTURES
CRATER LAKE NATIONAL PARK

Bldg. No.	
66	Crater Lake Lodge
67	Sinnott Memorial
116	Old Community Building
2	Ranger Dormitory
24, 25, 28	Employee Residences
30, 31, 32	Employee Residences
19	Superintendent's Residence
20	Assistant Superintendent's Residence
5	Machine Shop
37	Sign Shop
186	Pump House
33	Garage and Woodshed
3	Messhall and Bunkhouse
36	Transformer House
13	Meat House

OREGON STATE HIGHWAY DIVISION

HIGHWAY BUILDING • SALEM, OREGON • 97310

TOM McCALL
GOVERNOR

F. B. KLABOE
ministrator of Highways

September 26, 1974

Paul Koehler
National Park Service
Denver Service Center
655 Parset Ave.
Denver, Colorado 80225

Dear Mr. Koehler:

This is to confirm our recent conversation concerning Crater Lake National Park. Except for the lodge building, there are no sites or properties within Crater Lake National Park currently on the National Register or being considered for nomination.

Thank you for the opportunity to comment.

Very truly yours,

David G. Talbot
State Parks Superintendent

DGT:jw

cc: Paul Hartwig
John Rutter

United States Department of the Interior

NATIONAL PARK SERVICE

Crater Lake National Park
Post Office Box 7
Crater Lake, Oregon 97604

IN REPLY REFER TO:
L7617(PNR)D
XDI8
CRLA

November 30, 1976

Memorandum

To: Regional Director, Pacific Northwest Region

From: Superintendent, Crater Lake National Park

Subject: Estimate of Operational and Other Costs/New Administrative Site - Crater Lake National Park

As requested in Mr. Huebner's memo of November 5, 1976, we have attempted to put together some realistic cost/savings figures associated with a new Headquarters site in the Panhandle area of Crater Lake National Park. Please keep in mind that these are estimated and without refinement by a qualified analyst may or may not be valid.

The estimates are based on the following assumptions;

1. Operations will be conducted as proposed in the preliminary DES.

2. Numbers of permanent and seasonal employees will remain static with administrative functions for the park remaining in Klamath Falls.

3. All costs are figured on salary rates and costs for supplies and materials at 1976 fiscal year rates. No adjustment for inflationary trends for future years involved.

4. All cost figures estimated on an annual recurring basis.

The following are our estimates of costs/savings associated with the concept of the administrative area for Crater Lake National Park being moved to the Panhandle.

(+ indicates added expense)
(- indicates savings)

UTILITIES (Residences)	Cost/Savings
1. Electricity	+ $1,300
2. Fuel Oil	+ 3,000

Discussion
Several Steel Circle residences would remain occupied in the winter by one or two snowplow operators and ranger personnel. This will be necessary for visitor protection, efficient snow removal operation, to operate emergency power generator and monitor water distribution system. Two duplex units in the Steel Circle would probably be needed. Some heat would also be necessary in the other Steel Circle residences without rent revenues to prevent damage from condensation due to alternate freezing and thawing. Roof shoveling would still be required with the exception of only the mildest of winters - (discussed later).

UTILITIES (Government Buildings)	Cost/Savings
3. Electricity	+ 2,000
4. Fuel Oil	+ 15,000

Discussion
The maintenance buildings remaining in the Munson Valley area would continue to be heated for use in the winter, plus serving as dual facilities in the summer. In the winter, snowplow storage is required as it would be logistically unwise to deadhead snowplows from the Panhandle each day to work areas. Very often, snow removal is confined to higher elevations during warmer storms requiring storage at Munson Valley to prevent expensive deadheading. Even though the old administration building would be unused in the winter, some heat would be required to prevent damage from alternate freezing and thawing, etc.

UTILITIES	Cost/Savings
5. Water and Sewer	+ 4,000

Discussion
Dual water and sewer systems at Munson Valley and the Panhandle would be required both winter and summer. The Annie Springs system supplying Munson Valley and the rim would remain operative in the winter for National Park Service employees living in Munson Valley and the operation of concession facilities on the rim. Biweekly chemical and biological monitoring on both systems would continue year around. Increased costs include; .3 man year of seasonal services, increased mileage and supplies and materials.

UTILITIES	Cost/Savings
6. Telephone	+ $3,600

Discussion
It appears that another telephone company will provide service at the Panhandle. United Telephone Company now provides service for the Park at Munson Valley and at the rim. The Beaver State Telephone Company provides services in the Ft. Klamath area. This means with two telephone exchanges, a possibility exists of long distance charges between the Panhandle and Munson Valley. More telephones will be necessary particularly during the summer. Some reduction in the number of instruments could be realized during the winter at Munson.

UTILITIES	Cost/Savings
7. Radio	+ 250

Discussion
Base stations would be required at each location (Panhandle Headquarters and Munson). The repeater site at the Watchman would function nicely for both locations. A few more (3 to 4) portables would be necessary. All the increases in radio communication after purchase of the new equipment, would be a small amount for maintenance.

TRANSPORTATION	Cost/Savings
1. Snowplowing	- 2,000

Discussion
Snowplowing expenses in Crater Lake National Park at today's costs are in excess of $100,000 per year. This includes personal services, vehicle amortization, and charges, cost of repairs, and fuel and oil. We also reviewed snow removal costs as estimated for fiscal year 1968, which was compiled at that time to compare operating expenses if Headquarters were moved to the Panhandle area of the Park. That report estimated that approximately $6,000 would be saved if the Headquarters were located at the Panhandle. However, additional travel time during spring opening would increase spring opening costs about $2,000. A total savings of $4,000 was estimated in 1968 for all snow removal operations through improved efficiency. The Stone Houses and Sleepy Hollow areas would not be plowed. One loop of Steel Circle and the new Headquarters site would be plowed, thus balancing out these small areas.

There would also be extra costs in spring opening due to additional commuting time from the Panhandle Headquarters to the work site which would somewhat balance out other savings.

TRANSPORTATION	Cost/Savings
2. Other	+ $1,300

Discussion
With the Headquarters at the Panhandle area in the Park, there would be increased transportation costs for the employees for travel to Munson Valley. This would be particularly true in summer operations. It is difficult to estimate how many trips this would be, but not including workmen living at the Panhandle with the work site elsewhere, we estimate 500 trips per year. This would be offset some by those trips from the Panhandle Headquarters to the administrative office in Klamath Falls and for supplies in Klamath Falls.

OTHER MAINTENANCE ACTIVITIES	Cost/Savings
1. Garbage Collection	+ 1,000

Discussion
At the present time, during the summer season, Crater Lake contracts garbage collection and disposal. With a new facility at the Panhandle, this contract will have to be increased proportionately.

OTHER MAINTENANCE ACTIVITIES	Cost/Savings
2. Quarters Maintenance	+ 3,000

Discussion
Quarters maintenance costs would not change appreciably due to increased revenue in the quarters account from rent. However, seasonal housing in Steel Circle will be without income for nine months with additional maintenance due to a more transient type of occupancy.

OTHER MAINTENANCE ACTIVITIES	Cost/Savings
3. Building Maintenance	- 2,000

Discussion
With the disposal of older, high maintenance, buildings in the Munson Valley area, it is estimated that for a period of about ten years building maintenance costs would be reduced with the Headquarters at the Panhandle area.

OTHER MAINTENANCE ACTIVITIES	Cost/Savings
4. Road Maintenance	$ -0-

Discussion
New service roads in the Panhandle area would be offset by elimination of the road in the Sleepy Hollow area. Therefore, little or no difference in road maintenance costs.

OTHER MAINTENANCE ACTIVITIES	Cost/Savings
5. Roof Shoveling	+ 1,500

Discussion
In a low heat situation for the unused residences at Munson Valley, together with better insulation (1976), we must assume that these buildings must be shoveled each winter. Two of the structures are built to withstand 200 pounds per square foot and the six others 300 pounds per square foot. These six have never been shoveled in the past. However, with insulation and low heat in the buildings with little or no snow melt on roofs, we must figure on shoveling these buildings at least once. With no community type building being programmed for the Panhandle area, the Community Building at Munson Valley will still be utilized for community functions. Due to a high heat loss in this building, no shoveling has been necessary in the past and none is anticipated.

EMERGENCY EQUIPMENT	Cost/Savings
1. Structural Fire Control	+ 3,000

Discussion
Another complex at the Panhandle would require fire protection equipment at the site with annual maintenance costs involved. Some year around functions would remain at Munson Valley which would require existing equipment to remain at that area. New equipment must be purchased ($60,000) for the Panhandle area of the Park to adequately protect new structures and the safety and property of the employees living there. Annual maintenance costs would be incurred for this new equipment.

SUMMARY	Cost/Savings
Utilities (Residences)	
1. Electricity	+ $1,300
2. Fuel	+ 3,000
Utilities (Government Buildings)	
3. Electricity	+ 2,000
4. Fuel	+ 15,000
5. Water and Sewer	+ 4,000
6. Telephone	+ 3,600
7. Radio	+ 250
Transportation	
1. Snowplowing	- 2,000
2. Other	+ 1,300
Other Maintenance Activities	
1. Garbage	+ 1,000
2. Quarters Maintenance	+ 3,000
3. Building Maintenance	- 2,000
4. Road Maintenance	-0-
5. Roof Shoveling	+ 1,500
Emergency Equipment	
1. Structural Fire Control	+ 3,000

(Total added expense = $38,950)
(Total savings = 4,000)

EXTRA COST PER YEAR = $34,950

The following is a brief summary of the advantages and the disadvantages of Headquarters at the Panhandle verses Munson Valley.

PANHANDLE - HEADQUARTERS

Advantages

1. Light snowfall area.
2. Closer to school facilities on dry roads.
3. Pleasant year around living conditions.
4. Moderate snow removal problems at Headquarters site.
5. Shorter distance to shopping area (Klamath Falls) over snow free roads.

Disadvantages

1. Not centrally located in Park.
2. Separate summer Headquarters operations would be necessary at Munson Valley.
3. Longer commuting distance by some workers to work site - time consuming with less productivity.

MUNSON VALLEY - HEADQUARTERS

Advantages

1. Central location in Park.
2. Existing facilities would be utilized to full potential.
3. Ideally located for most summer activities.

Disadvantages

1. Less favorable living conditions within heavy snowfall area.
2. As existing facilities outlive their useful life, i.e., Sleepy Hollow residences, replacement structures would be constructed in same high snowfall area with expensive replacement costs.

We believe it is fair to state the existing Headquarters area at Crater Lake National Park probably presents the most restrictive living conditions outside the state of Alaska. Weather records disclose snow falls at Munson Valley an average of 94 days per year with the total snowfall averaging 600 inches. Snow depths average 12 to 16 feet at the height of the winter. Snow covers the ground from October until July.

No weather records have been kept for the Panhandle area but it is snow free three to four months more than Munson Valley with snow levels reaching only three to six feet. Thermal inversions are common in the Klamath Basin so we expect a proportion of nighttime temperatures to be lower at the Panhandle Headquarters site.

The effect upon personnel and their productivity living in Munson Valley should be considered serious and the morale factor is discussed extensively in the DES. Employee transfers are frequent which increases Service costs. It is difficult to assess the intangible benefits received by employees if Headquarters were located at the Panhandle, but the opportunity for improved morale would be greater. There is no evading the fact that a dual Headquarters will be necessary during the visitor season. This will be burdensome and expensive.

We believe the cost/savings data in this report is objective and conservative. We hope that if there are other items which we have not considered or if questions arise on the validity of our estimates in the report, we would be contacted for a re-evaluation.

Frank J. Betts

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APPENDIX F

PLANNING TEAM

Numerous National Park Service employees, private individuals, and organizations have participated in the lengthy planning process leading to this draft document. This environmental statement was prepared by:

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As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities to protect and conserve our land and water, energy and minerals, fish and wildlife, parks and recreation areas, and to ensure the wise use of all these resources. The Department also has major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.