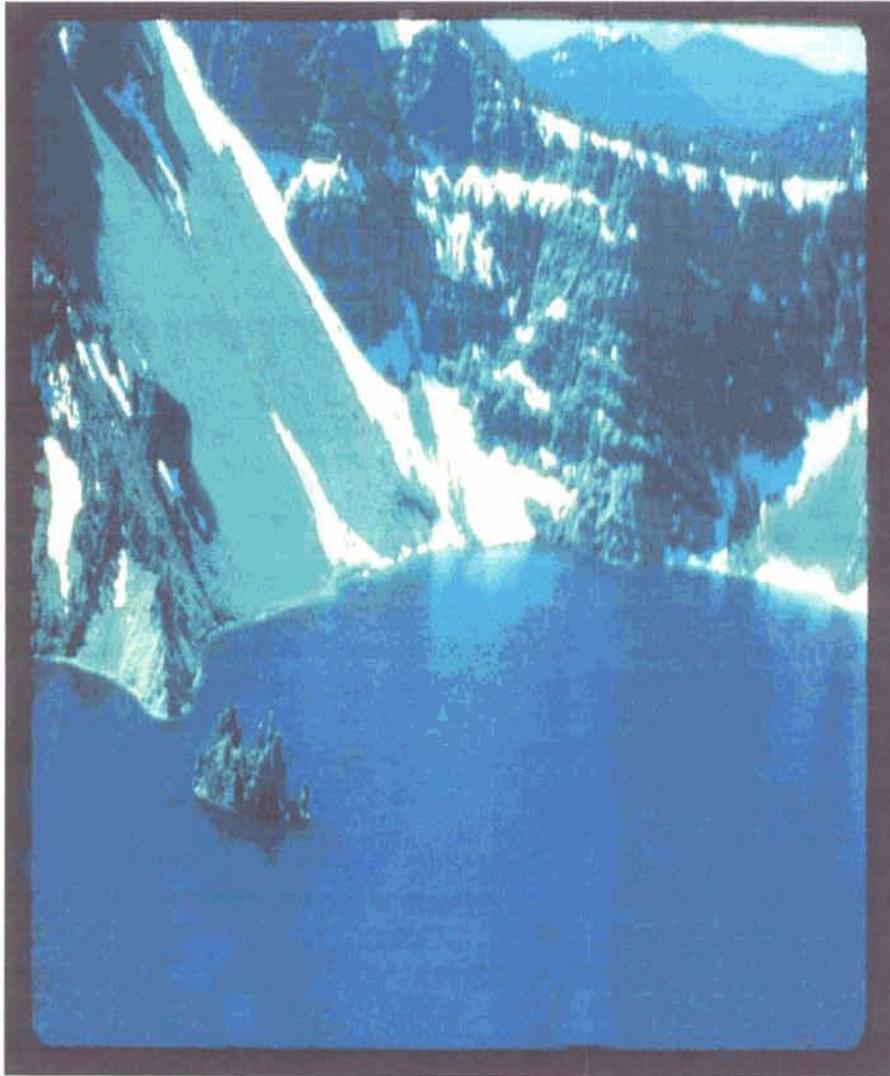


Crater Lake National Park
Resource Preservation and Research
Annual Accomplishments Report



1999

Crater Lake National Park
Resource Preservation and Research

Looking Back at 1999 and Toward the Year 2000

I am pleased to present to you the 1999 Annual Accomplishments Report for the Division of Natural Resource Preservation and Research. Throughout the year our staff is often faced with significant challenges to preserve the natural resources of Crater Lake National Park. The threats to this park range from the obvious to those yet detected; from within as well as from outside our boundaries. As our world grows smaller, we are increasingly aware that the Crater Lake ecosystem we strive to preserve unimpaired is but a part of a greater socio-ecologic system. We are undeniably affected by what goes on around us.

Our staff, like most in the National Park Service, is small but extremely dedicated to our mission of natural resource preservation. At this time of the year when we are able to “take stock” of what we did, I am always gratified to recognize that we have made a tremendous difference. We have indeed accomplished much.

We continue to learn about the resources for which we are responsible. Our natural resource inventories are helping us know more today about what species live in the park. Through our monitoring we are learning what role they play and how they interact in the greater Mazama ecosystem. Monitoring also helps us understand if resources are within a normal range of variability. When we believe that our systems are outside of the normal range, we focus research to determine cause and effect.

In some cases, we have identified where the natural systems need intervention and we are actively restoring these systems. Scars from development have been restored with their native genotypes. The bull trout is on its way back from the brink of extinction in the park. We have removed tons of hazardous wastes from the park. And for the first time in a decade, natural fire has been allowed to reclaim its ecological role.

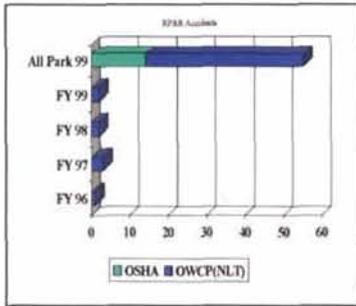
The future will undoubtedly throw us some curves. But it will also present opportunities through technology and science. It will give us new tools to better understand the ecology of this park. Armed with knowledge and understanding we will be better equipped to be better managers and more sensitive stewards. We look optimistically toward the new millennium.

William M. Brock
Chief, Resource Preservation and Research
Crater Lake National Park

Administration

Program Oversight

Program oversight by our Branch Chiefs continues to be excellent, reflected in a highly motivated staff, superior fiscal accountability and continued acknowledgement by other divisions of our support and attention to administrative details. In particular, our Terrestrial and GIS Branches provided significant ongoing support throughout last year to assist the Ranger Division in the implementation of the park's Fire Management Plan. The Aquatics Branch provided funding and assistance in setting up an aquarium in the park Visitor Center for an interpretive display on park fisheries management.

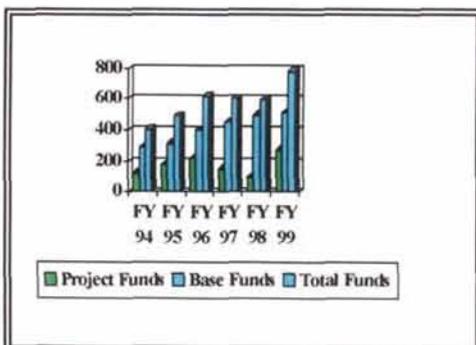


Safety is, and will continue to be a primary focus of our line supervisors. Our diligence in recognizing workplace hazards, building safety awareness and promoting safe work behaviors resulted in zero OSHA reportable accidents last year, zero OWCP lost time accidents and only two minor mishaps requiring limited OWCP compensation. We will continue to build upon this success and remain committed to achieving an absolute zero accident rate.

Accurate property accountability and security for sensitive equipment also continue to be a focus of our staff. We are working with the Administrative Division to accurately identify our responsible property. We will develop better storage for accountable property in the wake of construction at our offices. We will also improve upon our internal property accountability system.

Outside activities vie for our time and attention. In particular, we dedicated a significant amount of time assisting the Solicitor's Office and WASO Water Resources Division in the Alternative Disputes Resolution for the Klamath Basin Water Rights Adjudication. Over the course of the year we have gradually inched toward a resolution. I anticipate that this issue will persist throughout this winter until a settlement is reached or we are forced to litigate.

Funding

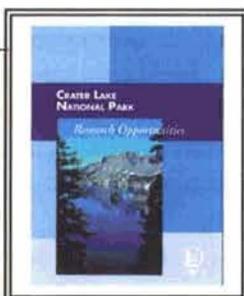


ONPS support for natural resource preservation increased for the sixth year. Base financial support for natural resource preservation increased slightly over FY 98 levels primarily due to a 3.6% cost of living adjustment for personal services. Project support remained very strong accounting for 35% of our total funding in FY 99.

We have endeavored to market our program needs to draw upon a wide variety of sources for financial and program support. Our Branch Chiefs completed several high quality funding proposals which have currently secured an additional \$65,000 in project funding for FY 2000. In addition, a settlement agreement with the American Eurocopter Corporation awarded \$122,500 for lake bottom surveys in FY 2000.

The Park as a Laboratory

Over the years Crater Lake has become recognized internationally for its contributions to science particularly in the field of limnology. The research prospectus was designed to help attract and guide independent research at Crater Lake National Park. Through this prospectus we hope to broaden academic interest and spawn additional research in the park.

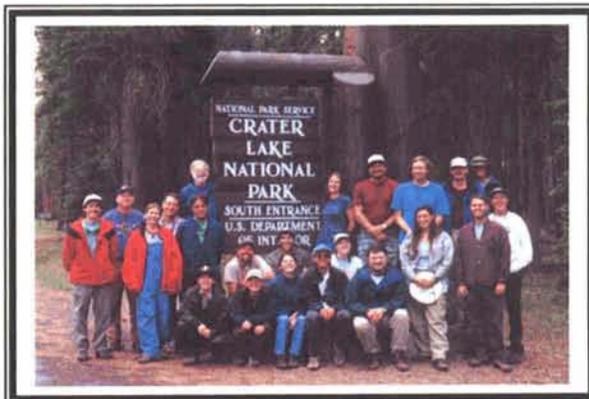


A Research Prospectus was completed last year. This document will serve to market the park's research needs and hopefully attract independent scientists to help us understand the park's complex ecosystems. This document was well received by the Regional Director and touted as an example of promoting parks as laboratories for collaborative research. The prospectus was made possible primarily through a donation from the Crater Lake Natural History Association. The USGS also contributed funding and coordinated printing through Oregon State University.

Staffing

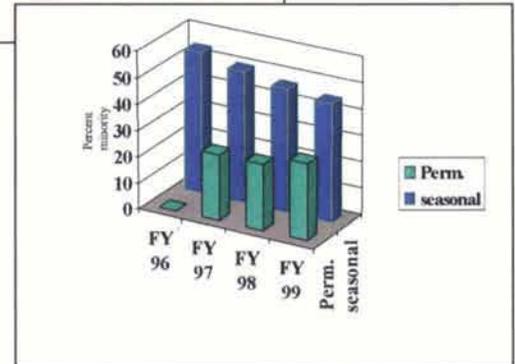
Commensurate with increases in base funding, the division continues to grow as we filled one critical permanent position to oversee a new Geographic Information System (GIS) Branch.

Currently we are operating at approximately 49% of our proposed workforce based on an objective analyses of workload (RMAP). The future for additional positions in natural resource management appears bright. We developed an interdisciplinary request (OFS) for ONPS base funding last year. The request was well received in Region and we anticipate a base increase of approximately \$288,000 within the next 2-3 years. Future positions would establish follow-up management for stream fisheries, a wildlife management program, data management capabilities and an enhanced research focus through a park Science Advisor. This proposal, if funded, will provide an additional 22% of our identified workforce need.



In addition to quantitative improvements we have also enhanced the quality and maintained the diversity of our division's workforce. The Resource Careers Initiative identified the professional nature of our positions and resulted in upgrades to our Fisheries Biologist and GIS Specialist positions.

Our FY 99 seasonal workforce was made up of 45% minority candidates. The minority compliment of our permanent workforce increased slightly to 29%. We had zero EO complaints of discrimination or harassment, either formal or informal.



Inventory

Information Management

Bibliographic information on park resource management and research activities is an important foundation to our information base. We lost our bibliographic database in a series of computer LAN modifications in the park over the past several years. We have begun to rebuild and refine that database by establishing a centralized database of all published and unpublished manuscripts specifically related to natural resources management at Crater Lake National Park. Currently we have an old database that identifies 1104 natural resource publications. We have located 237 hard copies of these documents.

A new, moderately robust computer was added to the Geographic information System's (GIS) lab complement early in the year and we promptly integrated it into the park-wide Windows NT network system. We also added a Trimble Pathfinder Pro XR global positioning system (GPS) receiver to our inventory, as well as software for creative display of GIS data, and in-house analysis of satellite and other raster data. Initial tests of the Pathfinder Pro XR were most impressive, offering both greater precision and convenience in gathering field data. We experimented with several means of improving accuracy of satellite derived positioning data including: a Community Base Station (CBS) and a

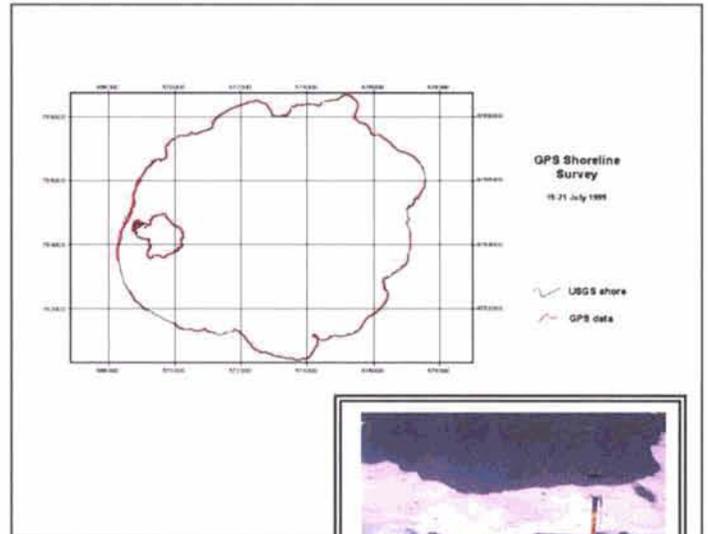
Our GIS is truly an interdivisional tool. Last year this technology provided support and analyses for numerous projects. Most of these projects could not have been accomplished without GIS technology. Some examples include:

- Compilation of potential lynx habitat
- Display system for lightning-strike data
- Maps for fire management
- Support for cultural resource studies
- Locations of park infrastructure
- Wilderness and fire management planning support
- Review and correction of park base maps

The above listing is selective, not comprehensive, and is intended to illustrate the breadth of the support that the GIS Program is capable of providing to the park.

radio-beacon transmitter and receiver pair. Emerging alternatives including a possible new Coast Guard mid-frequency beacon differential data transmitter in the Klamath Falls area and the availability of the Javad equipment-positioning system in the park may offer other cost-effective options for our field positioning needs.

We used GPS to acquire new alignments for the Cleetwood Cove and Watchman trails and the historic horse trail and added them to our database. A new alignment of the shore of Crater Lake was also acquired from a weeklong lake operation utilizing a Zodiac boat and hand-held GeoExplorer II GPS receivers. It is quite clear that there are significant differences between the new shoreline and those previously published by the U.S. Geological Survey. The experience gained by this exercise will be invaluable in developing a plan to augment forthcoming high-resolution bathymetric data for the lake with detailed near-shore bathymetry and navigational hazards data.



We discovered that several digital orthoquads (DOQs) provided to us by the Forest Service were flawed. The errors were traced and corrected in-house for internal use. Local fieldwork suggested that there were also flaws in the classification structure in our vegetation cover data. These too were corrected. We now have considerable confidence in the vegetation cover data set. A systematic field check to verify these data is in the offing.



We have begun to build an archive of survey monuments in and near the park starting with publicly available descriptive information downloaded from the National Geodetic Survey's web-sites. We hope to complete this archive within a couple of years.

Floral Inventories

Last year, funding from the Regional Ecosystem Office enabled us to conduct field surveys towards the development of a Plant Association Group Map in cooperation with the USFS and BLM. This digital map will provide seamless plant association coverage to compare with neighboring agency lands within the Southwest Oregon province.

Whitebark pine is a sensitive community in the park. Crater Lake has 225 acres of high elevation forest dominated by whitebark pine. These stands located around the caldera rim are important to the survival of the Clark's nutcracker, a commonly seen year-round resident of the park. Last year, a volunteer helped us establish 24 permanent plots in the park's densest stands to determine the percent of whitebark pine infected with blister rust.

This effort, in cooperation with BRD scientists at Glacier NP, is part of a long-term study to characterize the health of whitebark pine communities within the western US. Twenty-four additional plots will be established in FY 2000.

Another volunteer converted our most recent plant inventory developed by Peter Zika in 1995 into a user-friendly electronic database for use by park staff. The park is home to at least 680 vascular plant species.

Faunal Inventories

A student volunteer completed an exhaustive literature search and developed a comprehensive list of the park's potential vertebrate fauna. She identified a total of 260 taxa and completed an electronic database that includes: 161 birds, 73 mammals, 11 amphibians, 10 reptiles and 5 fish species. In addition, last year we were picked as one of a select group of parks scheduled for funding for a comprehensive field survey of vertebrates in the near future. This vertebrate list will provide the foundation for a more systematic inventory. Recent announcements of increased funding for the service-wide Inventory and Monitoring Program suggest that this inventory could be initiated as soon as next year and expanded to include all biological resources.

We continued to survey suitable park habitats for wolverines and, in addition, initiated surveys for the Canada lynx last summer. Winter surveys for wolverine did not detect wolverine presence at the recording station established near Union Peak. The park, in cooperation with the USFWS, participated in a regional survey for lynx, by establishing 22 hair snag stations over a 32-mi² survey area. Hair was detected at three locations. The samples are being analyzed to determine if the fur recovered is indeed lynx.

Geology and Soils Inventory

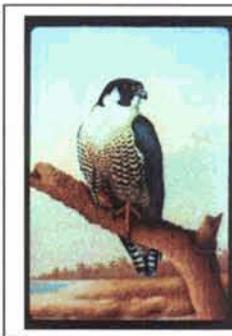
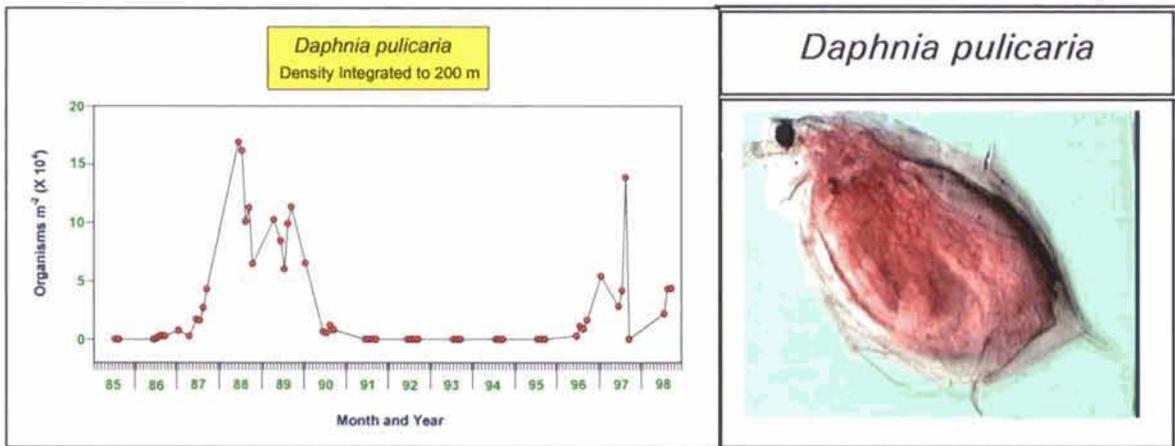
The USGS did not request any additional support beyond an extension of their research permit. The draft geologic map has been submitted for peer review prior to final publication.

We contracted with the NRCS to conduct the first year of a two-year soil survey in the park. We provided funding for archeological compliance surveys and logistical support. The NRCS was able to complete their first season of fieldwork. We anticipate a completed soils inventory by 2001.

Monitoring

Water Resources

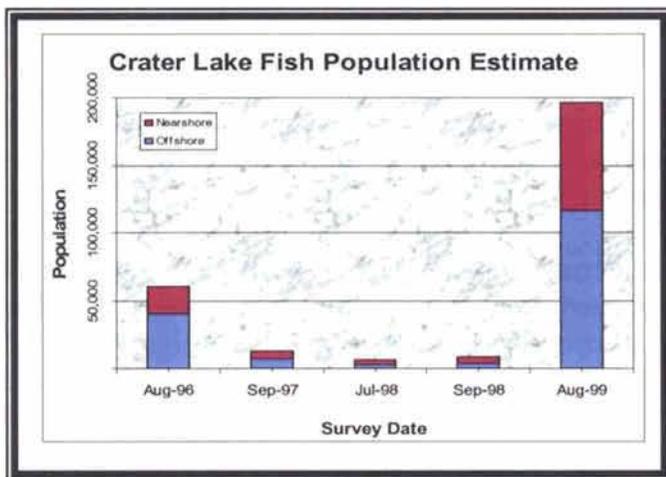
We conducted three trend analyses of Crater Lake in July, August, and September with the assistance of personnel from OSU and Rogue Community College. The long-term monitoring program has demonstrated that Crater Lake is a complex, dynamic system. For example, the population of *Daphnia pulicaria*, the lake's largest zooplankton, has undergone dramatic changes over the last fifteen years. We hypothesize that either non-native kokanee salmon or nutrient upwelling is affecting daphnia abundance. Other zooplankton species have also changed greatly in abundance. The interactions between nutrients, phytoplankton, zooplankton, and fish are being investigated.



Fish and Wildlife

Our wildlife monitoring program focused on two listed species last year: the peregrine falcon and northern spotted owl. Early spring surveys confirmed whitewash presence at the historical peregrine eyrie, suggesting territorial marking. There was no evidence of nesting. Other suitable habitat was monitored at Dyar Rock and Llao Rock. One adult peregrine was seen during the second protocol visit to Dyar Rock, confirming presence. In late August, the USFWS removed the peregrine falcon from the endangered species list. Nevertheless, we will continue annual monitoring of falcon habitat, to determine relative abundance within the park.

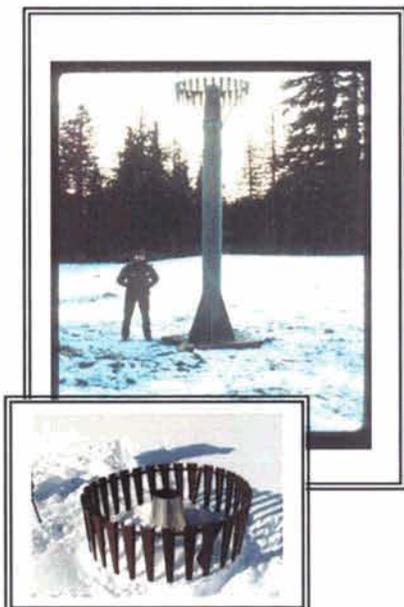
Our crews made 24 visits to 14 of the 18 known spotted owl activity centers located within the park. They also surveyed two additional areas, Castle Point and Wildcat Creek last year. No new activity centers were identified. Eight owls were located in six separate activity centers (Boundary Springs, Crater Creek, Little Copeland Creek, Lower Sun creek, Sand Ridge, and Red Blanket Canyon). No juveniles were located this year. In many cases, audio responses were the only form of detection. Biologists studying spotted owls on other lands adjacent to the park also reported a lower level of responsiveness this year compared to previous years. This coincides with the lack of visual confirmation of many of the park owls. The heavy snow accumulation and late snowmelt this year may have influenced owl activity and detection.



Using hydroacoustic technology, we have been able to study the size and behavioral patterns of the Crater Lake fish population. As many fishermen noted this summer, the fish population was significantly higher than recent years. In fact, populations were approximately 23 times higher than 1998. A similar pattern occurred in 1989, followed by the disappearance of daphnia.

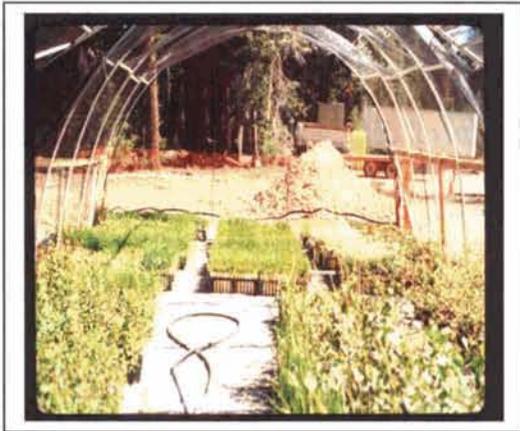
Using this technology in conjunction with data from fish caught in gill nets, we will be able to quantitatively examine the affects of the fish population on other aspects of lake ecology, especially in terms of the affects on zooplankton.

Air Resources and Climate



Our Aquatics group continued to service the weather station and bulk precipitation gauges. Long term weather monitoring is important to understanding ecosystem dynamics as well as global changes that may affect the park. We also continued to service the IMPROVE fine particulate monitor year round. A passive ozone monitor and nephelometer are maintained and operated in the summer. Results from our air quality monitoring indicate that the condition park's airshed is very good, with relatively little impact from fine particulates. Visibility is high with only a 3.3% frequency of impairment from all sources. Less than 1% is considered moderate to heavy impairment.

Restoration



Terrestrial Sites

We developed restoration plans for two upcoming fee demonstration sites: the North Junction and Vidae Falls. There were numerous concerns expressed about the plans related to potential impacts to cultural features. Management determined that these projects were principally cultural projects and the Cultural Resource Division assumed responsibility for their planning. Eventually the restoration of the North Junction was tabled. Cultural Resources developed the site plan for

Vidae Falls and we provided a revegetation plan with an estimate of costs and time frames necessary to rehabilitate the impacted areas.

We completed the final year of monitoring for the Upper Munson Valley Road restoration project. Surveys were conducted on four visits in August and September. Relative plant mortality from the 1998 planting was estimated at 25%. High vigor and survival was most noticeable in areas where plantings were clumped and duff levels were deep. The most successful natural seeding came from lupine and grass species. Seasonal rains were sufficient in frequency and duration to preclude the need for artificial watering.

The landscape at Mazama Dormitory was successfully planted using all park volunteers after a year's setback from construction repair delays. More than 2400 native shrubs, forbs, grasses and sedges were located around the dormitory, central building and parking area which house concessionaire employees. Erosion control mat and grass seed were applied in fall 1998.

In cooperation with Casey Baldwin and the Friends of Crater Lake, we also completed a restoration project for Mt. Mazama Collomia, a rare plant in the park. The plant was propagated and has been reestablished where it was once obliterated near Thousand Springs. This project has given us new insights into successful restoration techniques for this sensitive plant.

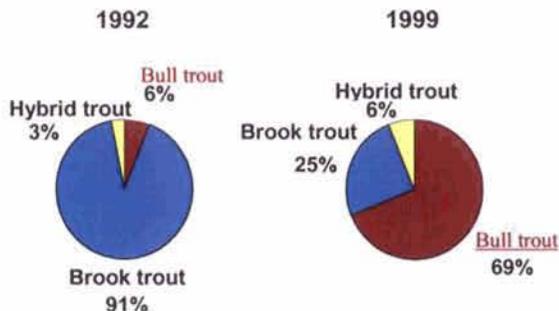
A spill site that was discovered two years ago at the South Yard Maintenance areas was cleaned up through interagency cooperation with the U.S. Corps of Engineers. Environmental contractors removed approximately 400 tons of road oil and contaminated soil possibly dumped during road resurfacing years ago. The contaminants were disposed of in an approved facility and the site back-filled with clean soil.

Aquatic Species

This was to be the final year of our current bull trout restoration project at Sun Creek. Unfortunately, the heavy winter snowfall and subsequent high summer run-off hampered our efforts this year to the point where we were not able to complete the project as planned. We were able to: 1) complete a bull trout census, 2) mechanically remove non-native brook trout, 3) develop techniques for hatchery rearing, 4) develop a new mechanical removal technique using trap nets that will aid in temporary bull trout removal in 2000, and; 5) significantly increase our interpretation of endangered and exotic fish management in the park visitor center. Additional funding was secured from Cluster and Fee Demonstration programs to complete the project next year.



Eight years of brook trout removal efforts using electroshockers has allowed the bull trout population to grow significantly. Likewise, the proportion of bull trout in the creek has increased dramatically.



Our Aquatic Ecologist and the members of the Bull Trout Restoration Crew are to be commended for their dedication over the past seven years to save this threatened species from extinction in the park. These employees were recognized with Special Achievement Awards last year for their outstanding work in bull trout restoration.



Anthropogenic Threats

Adverse Human/Resource Conflicts

We continued to use the compliance process outlined in the Superintendent's Directives to review and track projects in the park. The process is designed to anticipate potential

resource impacts during project planning and assure mitigation during project implementation. We reviewed 38 projects last summer. At least half of the projects submitted required some form of cultural approval. The vast majority (94%) were approved as categorical exclusions to NEPA. The process currently in place will work well as long as the participants are willing to submit projects on time with complete information and reviewers provide timely review.

Our Terrestrial Resource staff completed a Hazardous Tree Management Plan and provided copies to the squad for review, approval, and eventual implementation. Our Environmental Protection Specialist completed a Draft Bear Proof Food Locker Planning Report to help guide the future location and installation of food lockers in park campgrounds. This plan will also be provided to the squad for review and approval.

We completed compliance surveys and reports for Threatened, Endangered and Sensitive (TES) species for several planned park projects including: TC2 prescribed burn, Crater Peak Trail and PCT rehabilitation, and planning for the Godfrey Glen trail. TES fauna surveys were conducted according to USFWS protocol, and TES Flora surveys followed intuitive controlled survey methods.

Our Terrestrial Branch staff also identified and removed exotic plant species at two new locations this year. Spotted knapweed (1000-1500 individuals) was removed along an old burn unit on hwy 62 south. Bull thistle (50+ plants) was discovered and controlled at the north edge of "coyote meadow". This west-side meadow has continued evidence of cattle trespass that may be the source of exotic plant encroachment.

Research and Publications

Research Activities

We supported fourteen independent research studies in the park last year. One was funded with NPS funds, the Natural History Association funded four and nine were independently funded. Several of the independently funded projects used Crater Lake as one of numerous study sites to look at regional or global environmental patterns.

Research Results and Publications

The results of an investigation into the extent and significance of petroleum Hydrocarbon contamination in Crater Lake (Oros, et al 1998) conducted in 1995 was published through the College of Oceanic and Atmospheric Sciences at Oregon State University. The results indicate that boat operations on the lake are unavoidably introducing petroleum hydrocarbons and their combustion residues into the lake and sediments, however concentrations are low and similar to background levels.

We (Crater Lake N.P.) continued to synthesize data on Crater Lake Fish Population using our new hydroacoustic technologies. Our Aquatic Ecologist has also presented the results of several facets of our bull trout program at several professional meetings this year. The park's bull trout project was highlighted as one of the case studies for the Director's Initiative on Resource Management.

Bill Warneke (Oregon State University) submitted his thesis on near shore zooplankton in Crater Lake. Part of his work was also submitted for a peer review publication.

Researchers from the Microbiology Department at Oregon State University completed an NSF sponsored study of bacterial ecology in the lake. The bacterioplankton community in Crater Lake differs from communities found in other freshwater systems. Differences between Crater Lake and other lake bacterioplankton may be due to atypical properties of the study site. Crater Lake is a very deep, subalpine lake with approximately a 4:1 ratio of lake surface to catchment area. Phytoplankton productivity is believed to be limited by nitrogen and/or iron availability. These properties are rare in lake systems and more closely resemble oceanic systems. Most important, each of the phylogenetic groups dominant in the Crater Lake bacterioplankton includes or is closely related to culturable microorganisms. It may therefore be possible to cultivate the dominant microorganisms in the Crater Lake community to use as a laboratory model closely resembling a natural, oligotrophic microbial ecosystem.

The exchange of nutrients in the lake system was further studied using sediment traps moored to the bottom of the lake. The ongoing study demonstrates that large pulses of particles move down the walls of the lake and these particles are a source of nutrients into the deep basin of the lake. These results combined with results from the global monitoring program showed changes in the rates of productivity and vertical mixing from year to year as a result of variations in weather.

Dave Peterson (USGS – BRD) published a paper entitled “Detecting Long-Term Hydrological Patterns at Crater Lake, Oregon” based on tree ring chronologies. His research indicates that the lake level has been lower since the 1980's than in the 300 years previous. He also found that the lake is sensitive to variations in precipitation, making it an indicator of regional climate change.

Casey Baldwin (University of Idaho) submitted a draft version of his *Collomia mazama* research for inclusion on the park's website. Resource staff are in the process of reviewing the material.

Carol Ferguson (Southern Oregon University) completed a second season of field surveys to inventory the park's native bumblebees.

Thomas Robertson (Portland Community College) identified the hydrologic setting, water chemistry, aquatic invertebrates, and vegetation, of several representative springs and their associated riparian areas within the park.

Shannon Datwyler (The Ohio State University) collected leaf samples from *Penstemon* plants located on Wizard Island for DNA analysis. She is researching the potential for hybridization and gene flow in an isolated population of *Penstemon*.