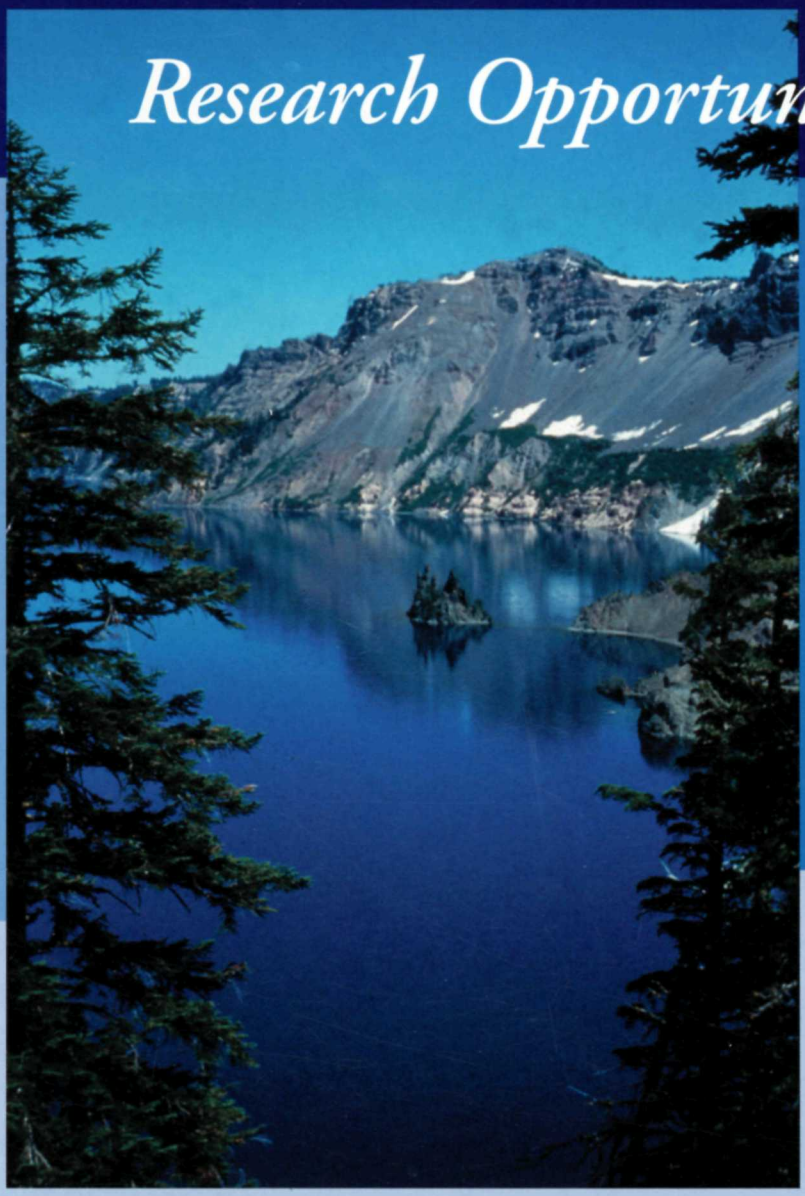
Crater Lake National Park

Research Opportunities



CONTENTS

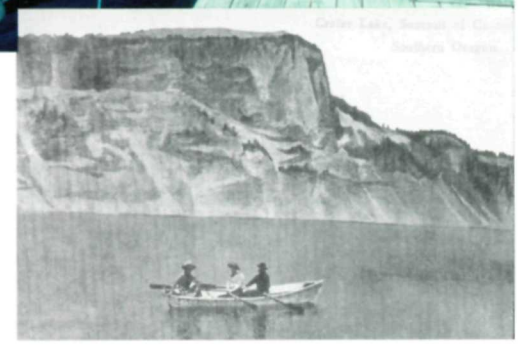
National Park Service, 1999

Since 1916 Crater Lake National Park has been managed

. . . to conserve the scenery and the natural and historic objects and the wild life therein and to provide for their use in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.

Preserving a national park is difficult. The complex interactions of natural ecosystems and our social systems are often in conflict. Our management decisions must not only serve the needs of a constantly changing society, but must also recognize the dynamics of natural ecosystems. Without a fundamental understanding of our natural resources and social systems and their interactions, managers run the risk of making improper decisions, which may threaten long-term preservation of a park. We intend to investigate the resources in our charge through comprehensive inventory and monitoring and to study their interrelationships to learn about natural variation and ecosystem function. Armed with scientific data, we can make informed management decisions and prevent many conflicts before they arise.

INTRODUCTION



Crater Lake sits astride the Cascade Range in a caldera left behind by the climactic eruption of Mount Mazama in South-Central Oregon 7,700 years ago. The first known scientific research in the area took place in 1883, when three men lowered a wooden rowboat almost 700 feet down from the caldera rim to the shoreline of the lake. Those early scientists mapped the shoreline and took soundings to determine the depth of the phenomenal body of water. Other researchers followed to measure the clarity and temperature of the water. Still more came to document the biota and geology of the lands surrounding the lake. This pioneering work helped convince Congress to preserve the area as a national park in 1902.

The research program at the Park has come a long way since those first measurements at the turn of the century. In 1982, we embarked on a comprehensive inventory and monitoring program of the Crater Lake ecosystem. Each year we gain new insights into the components and functions of this spectacular area. And we have found that the information we collect helps not only with the management of Crater Lake National Park, but is useful to those studying similar systems worldwide.

> ***The outstanding scientific discovery of the twentieth century is not television, or radio, but rather the complexity of the land organism. Only those who know the most about it can appreciate how little we know about it.***
>
> Aldo Leopold, Round River, 1953

We have a long way to go, however. Our research needs far exceed what can be accomplished by our staff, our funding, and our current collaborations. Through this prospectus, we invite you to join us in the process of learning more about the environs of Crater Lake National Park. Through collaboration with park staff and our existing research partners, we hope to add significantly to our scientific knowledge of the Crater Lake ecosystem and enhance the management of Crater Lake National Park.

Why Conduct Research At Crater Lake National Park?

By virtue of the legislation that established the National Park System, the parks are now some of the few remaining natural areas protected from development and other human-induced changes. Therefore, they can provide stable, protected sites for sustained studies. In addition, because many parks are managed in a relatively unaltered state, they offer the opportunity for scientists to study species in their native habitats or to conduct comparative research with altered systems.

In addition to offering a magnificent outdoor laboratory, we can assist visiting researchers with logistical support including transportation, laboratories, and temporary housing. And we have sources for other grants. One of the most promising programs is the Canon National Park Science Scholars Program, which funds graduate students in all relevant scientific disciplines to conduct research in national parks. We also can provide some direct financial support through the park's Natural History Association.

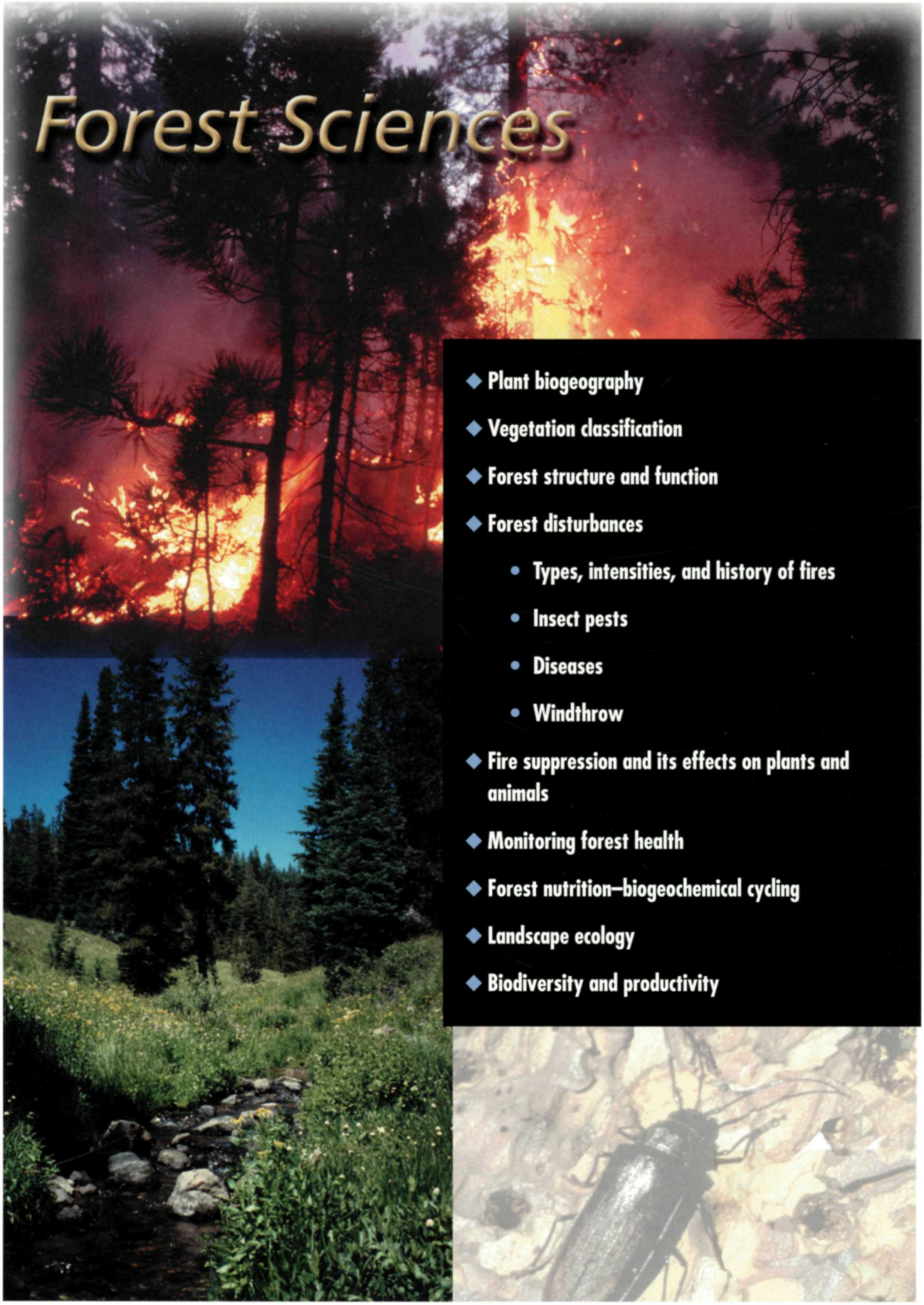
Research Opportunities

Crater Lake Park spans 183,244 acres, 90 percent of which is managed for wilderness. The elevation of the park is 3,950 to 8,929 feet. Summers are short and warm; winter snowfall is heavy, averaging 533 inches. The park area includes the caldera lake, sub-alpine habitats, old-growth forests, pumice landscapes, streams, seeps, and wetlands. With such geographic and ecological diversity, research opportunities abound. The following topics represent areas where more information is needed. We hope that these topics will spark your professional interest in conducting research at the park.

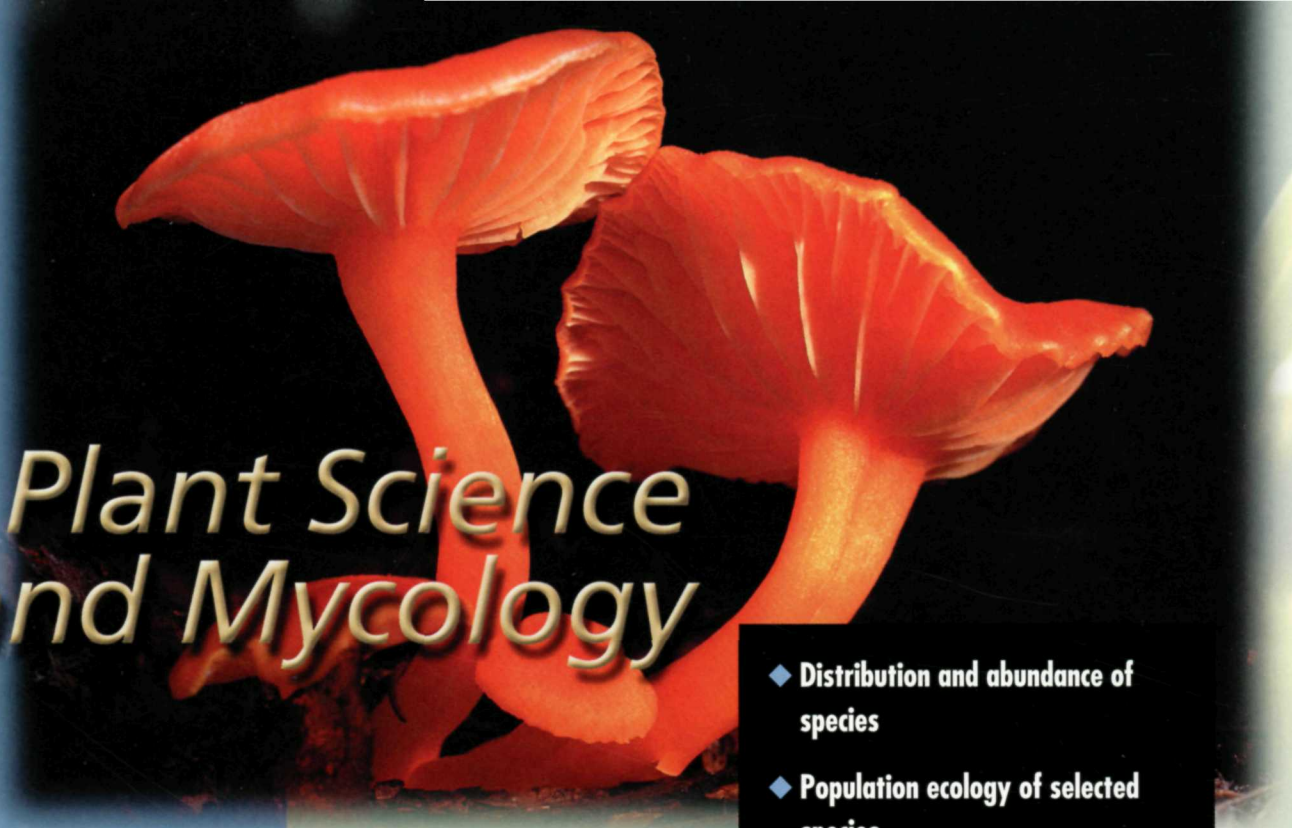
Given current funding and staffing levels, partnerships have become a necessity in achieving management goals in parks today. These cooperative efforts can fill almost any natural resource management need, including providing funding and staff for fieldwork and acquisition of natural resource information.

Natural Resource Year in Review, 1997

Forest Sciences



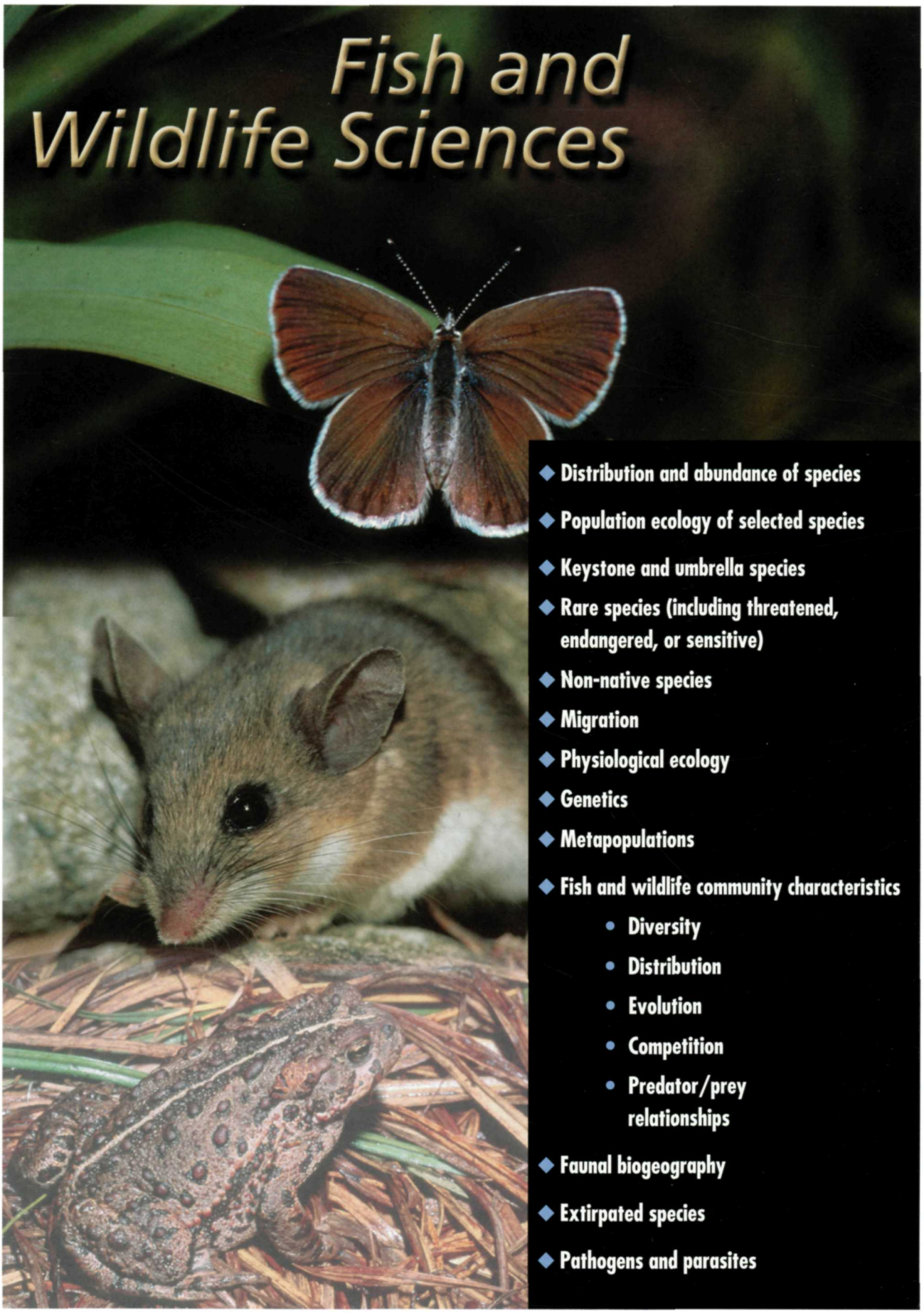
- Plant biogeography
- Vegetation classification
- Forest structure and function
- Forest disturbances
  - Types, intensities, and history of fires
  - Insect pests
  - Diseases
  - Windthrow
- Fire suppression and its effects on plants and animals
- Monitoring forest health
- Forest nutrition—biogeochemical cycling
- Landscape ecology
- Biodiversity and productivity



Plant Science and Mycology

- Distribution and abundance of species
- Population ecology of selected species
- Keystone and umbrella species
- Rare species (including threatened, endangered, or sensitive)
- Non-native species
- Plant-fungus interactions
- Genetics
- Evolutionary biology
- Metapopulations
- Community characteristics
  - Diversity
  - Distribution
  - Evolution
  - Competition
- Floral biogeography
- Extirpated species
- Pathogens and parasites
- Plant physiology

Fish and Wildlife Sciences



- Distribution and abundance of species
- Population ecology of selected species
- Keystone and umbrella species
- Rare species (including threatened, endangered, or sensitive)
- Non-native species
- Migration
- Physiological ecology
- Genetics
- Metapopulations
- Fish and wildlife community characteristics
    - Diversity
    - Distribution
    - Evolution
    - Competition
    - Predator/prey relationships
- Faunal biogeography
- Extirpated species
- Pathogens and parasites

Ecology and Ecosystem Processes

- Frequency, magnitude, and duration of fire
- Reintroduction of fire in altered ecosystems
- Fire regimes and the role of aboriginal burning
- Effects of fire on sensitive resources
- Interactions and cumulative effects of disturbance
- Weather events and ecosystem change
- Global climate change
- Energy flow and nutrient cycling
- Key linkages between species and the physical environment
- Key linkages between atmospheric, terrestrial, and aquatic systems
- Aquatic ecosystem diversity and classifications
- Physical and chemical characteristics of aquatic systems
- Aquatic and terrestrial communities of special concern
- Conceptual ecosystem modeling
- Winter ecology

Earth Sciences and Volcanology

- Geologic history
- Geologic hazards
- Role of glaciation
- Hydrothermal episodes
- Aerial extent of geologic events
- The role and effect of extreme or key weather events
- Geomorphology
- Bathymetry of Crater Lake
- Volcano/ice interactions
- Magma degassing
- Pyroclastic flow emplacement
- Landscape evolution
- Spatial distribution of geologic features
- Spatial distribution of soils
- The significance of micro-climates

Conservation Biology

- Threats and effects of non-native species
- Pathways and mechanisms of invasion by non-native species
- Integrated pest management
- Ecosystem restoration
- Effects of timber harvests
- Landscape fragmentation
- Permeability of park boundaries
- Effects of water withdrawal
- Threats to key species
- Effects of park development and visitation on animal migration
- Critical habitats for park wildlife beyond park boundaries
- Effects of pollution emissions on air quality

Social Sciences

- Changes in park use as a result of population growth
- Implications of adjacent land management planning
- Changes in local and regional land use
- Changes in cultural values affecting park use
- Effects or extent of illegal hunting
- Visitor response to rules and the effect of that response on future planning/rules
- Environmental history
- Effects of human use and development
- Aboriginal land use/prehistoric land use
- Current and projected patterns of human use in the park
- Changes in visitor behavior and use of the park
- Resource damage thresholds of human impact
- Activities and future plans of adjacent-land managers
- Effects of demographic trends and shifting cultural values
- Changes in visitor expectations
- Changes in attitudes toward wildlife and implications of various attitudes
- Changes in agency culture and attitude
- Effective information management and technology transfer
- Changes in technology use and their implications

Partnership Opportunities

We have a history of collaboration in our quest for knowledge about the natural and cultural components of Crater Lake National Park. We strive for highly integrated research through close working relationships with universities, other public and private research institutions, non-profit conservation organizations, and federal and state agencies. For example, a decade-long partnership with Oregon State University has been an essential component of our Crater Lake research, and we have collaborated with several divisions of the US Geological Survey in our search for information about Crater Lake geology and biology. Cooperative agreements and memoranda of understanding govern the terms of these relationships. We are interested in establishing additional collaborative relationships with private and academic institutions for long-term research.

Application Procedures

We want to encourage research that increases our knowledge and understanding of the resources at Crater Lake National Park. If you are interested in conducting research at the park, please contact us with your proposals. We require an application for conducting research or collecting material for research, group study, or museum displays. The park superintendent will review applications and can grant a permit for individual research or group study by a recognized academic institution. Permittees are required to document, label, and catalog collected specimens according to National Park Service standards. This process is essential for the future scientific value of the collection. Permittees are also required to file an Investigator's Annual report documenting their research activities.

Contact Information

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For additional information about Crater Lake National Park, visit our website at: www.nps.gov/crla

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We are grateful to the following individuals who came together to help us identify areas of research interest that would aid park managers in understanding the complex ecosystems we are charged to protect:

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