



Forest and Rangeland Ecosystem Science Center  
777 NW 9<sup>th</sup> St., Suite 400, Corvallis, OR 97330 (541) 750-1030

## Ecosystems

Goal: Understand the structure and function of ecosystems (forest, arid, semi-arid, aquatic, and wetland) in order to provide managers with new information to evaluate current and proposed resource management strategies and practices, and to facilitate development of sustainable practices for a variety of different ecosystems.

### Sample Accomplishments

- Young-stand Biodiversity Report - this study, completed in 2002, looked at effects of thinning on the development of old-growth characteristics and the diversity of plants and animals. This work has provided important information for managing young forests, with trees less than about 60 years old, which cover vast portions of the Pacific Northwest.
- Assessing Rangeland Health - in a collaborative effort, the USGS, Bureau of Land Management (BLM), Agricultural Research Service (ARS), and Natural Resources Conservation Service (NRCS) have jointly developed a qualitative technique for interpreting rangeland health in which 17 indicators are used to gauge three attributes of rangeland health. This information is helping land managers and technical assistance specialists assess the health of rangelands in order to know where to focus management efforts.

### Examples of Ongoing Work

- Biogeochemical Development of Coastal Pacific Northwest Forests
- Cooperative Forest Ecosystem Research Program (CFER) - a collaborative forest research program with BLM, Oregon State University, and Oregon Department of Forestry
- Consequences of Altered Precipitation for Carbon Sequestration and Biogeochemical Cycling in Temperate Forests
- Decomposition of 15N-Labeled Fine Roots and Fate of N they Release in Western Oregon, USA and Taiwanese LTER Sites
- Elwha River Ecosystem Restoration
- Effects of Prescribed and Wildland Fire on Aquatic Ecosystems in Western Forests
- Indicators of Ecosystem Decline for Subalpine Forest Systems at Crater Lake National Park

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*1879-2004*



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- Interactions of Cattle Grazing & Climate Change on Semi-Arid Ecosystems: Rangeland Health and Biogeochemical Cycles
- Interactions of Cattle Grazing and Climate on Semi-Arid Ecosystem Function
- Interactive Effects of Forest Management, Fuel Loads and Fire on Headwater Streams
- Tree Species Effects on Forest Biogeochemical Cycles

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# Restoration Ecology and Invasive Species

**Goals:** Detect and monitor invading populations, improve understanding of the ecology of invaders, identify characteristics of ecosystems resistant to invasion, and develop prevention, management, and control methods.

## Sample Accomplishments

- Restoring Forbs for Sage Grouse Nutrition - FRESC scientists identified some flowering plants that are important in sage-grouse habitat, particularly as food supply for nesting sage-grouse and growing chicks. Results indicate that establishment of these plant populations in combination with other habitat improvement techniques may aid in the recovery of the Greater Sage-Grouse.
- Wetland Management for Amphibians in the Willamette Valley - FRESC scientists spent 3 years examining the complex relationship among introduced bullfrogs and fish from the eastern United States in Oregon's Willamette Valley, as well as the effect of these introduced species on native pond amphibians. By some estimates non-native species cause more than \$138 billion in economic losses in the United States each year. The scientists found that the non-native fish are aiding bullfrog invasion by eating native dragonfly nymphs that would normally prey on bullfrog larvae. Results show that wetland mitigation projects that replace shallower temporary wetlands with deeper permanent ponds are probably helping to spread bullfrog and non-native fish. This is important information for resource managers concerned with amphibian declines.
- Establishment and Reproduction of Medusahead on Clay and Loam Soils
- Evaluation of Native Perennial Grass Materials for Restoration of Deteriorated Rangelands in the Northern Great Basin and Columbia Plateau Regions
- Germination Testing on Selected Grasses Native to Oregon
- Influence of Landscape Context, Hydrology, and Non-Native Species on Wetland Faunal Communities: Implications for Regional Conservation and Mitigation Practices
- Integrated Leafy Spurge Management: Combining Biological Control Tools to Reduce or Eliminate Herbicide Use
- Interactive Effects of Fire and Introduced Trout on Aquatic Biodiversity in High-Elevation Lentic Ecosystems

## Examples of Ongoing Work

- BLM's Emergency Fire Rehabilitation (EFR) Monitoring in the Intermountain West
- Coordinated Intermountain Restoration Project

- Impact of Invasive Species on Resident Aquatic Species at Whiskeytown National Recreation Area
- Integrated Restoration Strategies Towards Weed Control on Western Rangelands
- Intermountain Greenstripping and Rehabilitation Project
- Restoring habitat for shrub-steppe birds after an extensive, habitat-altering wildfire

# Conservation Genetics for Imperiled Species

Goal: Use molecular techniques to describe genetic identity, structure, and diversity in various wildlife taxa in order to diagnose population viability and help design recovery objectives.

## Accomplishments

Recent advances in genetics and molecular tools have revolutionized our basic understanding of biological and evolutionary processes. These contemporary applications have significantly enhanced our ability to delineate the finest level of biological diversity (i.e., genetic diversity). This has enabled us to provide quite detailed management recommendations regarding imperiled species. The FRESC conservation genetics lab provides guidance on small population management, species listing, and species recovery to agency partners and other stakeholders. Our approach is to use molecular tools, population viability modeling, pedigree analyses, and field data to provide perspective on species recovery strategies. We have worked on many species, including amphibians, mammals, and birds. We have contributed the vast amount of genetic information used by the U.S. Fish and Wildlife Service for reviewing the status of the snowy plover and all three subspecies of spotted owls. The spotted owl work includes discovery of hybrids between Northern Spotted Owls and California Spotted Owls as well as between California Spotted Owls and Mexican Spotted Owls.

## Ongoing Work

- Evaluation of inbreeding in spotted owls and further definition of the California/Northern spotted owl hybrid zone in Southern Oregon and Northern California.
- Conservation Genetics of Shorebirds: Identification of Conservation Units, Genetic Diversity, and Population-Specific Markers for North American Shorebird Species of Concern.
- Individual Identification, Pedigree Evaluation, and Reintroduction strategies for Puerto Rican Parrots.
- Taxonomic Definition, Population Status, and Conservation Genetics of Double-crested Cormorants on the Columbia River and Across their Entire range, Snowy Plovers, Red Tree Voles, Least Terns, Gull-billed Terns, Piping Plovers, American Kestrels, Red-cockaded Woodpeckers, Southern Torrent Salamanders, Larch

Mountain Salamanders, and Oregon Slender Salamanders.

# Landscape Dynamics and Resource Management

**Goals:** Evaluate and describe historic and present ecological conditions, landscape patterns, and ecological processes. Develop scientific models for predicting future landscapes based on conservation, restoration, or development actions.

## Sample Accomplishments

- SAGEMAP - FRESC scientists developed and now maintain a database of the spatial information needed to address management of sage grouse and sagebrush steppe habitats in the western United States. The spatial data on the SAGEMAP website (<http://SAGEMAP.wr.usgs.gov>) are an important component in documenting current habitat and other environmental conditions. The SAGEMAP project identifies and collects information for the region encompassing the historical extent of sage grouse distribution. State and federal agencies use this information to manage sagebrush ecosystems and wildlife species dependent upon them.
- Willamette Valley Wetlands -- The Willamette Valley constitutes a critical area where expanding human populations collide with the need for improved wetland quality and quantity. Past efforts for wetland restoration have been carried out on a local scale, but there has been no systematic approach for evaluating the success of these efforts or how they should proceed in the future. In partnership with the Oregon Department of Fish and Wildlife, U.S. Fish and Wildlife Service, Oregon Wetlands Joint Venture, and the National Shorebird Plan, we carried out a multi-spatial and temporal examination of the distribution, composition, and status of the Valley's wetlands using shorebirds as indicators of wetland connectivity. We plan to use this information to develop ecosystem-wide wetland management plans for the Willamette Valley. These recommendations will encompass landowner to ecosystem level considerations and represent a unique approach to wetland management, restoration, and creation.

## Examples of Ongoing Work

- Broad- and Mid-Scale Mapping of Sagebrush Habitats in the Intermountain West: An Hierarchical Approach
- Comparative Demography of Three Sensitive and Morphologically Similar Species of *Astragalus*
- Demonstration of Methods and Techniques for Natural Resources Management by the Military
- Designing an Experiment to Evaluate Effects of Fire and Fire Surrogate Treatments in the Sagebrush Biome
- Effects of Prescribed and Wildland Fire on Aquatic Ecosystems in Western Forests
- Effects of Thinning and Prescribed Fire on Aquatic and Terrestrial Herpetofauna: Little River Adaptive Management Area
- Evaluating Public Responses to Wildland Fuels Management
- Interpreting Indicators of Rangeland Health: Accuracy and Precision of Trained Evaluators
- Landscape analysis of black bear distribution patterns in Olympic National Park
- Response of Breeding Passerine Bird Populations to Multiscale Landscape Changes in the Intermountain West

- Use of Harmonic Radar to Follow Local and Migratory Movements of Passerine Birds in Shrub-Steppe Habitats
- Western Great Basin Wetlands Biodiversity Initiative
- Western Juniper Encroachment: A Multiple-Scale Look at Synchronous Response to Decadal Climatic Variation.



# Long-Term Monitoring

**Goal:** Measure present ecological conditions and conduct biological inventories in order to effectively monitor ecosystems over time.

## Sample Accomplishments

- Crater Lake Monitoring - Long-term monitoring of Crater Lake for the past twenty years has provided baseline information about the characteristics and natural dynamics of the lake. This baseline serves as a reference when researching changes in Crater Lake itself and in other lakes around the world. Each year we learn more about Crater Lake and continue to monitor our success at managing it so that future generations also can marvel at this deep blue wonder.
- Midwinter Bald Eagle Count - As the U.S. Fish and Wildlife Service considers whether to remove the bald eagle from the endangered species list, they can look to results of the National Midwinter Bald Eagle survey, which takes place each winter under the coordination of FRESA. More than 1000 participants survey approximately 700 routes in 42 states each year. Analyses indicate that the number of eagles counted increased almost 2% each year from 1986-2000. The survey provides a unique source of long-term baseline data. Also, unlike nesting surveys, it provides information on both breeding and non-breeding segments of the eagle population at a potentially limiting time of year at a continental scale. A public web site serves raw data and summaries of survey results (<http://ocid.nacse.org/qml/nbii/eagles/>).

## Examples of Ongoing Work

- Assessing the Presence of Terrestrial Herpetofauna and Mollusks: Evaluation of an Integrated Survey Method
- Avian Monitoring Program for Oregon and Washington
- Avian Research and Monitoring Support
- Golden Eagle Status
- Long-term Ecological Monitoring for the North Coast & Cascades Network
- Long-term Ecological Monitoring: Northern Spotted Owl Demographic Monitoring in Olympic National Park
- Long-Term Limnological Monitoring of Crater Lake
- Long-term nesting population and productivity changes of Prairie Falcons and Golden Eagles
- Marsh Bird Monitoring
- National Park Service Biological Inventory: Klamath Network
- NBII Great Basin Information Project
- NBII Pacific Northwest Node
- Northwest Forest Plan: Effectiveness Monitoring for the Northern Spotted Owl Habitat Model
- Olendorff Library-Raptor Information System
- Shorebird Monitoring Plan for Western North America
- Survey and Monitoring of Western Pond Turtles

# Wildlife Ecology and Biology

**Goal:** Understand the biology and ecology of animals and their habitats in order to support conservation and management efforts. Work includes warm and cold-blooded animals, invertebrates, and plants and often looks at species-habitat associations.

## Sample Accomplishments

- Sage grouse conservation assessment - USGS scientists have participated in this interagency effort, coordinated by the Western Association of Fish and Wildlife Agencies, to determine the status of Greater Sage-grouse and their habitats and identify potential threats to their long-term survival. Agencies, private organizations, and landowners have an urgent need for this assessment because of conflicting views concerning causes of declines and the appropriate management actions. Multiple petitions have been filed to provide protection for Greater Sage-grouse under the Endangered Species Act.
- Endocrine Disruptors - The river otter is a top predator of most aquatic food chains and eats a wide variety of fish species and aquatic invertebrates. This makes otters good integrators of their aquatic environments and a useful species for determining both wildlife and human chemical exposure and potential harmful effects. A completed study on river otters from the lower Columbia River showed that males less than one year old had significantly smaller reproductive organs in comparison to reference animals. This study was conducted on the frozen carcasses of otter collected by trappers in both the Portland, Oregon metropolitan area and at various downstream sites along a 110 mile stretch of the lower Columbia River. This underdevelopment of the reproductive organs was correlated with 6 organochlorine insecticides. Additional research is taking place to identify the contaminants responsible, their occurrence, and the mode of action or causal mechanism.

## Examples of Ongoing Work

- Amphibian Research Monitoring Initiative (ARMI)
- Assess Demographic and Physiological Status of Columbian Black-Tailed Deer in Olympic National Park
- Creating an Integrative, Spatially Explicit Habitat-Use Model for Wild Horses in the Great Basin
- Declining Amphibians in the Pacific Northwest: Do stocked Game Fish Spread Pathogenic Fungi?
- Development of Western Snowy Plover Predation Study at Nests on the Oregon Coast.
- Diet of the Bullfrog
- Effects of Dioxins, Furans, and PCBs on Nesting Success of Osprey along the Columbia River System, Puget Sound, Yakima River, and Willamette River.
- Oregon Spotted Frog Biology and Translocation
- Predicting Abundance and Demographic Performance of Northern Spotted Owls from Vegetative Characteristics around

## Nesting Areas

- Recovery of Salamander Populations in High-Mountain Lakes, Mount Rainier National Park
- Roosevelt Elk Ecology