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Western Ecological Research Center http://www.werc.usgs.gov

Research Support for NPS Mission

The Western Ecological Research Center (WERC) of the U.S. Geological Survey (USGS) has a strong and productive history of working with the National Park Service (NPS). That history started when many of our past and present Research Scientists were transferred from the NPS into the National Biological Survey (Service) in 1993. In 1997, those scientists became part of the Biological Resources Division of the USGS, thus strengthening their capability to conduct integrated natural resources research that meets the needs of NPS. The NPS mission is to protect and preserve natural and cultural resources for the use and enjoyment of present and future generations. WERC's 15 field stations are strategically located in California, Nevada, and Arizona, and 12 field stations conduct research largely in support of needs identified by NPS. Over 40 research projects are underway and focus directly on NPS needs at a cost of nearly $4 million. Indirect research benefits for NPS total nearly another $1 million. Several of the projects directly benefiting NPS are highlighted below. WERC also conducts research on natural resource issues of concern to other federal agencies such as the Fish and Wildlife Service, Bureau of Land Management, Minerals Management Service, and the Department of Defense. Many of these projects have cross-cutting application to NPS research needs.

Highlighted Projects

Sierra Nevada Fire Ecology

The Sierra Nevada Range forms the backbone of California, supplying the nation's most populous state with irreplaceable resources such as water, timber, and recreational opportunities. The southern portion of this range climbs from near sea level to 14,495 feet elevation in less than 60 miles, supporting an extraordinary diversity of plants and wildlife. The Sequoia and Kings Canyon Field Station was established in 1968 to provide client agencies scientific information for sound management of national parks and other federal lands in the Sierra Nevada. The field station's research currently focuses on four stressors identified by the congressionally mandated Sierra Nevada Ecosystem Project as

being particularly threatening to Sierra Nevada ecosystems: loss of natural fire regimes, exotic species invasion, air pollution, and human-induced increase in global temperatures. To address these issues, the Sequoia and Kings Canyon Field Station has formed strong research partnerships with the National Park Service, U.S. Forest Service, University of California, and many other universities. Current research includes studies of historical landscape change and fire regimes, effects of stressors on forest ecosystems, invasive plant response to disturbance, and the effects of prescribed fire on stream chemistry and hydrology.

The Yosemite Field Station is located within the Sierra Nevada Ecoregion, adjacent to Yosemite National Park. The station provides technical assistance to the National Park Service, Bureau of Land Management, U.S. Forest Service, and other client agencies. Using their expertise on fire behavior and ecology, plant ecology, wildlife ecology, geographic information systems, and inventory, survey, and mapping techniques, the lead scientist and staff at Yosemite Field Station address resource issues of concern to land managers.

Ecological and Social Impacts of Recolonizing Coyotes in the Urban Context

After a 40-year absence at the Golden Gate National Recreation Area, the howling of coyotes can be heard again as this symbol of the West returns to its former

range. How will coyotes fit in again at their old haunts, in a park that is wedged between the Pacific Ocean and the 6 million inhabitants of the San Francisco Bay area? New research by scientists at the USGS Western Ecological Research Center aims to help answer that question by providing NPS managers an understanding about how recolonizing coyotes interact with other carnivores and with humans. With funding from the USGS's Natural Resource Preservation Program that supports research in national parks, USGS scientists are beginning a multi-year study in which they will observe and track marked coyotes across Golden Gate NRA, gathering data on distribution, abundance, and habitat use. Coyote research will build upon extensive baseline data collected on bobcats, gray foxes, and other species prior to and during coyote recolonization. The study will focus on the effects of coyote recolonization on these species, including changes in their habitat use, prey selection and disease. In addition, the study will provide NPS managers with information about coyote behavior and interactions with visitors and neighbors of the park.

Endangered and Invasive Species

Channel Islands National Park provides access to the habitats of several rare and endemic plant species suffering from the impacts of exotic weeds and feral animals. The national park also has a wealth of marine resources in need of study and management. Field station biologists analyze data collected from the park and assist with the park's extensive resource monitoring program. Lead scientists and staff at the Channel Islands Field Station conduct research on the ecology and conservation biology of sensitive plants and animals at the Channel Islands and marine ecology of the islands and southern California's coast. A WERC scientist at Channel Islands Field Station accomplished the first successful laboratory spawning of white abalone leading the way toward restoring the nearly extinct white abalone population. In doing so, the field station supports information needs of the National Park Service, U.S. Fish and Wildlife Service, and other state and federal clients such as the Department of Defense, National Marine Sanctuary, and California Department of Fish and Game. Amphibian decline research focuses primarily on the distribution and status of declining amphibians throughout the parks of California and Arizona. The fieldwork takes place in the Sierra Nevada, in Yosemite and Sequoia-Kings Canyon national parks, and in the California Coast range, including Point Reyes National Seashore. Research on the causative factors for amphibian declines includes the role of habitat loss, introduced predators, and ecological effects of contaminants.

Inventory and Monitoring Support NPS Natural Resources Challenge

Recently Congress approved the NPS Natural Resources Challenge for 5 years. The NPS Inventory and Monitoring program (I&M) is one element of that major initiative. The NPS organized its I&M effort by linking parks in similar geographic regions into networks. Within the WERC sphere of influence of California, Nevada, and Arizona the NPS has 6 networks: Klamath, San Francisco Bay, Sierra, Mediterranean, Mojave/ Great Basin, and Sonoran Desert. WERC mobilized Center resources to meet the challenge by assigning one Scientist for each of the NPS networks as the lead contact. Each WERC coordinator is the focal point for communicating NPS needs to the research center. A Research Manager acts as the center coordinator to mobilized resources to help each network's efforts to

meet NPS needs, interests, and expectations. Additional I&M research is conducted in Point Reyes, Golden Gate, Southern California Bight, including Cabrillo NM and Santa Monica Mountains NRA, and in Arizona in the Southern Arizona Group of National Parks and Monuments.

Current Research Projects

Fire Ecology

- Fire research in forested and shrubland ecosystems
- Joint Fire Science – Fuels, Sequoia-Kings Canyon NP
- Role of fire in the Arizona Upland subdivision of the Sonoran Desert
- Joint Fire Science – Fuels, Yosemite NP
- Fuel mapping of Sierra Nevada ecosystems
- Fire and fuel dynamics of Sierra Nevada ecosystems
- The effects of alien plant invasions and fire on native plants and animals in NE Mojave Desert

Inventory and Monitoring

- State partnership test of the California Wildlife Habitat Relationship System: Effects of scale
- Explorations into biodiversity, and inventory and monitoring research program for the National Park Service
- Comparative study of terrestrial ecosystem dynamics between two MAB coastal biosphere reserves, France and United States.
- A test of inventory and monitoring techniques for terrestrial amphibians, reptiles, small mammals, and carnivores
- Channel Islands kelp forest dynamics
- Scientific review of Channel Islands NP monitoring protocols (NRPP)
- Trend and power analysis of long-term vegetation monitoring data, Channel Islands NP
- Reconstructing historical landscape changes in Sequoia-Kings Canyon National Parks: Historical photograph analysis
- An ecological survey, classification, and mapping of Sequoia and Kings Canyon National Parks
- Sierra Nevada global change research program
- Design and implementation of natural resource information management systems
- Focal herpetofaunal survey for Mojave Desert ecoregion

Threatened and Endangered Species

- Marbled murrelet use of Redwood National Park (NRPP)
- The role of pesticides in declining amphibian populations in the Sierra Nevada
- Distribution, populations status, and causes of decline for California amphibians
- Status of big-eared bats *(Corynorhinus (=Plecotus) townsendii)* in coastal California
- Status and trends of amphibian populations in the Southern Rocky Mountains
- Do endocrine disruptors play a role in amphibian population declines?
- Ecology of desert bighorn sheep
- Desert tortoise survivorship and dispersal on the Lake Mead National Recreation Area
- Restoration of the white abalone in southern California: Population assessment, brood stock collection, and development of husbandry technology
- Rare plant research in the Northern Channel Islands
- Pitcher's thistle
- A cooperative study plan to review the status of the western yellow-billed cuckoo in Arizona
- *Agave palmeri* flower stalk herbivory and population dynamics; Population and seed predation
- The effects of roads and potential toxicants from roads on desert tortoise *(Gopherus agassizii)* populations and on ecosystem health in the Mojave and Colorado deserts of California
- Geographic variation and environmental determinants of reproductive output in the desert tortoise

Invasive Species

- Safety and efficacy of green crab biological control
- Assessment of invasive exotic plants in the Channel Islands

- Joint Fire Science – Weeds, Sequoia-Kings Canyon and Joshua Tree national parks
- Status of introduced plants in southern Arizona parks and refuges
- The effects of alien plant invasions and fire on native plants and animals in Mojave Desert scrub and Sonoran Desert scrub communities
- Distribution, abundance and ecology of introduced plants in the Sierra Nevada national parks: Baseline data for management
- Alien annual grass distribution, abundance, and impact on desert tortoise habitat in the western Mojave Desert

Human/Wildlife Interactions

- Habitat use and competition by coyotes *(Canis latrans)* in urban and rural settings of coastal California national parks (NRPP)
- Reproduction by black-crowned night-herons and snowy egrets on Alcatraz Island, California
- The ecology of mountain lions in Redwood National and State Parks (NRPP)
- Mountain lion and human interactions in Yosemite National Park

Other Research

- Inventory and monitoring of sediment sources and transport
- Evaluation of watershed response to land use changes
- Stream recovery following watershed restoration
- Sequoia watershed research

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