

# Cooperative Research Units

## Program Year in Review

In Fiscal Year (FY) 2008, the Cooperative Research Units Program (CRU) operated with an enacted budget of \$16.17 million, which reflected a \$1.41 million net increase over the enacted FY 2007 budget. The additional \$1.41 million, derived largely from a Congressional earmark, enabled CRU to begin rebuilding scientific capacity. Between 2008 and early 2009, CRU hired Assistant Unit Leaders at the Pennsylvania, Nebraska, and Hawaii Units. The hiring action at Nebraska brought this Unit, the program's newest, to full staffing for the first time. The FY 2008 funding increase also enabled the program to accelerate plans to refill positions vacated through retirements. Currently, rehiring actions are ongoing in Oklahoma, Missouri, and New York. Finally, CRU reinvested federal operational funds to the Units so that existing state and university cooperator contributions could be more fully leveraged. In addition, the restoration of federal operating funds to the Units in FY 2008 has provided critical capital for investments in much needed research equipment and hardware.

## Strategic Directions

CRU cooperators have made it clear that to meet future natural resource management challenges, the program will need to develop new approaches to more effectively engage its cooperators in science-based decisionmaking. In addition, they have encouraged CRU to find new ways for the Units and their cooperators

to work together across state and regional boundaries. In response, CRU has embarked on an initiative to improve the integration of research, education, and technical assistance with conservation and management, by enhancing the program's expertise in structured, adaptive decisionmaking. CRU scientists and program managers gathered in July 2008 to develop an action plan for this effort (pages 4 and 5). Thus far in FY 2009, CRU has (i) provided training to CRU staff and state cooperators; (ii) developed pilot projects for collaborative decisionmaking with both state and federal cooperators; (iii) provided technical assistance to partners by leading resource problem-based workshops; and (iv) developed academic curricula for graduate programs in science-based decision support to train future natural resource professionals.

Plans to develop new ways of working across state and regional boundaries have been incorporated as a key goal of this initiative. This transboundary collaboration is currently being initiated in FY 2009 to address climate change, the most pressing challenge natural resource managers are facing. Several examples of transboundary collaboration are ongoing, including work the Alabama and North Carolina Cooperative Fish and Wildlife Units have initiated with state and federal cooperators on downscaling climate models for migratory bird management in the southeastern United States. Transboundary collaboration will also tap CRU's formidable expertise in climate change research, highlights of which are found on page 6.

In spite of a vacancy total that continues to exceed 20 positions, through 2009 and 2010, CRU is poised to support the Nation's and the Department of the Interior's interests in balanced energy development, climate change, and threatened fish and wildlife conservation. The continuing effort to restore science capacity in CRU will ultimately lead to the enhancement and expansion of graduate education and science training as mandated in the Cooperative Units Act, and thereby contribute to the science expertise needed to meet future natural resources challenges on issues of national priority.

## FY 2009 Outlook

For the majority of FY 2009, CRU has operated under a continuing resolution based on the FY 2008 enacted budget. The final budget for FY 2009 and the proposed budget for FY 2010 are uncertain at this time. Through FY 2009, CRU will continue to identify priority vacancy refills, and take action on rehiring scientist positions vacated through retirements. Additional opportunities to refill long-standing vacancies have been explored, with decisions on hiring dependent on the final FY 2009 enacted budget. To date in FY 2009, CRU has provided federal operational support to the Units that is comparable to that provided in FY 2008. This second year of enhanced federal operational support has had a significant beneficial, cumulative effect on the Units and the cooperators that guide them.

# Program Performance



TOM EDWARDS



JIM KAUFMANN



DANIELLE JAYEWARDENE



CHRIS KIRKPATRICK

Left to right: Bumble bee; Iowa State University graduate student Dawn Reding takes a DNA sample from a sedated bobcat, which was also fitted with a radio-collar, allowing researchers to track its movements; The filefish, in Hawaii, where Unit researchers are studying how coral is able to withstand predation by this species; Arizona Unit graduate student Dominic LaRoche with a Band-tailed Pigeon fitted with radio-transmitter as part of a study of population decline of this species.

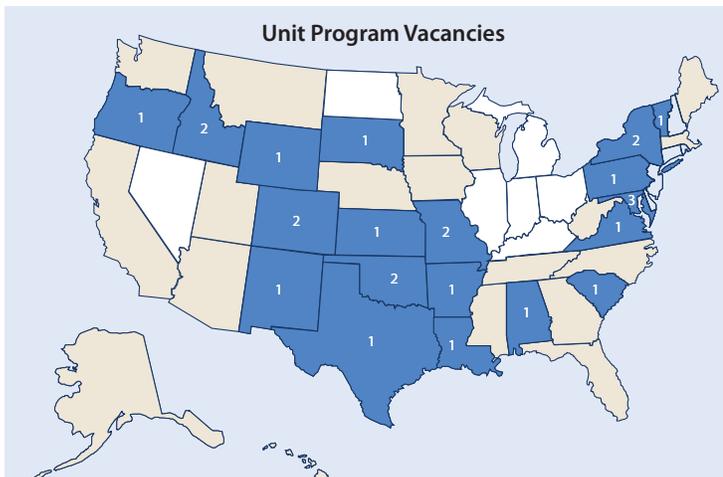
## Achieving the Unit Mission

In 2008, Units scientists and their cooperators advanced the mission of the CRU Program through joint research, education, technical assistance, and science support. Unit scientists continued to be very productive in 2008, completing a number of projects for federal (94) and state (135) partners. Unit scientists and their students remained actively engaged in service to professional societies delivering over 600 presentations. Many of these presentations were invited seminars, indicating that Unit scientists and their research are held in high regard by the scientific and management communities. CRU's service to university cooperators continued to be strong, with 75 academic classes taught in 2008 and an additional 46 workshops and short courses delivered to partners and cooperators.

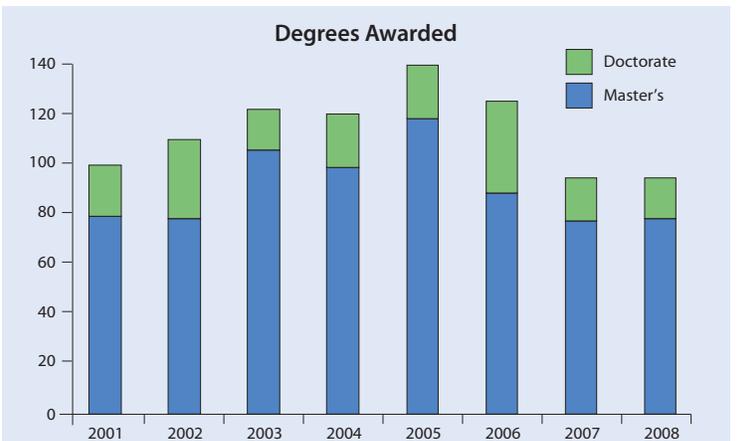
## Staffing and Trends in Productivity

CRU partially restored its science capacity in 2008, and several hiring actions have been initiated in 2009 to fill positions vacated through retirements. However, the program continues to sustain over 20 vacant scientist positions at Units across the country. Some concerns related to staffing include declines in 2007 and 2008 in the number of master's and doctoral students graduating each year. However, a trend for decreasing numbers of federal projects corresponds with an increase in the number of state projects, so the effects of reduced staffing are not entirely clear. A priority will continue to be to deliver products and science support services that are important to cooperators.

2008 Activity	Number
Projects for federal agencies	365
Projects for state agencies	489
Peer reviewed publications	316
Papers Presented	607
Invited Seminars	79
Academic Courses Taught	75
Workshops and Short Courses	46
Total number of students	619
Master's degrees awarded	76
Doctoral degrees awarded	16



Units with no vacancies (tan states) and those with at least one vacancy (blue) as of March 2009. Number indicates the number of positions that remain unfilled. As of March 2009, hiring actions have been initiated at the Oklahoma, Missouri, and New York Units.



Trend in degrees awarded to Unit students since 2001. Of the 619 students directly advised by Unit scientists, 76 were awarded master's degrees and 16 completed their doctoral program in 2008.

## Mike Conroy and Wiley Kitchens receive Meritorious Service Award from the Department of the Interior

In September 2008, Mike Conroy, Assistant Unit Leader, Georgia Unit, and Wiley Kitchens, Assistant Unit Leader, Florida Unit, each received the Department of the Interior's (DOI) Meritorious Service Award at an award ceremony held at the U.S. Geological Survey (USGS) National Headquarters in Reston, Virginia. Conroy was recognized for his outstanding contributions to the theory, development and application of structured decisionmaking and adaptive management to DOI lands and resources. Kitchens was recognized for his outstanding scientific and technical contributions to the USGS in wetlands ecosystem ecology and management for work described on page 7 of this report. Conroy continues to advance the application of structured decisionmaking through workshops for state and federal cooperators and Kitchens continues to provide critical information and research on the endangered Snail Kite and methods for assessing the efficacy of the Everglades' Restoration Plan.

## Honors and Awards

- **Chris Guy, Assistant Unit Leader, Montana Fishery Unit**, was awarded the Distinguished Service Award from the American Fisheries Society (AFS). Guy and his co-editor Michael Brown, South Dakota State University, were recognized for their outstanding contributions of time and energy for co-editing the new AFS book titled, *Analysis and Interpretation of Freshwater Fisheries Data*.
- **Mike Bozek, Unit Leader, Wisconsin Fishery Unit**, and graduate student Matthew Catalano won the AFS Mercer Patriarche Award for the Best Paper in the *North American Journal of Fisheries Management* for their paper titled, "Effects of dam removal on fish assemblage structure and spatial distributions in the Baraboo River, Wisconsin," (Catalano, M. J., M. A. Bozek, and T. D. Pellet. *North American Journal of Fisheries Management* 27: 519-530).
- **Duane Diefenbach, Unit Leader, Pennsylvania Unit**, was appointed to The Wildlife Society (TWS) Fellows Program. The Fellows Program recognizes TWS members who have distinguished themselves through exceptional service to the wildlife profession, and Diefenbach was one of only two that were appointed in 2008.

## Retirements and New Personnel

FY 2008 saw the retirement of four long time CRU staff: Charlie Rabeni, Unit Leader, Missouri Unit; Dick Neves, Unit Leader, Virginia Unit; Mike Richmond, Unit Leader, New York Unit; and Rich Malecki, Assistant Unit Leader, New York Unit. We wish these colleagues the very best in their retirement.

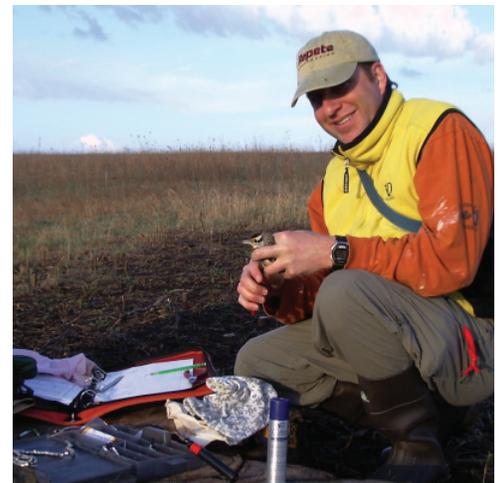
Tyler Wagner joined the Pennsylvania Unit as Assistant Unit Leader in April 2008, and was the only new hire in 2008. Early in 2009, CRU hired two new scientists: T.J. Fontaine, Assistant Unit Leader, Nebraska Unit; and Alan Friedlander, Assistant Unit Leader, Hawaii Unit.



CHRIS DOBONY



CLINT BOAL



JOHN DADISMAN

Left to right: New York Unit student Mike Wegan, with anesthetized adult black bear captured as part of collaborative effort with the U.S. Army's Fort Drum Military Installation in northern New York and New York State's Department of Environmental Conservation to assess population size, movements, and foraging habitats of bears; Carey Haralson, Texas Unit student, while banding White-tailed Hawks at Matagorda National Wildlife Refuge, Texas; Wisconsin Wildlife Unit post-doctoral researcher Kevin Ellison, bands an Eastern Meadowlark on a Conservation Reserve Program field as part of a tree-row removal project in southwestern Wisconsin.

The CRU Program has embarked on a new initiative to improve the integration of our research, education, and technical assistance with conservation and management. The program will initiate new collaborations to enable cooperators and partners to make sustainable, science-based decisions for conservation.



U.S. GEOLOGICAL SURVEY

## Transboundary Collaboration

• **Develop and implement programmatic mechanisms to enable transboundary collaboration.** The Nebraska and Iowa Units are collaborating with state and federal partners to evaluate what constitutes a successful wetland restoration. This transboundary project focuses on the Missouri River Valley in Nebraska, Iowa, Missouri and Kansas. The U.S. Army Corps of Engineers, in partnership with the U.S. Fish and Wildlife Service, and state fish and game agencies, are acquiring land and restoring habitat along the Missouri River as part of a mitigation program. Information from restoration sites will be used to formulate models relating the quality of wetland restoration with the occurrence and recruitment of reptiles and amphibians. These taxa are useful indicators of wetland restoration, habitat diversity, and function, because they require a variety of wetlands to successfully reproduce. The models developed will subsequently be used by managers along with other considerations such as connectivity of wetland patch networks, barriers to amphibian dispersal, and the presence of vegetated buffers to evaluate the success of individual restoration projects and to facilitate adaptive management of restoration efforts throughout the region.

Left: View of the Missouri River near Double Ditch Indian Village State Historic Site, north of Bismarck, North Dakota.



BARRY GRAND

Alabama Unit graduate student Carrie Johnson holds a box turtle capture during surveys for species of greatest conservation need on Alabama Department of Conservation Lands.

## Technical Assistance

• **Provide leadership in developing monitoring projects with cooperators.** Barry Grand, Unit Leader, Alabama Unit, recently completed the second year of a five-year project that includes seven co-principal investigators and eight graduate students. The research will develop habitat relationship models based on occupancy analysis to establish objectives and monitor progress for the management of species of greatest conservation need identified in Alabama's Comprehensive Wildlife Conservation Strategy, which covers every ecoregion in Alabama.

• **Provide expertise to cooperators at problem-based workshops.** Mike Conroy and Jim Peterson, Assistant Unit Leaders, Georgia Unit, conducted numerous science support workshops for a host of natural resource agencies. At one workshop for U.S. Fish and Wildlife Service biologists, they developed protocols for drought monitoring and response, and management for red-cockaded woodpeckers on military bases. In addition, during the 2008 meeting of The Wildlife Society, Conroy, Ken Williams (CRU), and Clint Moore (USGS Patuxent Wildlife Research Center) conducted a workshop resulting in a potential adaptive management program for Bobwhite Quail in Florida.

To this end, the program has launched a multi-pronged science support action plan that includes short- and long-term goals and objectives. New staff recruiting into the program in 2009 and beyond will possess knowledge, skills, and abilities that will make them successful practitioners of collaborative approaches, such as adaptive management. Below, we summarize the main goals of the action plan and highlights of progress to date.

## Research and Management

### • Enhance and enable reciprocity in the research and management enterprise.

The State of Vermont and the Vermont Unit have embarked on a project focusing on how the agency can achieve its conservation goals by helping local communities use structured approaches for including wildlife in their local planning. Such tools are critical in states such as Vermont where a great majority of land is privately held.

Alabama Unit staff and graduate students provided a brief overview of the structured decisionmaking process to the East Gulf Coastal Plain Joint Venture technical committee. The technical committee is comprised of biologists from state (Alabama, Florida, Mississippi, Tennessee, and Kentucky) and federal (U.S. Forest Service, U.S. Fish and Wildlife Service) agencies and several non-governmental organizations, including The Nature Conservancy. The structured decisionmaking process was used to review input from partners on the Open Pine Ecosystem Decision Support Tool being developed for the Joint Venture. The workshop facilitated the review and selection of priority species and landscape configuration objectives for the Open Pine Ecosystem Decision Support Tool using the framework for Strategic Habitat Conservation developed by the U.S. Fish and Wildlife Service.

Right: A color-banded Grasshopper Sparrow.



DUANE DIEFFENBACH

## Education

• **Develop student capabilities.** The Nebraska Unit, working with the University of Nebraska-Lincoln, has submitted a proposal to the National Science Foundation to support graduate education focused on structured decisionmaking for conservation and management. The proposal has received several favorable reviews to date. With the assistance of the Nebraska Unit, the University of Nebraska has also begun the development of a similar graduate-level special emphasis degree.

• **Educate CRU and agency personnel.** The program is supporting training and travel costs for CRU staff and their state cooperators to attend training classes held at the U.S. Fish and Wildlife Service National Conservation Training Center. Several states, including Montana, Vermont, New York, and Pennsylvania, will attend the introductory training along with their state cooperators to jump-start the active application of collaborative science-based processes for management.

• **Create new ways to provide science support services to agencies and cooperators.** Elise Irwin, Assistant Unit Leader, Alabama Unit, and Jim Peterson, Assistant Unit Leader, Georgia Unit, organized and led a symposium on structured decisionmaking at the annual meeting of the Southern Division of the AFS that was attended by scientists and cooperators from Missouri, Alabama, and Georgia.



NEBRASKA UNIT

Sam Wilson, Nebraska Unit graduate student and biologist for the Nebraska Game and Parks Commission, and project technician Kent Fricke release an otter into the Platte river.

## Research Focus – Climate Change

Climate Change is the most pressing boundary-independent challenge natural resource managers are currently facing. CRU cooperators continue to support broad-scale research projects aimed at understanding mechanisms affecting species and habitats at unprecedented scales. CRUs work in Climate Change research directly supports and is aligned with the Department of the Interior's and USGS's strategic science vision.

### Land Cover Modeling

**Barry Grand, UL**  
Alabama Unit



NATHAN TARR

Sanderlings at Cape Lookout National Seashore, North Carolina.

The Alabama Unit is working with staff and students from the North Carolina Unit to develop tools that incorporate the potential effects of climate change and urban growth in planning for bird conservation in portions of the Atlantic Coast Joint Venture area.

Working together, the Units hosted four workshops in North Carolina, South Carolina, Florida, and Georgia. Each of the workshops was attended by 15 to 25 natural resource professionals, and employed SDM to solicit input for a multi-state project funded through the North Carolina Unit entitled, "Conservation Design for Sustainable Avian Populations in the Eastern United States." Using their expertise in mapping land cover and animal distributions, the North Carolina Unit is developing models that project the effects of climate change and urban growth on bird habitat. The results of which will be incorporated into models under development at the Alabama Unit that prioritize areas and habitats for conservation with optimal effects on bird conservation. This approach is intended to be broadly applicable to other regions and wildlife species.

### Carbon Dynamics

**Dave McGuire, AUL**  
Alaska Unit



JENNIFER HARDEN

Drilling for core samples.

Dave McGuire's research in 2008 included three projects aimed at improving the understanding and modeling of carbon dynamics in Alaska. This research directly addresses the USGS Global Change Science Council priority to "provide knowledge to reduce the net transport of CO<sub>2</sub> from the biosphere and geosphere to the atmosphere."

Though studies are on-going, there are several notable results. First is an improvement to the widely used Terrestrial Ecosystem Model, through the addition of a new soil layer module which provides the capability to better estimate fire emissions and carbon dynamics across interior Alaska. Second is the development of generalized rules for biogeochemical models that describe spatial and temporal variations in the organic soil layers of North American boreal forests. A workshop will be held in March 2009 to compile carbon data on soil horizons to evaluate the generality of these rules.

### Avian Life History

**Tom Martin, AUL**  
Montana Wildlife Unit



TOM MARTIN

Orange-crowned Warbler.

Tom Martin is completing a five-year study that extends a comprehensive, long-term (23 year) project investigating climate effects on the high priority and vulnerable montane riparian ecosystem in the arid southwest. The project focuses on identifying causal mechanisms underlying changes in ecosystem structure and function, relative to climate variation, and will allow researchers to project future responses and identify management strategies.

This unique project has documented long-term population trajectories and demographic processes for the full array of plant, bird, and small mammal species comprising the ecosystem, and has modeled direct and indirect effects of climate change on the long-term fate of these species. Researchers found that the direct effects of climate change, together with the loss of deciduous vegetation, were associated with declines and local extinction of some bird species. The community structure of small mammals, which prey on bird eggs and nestlings, was also affected, resulting in additional effects to the bird populations.

### Biodiversity

**Tom Edwards, AUL**  
Utah Unit



TOM EDWARDS

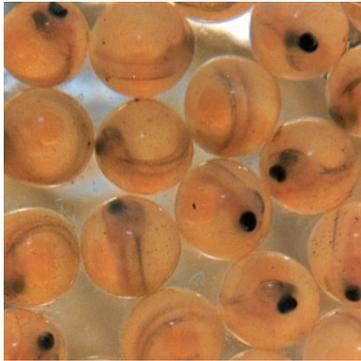
Ice sculptures from the Aletsch Glacier, Switzerland.

Tom Edwards is a collaborating scientist on the ECOCHANGE Project, a five-year research effort on global change that includes a consortium of 19 European Research Institutions from 11 nations. Research objectives are to evaluate the synergistic effects of land-use and global climate change on plant and animal distributions in western Europe, hindcasting for land-use history, and predictive forecasting of potential gains/losses in species distributions due to economic and ecological forces. Edwards works with investigators from the Swiss Federal Institute for Forest, Snow, and Landscape Research, located in Birmensdorf, Switzerland, with responsibilities for development of spatially explicit models of land-use change related to socio-economic data, and predictive distribution models of selected plant and animal species and groups under forecasted climate change.

The CRU program continues to deliver high quality research on a host of cooperator-identified natural resource issues. CRU has and will remain strongly focused on meeting cooperator-identified research needs irrespective of the scale and scope of the challenge.

## Dam Removal

**Joe Zydlewski, AUL**  
Maine Unit



PETER STEENSTRA

Atlantic salmon eggs near hatching.

The Penobscot River watershed occupies approximately one third of central Maine, and provides critical habitat for valuable fish species. Until the construction of several dams in the early 1800s, species such as Atlantic salmon, American shad, brook trout, and striped bass completed their anadromous life-cycle in the river and its tributaries. The planned removal of dams and the implementation of the Penobscot River Restoration Plan provide a unique opportunity to understand the impacts of dam removal and ecosystem restoration on the ecology of fishes in the northeastern United States. The Maine Unit, working in cooperation with private organizations, federal, and state agencies, and the Penobscot Indian Nation, has begun research to explore ecological questions relating to fish populations in this system, demonstrating the ability of cooperative research efforts to tackle complex and critical ecological problems.

## Game Management

**Duane Diefenbach, UL**  
Pennsylvania Unit



DUANE DIEFENBACH

Pennsylvania Unit student Andrew Norton, with captured white-tailed deer.

Duane Diefenbach has been collaborating with the Pennsylvania Game Commission on research of white-tailed deer since 2000. Diefenbach's research program has been designed to meet the agency's information needs as well as address fundamental ecological questions. Recently published results of this research confirms theories about how dispersal in yearling males is influenced by changes in the sex-age structure of the population. This research also provided basic population-level information needed by agency biologists to monitor the effects of harvest regulations and provided the data needed for population models that are used to develop management recommendations. Importantly, the research provided the state agency with evidence that new harvest regulations had the intended effect of reducing harvest rates on antlered males.

## Everglades Restoration

**Wiley Kitchens, AUL**  
Florida Unit



U.S. GEOLOGICAL SURVEY

Everglades freshwater marl prairie.

Wiley Kitchens has focused his research on the restoration of the Everglades, and in particular, on the Snail Kite, an endangered raptor. This species' range in the United States is confined to the Everglades. The Kite's population status is one of the performance measures of the success of Everglades restoration. Kitchens' research on Snail Kites has addressed a diverse set of objectives with an overall goal of providing managers with information pertinent to the restoration of Everglades wetland systems. Some of Kitchens' most recent findings document a precipitous and steady decline in the Kite population between 1999 and 2008. The causes of this decline are currently being investigated and appear associated with a combination of record high water levels followed by regional droughts.

## Conservation Genetics

**Melanie Culver, AUL**  
Arizona Unit



JIM CLARK

Captive Mexican wolf at Sevilleta National Wildlife Refuge, New Mexico.

Melanie Culver is studying reintroduced Mexican gray wolves on the San Carlos Apache and Fort Apache Indian reservations in Arizona for the U.S. Fish and Wildlife Service and the USGS. Her study aims to answer basic life history questions for these wolves, by addressing these objectives: (1) assess the feasibility of estimating minimum population size with mark-recapture models using wolf DNA; (2) identify prey use through DNA analyses; (3) assess prey use of three other co-occurring carnivore species, including mountain lions, black bears, and coyotes; and (4) better understand management options to identify desired "states" of wolf presence on the reservations. The results of this study are providing vital population-level information for the Mexican Wolf Program and will be used by the Apache tribes to better manage reintroduced wolves.

## Technical Assistance – Threatened Species Management

**Chris Guy, AUL, Montana Unit**

Chris Guy collaborated with the U.S. Fish and Wildlife Service and Glacier National Park on research that examined bull trout populations west of the Great Divide in Glacier National Park to evaluate the demographics of those populations in relation to landscape heterogeneity. The result was a comprehensive action plan for the management and recovery of bull trout in Glacier National Park. The project exemplifies how the Unit program can provide technical support for the management of a threatened species through applied research.



Bull trout captured in Glacier National Park.

CHRIS GUY



The **Cooperative Fish and Wildlife Research Units Program** would like to thank each of our cooperators for their continued support.

**U.S. GEOLOGICAL SURVEY  
WILDLIFE MANAGEMENT INSTITUTE  
U.S. FISH AND WILDLIFE SERVICE**

**UNIVERSITY COOPERATORS**

- |                                 |                                       |   |
|---------------------------------|---------------------------------------|---|
| Auburn University               | The Pennsylvania State University     | University of Minnesota                             |
| Clemson University              | South Dakota State University         | University of Missouri, Columbia                    |
| Colorado State University       | Tennessee Technological University    | University of Montana                               |
| Cornell University              | Texas Tech University                 | University of Nebraska, Lincoln                     |
| Humboldt State University       | University of Alaska, Fairbanks       | University of Vermont, Aiken Center                 |
| Iowa State University           | University of Arizona                 | University of Washington                            |
| Kansas State University         | University of Arkansas                | University of Wisconsin, Madison                    |
| Louisiana State University      | University of Florida                 | University of Wisconsin, Stevens Point              |
| Mississippi State University    | University of Georgia                 | University of Wyoming                               |
| Montana State University        | University of Hawaii                  | Utah State University                               |
| New Mexico State University     | University of Idaho                   | Virginia Polytechnic Institute and State University |
| North Carolina State University | University of Maine                   | West Virginia University                            |
| Oklahoma State University       | University of Maryland, Eastern Shore |   |
| Oregon State University         | University of Massachusetts           |   |

**STATE NATURAL RESOURCE AGENCY COOPERATORS**

- |  |   |
|--|---|
| Alabama Department of Conservation and Natural Resources | Nebraska Game and Parks Commission                |
| Alaska Department of Fish and Game                       | New Mexico Department of Game and Fish            |
| Arizona Game and Fish Commission                         | New York Department of Environmental Conservation |
| Arkansas Game and Fish Commission                        | North Carolina Wildlife Resources Commission      |
| California Department of Fish and Game                   | Oklahoma Department of Wildlife Conservation      |
| Colorado Division of Wildlife                            | Oregon Department of Fish and Wildlife            |
| Florida Game and Fish Commission                         | Pennsylvania Fish and Boat Commission             |
| Georgia Department of Natural Resources                  | Pennsylvania Game Commission                      |
| Hawaii Department of Land and Natural Resources          | South Carolina Department of Natural Resources    |
| Idaho Department of Fish and Game                        | South Dakota Department of Game, Fish, and Parks  |
| Iowa Department of Natural Resources                     | Tennessee Wildlife Resources Agency               |
| Kansas Department of Wildlife and Parks                  | Texas Parks and Wildlife Department               |
| Louisiana Department of Wildlife and Fisheries           | Utah Division of Wildlife Resources               |
| Maine Department of Inland Fisheries and Wildlife        | Vermont Department of Fish and Wildlife           |
| Maryland Department of Natural Resources                 | Virginia Department of Game and Inland Fisheries  |
| Massachusetts Division of Fisheries and Wildlife         | Washington Department of Ecology                  |
| Massachusetts Division of Marine Fisheries               | Washington Department of Fish and Wildlife        |
| Minnesota Department of Natural Resources                | Washington Department of Natural Resources        |
| Mississippi Department of Wildlife, Fisheries, and Parks | West Virginia Division of Natural Resources       |
| Missouri Department of Conservation                      | Wisconsin Department of Natural Resources         |
| Montana Department of Fish, Wildlife, and Parks          | Wyoming Game and Fish Commission                  |

**COOPERATIVE RESEARCH UNITS PROGRAM**

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|---|--|
| U.S. Geological Survey<br>12201 Sunrise Valley Drive, Mail Stop 303<br>Reston, Virginia 20192<br>Phone: 703-648-4260<br>Fax: 703-648-4269 | Byron K. Williams, Chief<br>Kevin Whalen, Deputy Chief<br>W. James Fleming, Unit Supervisor<br>Bern Shanks, Unit Supervisor<br>Mike Tome, Unit Supervisor<br>Shari Weant, Administrative Officer |
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Above photo: A Burrowing Owl perches atop a nesting burrow. Photo by Courtney Conway. Front cover photo: Glacier National Park, Montana. Photo by Chris Guy.