



## *Annual Report*

# Cooperative Fish and Wildlife Research Units Program



2005

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*Annual Report*

[www.coopunits.org](http://www.coopunits.org)

2005





Jim Mussell/MN Unit

Red-shouldered hawk nestlings; Minnesota Unit researchers have installed video cameras at nests to look at prey delivery to chicks by adults.



Dana Winkelman/CO Unit

Colorado Unit technician Mary Pearl Murphy, Colorado Division of Wildlife biologist Kevin Thompson, and Unit Leader Dana L. Winkelman prepare *Tubifex tubifex* worms for an experiment in Spring Creek, Colorado.

Front cover photos, clockwise from top left: Marie Perkins of the Louisiana Unit with a sora rail at Grand Cote National Wildlife Refuge, Louisiana (Sammy King/LA Unit). Rocky Mountain elk near the Wichita Mountains National Wildlife Refuge, Oklahoma (David Walter/OK Unit). Caspian terns at Rice Island in the Columbia River estuary (Michael Wilhelm). Utah Unit technician Celina Gabriel and graduate student Robert Al-Chokhachy weigh a bull trout caught on the South Fork of the Walla Walla River, Oregon (Shane Vatland/UT Unit).

Back cover photo: Red spotted newt photographed along the Appalachian Trail in the Pisgah National Forest, North Carolina (Jerome Brewster/NC Unit).

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Jerome Brewster/NC Unit

Researchers at the North Carolina Unit are investigating whether land snail and songbird communities are suffering from calcium limitation in the Great Smoky Mountains National Park, an area that receives high levels of acid precipitation.





Dick Neves/VA Unit

High school biology students from Richlands, Virginia, learn about freshwater mussels through participation in a field day sponsored by the Virginia Unit.



Ron Niebrugge/AK Unit

Alaska Unit master's student Julie Morse bands a black oystercatcher at Kenai Fjords National Park, Alaska.



## FROM THE OFFICE OF THE CHIEF, COOPERATIVE RESEARCH UNITS

To Our Unit Cooperators:

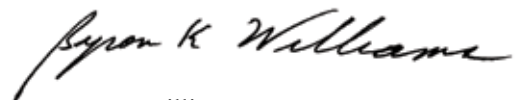
Each year the national Cooperative Research Units (CRU) Program office compiles a report of accomplishments that have been achieved through partnerships with the Cooperative Fish and Wildlife Research Units. This information is summarized as part of an effort to improve communications among Cooperators and partners. Again this year, we are distributing the CRU Annual Report prior to the North American Wildlife and Natural Resources Conference to make it available for the National Cooperators' Coalition (NCC) meeting at the conference.

With this report we have continued to revise the presentation of information in an effort to improve its appeal and usefulness while documenting program successes in meeting our mission goals for research, graduate education, and technical assistance. We have maintained the abbreviated format that was introduced last year, with further enhancement and a few new displays that were suggested by Cooperators. The detailed information on which the tabular and graphical displays are based is available on the CRU Web site at [www.coopunits.org](http://www.coopunits.org). As always, we encourage you to read the report, visit our Web site, and see the positive results of your efforts on behalf of CRU. And be sure to let us know if there are other changes you would like to see.

Please note that the new National Cooperators' Coalition is scheduled to meet at the North American Conference on Wednesday, March 22, 2006, from 3:00 to 5:00 p.m., in the Union Room C of the Hyatt Regency Hotel in Columbus, Ohio. The NCC meeting replaces the Cooperators' meeting that previously was held each year at the North American Conference. The coalition has asked the U.S. Geological Survey (USGS) to provide a briefing on the CRU Annual Report and an overview on the CRU budget, staffing, and other issues of interest to the Cooperators. I urge you to attend the meeting and participate in discussions with the NCC; your perspective is needed to ensure that the program remains healthy and productive in these uncertain budgetary times. If you wish to add topics to the meeting agenda, please contact coalition Chair Bob Davison.

I look forward to seeing you at this year's North American Wildlife and Natural Resources Conference.

Sincerely,



Byron K. Williams  
Chief, Cooperative Research Units



Wayne Hubert/WY Unit

Researchers from the Wyoming Unit pursue a moose to attach a radio collar.

## FROM THE CHAIR, NATIONAL COOPERATORS' COALITION

On behalf of the National Cooperators' Coalition, consisting of Cooperators and other nonfederal parties having interest in the Cooperative Research Units, I want to express our strong support for this highly effective program. I am particularly pleased to recognize the productivity and breadth of the program and its service to Cooperators in fiscal year (FY) 2005. The units, through their scientists and students, continue to make important contributions to our understanding and management of our nation's fish, wildlife, and other natural resources. Despite the increasing number of unit scientist vacancies, unit scientists are actively engaged in more than 1,000 projects addressing the needs of state and federal agencies.

The focus of NCC efforts continues to be on working effectively with the U.S. Geological Survey and Congress to forge a strong unit program—one that meets the research, education, and technical assistance needs of the Cooperators. This year, the NCC focused on securing sufficient funding to fill current scientist vacancies, restoring the program to full staffing and operations, and developing long-term vision and strategy to guide the program in the future. The NCC submitted testimony to the House and Senate Appropriations Committees on the FY 2006 CRU budget seeking sufficient funding to restore the integrity of all units and ensure that they can continue to support the needs of state, university, and private cooperators across the country. In addition, numerous individual NCC members, including state fish and wildlife agency directors and university presidents, urged Congress to increase its support of the program.

The 11-member NCC Steering Committee listed at the bottom of this page has completed a draft document concerning the future of the CRU program. The document describes the nature and unique values of the CRU partnership, the challenges facing natural resource research and education over the next decade, and a vision and strategies for how the NCC and the CRU program will build together on existing successes to provide an effective means of addressing these challenges. The draft vision and strategies will be circulated to NCC members and other CRU program cooperators for review and comment and will be finalized at the NCC annual meeting on March 22, 2006, in Columbus, Ohio.

The annual meeting of the NCC provides an opportunity for members to come together, gather information, discuss issues, and provide direction for future efforts. It is held in conjunction with the North American Wildlife and Natural Resources Conference and replaces the annual CRU Cooperators' Meeting. I invite all with an interest in the future of the Cooperative Research Units to attend and voice their support for this highly successful program.

Robert P. Davison  
Chair, National Cooperators' Coalition



Sammy King/LA Unit

Wes Cochran of the Louisiana Unit with a mud snake at Bogue Chitto National Wildlife Refuge, Louisiana.

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### National Cooperators' Coalition Steering Committee Members

*Chair:* Robert Davison, Wildlife Management Institute

*Vice Chair:* Nat Frazer, University of Florida

Rob Swihart, Purdue University

Larry Nielsen, North Carolina State University

Eric Schwaab, International Association of Fish and Wildlife Agencies

Bruce Thompson, New Mexico Department of Game and Fish

Dan Edge, Oregon State University

Steve Riley, Nebraska Game and Parks Commission

Rollin Sparrowe, Wildlife Management Institute (*retired*)

Jim Sweeney, University of Georgia

John Sweeney, National Association of University Fisheries and Wildlife Programs



## ABOUT THE COOPERATIVE RESEARCH UNITS PROGRAM

The Cooperative Research Units Program is a working partnership among the U.S. Geological Survey, state natural resource agencies, host universities, the Wildlife Management Institute, and the U.S. Fish and Wildlife Service. The program provides federal and state agencies access not only to unit scientists, but also to facilities and expertise at all cooperating universities. Because scientists and university faculty members have individual interests and a wide range of expertise, the program collectively represents a broad array of disciplines related to fish, wildlife, and natural resource management, with a wealth of knowledge about virtually every type of North American ecological community.

The first unit was established at Iowa State College in 1935 by J. Norwood “Ding” Darling. Darling was a visionary who recognized an urgent need for biological information, trained wildlife managers, and dissemination of information to management agencies. Darling didn’t quit with the establishment of the Iowa Unit, but went on to establish regional units that facilitated development of a national program. Today, there are 40 Cooperative Research Units in 38 states.

In 1960, Congress gave statutory recognition to the Cooperative Research Unit Program by enactment of Public Law 86-686, the Cooperative Research Units Act.

The Act reads:

“To facilitate cooperation between the Federal Government, colleges and universities, the States, and private organizations for Cooperative Unit Programs of research and education relating to fish and wildlife, and for other purposes. Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That, for the purpose of developing adequate, coordinated, cooperative research and training programs for fish and wildlife resources, the Secretary of the Interior is authorized to continue to enter into cooperative agreements with colleges and universities, with game and fish departments of the several States, and with nonprofit organizations relating to Cooperative Research Units: Provided, that Federal participation in the conduct of such Cooperative Unit Programs shall be limited to the assignment of the Department of the Interior technical personnel by the Secretary to serve at the respective Units, to supply for the use of the particular Unit’s operations such equipment as may be available to the Secretary for such purposes, and the payment of incidental expenses of Federal personnel and employees of cooperating agencies assigned to the Units. There is authorized to be appropriated such sums as may be necessary to carry out the purposes of this Act.”



Therese Donovan/VT Unit

A Vermont Unit researcher outfits a captured bobcat with a lightweight GPS collar that will record its daily movements. The collar will provide information on bobcat home range size, habitat use, and movements.



Wayne Hubert/WY Unit

Rusty Kaiser, a Wyoming Unit master’s student, attempts to locate radio-tagged greater sage-grouse at night. He studies their reproductive dynamics in an area undergoing natural gas development.

The Act and associated testimony define the mission and partners in the Cooperative Research Units Program. Since the Act was passed in 1960, the program has retained a strong focus on its tripartite mission of education, research, and technical assistance.

### Education

Unit scientists teach university courses at the graduate level, provide academic guidance to graduate students, and serve on academic committees. Training of future resource professionals is accomplished through a “hands-on” approach, as most research projects are carried out by graduate students participating with, and under the direction of, unit or other university scientists. The Cooperative Research Units Program also sponsors two minority education programs that focus on recruitment, training, research opportunities, and placement assistance for students.

### Research

Cooperative Research Unit scientists conduct investigations to meet the information needs expressed by unit cooperators and partners. Unit research is not base-funded, but rather is funded by state, federal, and nongovernment agencies to meet information needs relating to fish, wildlife, and natural resource management. The Cooperative Fish and Wildlife Research Units facilitate multi-agency collaborations to address joint needs of cooperators and partners, providing coordination and cost efficiencies to all parties. Units use each individual project as a building block in constructing research programs that provide not only applied science information for management, but also new techniques, scientific theory, and principles at a more basic level. The research conducted by units is locally approved by the coordinating committee overseeing each unit. Research programs and staff expertise differ widely among units, reflecting the needs of local cooperators. The research may be of local, regional, national, or international interest. Many projects involve multiple units and take advantage of the geographic locations of units across the country and the differences in expertise among units.

### Technical Assistance

Units provide technical assistance and training to state and federal personnel and other natural resource managers as needed. Cooperators can draw on the expertise of Cooperative Research Unit scientists, cooperating university faculty, and biologists of the cooperating state natural resource agency. Technical assistance includes numerous, diverse tasks, ranging from task force and recovery team participation, to conducting workshops and symposia, to writing newspaper articles. Technical assistance is provided as a one-to-one interaction or to groups through workshops and short courses.

Tennessee Wildlife Resources Agency biologist George Scholten, Tennessee Unit master's student Janice Kerns, and commercial fisherwoman Deb Blackwelder show two paddlefish specimens. Kerns is a master's student studying bycatch mortality in a commercial paddlefish fishery on the Tennessee River, with funding provided by the U.S. Geological Survey.



Phil Bettoli/TN Unit

In fiscal year 2005, the Cooperative Research Units once again displayed how a collaborative partnership among state and federal agencies, universities, and the Wildlife Management Institute can take advantage of unique talents and capabilities among natural resource professionals.

During this past year unit scientists, professors, and graduate students from 40 universities worked together on more than 1,100 research projects. Each project addressed an urgent conservation need, either at the national or state level, and each project relied on the diversity of technical expertise and facilities that make each unit a distinctive research entity. Collectively, the projects covered a broad spectrum of biological scales, from the molecular to the ecosystem level, and involved the investigation of management issues for a wide



Mike Vaughan/VA Unit

Catherine Tredick, on right, a master's student at the Virginia Unit, works with interns to process a captured black bear on Pocosin Lakes National Wildlife Refuge, North Carolina, as part of a population and genetics study.

variety of animals. Examples include the recovery of endangered species in almost every state, the impacts of global climate change, and the benefits of carbon sequestration. Chronic wasting disease and whirling disease also remained topics of high interest among our state and federal partners. Finally, unit scientists investigated a large number of population issues concerning game and sportfish, such as white-tailed deer in Pennsylvania, black bears in Virginia, woodcock in Minnesota, and salmonids in multiple western states.

While student education and research products are the most visible part of the CRU program, many other activities were carried out during the year. The following news items provide a brief summary of the program's events for FY 2005.

## Cooperative Research Units Web Site Undergoes Security Upgrade

Midway through the year, we received notices of several security vulnerability issues regarding our Internet site, [www.coopunits.org](http://www.coopunits.org). To correct these vulnerabilities and to increase the capability of our Web site, we began upgrading it and switched to a more universal programming format. At the end of the fiscal year, the transition was about 75 percent complete. This was a challenging process for unit scientists and for the headquarters' office because the CRU Web site plays a central role as a repository of program information. We will continue to invest in CRU Web development and bring our Internet site into full compliance

with security guidance while regaining full functionality. While the CRU Web site is accessible to Cooperators and the public, it is heavily used by CRU program staff to collect and organize data for Unit performance reviews, annual reports, preparations of future budget documents, and many other reporting purposes. Having current and historical program information in one place allows the program to track and manage productivity on a national scale. Future improvements to the CRU Web site will focus on providing Cooperators access to information on all unit research projects.

## Annual Report Format Revised

A major accomplishment for the year was a change in content and format of the program's Annual Report. Our FY 2004 Annual Report was produced in early FY 2005 and represented a major effort to make the document more readable and attractive to our Cooperators and supporters, who requested this revision. Traditionally, the annual reports archived program productivity and events, functions that are now being met by our CRU Web site. The Web site contains an extensive database of students, publications, courses taught, and other information relevant to each unit. Please visit our Web site at [www.coopunits.org](http://www.coopunits.org).

## CRU Accomplishments in Brief

The following is a partial list of collective accomplishments of the Cooperative Research Units Program this year.

Information needs being addressed through research projects	<b>1,161</b>
Peer-reviewed scientific publications (in more than 100 journals)	<b>236</b>
Presentations to scientific audiences	<b>687</b>
Graduate courses taught	<b>133</b>
Graduate students directly supervised	<b>683</b>
Graduate students completing degrees (105 M.S. and 20 Ph.D.)	<b>125</b>

## Strategic Planning

Last year we reported that, at the request of Congress, we had submitted a strategic plan for expansion of the Cooperative Research Units. This plan was developed with the assistance and input of program Cooperators. Department of the Interior Secretary Gale Norton and Congress accepted the expansion plan during FY 2005.

As a separate exercise, CRU started developing a five-year strategic plan that focuses on program operations. Dr. Nat Frazer, representing the National Cooperators' Coalition, along with unit scientists and headquarters personnel, met in Reston, Virginia, to draft a set of goals, outputs, and outcomes that will be incorporated into the operation plan. This plan should be completed and available for review in FY 2006.

## Cooperative Agreements Renewed for Five Units

Cooperative Agreements for the establishment and operation of Cooperative Fish and Wildlife Research Units are living documents with no expiration date. However, it is intended that each agreement be revisited and renewed at five-year intervals. Our goal is to renew at least four agreements annually, a target that we successfully reached in FY 2005. New agreements were signed for the continued operation of the Florida, Louisiana, Missouri, South Carolina, and Wyoming Units.

## Two Unit Scientist Positions Filled; Additional Positions Lost

Even with tight budgets, we were able to fill two positions this year. A Congressional add-on for the Nebraska Unit funded the first of two assistant unit leader positions. Kevin Pope accepted this position and reported for duty. Mike Mitchell, formerly of the Alabama Unit, was selected as unit leader for the Montana Wildlife Unit following Joe Ball's retirement. However, even as the program filled two of its vacancies, there was a net loss of three positions due to attrition and a lack of sufficient funds to refill the vacancies.

## New Unit Supervisor

Bern Shanks reported for duty in FY 2005 as supervisor of the following units: Arizona, California, Colorado, Hawaii, Idaho, Kansas, Montana, New Mexico, Oregon, South Dakota, Utah, Washington, and Wyoming. Shanks succeeded Lynn Haines, who retired at the end of FY 2004. Shanks is located in Seattle, Washington, and brings to CRU his experience as a faculty member, head of a state game and fish agency, and manager in the U.S. Geological Survey's Biology Discipline.



Julie Morse/AK Unit

Black oystercatcher at Kenai Fjords National Park, Alaska, where Alaska Unit Assistant Leader Abby Powell and master's student Julie Morse study the effects of human disturbance on this species.

## All Hands Meeting held in Jacksonville, Florida, March 2005

In March 2005, a programwide meeting was held for all unit scientists and staff. This “All Hands” meeting in Jacksonville, Florida, was the first one held since 2001. Ninety-nine of the

program’s 101 scientists attended the meeting, along with supervisors and headquarters staff. Also participating were the following individuals:

### U.S. Geological Survey

Chip Groat, Director  
Sue Haseltine, Associate Director for Biology  
Nancy Baumgartner, Deputy Ethics Counselor  
Kevin Whalen, Program Coordinator  
John Thompson, Research Grade Evaluation Coordinator

### U.S. Fish and Wildlife Service

Steve Williams, Director  
David Allen, Director, Pacific Region  
Sam Hamilton, Director, Southeast Region  
Dan Ashe, Science Advisor

### Other Participants

Nat Frazer, University of Florida  
Bob Davidson, Wildlife Management Institute  
John Baughman, International Association of Fish and Wildlife Agencies  
Rollin Sparrowe, Wildlife Management Institute (*retired*)  
Robert Lackey, Environmental Protection Agency

The theme for the meeting was “Meeting New Challenges in Science and Education.” Attendees discussed the increasing demands for productivity, accountability, documentation, and program relevance in times of declining budgets, legislation of scientific practices, and challenges to science in relation to science-based decisions and regulations.

David Allen, Sue Haseltine, John Baughman, Nat Frazer, and Rollin Sparrowe participated in a panel discussion on the defensibility of unit science. Unit Leaders Carl Schreck (Oregon Fisheries Unit), Chris Ribic

(Wisconsin Wildlife Unit), and Charles Rabeni (Missouri Unit) made presentations on their predictions of trends and future directions in CRU science. Dan Ashe, Kevin Whalen, and John Thompson led discussions on the challenges to the relevance of unit science. Numerous other topics and discussions were incorporated into the meeting, sparking many followup discussions once the sessions ended.

This All Hands meeting provided an important opportunity for unit scientists to discuss science issues and unit operations. The CRU Headquarters Office intends to hold its next national meeting in FY 2009.



Scott McConnell/OK Unit

Great horned owl observed during avian surveys in the Oklahoma Panhandle.

## Charles Meslow receives Aldo Leopold Award

Charles “Chuck” Meslow, retired leader of the Oregon Fish and Wildlife Research Unit, received The Wildlife Society’s Aldo Leopold Award for 2005. The Leopold Award is the highest professional award in the wildlife profession and acknowledges Meslow’s career contributions toward the understanding and management of old growth forest ecosystems in the Pacific Northwest.



Charles Meslow

Charles Meslow, retired leader of the Oregon Unit, received The Wildlife Society’s Aldo Leopold Award for 2005.

Meslow is the fifth recipient with close ties to the Unit program to be honored with this award in the last eight years and the CRU program’s twelfth recipient since The Wildlife Society created the award in 1950. It is most fitting that J. N. “Ding” Darling, the father of the Unit program, was the first recipient of this award.

Leopold Award winners with ties to the Unit program are:

- 1950 J. N. “Ding” Darling
- 1953 Ira Gabrielson
- 1978 Henry Mosby
- 1982 Thomas Scott
- 1983 Dan Leedy
- 1987 Tom Baskett
- 1990 Tony Peterle
- 1998 John Craighead
- 1999 David Klein
- 2002 Rollin Sparrowe
- 2004 David Anderson
- 2005 Charles Meslow

## Longevity of Service

Ken Higgins, assistant unit leader for wildlife at the South Dakota Unit, was recognized in August for his 40 years of federal service, the longest tour of duty for any scientist currently in the unit program. He has spent the last 20 years working at the South Dakota Unit where he was a mentor to more than 90 graduate students and touched the lives of many more. Previously he worked at the Northern Prairie Wildlife Research Center where his studies on waterfowl and non-game wetland bird ecology led to his appointment as Biologist in Charge of the Woodworth Experiment Station. Higgins is well known for his practical and management oriented research, yet his research on landscape-scale influences on bird distributions and how to derive wildlife benefits from alternative energy sources are on the frontiers of ecological research. He has announced his intention to retire in 2006 to start a museum of commercial fishing.

## Other National Recognition

### Professional Awards

- Charles Berry, South Dakota Unit.....Elected to Board of Directors, American Institute of Biological Sciences
- Bob Carline, Pennsylvania Unit.....Best Paper in the *North American Journal of Aquaculture*
- Steve DeStefano, Massachusetts Unit.....Appointed as Fellow, The Wildlife Society
- Chris Guy, Montana Fisheries Unit.....Excellence in Fisheries Education Award, American Fisheries Society

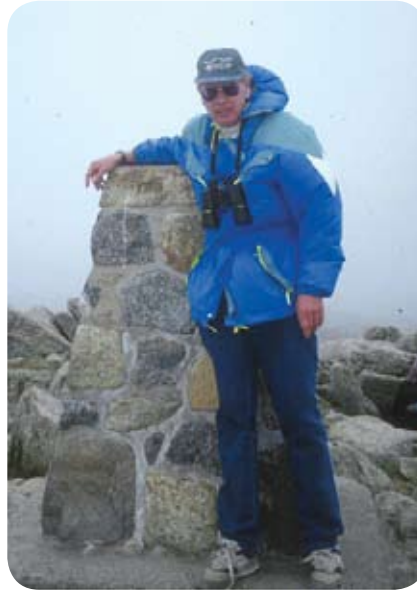
### Elected Society Positions

- Steve Chipps, South Dakota Unit.....Secretary, American Fisheries Society, Education Section
- Bill Fisher, Oklahoma Unit.....President-Elect, American Fisheries Society, Computer Users Section
- Tom Kwak, North Carolina Unit.....President-Elect, American Fisheries Society, Education Section
- Joe Margraf, Alaska Unit.....President-Elect, American Fisheries Society, Western Division
- Tom Martin, Montana Wildlife Unit.....President-Elect, Cooper Ornithological Society
- Pat Mazik, West Virginia Unit.....President-Elect, American Fisheries Society, Southern Division
- Glenn VanBlaricom, Washington Unit.....President-Elect, Society for Conservation Biology

## CRU and Leetown Science Center Sponsor Fishing Day for Recovering Military Personnel

The CRU program teamed with the Leetown Science Center Kearneysville, West Virginia, to provide a recreational opportunity for soldiers and Marines recovering from injuries received while serving in Iraq and Afghanistan. All of the patients were recovering from amputations and were learning how to use their prosthetic limbs; thus this recreational opportunity was also a time of self testing and confidence building. The pond used at the science center was originally constructed to enhance fishing opportunities for people with disabilities and is surrounded by a paved trail and several specially-constructed fishing docks, ideal for wheelchairs. In addition, the U.S. Department of Agriculture has a nearby aquaculture facility and supplied rainbow trout to stock the pond for this special event. The weather was good, the fishing was great, and the event was a success. We hope to repeat this activity in FY 2006.

## Stanley Anderson, Long-term Leader of Wyoming Unit, Passes Away



WY Unit

Stanley Anderson, atop Mt. Kosciusko, Australia.

Stanley Anderson, the long-term Leader of the Wyoming Cooperative Fish and Wildlife Research Unit and Professor in the Department of Zoology and Physiology, passed away on September 1, 2005 at the age of 66. Dr. Anderson moved to Laramie in 1980 as the first leader of the Cooperative Unit. In that position

he conducted wildlife research, mentored graduate students, taught graduate-level courses, and provided numerous services to the University. Dr. Anderson had an international reputation for his research in bird ecology and the preservation of rare and endangered vertebrates. In recent years his research focused on animals such as the Greater Sage-grouse, Pygmy rabbit, Burrowing owl, and Black-footed ferret. During tenure as leader of the Cooperative Unit, he published over 200 papers and books on wildlife biology subjects. Dr. Anderson was proud to have advised or co-advised 100 graduate students while serving at the University of Wyoming. His students now serve as faculty at other universities, biologists with state and federal natural resource management agencies, leaders within non-government conservation organizations, and a wide variety of other wildlife-oriented professions. Dr. Anderson was particularly fond of referring to his students as his “academic progeny.”



Jim Peterson/GA Unit

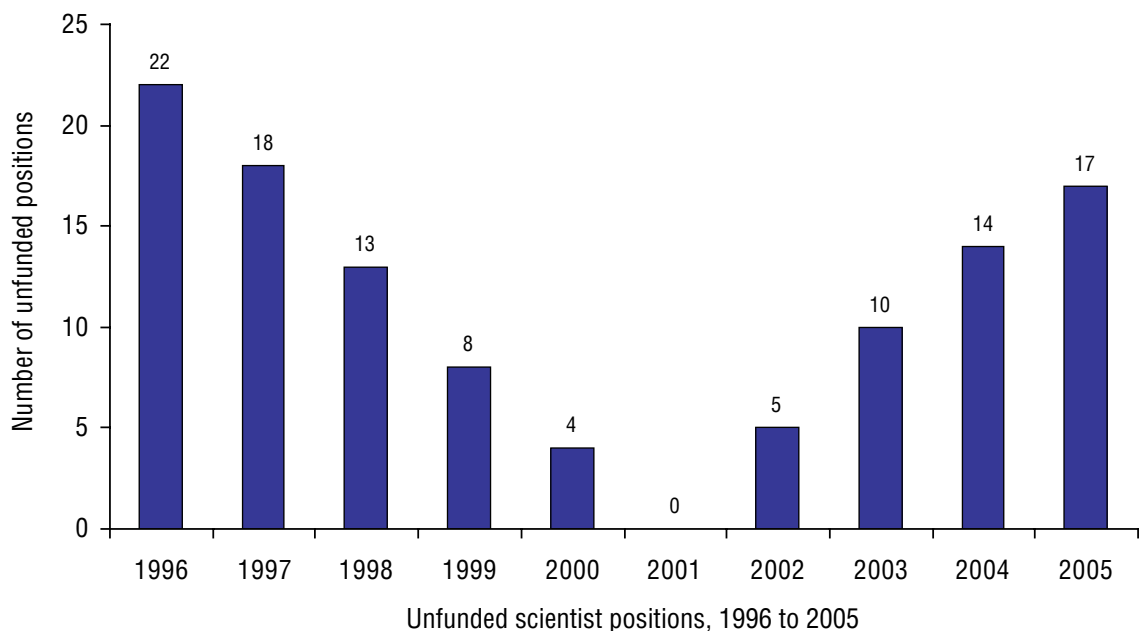
Georgia Unit graduate students (left to right: Cathy Marion, Austin Meadows, and Sean Meadows) participate in a class on proper snorkeling techniques for surveying stream-dwelling trout.

## BUDGET OUTLOOK FOR FY 2006

Fiscal year 2006 began on a historic note for the Department of the Interior: For the first time in 23 years, the Interior budget was signed into law before the fiscal year began. Following this memorable event, however, was the aftermath of multiple hurricanes hitting the southern region of the United States during August and September of 2005. The massive destruction of buildings and land, coupled with the urgent rescue and recovery needs of residents in Louisiana, Mississippi, Florida, and elsewhere, may necessitate government-wide budget cuts to sustain federal relief and recovery efforts. Only time will tell how this might affect CRU program dollars in FY 2006 and beyond.

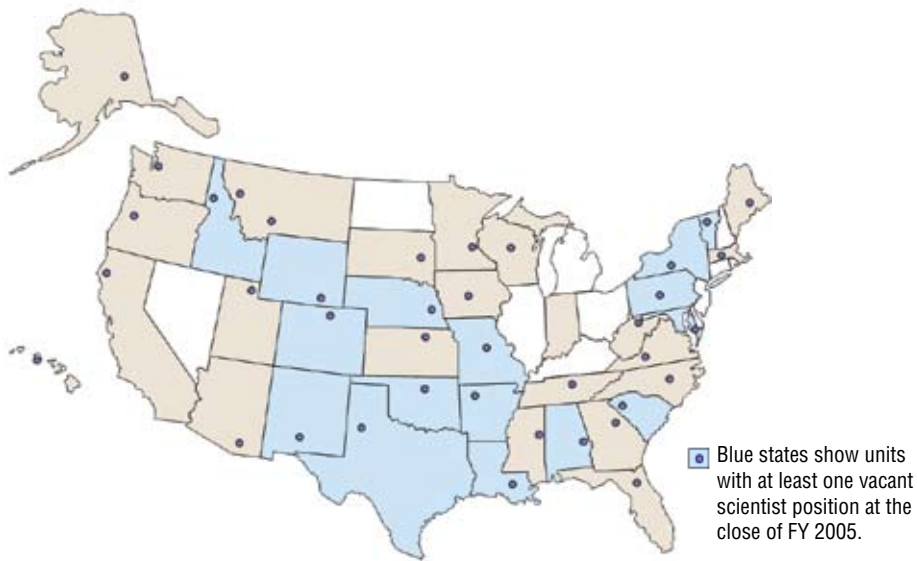
The good news for FY 2006 is that funding for the Nebraska Unit was reinstated by Congress, bringing our appropriation for FY 2006 to \$14.7 million. This puts the program's budget on par with funding in FY 2005, which is perhaps the best outcome we could expect in lieu of the funding cuts that many other domestic programs are experiencing.

The bad news is that even without a potential budget rescission to help defray hurricane recovery costs, our real dollars are shrinking at the rate of two to five unit scientist positions each year. Operational funds at all levels within the program have declined significantly, and without further recovery of salary dollars through vacated positions, we will not meet future program needs. In recent years, CRU has had to depend on new vacancies to pay for uncompensated, mandated federal pay increases and to fund operations at the unit and headquarters levels. Historically we have been able to recapture funding from vacated positions to re-staff at least some of the existing vacancies in the program. However, at current funding levels we will be unable to continue this practice in the future.





During FY 2005, the number of unfunded scientist vacancies increased by three, bringing to 17 the number of vacant scientist positions. We expect a similar scenario in FY 2006, as we recover salary dollars from vacated positions to cover current program costs. Without funding increases in FY 2007, the number of vacancies will likely grow larger. This unfortunate change continues a trend since the program was fully funded in FY 2001. The program is rapidly approaching its historic high of 22 unfunded science positions, which occurred in 1996.



Units with vacancies at close of FY 2005



Wayne Hubert/WY Unit

Wyoming Unit master's student, Kristopher Kuhn, holds a sauger caught as part of a study of winter habitat selection.

## STAFFING UPDATE

### Positions Filled

Assistant Unit Leader, Nebraska Unit.....Kevin L. Pope

Unit Leader, Montana Wildlife Unit.....Michael S. Mitchell—promoted from  
Assistant Unit Leader, Alabama Unit

Western Supervisor, CRU Headquarters.....Bernard Shanks—reassigned from USGS,  
Biological Resources Discipline

Student Intern, CRU Headquarters.....Anna Zukowski—student at James Madison  
University

### Positions Vacated

Assistant Unit Leader, Idaho Unit.....Gerald Wright—retired, October 1, 2004

Assistant Unit Leader, Wyoming Unit.....Frederick G. Lindzey—retired, December 1, 2004

Unit Leader, Montana Wildlife Unit.....I. Joseph Ball—retired, November 4, 2004

Unit Leader, Wyoming Unit.....Stanley H. Anderson—passed away,  
September 1, 2005

Student Intern, CRU Headquarters.....Shana Zukowski—transferred to USGS,  
Fiscal Services

## CONTEMPORARY TOPICS

Cooperative Fish and Wildlife Research Units link the expertise of unit scientists and participating university faculty with issues of importance to state and federal cooperators and partners in the conservation community. Unit scientists and affiliated faculty work directly with state and federal agency cooperators to identify information needs and plan research to address those needs. Cooperator and partner interests are further expressed by their willingness to fund research projects of highest interest to them. The result of this strong collaboration between agencies and units are research projects that have an applied component and implications for a variety of management and policy decisions to which agencies must respond. The following pages provide a brief look at selected research topics in which unit scientists and cooperating faculty were engaged at the end of FY 2005. Work on these projects will continue into FY 2006.

### CLIMATE CHANGE

Research on climate change focuses on more than just variation in global temperatures, precipitation, and storm patterns. It enhances our understanding of how climate change is linked to alterations in atmospheric concentration, the distribution and quality of water, the viability of ecosystems and the amount of carbon stored within the environment, as well as how ecological systems respond to climate change. Since 2002, Cooperative Research Units have participated in the interagency Climate Change Science Program, focusing on research questions that address ecosystem-related issues. Selected climate change projects continuing into FY 2006 include the following:

The Alaska Unit is comparing and contrasting the results from two models of forest carbon dynamics to explore how an increased focus on carbon sequestration may influence U.S. carbon stocks and flows at a regional scale if changes in the climate occur.



Joseph J. Fontaine/MT Unit

A typical research plot in the Coconino National Forest, Arizona, is used by Montana Wildlife Unit researchers to study a high elevation avian community and riparian ecosystem.

The Montana Wildlife Unit is continuing a long-term study on how climate change influences the structure and function of a high elevation riparian ecosystem in Arizona. Its growing database is generating valuable information on

the impact of climatic alterations on population growth trends of bird and plant communities, and on various trophic interactions such as the intensity of elk browse on deciduous trees and the extent of nest predation among birds.

The Texas Unit is evaluating the combined effects of air pollution and global climate change on desert ecosystems. Results of the project will yield insight on how increased precipitation and nitrogen deposition influences species composition, microbial activities, nitrogen mineralization rates, and other biological functions on the Sotol-grassland and high-elevation oak-pine forest of Big Bend National Park, Texas.

The Hawaii Unit is working to identify features of U.S. coral reef ecosystems that show resistance and resilience to climate change. Results of the study will help marine scientists develop strategies for identifying and protecting coral communities that display the greatest probability of surviving predicted consequences of climate change in the twenty-first century.

## WETLAND SYSTEMS

Wetland habitats occur in the American landscape in many forms, ranging from wet meadows and marshlands to wooded swamps. Countless species of fish and wildlife depend on wetland ecosystems during at least one of their life stages, which is why so many unit Cooperators want to acquire a better understanding of how these systems function and how various species of flora and fauna depend on the diverse and complex habitat type. Selected wetland research projects continuing into FY 2006 include the following examples:

The Florida Unit is determining the response of various plant species to natural and human-induced changes in the hydrological regime of the Everglades Water Conservation Area, Florida, a favored nesting and foraging spot for the endangered snail kite.

The Iowa Unit is surveying amphibians in semi-permanent wetlands of an agro-ecosystem to estimate the prevalence of anatomical malformations and the pathogenic chytrid fungus. They are



Charles Berry/SD Unit

Researchers at the South Dakota Unit drill a piezometer well to monitor groundwater levels between a livestock dugout and a stream as part of a study of how fish use floodplain wetlands.

also reviewing water quality and land use data to determine if there is a relationship between the amphibian malformations and fungal disease spread.

The Louisiana Unit is evaluating the short- and long-term impacts of thin layer dredge spray, a technique often used for rebuilding marshland surfaces, on plant community development, soil properties, soil elevation, and nutrients.

The South Dakota Unit is evaluating the impacts of constructed impoundments and wetlands on the endangered Topeka shiner and other native prairie fishes to identify which construction methods and habitat management techniques are most compatible with conservation objectives.

## ANADROMOUS FISH

Anadromous fishes, like Pacific and Atlantic salmon, sturgeon, and steel-head trout, are migratory species that spend early life stages in a freshwater stream or river, migrate to saltwater to feed and grow into adulthood, and then return to their native freshwater



Christine Moffitt/ID Unit

Fall Chinook salmon smolts are being studied at the Idaho Unit.

habitat to spawn. As out-migrating juveniles, and as returning adults, anadromous fishes must overcome a diversity of obstacles, such as hydropower dams, commercial and sportfishing, predation by bears, birds and sea lions, and competition with introduced sportfish. Unit scientists and affiliate faculty seek to understand the impacts of these obstacles on fish movements, recruitment, and survival. Other studies are designed to increase our understanding of the life histories and ecology of anadromous fishes in freshwater habitats. Selected projects focusing on anadromous fishes and continuing into FY 2006 include the following examples:

The Idaho Unit is conducting field and laboratory experiments to determine how warmer water temperatures affect the growth, physiology, and survival of subyearling Chinook salmon that have been surgically implanted with a Passive Integrator Transponder tag.

The Idaho Unit is comparing the intensity of sea lion predation on adult salmon between areas in and near Bonneville Dam fishways. It is also testing the ability of acoustic transmitters to keep sea lions out of fishway entrances.

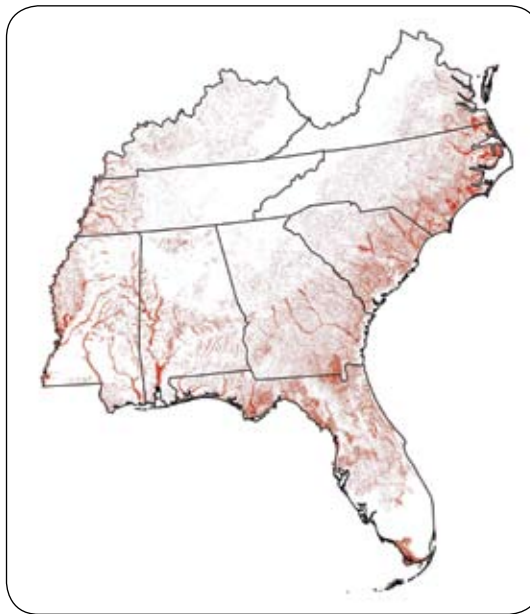
The Maine Unit is assessing Atlantic sturgeon abundance and seasonal distribution below the Veazie Dam on the Penobscot River. Results will help local land managers predict how removal of the Veazie Dam may influence Atlantic sturgeon redistribution.

The Alaska Unit is analyzing data on the release or escape of Atlantic salmon from net pen cultures on the Pacific coast. Its goal is to develop a risk assessment addressing the possibility and consequences of Atlantic salmon invading Alaska streams.

## GAP ANALYSIS PROGRAM

Initiated in 1989, the Gap Analysis Program (GAP) seeks to “keep common species common” by mapping the distributions and habitat characteristics of fish, mussels, crayfish, snails, birds, amphibians, reptiles, and mammals at the state and regional scales. These maps also include characterizations of land and water management activities that are already in place on government and private lands. These comprehensive maps provide natural resource managers with detailed information about where conservation efforts are the strongest and where more attention is needed to protect the nation’s biological diversity. What follows is a look at selected GAP projects which will be continuing into FY 2006.

The North Carolina Unit coordinates the Southeast Regional GAP Project. The primary objective is to create



Steve Williams/NC Unit

This map shows the predicted habitat of the prothonotary warbler in the southeastern United States.

detailed land cover and animal modeling datasets that are ecologically meaningful and consistent across the southeastern United States.

The Virginia Unit is investigating a number of fish species that occupy select hydrologic units within the upper Tennessee River drainage. This project includes mapping the habitat range, habitat characteristics, and stewardship efforts for identified fish species and predicting the occurrence of each fish species in river reaches throughout the drainage.

The Georgia Unit is integrating GAP data layers with socio-economic and hydrological data to create a GIS-based tool that government officials will be able to use when developing green infrastructure plans in Georgia counties.

The Alabama Unit is constructing a regional land cover map for Alabama, Mississippi, and Florida that displays land cover classes and indigenous animal species relative to existing land stewardship activities on public and private lands.

## ADAPTIVE MANAGEMENT PLANNING

Although natural resource managers have access to volumes of research on various habitat communities and associated animals, they still find themselves making management decisions that are based on some level of uncertainty. To ensure that action is taken to counter a conservation threat, federal and state agencies are increasingly relying on adaptive management to guide the decision-making process. This approach employs a “learning by doing” philosophy and essentially treats management problems as research experiments. In general, biologists develop different models of ecosystem processes based on formal hypotheses and then compare the predicted outcomes of management actions to empirical data after they are implemented. This not only

provides feedback for evaluating the efficacy of management actions for meeting stated objectives, but also increases our level of understanding of ecological processes and interactions. The following is a representation of selected adaptive management projects continuing into FY 2006.



Melody Hendrix

Scrub jay at Merritt Island National Wildlife Refuge in Titusville, Florida.

The Florida Unit is developing a formal decision-making framework to guide habitat management decisions for the threatened Florida scrub jay at Merritt Island National Wildlife Refuge.

The Alabama Unit is developing a water flow management plan for the Harris Dam on the Tallapoosa River. This will create a template that will guide the integration of decision analysis and adaptive management planning into the Federal Energy Regulatory Commission relicensing process.

The Georgia Unit is creating an adaptive decision support system for the Bobwhite Quail Initiative in the Southeast. The result will be used to guide landscape-level conservation efforts for all birds occupying early successional habitats on private lands throughout Georgia.

The Washington Unit is developing a science-based risk assessment and model to support the prevention of and timely response to aquatic non-indigenous species invasions in Puget Sound.

## MARINE MAMMALS

Although many unit scientists address management issues concerning terrestrial and freshwater organisms, others devote their time to marine mammal research questions. These scientists busy themselves with improving the accuracy of population estimation techniques, investigating reasons for population declines of threatened and endangered species, studying conflicts between commercial fisheries and marine mammals, or simply furthering the scientific community's understanding of a specific animal's population demographics, habitat associations, feeding behaviors and movement patterns. This information is used to support management planning efforts at the local and international levels. Selected marine mammal projects continuing into FY 2006 include the following examples:

The North Carolina Unit is evaluating the detection probabilities for manatees among multiple survey techniques. The goal is to improve the accuracy of aerial survey designs commonly used to estimate manatee population trends.

The Washington Unit is estimating the population size of killer whales and three species of baleen whales along the western coast and central Aleutian Islands of Alaska. The goal is to determine how the detection



Jason Wettstein/Alaska SeaLife Center

Harbor seal habitat is being assessed by scientists at the Washington Unit.

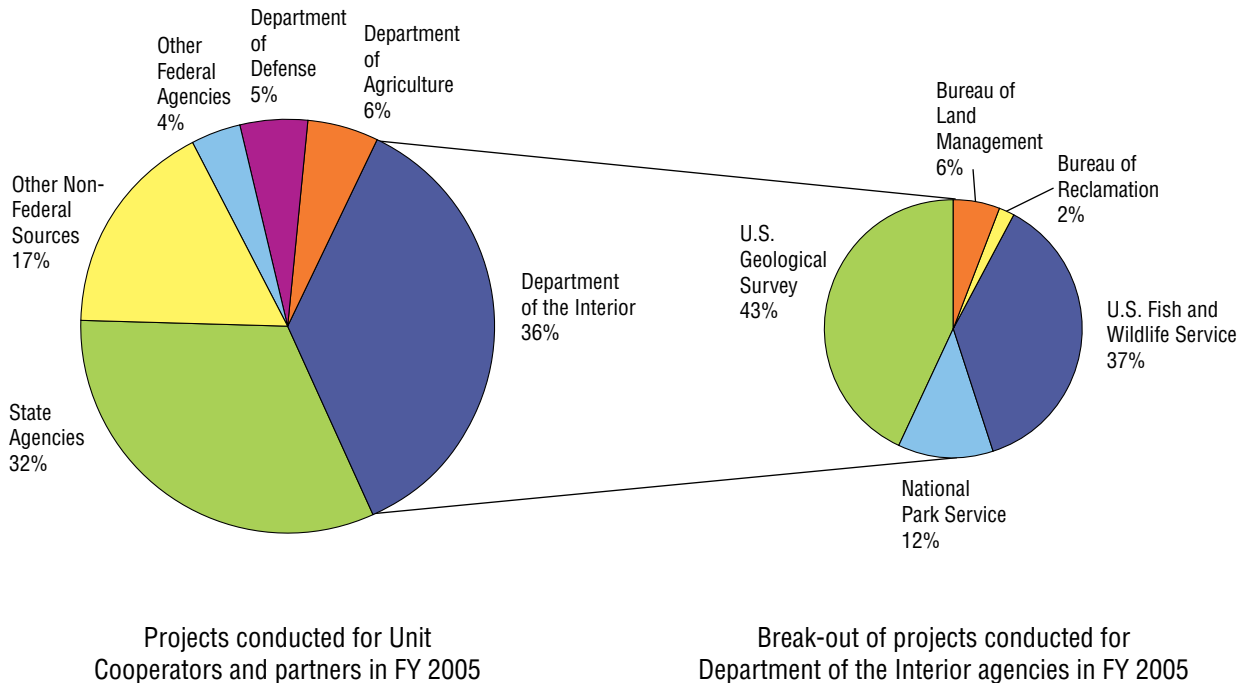
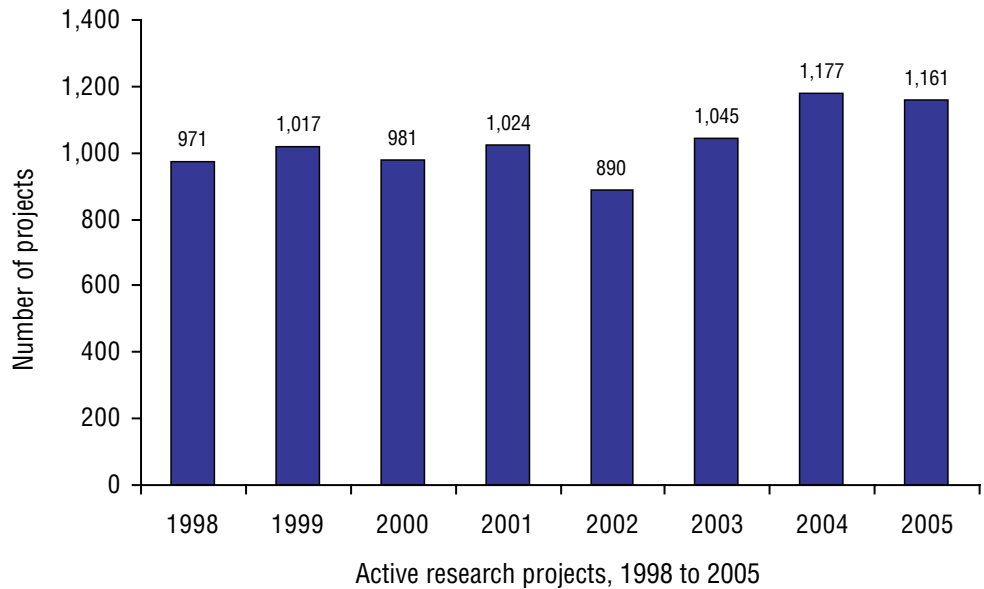
probability of transient killer whales could be improved. Results will help marine scientists assess the level at which this killer whale ecotype is contributing to the population decline of sea otters and pinnipeds.

The Wisconsin Wildlife Unit is investigating the recent decline of the threatened southern sea otter population. It is evaluating historical changes in mortality patterns and looking for spatial relationships that link the locality of sea otter deaths to population levels, habitat distribution, and possible disease agents.

The Washington Unit is working to identify characteristics of favorable haul out habitat for Alaskan harbor seals, focusing specifically on topography, water depth, land cover type, human presence, and predator abundance. Unit scientists will use the information to develop a model that predicts the coastal formations favorable for harbor seals.

## PROJECTS AND FUNDING SOURCES

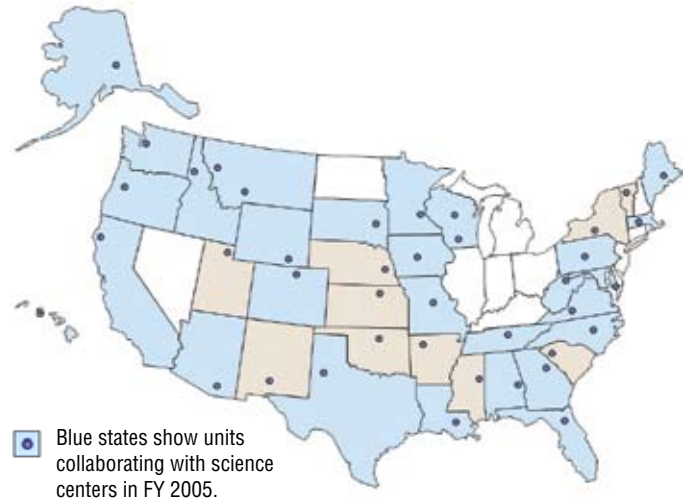
Funds appropriated to the Cooperative Research Unit program are used to staff, support, and manage the U.S. Geological Survey's participation in this federal partnership with states and universities. Ninety percent of FY 2005 program dollars were allocated to staff salaries and benefits, a percentage that has typified the program over time. The research and technical assistance activities of individual units are supported by reimbursable funds from state, federal, and local governments and non-government organizations. The size and number of new and continuing projects varies annually based on Cooperator and partner needs and available funds.



## U.S. GEOLOGICAL SURVEY INITIATIVES

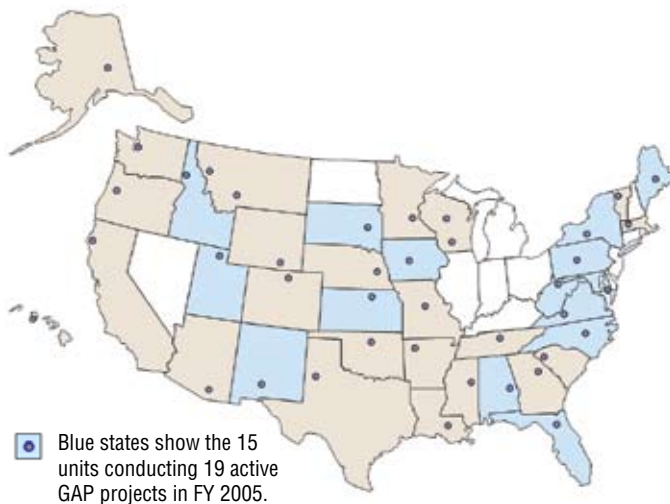
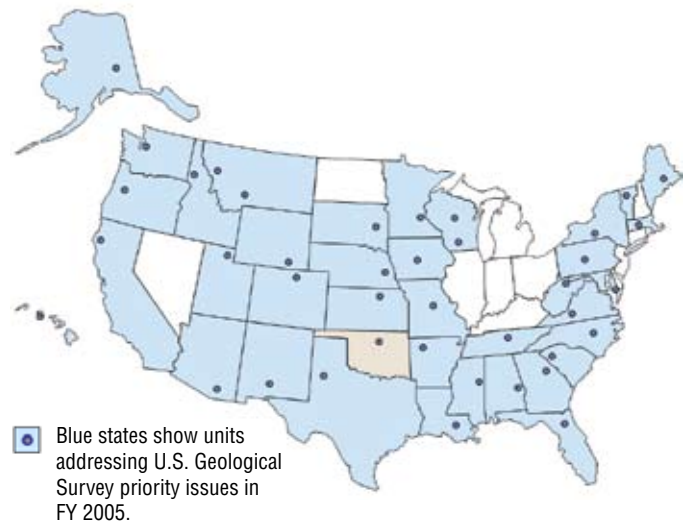
### Collaboration with Science Centers

Cooperative Fish and Wildlife Research Units provide U.S. Geological Survey Science Centers access to facilities and faculty expertise at host universities, thereby enabling the U.S. Geological Survey to better respond to priority issues of concern to federal land and resource managers. Access to units and their host university capabilities crosses all political and bureau jurisdictional lines, and links expertise with needs throughout the country. In 2005, 29 Units worked in collaboration with science centers on 77 projects to address a diverse range of topics including chronic wasting disease, grizzly bear genetics, freshwater mussels, mercury levels in shorebirds, steelhead restoration, distribution of amphibians, control of brown tree snakes, and whirling disease.



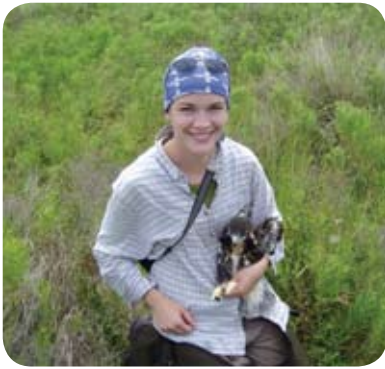
### Response to Priority Issues of the U.S. Department of the Interior

In addition to the science centers, Cooperative Fish and Wildlife Research Units play an important role in assisting the U.S. Geological Survey to meet regionally and nationally coordinated programs and initiatives that support the science needs of other Department of the Interior agencies. In FY 2005, 39 Units helped to address 207 priority issues of Department of the Interior agencies through national U.S. Geological Survey programs such as Amphibian Monitoring Research and Inventory, Fire Science, Global Change, and Invasive Species.



### Participation in the National Gap Analysis Program

The U.S. Geological Survey National GAP Program originated through the Cooperative Research Units Program under the leadership of Mike Scott at the Idaho Unit. The GAP Program characterizes and geo-references vegetation types as predictors of vertebrate distributions. Patterns of biological richness and species diversity are mapped against land ownership patterns to show gaps in protecting areas of high biodiversity. GAP data are used by local, state and federal governments for land use planning and species protection.



Clint Boal/TX Unit



Dustin Loftin/KS Unit



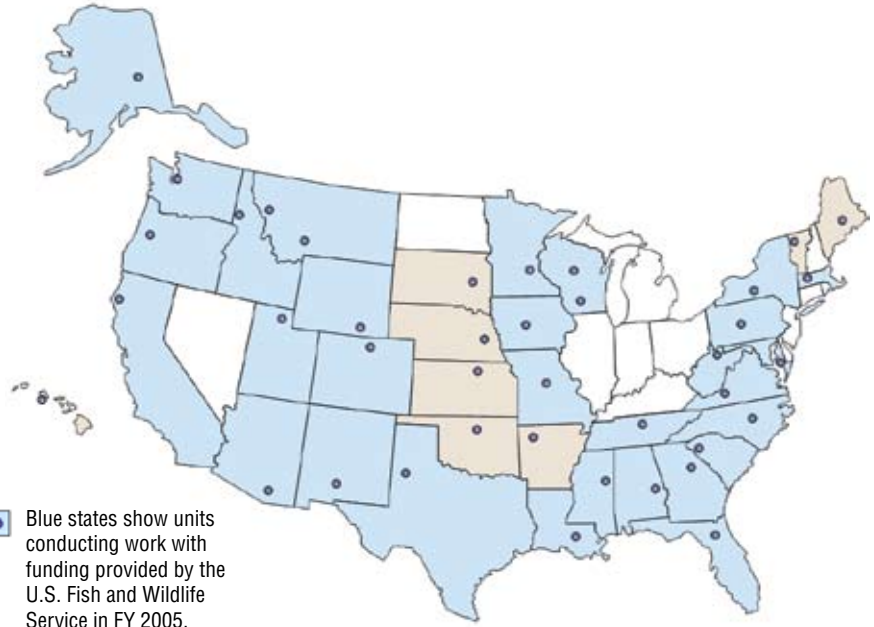
Ted Simons/NC Unit

Top: Texas Unit master's student Carey Haralson bands a white-tailed hawk at Matagorda National Wildlife Refuge, Texas. Middle: Sampling desert pupfish at Cabeza Prieta National Wildlife Refuge, Arizona. Bottom: Radio-tagged American oystercatcher chick at Cape Lookout National Seashore, North Carolina.

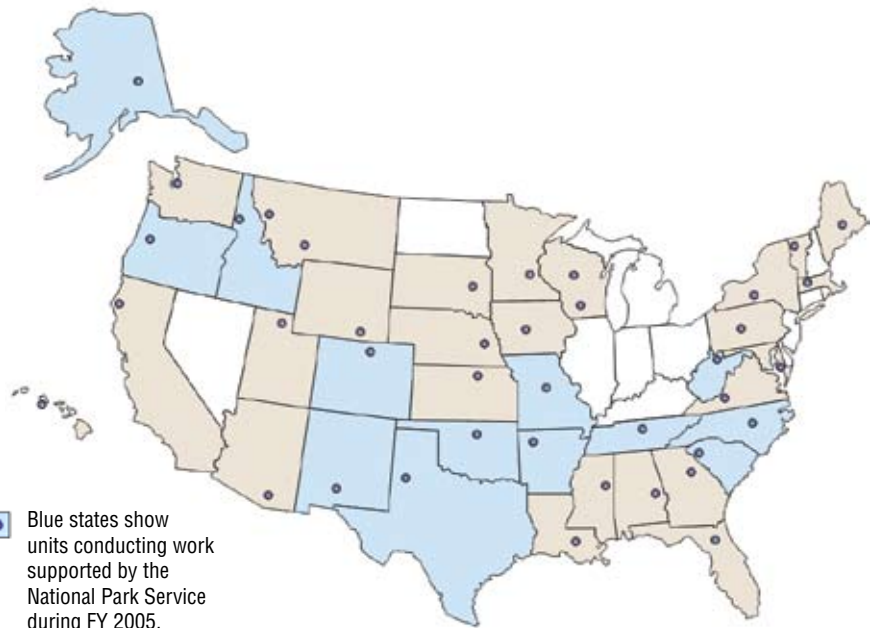
## OTHER DEPARTMENT OF THE INTERIOR INITIATIVES

### U.S. Fish and Wildlife Service and National Park Service

U.S. Fish and Wildlife Service and National Park Service managers seek out CRU expertise throughout the country to address specific needs, regardless of the unit's location. Units also respond to agency information needs at a local level, through collaborations with national park or national wildlife refuge managers and biologists and other local agency personnel.



U.S. Fish and Wildlife Service



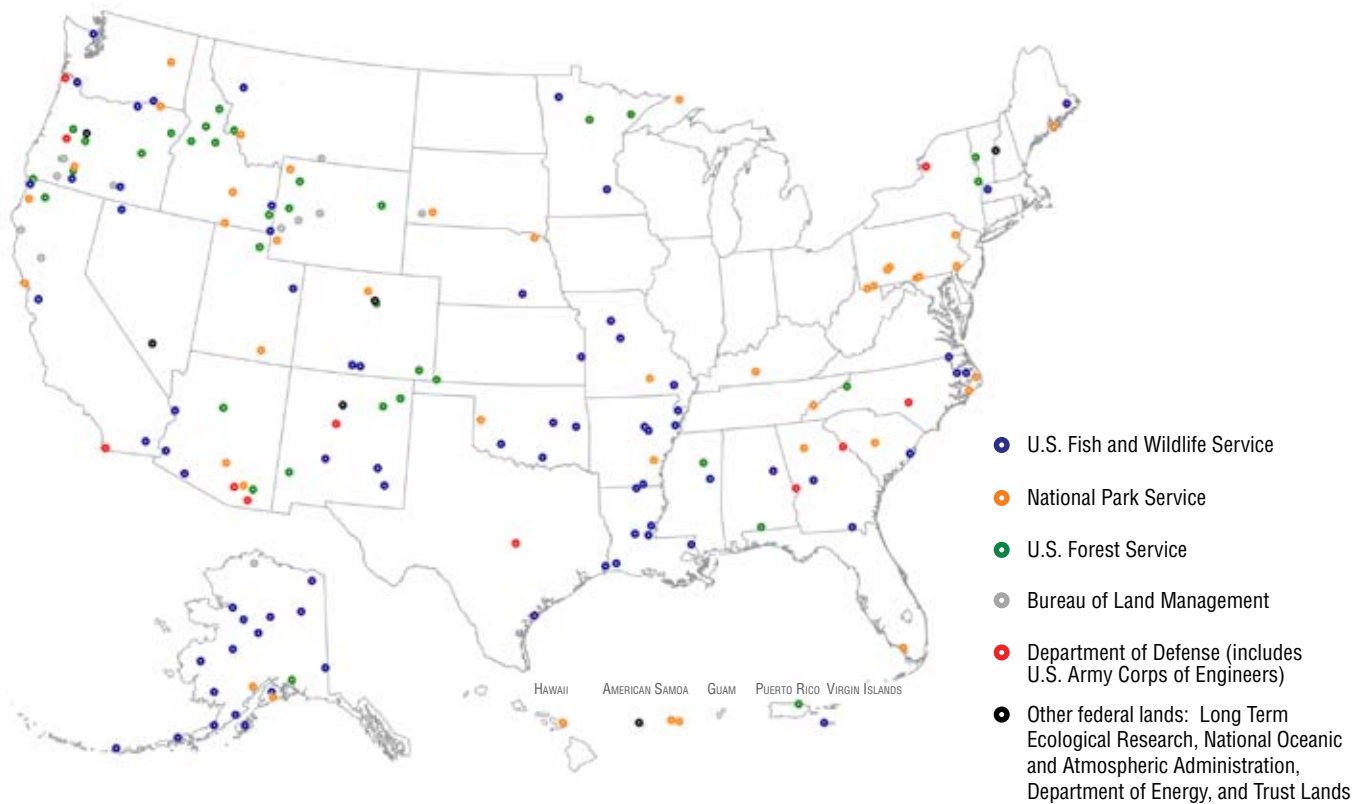
National Park Service



## SITE-SPECIFIC RESEARCH SUPPORTING FEDERAL RESOURCE MANAGEMENT

Unit scientists focused much of their research on issues of importance to federal land and resource managers, and conducted many site-specific research projects on federal lands in FY 2005. Many of these projects were conducted for the Department of the Interior, at U.S. Fish and Wildlife Service, National Park Service, and Bureau of Land Management sites. Projects were also conducted at sites managed by the U.S. Forest Service, the Department of Defense, and a number of other federal agencies.

Site-specific research often represents a collaborative partnership between an individual unit and the federal agency managing a particular site, with the collaborating federal agency providing much logistical and operational support for the work. Sites identified on the below map include those federal lands where unit scientists conducted research during FY 2005.



Research on federal lands



Carlene Henneman/MN Unit



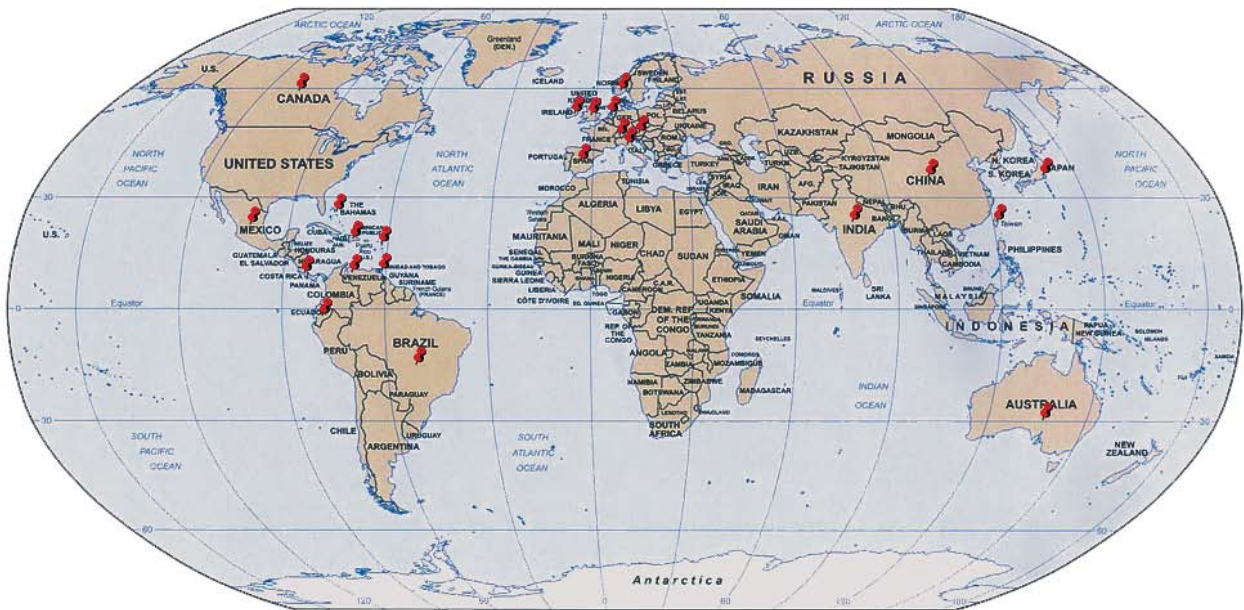
Patrick Jodice/SC Unit


Left: Minnesota Unit student Monica Awasthy conducts a broadcast call survey for red-shouldered hawks at Camp Ripley National Guard Training Site, Minnesota. Right: Felicia Sanders of the South Carolina Department of Natural Resources assists on a South Carolina Unit project assessing the impacts of ticks on brown pelicans at Cape Romain National Wildlife Refuge, South Carolina.

## INTERNATIONAL RESEARCH AND ASSISTANCE

Cooperative Research Units Program scientists, participating university faculty, and graduate students work through the Cooperative Research Units Program to address natural resource conservation issues and technical assistance needs throughout the world. This often presents opportunities for the exchange of students, broadens aspects of university international programs, and increases opportunities for scientific advancement.

The map below shows where field work, technical assistance, workshops, and graduate training occurred during 2005.



 International science and technical assistance activities of the Cooperative Research Units Program



Brad Griffith/AK Unit

The China Conservation and Research Center for the Giant Panda, in Wolong Nature Reserve, Sichuan Province, China. Alaska Unit scientist Brad Griffith was invited to join the Wolong Nature Reserve Advisory Council to recommend strategies for the release of captive-reared giant pandas into Wolong and other giant panda reserves within China. Inset: A giant panda at the research center.

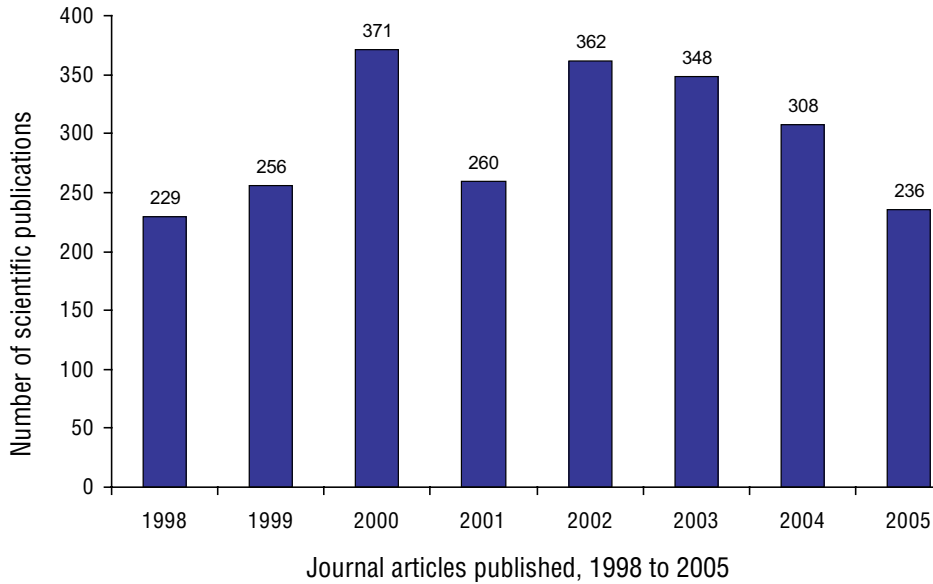


Chris Downie/AR Unit

Adam Green of the Arkansas Unit removes a female northern pintail from a funnel trap at Lake Kutawagan, Saskatchewan, Canada.

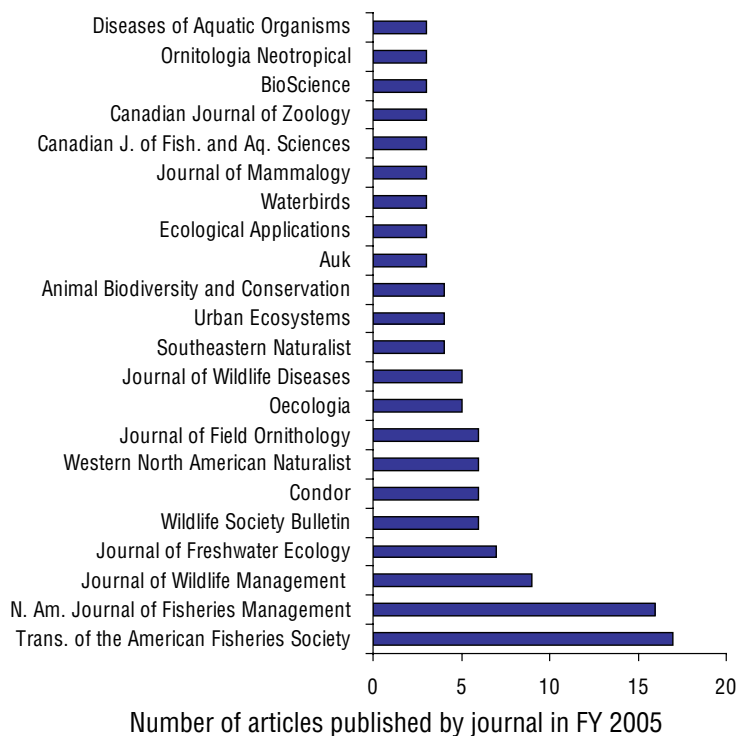
## SCIENTIFIC PUBLICATIONS

Cooperative Research Units Program scientists, students, and other personnel publish an average of about 300 peer-reviewed scientific publications per year. Fluctuations occur as a result of changes in Unit staffing and funding levels, and because of unpredictable publication cycles in relation to research completion dates.



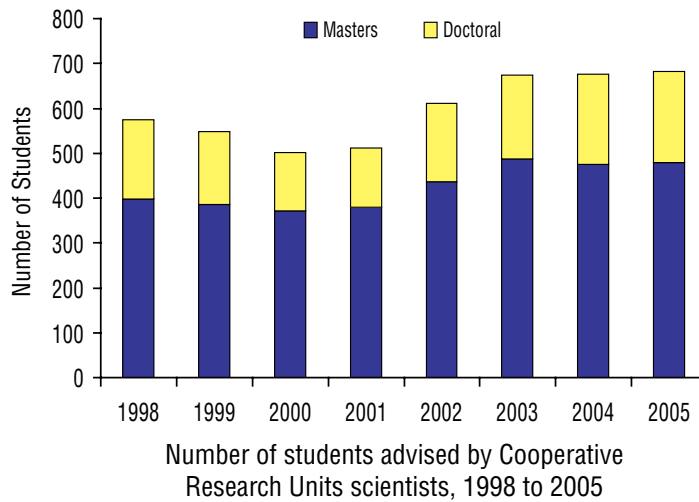
### Top Outlets for Cooperative Research Units Publications

Widely read land and resource management journals and symposia proceedings were targeted outlets for Cooperative Research Unit science in FY 2005, continuing the program's history of providing accessible information to address resource manager needs. However, the breadth of Cooperative Research Unit science addresses a complexity of topics resulting in the publication of research results among a wide array of scientific outlets. In FY 2005, scientific papers of unit scientists and students were published in 114 journals, books, and symposia and conference proceedings.



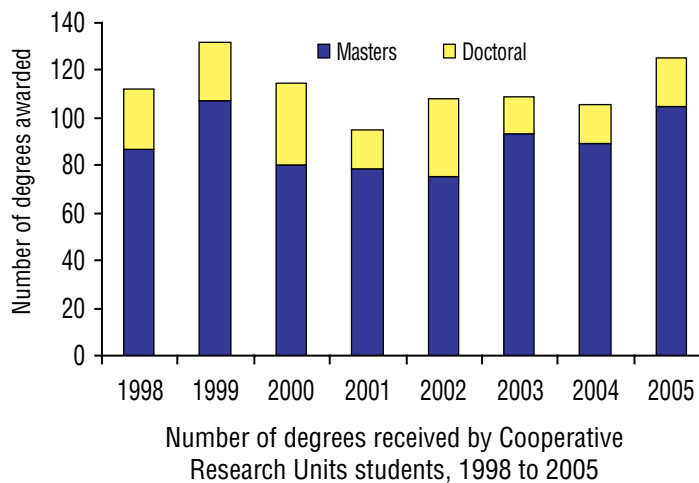
## GRADUATE STUDENT ADVISING

Cooperative Research Unit scientists participate actively in the academic programs of participating universities. These activities focus on graduate education, including formal classroom instruction as well as academic and research advising for students. Unit scientists are encouraged to recruit a culturally diverse group of candidates to train in natural resource science and management. Most Cooperative Research Units scientists are recognized as full faculty members with rights and responsibilities commensurate with their faculty appointments. A total of 683 students were advised by federal scientists in FY 2005.



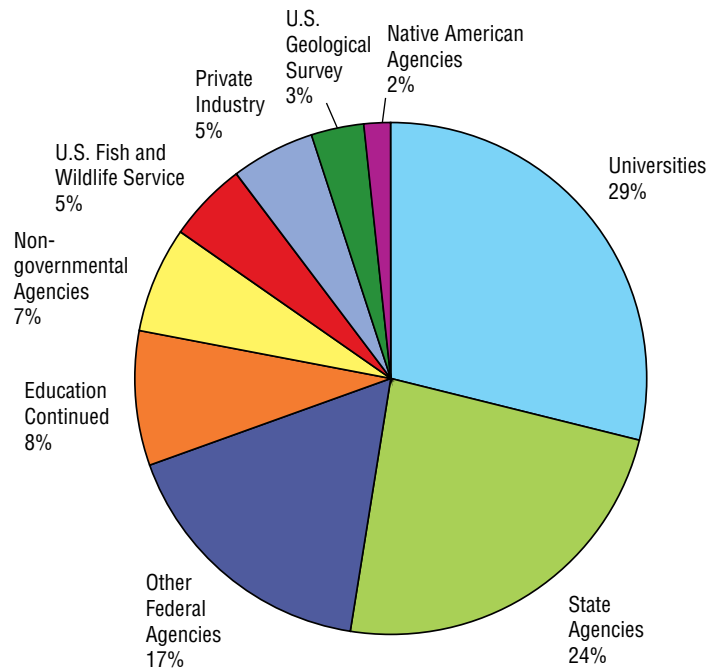
## Graduate Degrees Awarded to Students Advised by Units Scientists

Graduate degrees at both the master's and doctoral level are awarded by host universities to students mentored by scientists of the Cooperative Fish and Wildlife Research Units. The units also expand training opportunities for undergraduates, linking undergraduate and recently graduated students with real world field and laboratory experiences that complement academic coursework. A total of 125 unit students were awarded graduate degrees in FY 2005.



## EMPLOYMENT OF GRADUATING UNIT STUDENTS

Unit students are in high demand by state and federal agencies. Cooperative Fish and Wildlife Research Units help students blend their academic programs with real world natural resource issues that many state and federal agencies face. Because most CRU projects are funded by federal agencies, students often work closely with agency personnel while carrying out their student research, and are thereby provided with opportunities to interact with professionals in their field of study and to learn about their sponsoring agency. At the same time, this interaction provides agencies with a resource for evaluating potential future employees. Collectively, graduating unit students were hired by a diverse set of employers in FY 2005, including federal and state agencies, universities, and private companies.



Composition of employers of unit students obtaining employment in FY 2005



Barry Grand/AL Unit



Nick Ahrens/IA Unit

Left: Alabama Unit graduate student Laura Hansen baits a feral pig trap for a mark-recapture study on Ft. Benning, Georgia. Right: Chris Penne, Iowa Unit graduate student, prepares to collect winter telemetry data on Clear Lake, Iowa, as part of a project which will document seasonal location and movement of common carp.

## MINORITY EDUCATION

### Undergraduate Training Programs for Minority Students

State and federal agencies long have maintained programs to attract minorities and women into the natural resources field with the hope of producing trained professionals who could be recruited into the profession. The Cooperative Research Units Program has sponsored several undergraduate programs as part of the Department of the Interior's contribution toward this effort. Unit scientists work almost exclusively with graduate students, but have found that the number of minority students with an interest in the fish and wildlife management is a limiting factor when recruiting individuals for graduate research assistantships. Currently the CRU program is engaged in partnerships with the University of Arkansas at Pine Bluff (UAPB) and the University of Arizona to recruit and train minority undergraduate students in the natural resource sciences. Some of these students will enter the Unit graduate program. Others will serve as opinion leaders in their communities, or enter the natural resource profession directly upon graduation.

### Minority Training Program at the University of Arizona

Eugene Maughan, former leader of the Arizona Cooperative Fish and Wildlife Research Unit, helped establish one of the Cooperative Research Unit's longest running and most successful minority training programs. Maughan invested his time and energy in recruiting, educating, and mentoring Hispanics and Native Americans as future natural resource professionals. Since Maughan's death, CRU and the University of Arizona still employ Maughan's personal approach to minority student outreach, mentoring each recruited student through the rigors of academic life and the cultural differences that exist between the student's home and campus communities.

This year the Arizona program worked directly with seven students (five undergraduates and two graduate students). The six-year graduation rate for students in this program is 87 percent, which is more than twice the graduation rate for minorities university-wide.



Scott Bonar/University of Arizona

Cristina Velez, a graduate student, breeds Yaqui fishes in a lab at the University of Arizona. These endangered fishes are found on the San Bernardino National Wildlife Refuge on the border of Arizona and Mexico.

## Minority Training Program at the University of Arkansas-Pine Bluff



Michael Eggleton/University of Arkansas Pine Bluff

Undergraduate students at the University of Arkansas-Pine Bluff gain experience in pond seining techniques through participation in field exercises.

The Cooperative Research Unit program initiated its minority outreach partnership with UAPB in 1982, and in 2001 the partnership was reconstructed to form the National Cooperative Fisheries Program (NCFP). The goal of NCFP is to attract ethnic minorities into the fields of fisheries biology and natural resource conservation and management. Each year the University of Arkansas-Pine Bluff recruits two individuals from across the nation and provides scholarships and work opportunities for accepted students. Once in the program, the students must fulfill rigorous scholastic requirements and are expected to acquire work experience with an agency or a Coop Unit.



Michael Eggleton/University of Arkansas-Pine Bluff

LaDarrius Strong, center, and other undergraduate students at the University of Arkansas-Pine Bluff participate in fisheries research lab exercises. Strong is the first NCFP graduate, and immediately upon graduation in May 2005, he began work as a conservation officer for the Missouri Department of Conservation.

In 2005, the National Cooperative Fisheries Program graduated its first student, and additional students are expected to graduate in 2006 and each year thereafter. In 2005, CRU renewed its agreement with UAPB to continue administering the National Cooperative Fisheries Program through 2009.

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Dana Winkelman/CO Unit

Colorado Unit students and technicians identify and count *Tubifex tubifex* worms in a temporary field laboratory at Spring Creek, Colorado.



Christine Moffitt/ID Unit

Idaho Unit graduate student Kara Anlauf pipettes plasma as part of a study of Chinook salmon.

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Michael Jones/IA Unit

Mary Litvan, a graduate student at the Iowa Unit, prepares to take data on a fish caught in a southwest Iowa stream that has been modified by boulder weirs. The project will evaluate fish passage over boulder weirs with steep and shallow slopes.

### **Kansas Cooperative Fish and Wildlife Research Unit**

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Robert Bramblett/Montana State University

Research technician Ryan White, left, and Windy Davis, a Montana Fishery Unit graduate student, use a net to catch fish in Dry Creek, Montana, as part of a study of the effects of coalbed methane development on fish in the Powder River Basin in Wyoming and Montana.

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Tom Kwak/NC Unit

North Carolina fisheries biologists examine a longnose gar from the Deep River, North Carolina. Left to right: Wayne Stearns, North Carolina Museum of Natural Sciences; Mike Holliman, North Carolina Unit; and Bobby Kimbrell, North Carolina Wildlife Resources Commission.



Charles Berry/SD Unit

South Dakota Unit student Sharen Kahara demonstrates the use of a signal flare during a boating safety course.

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Wayne Hubert/WY Unit

Scott Becker, a Wyoming Unit master's student, attaches a radio collar to a moose cow as part of a study of moose movement, habitat use, and mortality rates in the area near Jackson Hole, Wyoming.

## The Cooperative Research Units Program

would like to thank each of the cooperators below for their continued support.



U.S. Geological Survey  
The Wildlife Management Institute  
U.S. Fish and Wildlife Service

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