

**America’s Natural Heritage**

Initiative Component	FY 2001 Program Change \$(000)	Page Reference
DOI Science (\$15.0 million)		
DOI Science Priorities	13,000	68
Amphibian Research and Monitoring	2,000	71
Fish and Wildlife Disease	1,000	74
Cooperative Research Units	700	76
Total	16,700	

*“This research provides the park with empirical data that describes how bobcat and coyote territories are affected by roads and the urban interface in a fragmented landscape. The information will be used to make informed decisions about management along park boundaries and roads. This information may contribute to decisions regarding future land acquisitions. It also provides important information to share with neighboring public land managing agencies, that will allow the NPS to better evaluate adjacent land management, and influence land management at the landscape level. The information on disease transmission in urban versus rural areas may influence decisions about pets on trails and in residences in the park, and how we educate park neighbors about the impact of the pets on park wildlife. The NPS also understands that these research results will be critical to evaluating the effect that the recent natural reestablishment of coyotes in the park is having on bobcat and gray fox populations and habitat use.”*

*“The information provided by North American Amphibian Monitoring Program is current and easily available over the www. Because the protocols have been peer reviewed and often validated with specific research studies, they are very helpful in efficiently planning solid monitoring and research projects of my own.”*

*“Results of the work completed will determine how we manage our forest lands for Roosevelt elk; the Coop Units work has redefined what we now consider optimum habitat for elk and will change how we manage road closures for the species.”*

## DOI Science

**\$15.0 million**

DOI Science has two components, DOI Science Priorities and Amphibian Research and Monitoring, each of which represents important DOI management requests for science-based decisionmaking. DOI Science Priorities includes top management priority requests to the USGS for science research and information as determined by each DOI

DOI Science	(\$000)
DOI Science Priorities	13,000
Amphibian Research & Monitoring	<u>2,000</u>
Total	15,000

bureau, under the Agreement on USGS Research Support for DOI Resource Management Bureau Needs. These priorities cover a broad spectrum of multidisciplinary biological and earth science expertise. Amphibian Research and Monitoring, conducted in partnership with the National Park Service, Fish and Wildlife Service, and Bureau of Land Management, is a national program, led by the USGS, to determine the status of amphibians and to investigate potential factors causing their declines and malformations.

## DOI Science Priorities

**+\$13.0 million**

### Issue

Department of the Interior (DOI) land and resource managers deal with complex management and regulatory issues concerning America's parks, refuges, and public lands. These lands provide habitats for a diverse array of native and (or) invasive species, and contain vital natural resources that must be managed for multiple purposes. Managing land and other resources for which DOI has legislated responsibility, while preserving ecosystem health, requires an integrated scientific approach, incorporating the disciplines of biology, cartography, geology, and hydrology, to ensure that decisions are based on sound understanding of ecosystems and the processes that occur within them.

### USGS Role

The Department of the Interior is implementing the Agreement on USGS Research Support for DOI Resource Management Bureau Needs, signed by all the DOI bureau directors in early FY 1999. This agreement recognizes the role of the USGS as the science provider for DOI and outlines the budget development process necessary to ensure the provision of sound and effective USGS science support for the DOI bureaus. The process involves assessing the status of current science support, identifying gaps and cross-bureau applications, and formulating priorities for USGS research in support of DOI bureaus' land management needs.

**Current Program**

DOI Science Priorities is a new initiative that integrates the scientific expertise of the USGS to address complex DOI land and resource management decisions. This increase will fund projects that complement programmatic work between USGS and DOI bureaus.

**FY 2001 Program Change**

Funding increases (in \$000) for DOI Science Priorities are broken down by subactivity as follows:

Geographic Research and Applications	1,300
Earth Surface Dynamics	1,950
Hydrologic Networks and Analysis	3,250
Biological Research and Monitoring	<u>6,500</u>
Total	13,000

The disciplines funded by these subactivities will be coordinated at the regional level to provide integrated, multidisciplinary science in response to complex management needs for the following DOI requests which are grouped thematically:

**Strategies for Ecosystem Restoration:** Federal managers require scientific information to achieve desired landscape conditions through ecosystem restoration on a watershed, habitat, or ecosystem basis. In FY 2001, USGS will plan to initiate work on the following DOI requests: acid mine drainage studies on the Monongahela River (OSM), abandoned mine land reclamation studies in selected watersheds in western states (BLM), effects of oil and gas development on habitats of sage grouse, mule deer and pronghorn in southwestern Wyoming (BLM), studies of “big river fish” such as the bonytail chub and razorback sucker reintroduced in the Lower Colorado River Basin (FWS), and impact on dam removal on fish habitats (FWS). BIA has requested that USGS provide research and information to assist selected Tribes in the development of Integrated Resource Management Plans.

**Ecosystem Monitoring Protocols:** Ecosystem monitoring provides land and resource managers with the information they need to evaluate the status and trends of animals, plants, and habitats, model and monitor ecosystem restoration activities, and assess the outcomes of management practices. In FY 2001, DOI managers have requested: inventory and monitoring protocols to assist wildlife refuges (FWS); status and trends of the genetic diversity of salmon and trout species in central and southern California (FWS); development of water quality and ecological models to support adaptive management strategies for BOR reservoirs on the Colorado River; ground water flow models and water quality studies of the desert southwest to determine water rights issues (NPS); mineral resource assessments for use in development of resource management plans in Oregon (BLM); and identification of gas hydrates and effect of resource development on associated exotic worm tube communities in the Gulf of Mexico (MMS).

**Rangeland and Riparian Health:** Rangeland ecosystems in arid and semi-arid environments are often limited in their ability to adjust to ecological stresses such as cattle and sheep grazing, invasion of non-native species, large resident populations of wild horses, and fire. USGS will begin a study to determine the long-term genetic viability and behavioral characteristics of wild horse herds and their effect on rangeland health in Utah and Nevada

(BLM); and research the role of fire in rangeland ecosystems, including the effects and ecological consequences of fire and post-fire treatments on ecosystem response (BLM).

***Declining Species and Species at Risk:*** The USGS will assist DOI bureaus in developing national monitoring protocols; assessing status and trends, including demographic parameters; assessing the quantity, quality, and suitability of existing habitats; and understanding the effects of land management practices on the habitats of those declining and at-risk species that may lead to the identification of alternative management practices in order to promote species viability (BLM, FWS). Suggested species for study include declining plant and bird species in Hawaiian forests; several species in the Columbia Basin shrub steppe; species endemic of alkali scrub habitats in Central Valley (CA); and colonial waterbirds/seabirds in the Gulf of Mexico, the Great Lakes, and other coastal regions.

***Impacts of Invasive Species:*** DOI bureaus lack information in three broad categories: (1) ecosystem level effects of invasive species; (2) specific control techniques and their consequences; and (3) regional, integrated invasive species management plans that take into account current land management practices and the effects they have on the containment or spread of exotic species. Specific work requested by BLM includes determining how weeds, such as the perennial pepperweed, spread, the impacts of weeds distribution on range forage productivity, and determining treatment options and restoration techniques.

***Quick Response (FWS) and Natural Resources Preservation Programs (NPS):*** FWS and NPS have identified the need for place-specific science at the field level to enhance land and resource management capabilities. These studies are characterized as short-term needs for biological scientific information and can address many issues, including invasive species, threatened and endangered species, contaminants, and other issues that require immediate response.

A common theme underlying all these categories is the need for the results of research investigations and tactical science to be available to land managers in GIS formats and (or) decision support systems.

## Partners and Customers

The USGS works closely with each of the DOI bureaus, and State and local agencies in planning, coordinating, and implementing projects. For DOI Science Priorities, USGS initiated regional meetings in FY 1999 with each DOI bureau to determine regional priority science needs. National-level meetings refined the list of priorities and the resulting requests are described in the Program Change section (below). In FY 2001 the requested \$13 million will be used to develop projects that address the following level of effort: \$3 million each for BLM, FWS, and NPS, and \$1 million each for BIA, BOR, MMS, and OSM. Each DOI bureau has provided USGS with a list of top management issues that require research and or applied science to address solutions. The priorities and projects will be further defined as USGS continues the collaboration and discussion with other bureaus.

## **Products**

The USGS will make data, systematic analyses, and reports available through GIS-formats, CD-ROMs, Web-based data and reports, and peer-reviewed publications. Among products that DOI bureaus have requested are geo-spatial data sets, decision support tools, web-based analysis tools, hydrologic and ecological models, resource assessments, and cartographic displays of information.

## **Amphibian Research and Monitoring**

**+\$2.0 million**

### **Issue**

At least 230 species of frogs and salamanders make up the amphibian fauna of the continental United States. Focused research in local areas over the past 10 years has indicated unabated declines in some amphibians, though the exact extent of losses remains unknown. Reports of malformed frogs, toads, and salamanders are also increasing. In May 1998, an international meeting of experts convened by the National Science Foundation concluded that significant amphibian declines have occurred in protected areas not subjected to obvious changes in habitat, such as National Parks, Wildlife Refuges, and wilderness areas.

Declines and malformations in amphibian populations have been reported from many parts of the world, including the United States. Amphibians are considered good indicators of general ecosystem health due to their close association with various aquatic habitats and sensitivity to different environmental stresses. Habitat destruction and alteration have been shown to cause amphibian declines, but significant declines have occurred in protected areas not subjected to obvious changes in habitat. The USGS is leading a coordinated research effort extending beyond the Department of Interior (DOI) to other Federal, State, and academic partners, to track the status of amphibians nationwide and investigate potential causative factors for their decline.

### **USGS Role**

With perhaps the largest cadre of professional herpetologists in the U.S., the USGS is uniquely qualified to investigate the twin issues of amphibian declines and malformations. Its scientists are in the forefront of tracking amphibian populations, documenting environmental change, and conducting research designed to understand amphibian development, life history and potential causes of decline.

### **Current Program**

The USGS has taken the lead in this important national initiative. Biologists are conducting amphibian surveys on DOI lands, hosting training workshops, designing databases, and managing data collection. Scientific studies are underway that investigate disease, contaminants, ultra-violet radiation, and habitat alteration factors that could cause amphibian decline. Since most amphibians in the U.S. are water-dependent for one or more stages of their complex life cycle, USGS hydrologists are describing the basic water quality and generally assessing past and present habitat at many amphibian survey sites. It is widely believed that changes in habitat are responsible for the decline of many amphibian populations. To help address this concern, USGS cartographers and geographers are providing high-resolution maps of survey sites, and developing novel approaches to analyze land-use, land-cover, and other geospatial information to correlate habitat change with amphibian declines.

To coordinate this nationwide and interagency effort, the USGS has developed a comprehensive Amphibian Research and Monitoring Initiative has been developed to define the roles and responsibilities of various institutions and organizations inside and outside the USGS, including DOI and other stakeholders with natural resource management responsibilities. The framework established in the Initiative addresses where surveys will be conducted, the frequency of surveys, what amphibian populations and habitat variables will be measured, and how survey data will be managed. Information tools and management prescriptions will be transferred to resource managers responsible for arresting or reversing amphibian declines and malformations.

### **FY 2001 Program Change**

The Amphibian Research and Monitoring Initiative proposes conducting a nationwide survey of amphibian populations and comprehensive research studies on causal factors. Funding provided in FY 2000 will enable USGS to initiate surveys in 5 of 7 biogeographic regions. The funding increases requested in FY 2001 will provide full support for the 5 regions where work is already underway, provide partial support for the 2 remaining regions, and enable USGS to initiate the research component of the Initiative.

**Geographic Research & Applications +\$0.1 million:** The proposed increase for Amphibian Research and Monitoring will support the compilation and analysis of geospatial data to characterize habitat in areas of demonstrated amphibian loss and to develop methods to use spatial analytical techniques to predict potential amphibian loss.

**Toxic Substances Hydrology Program +\$0.5 million:** The request will fund comprehensive research studies on causal factors for declining amphibians related to hydrologic changes and contaminants. It will enable hydrologic and water-quality characterizations, and causal-factors research to be conducted in the Upper and Lower Mississippi River Basins in FY 2001. It will also support a more comprehensive evaluation of the range of environmental contaminants that may influence amphibian declines across the Nation.

**Biological Research and Monitoring +\$1.4 million:** A portion (\$1.075 million) of this request will fund monitoring surveys in the Upper and Lower Mississippi River Basins in FY 2001 to meet national Initiative objectives mentioned above. Amphibian malformations have been observed in the upper reaches of the Mississippi River, and there is much anecdotal information suggesting declines in numerous amphibians in the Lower Mississippi River basin, but additional funding is needed to begin surveys in these regions.

The funding would also increase research (\$0.265 million) on disease (chytrid fungus), parasite (nematodes), and contaminant effects on amphibians. Preliminary findings indicate that these environmental insults, acting alone or in combination, may be contributing to widespread amphibian declines and/or malformations.

Additional resources (\$60,000) are requested to increase data storage, analytical, and reporting capability. The structure of standardized databases would be expanded and enhanced to accommodate status and trend information from other Federal, State, and private amphibian monitoring programs. Collection and management of data generated by monitoring and research activities is critical to the overall effort.

## **Partners/Customers**

DOI bureaus are major partners in this effort. The National Park Service, Fish and Wildlife Service, and the Bureau of Land Management also received new appropriations in FY 2000 to work with USGS on this important amphibian initiative. In addition, the USGS will work with other Federal, State, non-governmental organizations and academic institutions to expand survey coverage and data collection beyond DOI lands. These partners are seeking information concerning the status and trends of amphibians, sites where amphibians are declining, factor(s) responsible for declines, and recommended alternative activities that may be pursued in an adaptive management context. These partnerships will include web-based data sharing, development and use of common survey protocols and databases, sharing and leveraging funds, and training workshops and symposia to exchange information and expertise.

## **Products**

The USGS-led effort will produce long-term density and distribution information, cause and effect research findings, decision support systems, and other tools needed by partners to inform planning and management actions to halt or reverse the declines and malformations of amphibians on their lands.

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**Fish and Wildlife Disease****+1.0 million****Issue**

Late in August 1999, an encephalitis outbreak occurred in New York City. Within weeks the mosquito-borne disease had spread to many counties in New York, Connecticut, and New Jersey. Dozens of people were infected and seven died. Biologists from the USGS National Wildlife Health Center soon identified crows and other birds as the natural host and carrier for the virus. The deadly virus was identified as the West Nile variety, never before found in the United States. Although the cold fall weather removed the immediate threat of mosquitoes infecting people, USGS scientists have continued to monitor the spread of the virus in bird populations. As a result scientists have discovered the virus in eighteen native bird species in New York, New Jersey, Connecticut and Maryland.

Emerging and exotic diseases threaten restoration of the Nation's trust fish and wildlife species, including salmon. Climatic change, pollution, and land development stress both fish and wildlife populations, predisposing them to disease. Viral diseases (such as infectious salmon anemia and retroviral sarcoma) as well as a resurgence of latent pathogens such as "coldwater disease," affect fish hatcheries and endangered species re-introduced into the wild. We lack the baseline data needed to determine the distribution of such diseases, and to devise control methods.

Brain lesions in birds (avian vacuolar myelinopathy or AVM) have been a growing concern since they were first diagnosed in 1994. Originally diagnosed in bald eagles and coots in Arkansas, the syndrome has been detected in other birds, especially ducks, and in other southeastern States.

**USGS Role**

USGS is an international leader in fish and wildlife health. USGS has broad expertise in infectious and noninfectious diseases as well as other wildlife health matters. The presence of supporting disciplines within USGS provides access to other facets of science, such as assessments of water quantity and quality, spatial data from geographic information systems, and data about geological settings.

**Current Program**

Wildlife disease research supports a national program dealing with all aspects of wildlife health issues providing research and technical support to the FWS, other Federal agencies, and State fish and wildlife agencies. Fish disease research focuses on development of better methods for detection of causative agents, fish species resistance to disease, the role of environmental contaminants upon the disease cycle, improved diagnosis of disease, and development of new vaccines. The results are used to understand the factors that control the distribution and transmission of fish diseases and the effects on fish restoration efforts.

## FY 2001 Program Change

**Biological Research and Monitoring +\$1.0 million:** The largest portion of this increase will be used to better understand the deadly West Nile encephalitis virus. Crows and other birds that carry the virus will be studied and their role in spreading the disease to humans documented. The funding increase will also enable USGS to expand its research on Avian vacuolar myelinopathy (AVM) disease, to help curb its spread. These funds will also increase the USGS grant to the Southeastern Cooperative Wildlife Disease Study to assist with both these projects.

This increase will also provide for the development of immunologic detection systems for infectious salmon anemia, a devastating disease of Atlantic salmon, to monitor, contain, and control the potential devastating impact of this virus upon the salmonid populations of the U.S. Additional resources will be directed toward study of fungal diseases in Chesapeake Bay fish.

## Partners/Customers

The U.S. Fish and Wildlife Service, the U.S. Department of Agriculture, State fish and wildlife departments, commercial and sports fisheries as well as public health agencies would benefit from simple, cost-effective tools for diagnosing fish and wildlife diseases such as whirling disease, pfiesteria, avian cholera, and botulism. Diagnostic tools are the first step toward developing control measures.

## Products

The most important product will be detailed information of the geographic distribution of the West Nile virus in bird populations of the East and Gulf coast States. The National Wildlife Health Center has been able to use sick and dead crows as a visible indicator of the West Nile virus. Public health agencies will be able to anticipate where the disease is likely to occur, quickly test diseased birds and mitigate the impacts of the deadly encephalitis disease on humans.

Other wildlife diseases (such as AVM) that cause brain lesions in bald eagles and ducks will be better understood. In addition, the USGS will study certain fish and aquatic diseases and make available to the State and Federal wildlife managers the means to stop the spread of disease in wild and endangered fish populations.

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**Cooperative Research Units****+\$0.7 million****Issue**

Over the past 3 fiscal years, the Unit program received programmatic increases totaling \$2.5 million. These funds were used to staff and support existing science vacancies reducing the number of unfunded Unit science vacancies from 20 in FY 1997 to only 2 in FY 2000. Recruitment actions completed or in progress during FY 1999 and early FY 2000 include Unit scientist positions in Alabama, Alaska, Arizona, Arkansas, California, Georgia, Hawaii, Louisiana, Maine, Maryland, Massachusetts, Minnesota, New Mexico, Pennsylvania, South Dakota, Texas, Vermont, Washington, West Virginia, and Wisconsin. These positions will increase the breadth of expertise of the Cooperative Research Units program and allow the program to better address contemporary issues raised by natural resource managers, and to meet USGS commitments to university and State cooperators.

**USGS Role**

The USGS is the lead Federal agency in this cooperative program, contributing Federal scientific staff to work with State agencies and universities to address resource information needs for science-based management of resources, and training needs of the next generation of natural resource professionals. The USGS staffs each Unit with two to five Federal research scientists. Cooperating universities provide office space, administrative support, and access to university facilities. The State game and fish agencies provide base funding and logistical support for research activities. The support of all Cooperators achieves a pooling of resources that provides a multiplier effect for everyone, thus enhancing the program's cost-effectiveness to each Cooperator. USGS also provides Federal administrative support to all Units and for the national program and represents the national interest of the collective of program Cooperators.

**Current Program**

The Cooperative Research Units program consists of 39 Cooperative Fish and Wildlife Research Units located on university campuses in 37 States. The mission of the Cooperative Research Units program is threefold: (1) to provide scientific research for the understanding and management of fish, wildlife, and other natural resources; (2) to provide technical assistance to natural resource managers in the application of scientific information to natural resource policy and management; and (3) to train future natural resource professionals.

**FY 2001 Program Change**

**Cooperative Research Units +\$0.7 million:** The proposed increase will complete a multiyear effort to fill all science vacancies in the Cooperative Research Units program and support existing science positions. Filling these vacancies (created through attrition and funding shortfalls to date) will enable the USGS to meet its commitment to its State and university partners in this cost-shared program. Full staffing will increase the breadth of technical

expertise available to State and Federal resource managers to address contemporary and emerging natural resource issues. It will also increase the capability of Units to respond to a greater number of State and Federal information needs. Staffing Unit vacancies will provide additional opportunities for USGS to partner with universities in the training of the next generation of natural resource professionals. The budget initiative will not expand the number of Units or scientific positions beyond those already authorized, nor enhance operational support to existing Units.

### **Partners/Customers**

The Cooperative Research Units program is a unique model of cooperative partnerships among Federal and State Governments, academia, and the Wildlife Management Institute. These partnerships are maintained as one of USGS's strongest links to Federal and State land and natural resource management agencies. More than 12 Federal bureaus have developed cooperative relationships with the Unit program, relying on the economy of the program, the expertise of the science in the program, and the quality and timeliness of the products.

### **Products**

The Unit program initiates and completes approximately 200 research projects annually, with more than 1,100 active research projects at any given time. Technical and/or management reports are generated for each project and provided to sponsoring agencies. Technical agency reports are complemented by scientific publications (numbering more than 300 annually) to more broadly distribute the findings and make results more available to the scientific and management community. Assistance also is provided to sponsoring agencies for interpreting and applying research findings. This is done through personal contacts, and participation in workshops, and technical committees. Through affiliations with host universities, Unit scientists advise and mentor more than 600 graduate students annually.

