

Wildlife: Terrestrial and Endangered Resources Program

Wildlife: Terrestrial & Endangered Resources research is conducted on migratory birds, mammals, amphibians, and their habitats. Results complement and support the conservation and management efforts of Federal and State wildlife agencies, non-governmental organizations and international treaties.



Program Goals

To manage a national amphibian research and monitoring program:

- ◆ Understand scope, severity, and causes of amphibian declines
- ◆ Provide scientific information to support management and conservation actions



The Amphibian Research and Monitoring Initiative supports research to determine the causes of amphibian population declines

To develop tools such as predictive models, decision support, and expert systems for science-based management of wildlife and plant populations and their habitats:

- ◆ Determine factors involved in the population dynamics of large predators and identify potential management strategies
- ◆ Identify and evaluate potential management strategies for pest and introduced species

To develop restoration strategies for federal lands & critical environments:

- ◆ Identify spatial and functional habitat requirements in support of management strategies by Federal land managers and cooperating agencies
- ◆ Determine the impact of exotic and introduced species

- ◆ **Species of Emphasis**
 - Migratory Birds
 - Amphibians
 - Large Predators
 - Invasive/Pest Wildlife
 - ◆ Population-Habitat Linkages
 - ◆ Wildlife Disease
 - ◆ Science for Declining & Endangered Species

- ◆ Provide DOI natural resource managers with synthesized data, information, and tools to understand causal relationships between habitat quality and quantity as reflected by the populations occupying the habitat
- ◆ Increase use of genetics and molecular tools

To evaluate the status of plant and animal species at risk and provide scientific guidance for their conservation and management:

- ◆ Develop science for Habitat Conservation Planning
- ◆ Develop specific population viability analyses, limiting factor determinations, and modeling for species recovery
- ◆ Assess the conservation requirements of seriously declining migratory species
- ◆ Evaluate effectiveness of management recovery effort

To provide specific management models for declining migratory bird populations:

- ◆ Assess the conservation requirements of seriously declining migratory species
- ◆ Develop basic biological information needed to support the formulation of management strategies for declining species

For more information

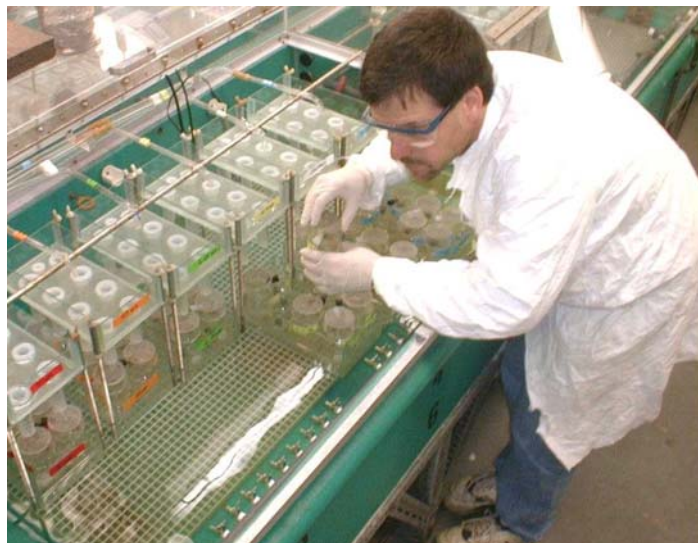
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The USGS Contaminant Biology Program

The Contaminant Biology Program investigates the effects of environmental contaminants on the Nation's living resources, particularly resources on lands under the stewardship of the Department of the Interior. This information is used to determine the role of contaminants in species declines and mortality, establish cleanup levels and restoration goals, assess risk and damage to natural resources, and monitor changes resulting from restoration or natural processes. Areas of special emphasis include mercury, toxicological techniques, emerging chemicals, toxic responses of species underrepresented in the toxicological literature and imperiled species. Investigations also reveal the mechanisms of toxicity, compare toxic responses of different species, and develop instrumentation and biomarkers to identify chemical exposure or effects. Scientists investigate a broad range of substances, including lead shot, mine tailings, sewage effluent, agricultural drainwater, pesticides, explosives, fire retardants, and petroleum products, antibiotics, hormones, and other wastewater-related chemicals.



Scientists use laboratory bioassays and other methods to investigate substances that are directly lethal to plants and animals, or may suppress immune function, disrupt the endocrine system, deform embryos, or impair reproduction or

Program Goals

Contaminated Habitats - Develop the scientific basis for assessment, restoration and monitoring of habitats that are contaminated by mining, agriculture, forestry, wastewater, industry, and chemical control agents. Develop the toxicological basis to remediate and prevent contamination by providing information on the risk of environmental contaminants, biological controls, and nontarget effects of chemicals used against

invasive species, fire, and other hazards.

Toxicology and Chemistry - Determine the sources, fate, exposure and effects of environmental contaminants. Develop and standardize biomarkers, and other methods for molecular biology, chemical analysis and toxicology.

Integration of Ecological Stressors - Improve the scientific basis for evaluating the effects of multiple

stressors, or stressors at multiple levels of biological organization or at multiple temporal and spatial scales.

For more information

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Terrestrial, Freshwater, & Marine Ecosystems Program

Terrestrial, Freshwater, & Marine Ecosystems research focuses on understanding the factors controlling the structure, function, and condition of terrestrial, freshwater, and marine ecosystems. Investigations identify, explain, and predict the ecological consequences of short-term and long-term environmental changes, including how human activities modify ecosystem components and processes and how modified ecosystems can be restored and managed. Topics include the causal relationships underlying interactions between natural biotic communities and their environments; ecological linkages within and among plant and animal communities, ecosystems, and surrounding landscapes; processing of energy and matter in ecosystems; influences of human alterations on ecosystem composition and processes; effects of ecosystem management practices and tools to predict implications of management policies on ecosystem structure and function; and methods for returning impaired ecosystems to a self-sustaining natural condition. Activities include determining ecosystem vulnerability to adverse effects of environmental change and providing information to mitigate these effects.



Programs Goals

1. To quantify and understand factors influencing patterns of temporal and spatial variability in key ecosystem components:
 - Increase understanding of linkage between wetlands, rivers, lakes, and surrounding landscapes
 - Quantify the role of scaling in understanding and managing the spatial and temporal responses of biological systems to global change
 - Increase understanding of coral reef ecosystem and coastal and estuarine environments
2. To model factors controlling ecosystem patterns at various scales and develop decision support systems which integrate this information with management options:
 - Develop and test management options for adapting to the effects of global change and
 - Minimizing undesired effects of global change
 - Incorporate human dimensions (social and economic data) information into decision support

- and expert systems for management and conservation
3. To develop indexes of ecosystem sensitivity to change and vulnerability to potential stressors, and tools to predict ecosystem responses to environmental change:
 - Determine relative sensitivity of biological resources and geographic areas of the nation to global changes in order to detect early changes and prioritize response actions



4. To devise a restoration and adaptive management framework for impaired ecosystems:

- Improve the scientific basis for wetlands rehabilitation and restoration
 - Improve methods for post fire rehabilitation
 - Develop a USGS fire ecology research and management assistance plan
5. To identify research areas representative of U.S. ecosystems and initiate a research reference site network:
 - Develop strategy to designate and begin characterizing Index Sites representatives of the nation's ecosystems
 - Select prototype sites with an initial focus on Department of Interior lands

For more information

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FISHERIES: AQUATIC AND ENDANGERED RESOURCES PROGRAM

The **Fisheries: Aquatic and Endangered Resources Program (FAER)** focuses on the study of fishes, fisheries, fish diseases and parasites, aquatic organisms and their water based and water-dependent habitats. Endangered species and those that are imperiled receive special research interest. The Program's research on the diversity, natural history, health, and habitat requirements of fish and other aquatic organisms is carried out to support the management, conservation and restoration of our Nations aquatic resources.

AQUATIC SPECIES DIVERSITY



Expand information and improve understanding of:

The status, diversity, and natural history of aquatic organisms (animals and plants).

The life history requirements of native fishes and other aquatic organisms.

RELATIONSHIPS OF AQUATIC SPECIES AND HABITATS



Understand how differences and changes in habitat influence:

Ecological adaptation and potential productivity of salmonids.

Food webs in lakes, rivers, and coastal waters.

Life history and productivity of coastal fisheries populations

Aquatic resource health and environmental interactions

AQUATIC SPECIES AT RISK

Evaluate status and provide scientific guidance for:

Habitat Conservation Planning

Population viability analysis

Limiting factor determination

Effectiveness and modeling of species recovery

Develop genetic and molecular tools

AQUATIC ORGANISM HEALTH



Foster aquatic organism health to:

Complete risk assessment and develop tools to mitigate the impact of selected aquatic diseases

Complete FDA data requirements for priority fish culture drugs and chemicals

Develop strategies for management of disease risks to fisheries

RESTORATION OF SPECIES AND HABITATS



Provide science to restore and maintain declining species and habitat by developing tools for:

Critical limiting factors assessment for salmonids

Geo-spatial analysis of biological and physical processes

Strategies for managed rivers

Fish culture and hatchery supplementation assessment

Migratory fish passage improvement



For more information

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Invasive Species Program

Biological invasions are rapidly becoming one of the greatest threats to the natural environment of the United States. The Invasive Species Program encompasses all major groups of invasive organisms and provides information and technologies to combat invasive species.



Interim Long-term and Five-year Goals

Prevention – Conduct research and develop methods and technologies to prevent the introduction of invasive species.

Develop, improve, and evaluate methods for management of priority pathways.

Support development of indices of the potential invasiveness of species not yet established in U. S. ecosystems.

Early Detection and Rapid Response – Identify and report new invasions and assess risks to natural areas and waters.

Develop early detection and reporting networks for all taxonomic groups in cooperation with other agencies and organizations.

Support rapid assessment and response for new invaders affecting U.S. ecosystems and native species.

Monitoring and Forecasting – Assess changes in the populations and distributions of established invaders.

Develop multi-scale monitoring and forecasting of established invasive species in U.S. ecosystems (by ecosystem and taxonomic group).

Effects – Determine the effects of invasive species and the susceptibility of habitats to invasion:

Expand research on the effects of priority invasive species on native species, habitats and ecosystem functions.

Develop reliable methods for better understanding of the socio-economic impacts of invasive species.

Control and Management – Provide approaches to contain, reduce, and eliminate populations of invasive species and restore habitats and native species.

Develop effective methods for the control of priority invasive species threatening public lands and waters.

Information Management – Provide and coordinate the collection, synthesis, and accessibility of invasive species information.

Increase the availability of data on non-indigenous species through NBII and the NISC website.

Provide syntheses of invasive species information to guide policy and inform the public

The U.S. Geological Survey (USGS) is the primary research arm of the Department of the Interior (DOI), which manages nearly one-fifth of all land in the United States. DOI co-chairs the National Invasive Species Council (NISC), and USGS plays a significant role in implementing the National Invasive Species Management Plan.

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Status and Trends of Biological Resources Program

S&T Program Goal

The Status and Trends of Biological Resources Program measures, predicts, assesses, and reports the status and trends of the Nation's biological resources to facilitate research, enable resource management and stewardship, and promote public understanding and appreciation of our living resources.

Focus

A fundamental requirement of resource managers and scientists and a key component of adaptive management is knowledge of what resources exist (inventory), where they are located (distribution), how many there are (abundance), and how they change over time (trend). The strategic question that focuses and directs the Program is what are the ranges in the variability of species, communities, and ecosystems and how are they changing over spatial and temporal scales? To effectively manage biological resources, there is a need to measure their abundance, distribution, and condition over time and the processes and functions of the systems in which they reside.



S&T Program Objectives

Progress toward accomplishing the overall Goal is marked by achievements made in the following Program Objectives:

Monitoring Framework: The Program provides a framework that facilitates the integration of information from a variety of sources at multiple spatial and temporal scales to describe and track the abundance, distribution, productivity, and health of the Nation's plants, animals, and ecosystems. **Priorities** include the formulation of partnerships to identify current inventory and monitoring programs and projects; acquire understanding of why and how the efforts are conducted; and promote opportunities to share and increase the collective knowledge concerning the status and trends of biological resources.

Methods Development: Emphasizes the development and evaluation of inventory and monitoring methods, protocols, experimental designs, analytic tools, models, and technologies to measure biological status and trends. **Priorities** include developing valid statistical and analytical methods, measures of detectability and comparability, review methods to optimize monitoring design, and provide technical assistance to Department of Interior bureaus.

Data Collection and Management: Critical, high-quality monitoring data is collected, archived, and shared in cooperation with our partners to determine the status and trends of biological resources. **Priorities** include building and supporting benchmark

databases and archives; integration of data from other programs; and improving access to biological status and trends data.

Analyses and Reporting: The Program produces and provides analyses and reports synthesizing information on the status and trends of our Nations' flora, fauna, and ecosystems responsive to the needs of the scientific community, land and resource managers, policy makers, and the public. **Priorities** include the improved timeliness and ease of access to program data and information products through the web to reflect current information and knowledge on the status and trends of biological resources.

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USGS Biological Resources

The USGS Biological Resources Programs seek to collaborate with Federal, State, Tribal, private sector, and university organizations nationwide to provide credible science-based, biological information needed by natural resource managers and others.



At the more than 1600 USGS-BRD employees are located at 18 Science Centers, 40 Cooperative Research Units, and numerous field stations throughout the United States. Science focuses on issues especially relevant to Federal lands, trust species and resources. Biology Programs include:

STATUS & TRENDS

Assesses and reports on the status and trends of the Nation's biological resources; develops and evaluates inventory and monitoring methods; and collects, archives and shares monitoring data to facilitate research, enable resource management and stewardship, and promote public understanding and appreciation of our living resources. Provides critical information and methods to support land management agencies and their stakeholders.

CONTAMINANT BIOLOGY

Environmental exposure and biological effects of contaminants on fish, wildlife and plants are the focus of research in Contaminant Biology. The information is used to develop options for mitigation, restoration or prevention of contamination in mine lands and in urban, industrial and agricultural environments.

FISHERIES: AQUATIC AND ENDANGERED RESOURCES

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natural history, health, and habitat requirements of fish and other aquatic organisms is carried out to support the management, conservation and restoration of our Nations aquatic resources.

WILDLIFE: TERRESTRIAL & ENDANGERED RESOURCES

USGS scientists conduct investigations on mammals, migratory birds, amphibians, and other wildlife species. These projects complement and support the efforts of state wildlife programs. Studies of wildlife diseases help managers to understand the effects of disease outbreaks on wildlife populations. Endangered and threatened species are studied to determine the factors contributing to their decline and to provide the information and tools needed for their recovery.

TERRESTRIAL, FRESHWATER, AND MARINE ECOSYSTEMS

Research focusing on the interactions controlling the structure, function, and condition of terrestrial, freshwater, and marine ecosystems to identify and predict the ecological consequences of short- and long term environmental changes. Emphasis on the development of techniques for restoration/rehabilitation with emphasis on the Everglades, degraded river and stream ecosystems in the Lower Mississippi River Valley, damaged Great Plain and Ozark Plateau ecosystems, degraded wetlands and oak-savannah ecosystems in the Great Lakes, Colorado River, Mojave Desert, and both aquatic and terrestrial ecosystem in the

West, including Hawaii and Alaska. Ecosystem studies in South Florida, Chesapeake Bay, Platte River, Greater Yellowstone, Mojave Desert, and San Francisco Bay will help to provide the tools for resources managers to predict implications of management policies on ecosystems and rehabilitating impaired ecosystems into self-sustaining natural systems.

INVASIVE SPECIES

Studies are conducted on factors influencing invasions of habitats by non-indigenous species and their effects on native species. The program develops information, methods and tools for detection, monitoring, forecasting, and assessing invasions as well as for effective prevention and control strategies.

COOPERATIVE RESEARCH UNITS

Studies conducted by Unit scientists and their students focus on contemporary natural resource issues. Unit scientists also participate in the education of graduate students destined to become natural resource managers and scientists and provide technical assistance and continuing education to natural resource professionals.

BIOLOGICAL INFORMATION MANAGEMENT & DELIVERY

Emphasis is on dissemination and integration of information through the National Biological Information Infrastructure to meet the needs of technical and non-technical users.