

# STRATEGIC PLAN: 2005-2009

The U.S. Geological Survey (USGS) provides a broad range of national expertise in geography, geology, hydrology, and biology. The mission of the USGS is to provide reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; assist others in managing water, biological, and mineral resources; and enhance and protect quality of life. The USGS places a special emphasis on providing science to the land and resource management bureaus of the Department of the Interior (DOI). The Biological Resources Discipline activities assist in maintaining healthy ecosystems and natural resources so that these habitats can continue to provide food, energy, medicine, transportation, and recreation.

## MISSION

The mission of National Wetlands Research Center (NWRC) is to develop and disseminate scientific information needed for understanding the ecology and values of our Nation's wetlands and for managing and restoring wetlands, coastal habitats, and associated plant and animal communities.

## GOALS

The NWRC is a Federal science organization that provides long-term (over decades), large scale (across State and other political boundaries), relevant (addressing the DOI stewardship responsibilities), scientific information to the Nation. Three overarching goals that guide the direction of the Center are:

*Build Scientific Knowledge: Seek Discovery*

*Provide the scientific information to address current and future questions related to wetlands, watershed processes, coastal ecosystems, and Department of the Interior trust species. Invest in new scientific capabilities and technology development to ensure future challenges can be addressed.*

*Develop the Partnerships: Adaptive Science/Management*
*Build iterative research-management relationships with other DOI bureaus, other governmental organizations, nongovernmental organizations, and academia that ensure effective science information is provided, the Center's products are used, and scientific capabilities are evolving to meet future biological issues.*

*Focus on Outcomes*
*Evaluate the effectiveness of the Center's science enterprise and continually seek to enhance the impact on resource management, regulations, and policy.*

The Center addresses emerging issues that are of concern to natural resource partners and the scientific community in both **thematic and geographic** *areas* where science is critically needed by stakeholders.

## THEMATIC AREAS

*Watershed Science for Management and Restoration: Discovery & Understanding*

- Provide biological information needed for sustainable management of watersheds at a landscape scale under dynamic influences related to human activities and changing environmental conditions
- Develop scientific information that quantifies the complex processes that drive the health and viability of plant and animal communities and their habitats, including the impacts of invasive species and global climate change, population genetics, and habitat-species relationships.

*Science for Coastal Environments: Monitoring & Integrated Science*

- Provide the scientific information, in cooperation with other USGS scientific disciplines, required for sustainable management of coastal environments, including relationships to the human dimension and footprint.
- Conduct research that supports coastal restoration programs, including a comprehensive understanding of the relationships among plant and

animal communities and the coastal environment.

- Develop science and technology in programs to assess and predict ecological consequences related to natural hazards including hurricanes, landslides, erosion, and other large-scale hazards.

*Modeling and Spatial Analysis: Prediction and Forecasting*

- Develop conceptual models of large systems, both geographically and ecologically based, that guide adaptive management/adaptive science approaches to complex biological problems (especially restoration).
- Develop and implement quantitative and predictive models designed to assist resource management decisions that link management actions to ecological outcomes.
- Create and adapt existing tools and technologies from other disciplines to address ecological questions.
- Develop predictive models that address fire and global change in large-scale ecosystems restoration and management.

*Science Impact: Synthesis & Fusion*

- Synthesize scientific information to ensure the appropriate understanding and use of the information and tools by resource managers, policy and decision makers, and regulatory agencies.
- Develop biological information tools and products critical to DOI, other Federal and State stakeholders, and the public and support their use through training, education, and outreach.
- Use innovative approaches to enhance the fusion of biological, hydrological, geological, and geographic information to achieve synergistic results and a deeper comprehension of ecological processes.

## GEOGRAPHIC AREAS

The four thematic science areas above represent opportunities for developing science across many different landscapes. The Center has developed expertise and solid partnerships in the first two geographic areas below and will continue to seek new opportunities to enhance the impact of our science in management and restoration efforts. The Center has also developed partnerships around the world that help elucidate the complex processes that drive biological systems in watersheds and coastal environments. It is critical that comparative studies and diverse scientific cooperative efforts be continued and enhanced in order for the Center to remain in the forefront of

scientific discovery.

*Gulf of Mexico Coast*

- Coastal land loss and habitat degradation are occurring on the Gulf of Mexico coast at alarming rates. Among other issues, this area supports the migration and wintering of more than 70% of the Nation's migratory bird populations, provides a buffer against hurricane threats to coastal and urban communities, and is a major economic portal for the United States for gas and oil resources (about one-third of all resources) for the Nation. The Texas coast supports some of the highest concentrations of spring-migrating Neotropical songbirds that concentrate in coastal hardwood bottomlands (e.g. Columbia Bottomlands). These critical habitats are being replaced by subdivisions and other development activities, including a large number of communication towers, at an increasing rate. The NWRC needs to expand efforts with its partners to ensure the critically needed science is developed to enable management projects to reverse the trend in land loss and restore coastal environments.

*Lower Mississippi Valley*

- The alteration and degradation of the forest and wetland ecosystems of the Lower Mississippi River Alluvial Valley (LMV), the Nation's largest floodplain, are nearly unprecedented in both scale and scope, and represents the greatest opportunities for habitat restoration of any region in the United States. The conversion of more than 75% of the riparian forests, primarily to agriculture, has caused the loss and degradation of many ecosystem functions and services including plant and animal habitat, flood storage, nutrient and sediment retention, and carbon storage, and resulted in these areas becoming net sources of greenhouse gases and nutrients as opposed to net sinks under natural forests. The Center has expertise and data that are needed to understand and effectively restore and manage the LMV and is working closely with the USFWS and other stakeholders to build a framework for research and management to restore the Nation's great floodplain.

*Watersheds and Coastal Environments of the World*

- Coastal environments are threatened on a global scale as human populations and development pressures increase in coastal areas. These coastal areas are highly susceptible to natural disasters. In addition, entire watersheds and critical processes are threatened by land use practices and human development. The Center will continue to develop scientific partnerships across the United States and with

other countries to facilitate research and cooperation to understand large ecosystem function and processes. Comparative studies allow hypothesis generation and testing that will ultimately drive the management, policy decisions, and regulations related to land and water resource management. Research on this scale is required to investigate the processes and impacts of large-scale ecological changes, such as sea-level rise and climate change, and it is critical to examine ecosystems that are affected by different biotic and abiotic factors. Expanding research and cooperative efforts to far reaching ecosystems allows for new hypothesis generation and testing at a landscape scale.

## LINKAGES TO ORGANIZATIONAL STRATEGIC GOALS

The National Wetlands Research Center has developed goals within the context of the DOI, USGS, and USGS National Programs. Like all USGS Science Centers, the current NWRC Projects address the USGS Program goals that were developed before FY2005; however, this strategic plan also looks to the future and is connected to new USGS Program goals that were recently developed and released in a series of 5-Year Program Plans. The context for the NWRC strategic direction, and linkages to other organizational strategic goals, are presented in the Appendix.

## GUIDING PRINCIPLES

The management of the Center is based on the following general principles to guide the implementation of our mission and science planning:

- Create a safe and professional work environment that sustains the values of personal respect, integrity, appreciation of diversity, and customer/partner service and promotes the passion and creativity that is vital to the scientific enterprise.
- Engage our scientific cooperators and the end-users of our scientific information in all aspects of the scientific process, from planning through application.
- Develop the critical science needed to support the mission of the Department of the Interior bureaus through close cooperation.
- Develop strong partnerships that promote an adaptive approach to both science and management.
- Continually seek new approaches, tools, and methods to meet the emerging needs of our partners.
- Integrate the intellectual assets of USGS scientific disciplines to address large-scale, complex ecological problems.

## CORE CAPABILITIES

The core capabilities of NWRC have been developed in response to partner needs since

the inception of the Center. The Center has developed expertise in areas that support resource management, policy development, and regulatory authorities of the Department of the Interior, as well as our key partners including the States, non-governmental organizations, and other Federal agencies. These core capabilities include:

- Determining the processes affecting wetland community viability
- Characterizing and monitoring wetland ecosystems and wetland dependent flora and fauna
- Applying geospatial analyses to develop and test hypotheses at a landscape scale
- Modeling and analyzing species–habitat relationships to improve management techniques
- Developing remote sensing tools for early detection, monitoring, and assessing the impacts of invasive species
- Development of informational tools for synthesis and access to biological information
- Technology transfer, training, and on-the-ground technical support for DOI natural resource managers

## VISION

The Center serves the Nation as the preeminent source of scientific information and technology used by those who manage and restore wetlands, coastal habitats, and the species that depend upon them.

## CHALLENGES

*Funding Stability* – Sustained scientific capability requires the ability to plan and conduct experiments over an extended time period. The redirection of funds, erosion of “buying power” resulting from level funding, and funding reductions and rescissions work against sound management of a scientific enterprise, the ability to retain scientific capability, the maintenance of relationships with DOI client bureaus, and the effectiveness in meeting the DOI and other stakeholder needs. There is a need to build base funding to support the leveraging of reimbursable funds to the Center.

*Changes in Staff* - While stability of the intellectual foundation of the Center is essential for a stable program, there is also a need for the flexibility to create new technologies and integrate multidisciplinary approaches as they become available from the academic community. Maintaining a balance between stability and flexibility will be a challenge.

*Training* – While areas such as information technology security have grown into institutionalized training efforts, the scientific development of the future workforce continues to be a major challenge. Moreover, cross-disciplinary training needed to enhance the integration of our science and the ability to address complex landscape-scale

problems is an area that remains undeveloped.

*Facilities* – The National Wetlands Research Center is well situated to bring a multi-disciplinary science approach to support land management and environmental challenges associated with the human population shifts to coastal locations and associated watersheds. These issues can only be addressed by building integrated, multidisciplinary approaches that require specialized facilities that are designed, owned, and maintained by the organization for optimal effectiveness. A multidisciplinary team, chartered by the Central Regional Director, has completed the specifications and design phase for an addition to the Center that will support USGS science needs and those of its partners. The new addition will support integrated science that will address complex, landscape-scale ecological problems.

## SCIENTIFIC AGENDA

The NWRC has had the opportunity to work with other USGS disciplines, and the partners, to look to the future and define a scientific agenda. In 2003, at the request of the Central Regional Director, an integrated team was formed to develop the future science that would be undertaken at an expanded, integrated USGS facility in Lafayette, Louisiana. The following future science agenda was developed by representatives of all four USGS disciplines in cooperation with our partners.

***Improve our Understanding of Complex Natural Processes*** – needed to plan river diversions, large-scale vegetative plantings, hydrologic management, beneficial or dedicated use of dredged materials, beach and barrier renourishment and how those physical and biological processes affect the outcomes of restoration strategies. Important too is the understanding of how the biological processes interact with physical processes and improving our abilities to forecast how biological systems will respond to physical change. The Center is a world-class leader in understanding how climate change will interact with other natural and human induced processes that affect coastal habitats. Future research will explain the role of sea-level rise on coastal habitat sustainability and restoration success. The focus will be on coastal areas that are already stressed or deteriorating because of subsidence, changes in hydrology, a lack of sediment or nutrient delivery, or human developments (such as flood control levees, impoundments, and dredged canals).

***Evaluation of Restoration Success and Development of Novel Methodologies for Restoration*** - design and test methodologies for surveying and monitoring restored, created, and rehabilitated marsh and forested wetlands, seagrasses and other submerged aquatics, and barrier islands. Appropriate methodologies for various spatial and temporal scales will be developed and tested in collaboration with partners. Additional greenhouses are needed for experiments that test hypotheses relating to plant growth, species tolerance to environmental stress, and effects of environmental perturbation on ecological services (such as carbon sequestration). Work describing the effectiveness of restoration will support “adaptive management” by enabling resource managers to

respond in an iterative fashion to trends in ecosystem response associated with environmental change or specific restoration techniques.

***Improve our Understanding of Complex Interactions*** - among individual plant species interactions, population dynamics and community processes for the predominant systems being restored (e.g., riverine, open waters and bays, fresh marsh, brackish marsh, intermediate marsh, salt marsh, and barrier systems). Experimental ecology will involve field sites, controlled greenhouse environments, and laboratories. A herbarium is also needed to house specimens. Biogeochemical and specific soil equipment will be needed to evaluate nutrients and environmental stressors in different soil conditions and types, to assess their interactions with the biota. A laboratory dedicated to mesocosm and growth-chamber (mini-phytotron) research will be used.

Interactions among biotic and abiotic processes may lead to thresholds and feedbacks that dramatically alter both the sustainability of ecosystems and their value to society. Understanding these complex interactions is an important aspect of climate change impact and invasive species science. For example, competitive interactions between native and nonindigenous species are often the primary pathway for a nonindigenous species to become “invasive.” Changes in sea level can lead to rapid, threshold-type responses within ecological communities, as illustrated by episodic losses of coastal wetlands in Louisiana and Florida during the past 100 years. Advancements in our understanding of complex ecosystem dynamics are needed to support adaptive management and to provide strategies for mitigation of and adaptation to the interactive effects of climate change and human activities on biological systems.

***Restoration Genetics Research*** – Both natural and restored populations must have sufficient genetic diversity to be viable, an aspect of restoration that is all too often forgotten or ignored by practitioners and scientists alike. The decline in population viability or individual fitness of rare species is often a function of loss of genetic diversity or increasing frequencies of occurrence of deleterious alleles through random drift; thus the importance of studying genetics in rare or endangered species that are the targets of restoration is especially important. The NWRC is already a leader in this field, and along with their university partners will give this aspect of restoration the attention it requires.

***Status, Trends, and Ecology of Wetland-dependent Fish and Wildlife*** – There are immense gaps in our understanding of how restoration programs and projects will affect fish and wildlife populations and the interaction of fish and wildlife with landscapes. Restoration will inevitably shift landscapes from one kind of system to another, e.g., from estuarine to more fresh water in nature, or shallow bays to marsh systems. Such shifts also affect the capability of these systems to support fish and wildlife. Systems dominated by estuarine species of fish may move toward systems dominated by freshwater species. Populations of waterfowl and other wetland birds that heavily use freshwater systems may shift toward kinds of waterfowl and wetland birds that use saltier systems. Open water systems may shift to marsh and entirely different species of fish and wildlife. These relationships are not well understood, and although we do know enough to forecast shifts in general, the details of how they respond over longer periods

of time are unknown. These efforts would improve our understanding of populations of fresh and estuarine fishes and invertebrate or vegetative food bases, their ecology and the basic natural mechanisms for sustained population management. It would improve our understanding of how bird populations respond to these changes, the functions and values of various habitats and habitat systems, including values for food, breeding, rearing young, or escape cover. It would also improve our understanding of how mammalian species, muskrat, nutria, rats, mice, raccoons and other species use these various habitats and how the value of these habitats shifts in response to environmental change.

***Ecological Modeling and Landscape Ecology-GIS Laboratory*** - The use of ecological models is growing rapidly to aid engineers and managers in designing restoration projects and evaluating their effectiveness. Indeed there is a revolution in ecological models that began with the emergence of improved computer capabilities yet the science of ecological modeling is young. The expression of relationships to physical change, which provides the underpinning to such models, needs improvement. The approach to ecological modeling must result in an improvement in our ability to forecast what will happen to plant and animal communities as we alter the physical world and improve model accuracy in forecasts of outcomes of various restoration activities.

***Chemical Threats / Toxicity*** – Toxic materials in river waters and sediments may prove to be a significant problem for projects involving river diversions of water and sediment. There is widespread concern on the possible water-quality impacts on aquatic and semi-aquatic organisms and on algae, submerged aquatic plants (SAVs), marsh plants, and swamp vegetation in coastal restoration projects receiving water from the Mississippi River and coastal rivers draining agricultural and urban areas. Restoration project managers are concerned that major sources of fresh water available for coastal and forested wetlands may be declared off limits by the U.S. Environmental Protection Agency because of the presence of several pesticides in these waters. Compounds of concern in these rivers include the triazines herbicides, fipronil, trace metals, and emerging contaminants such as those from pharmaceuticals.

Few studies have been done using these compounds to determine their toxicological impacts, if any, on the flora and fauna present in coastal restoration project areas. For example, recreational users of the Atchafalaya Basin, the major distributary of the Mississippi River, have complained about the decline in frog populations but data are insufficient for evaluating the influence of atrazine on amphibian declines. Additionally, a flotant marsh receiving Atchafalaya River water for the last 30 years is deteriorating dramatically. It is unclear at this time whether this large loss of wetlands is caused by nutrient enrichment or stress by exposure to atrazine in the Atchafalaya River water. There is an urgent need to determine what levels of these compounds will impact indigenous flora and faunal populations in impacted areas. This determination can be accomplished by the expansion of wet lab and office space for toxicologists to conduct experiments and genetic/morphometric evaluations of specimens exposed to these compounds.

***Invasive Species*** – Most U. S. invasive species are found in aquatic and wetland environments. Forestry, fisheries, navigation, recreation, public water supplies, and public health are among the affected sectors. Loss of native biological diversity because of invasive species constitutes one of the greatest long-term potential impacts affecting the national parks and national wildlife refuges in the coastal zone. In addition, changes in ecosystem characteristics caused by invasive species raise important questions about a wide variety of coastal issues including alteration of fish and wildlife habitat, impacts on restoration efforts, and the need for adjustments in management plans.

Water sources for restoration projects often contain invasive species. This is especially true for the Mississippi River and coastal water bodies that are subjected to the spread of invasive aquatic organisms that arrive in the ballast waters of international vessels. Organisms such as the zebra mussel have serious impacts on the ecology of receiving waters, especially on native freshwater bivalves found there.

NWRC scientists, in collaboration with DOI land managers, have initiated several projects that address invasive species problems in the Gulf of Mexico coastal region. Most of these current projects involve Chinese tallow, nutria, and cogon grass, but there are numerous other species of concern to wetland and coastal managers. NWRC will expand its invasive species science in the coastal zone and the Lower Mississippi Valley to address the following BRD National Program goals: understanding the pathways of introduction, assessing and reporting the abundance and spread of invasive species, and assessment of the effects of invasive species on ecosystem properties.

***Lower Mississippi Valley Initiatives*** - The alteration and degradation of the forest and wetland ecosystems of the Lower Mississippi River Alluvial Valley (LMV), the Nation's largest floodplain, is nearly unprecedented in both scale and scope and represents the greatest opportunities for habitat restoration of any region in the United States.
In addition to the well documented effects on numerous wildlife species such as the Louisiana black bear, wetland losses in the LMV have reduced the nutrient buffering capabilities of the river system, thereby increasing nutrient overloads into the river mainstem and leading to hypoxia in the northern Gulf of Mexico.

Forested wetlands have the potential for enormous carbon sequestration to offset carbon being pumped into the air by human activities. The specific issues that will be addressed by NWRC scientists are: amounts of carbon sequestration, greenhouse gas emissions, restoration options and methods for forested wetlands, impacts on related on and off-site environmental conditions, and effects on fish and wildlife.

NWRC, in cooperation with Patuxent Wildlife Research Center, is developing GIS tools for use by the U.S. Fish and Wildlife Service and other agencies that are involved in large-scale ecological restoration in the LMV. A conceptual model will also be developed to identify the underlying natural processes controlling ecosystem structure and function and the response of riparian forests in the LMV to stressors and disturbance, especially in light of the impacts to DOI trust resources and species from extensive habitat restoration

and predicted climate change. The conceptual model will synthesize our current understanding of ecosystem processes, environmental gradients, and linkages between systems in the LMV.

In cooperation with six LMV States, the U.S. Army Corps of Engineers, and the U.S. Fish and Wildlife Service, the USGS is leading an emerging initiative called the Lower Mississippi River Natural Resource Assessment as authorized in Section 402 of the Water Resources Development Act of 2000. The primary role of USGS will be to gather and inventory, analyze, and deliver critical scientific information and technologies needed by various State, Federal, and private river managers to ensure a proper balance between the often competing economic, flood-control, recreational, and environmental interests.

***Coastal Change (Spatial Investigations)*** - As the human population of the United States continues to migrate to coastal areas, it is becoming increasingly important that we understand the changes in the landscape and its ecosystems occurring as a result of both human and natural influences. The proposed Coastal Change Institute would focus on long-term monitoring of coastal change, as it relates to topography (land loss/gain and subsidence) and bathymetry (sea-level change, shoreline definition) at a very high resolution and on an established, relatively frequent cyclical basis. This effort will not only be responsible for the operational aspects of this monitoring program, but will also be responsible for new technology and technique development related to monitoring coastal change, and for managing and disseminating scientific data and information gathered to stakeholders across all sectors. There will also be a scientific visualization component to analyze and display data and information. Lastly, the effort will support the Coast-wide Ecosystem Reference Monitoring System for Louisiana restoration programs.

Specific functions to be performed:

- Spatial data collection, processing, and modeling to include satellite and airborne imagery and other sensor data (e.g., radar, thermal, bathymetric data) including ground-based data integration.
- Analysis of current and historical data collected to derive specific metrics (e.g., ecosystems alterations, land loss, subsidence over time, changes in shoreline).
- Management and dissemination in electronic form, i.e., Internet, of raw and derived data to partners and other stakeholders.
- Regional and site-specific computers simulation/visualization including 3- and 4-dimensional outputs.
- Monitor wetland gain/loss trends and functions for the proposed $14 billion coastal Louisiana restoration program.

***Socioeconomic Analyses*** It is important that resource managers understand the human dimensions of ecological restoration and management. Many coastal restoration projects that have been well thought out from an engineering/ecological/geologic perspective have been challenged by inadequate prior assessment of the ways in which they will affect the human communities that live within the impact area, especially those community members who engage in long-practiced commercial or recreational uses of

the areas. The result has been unintended and previously unrecognized socioeconomic impacts, both positive and negative. When unanticipated negative effects of a restoration project have become evident to various local community member's opposition and mobilization to question, alter, delay, or stop the project have resulted. Conflicts of this nature are currently a major obstacle in the planning of freshwater diversions in coastal Louisiana. Partnerships will be developed with the USGS Fort Collins social sciences group and universities to address these problems.

## PARTNERS

The National Wetlands Research Center will continue to develop partnerships with other DOI bureaus, other governmental organizations, nongovernmental organizations, and academia to strengthen our ability to address complex environmental issues. These partnerships will enhance our abilities to provide credible scientific information to assist policy makers and land managers who will face increasingly complex social and environmental decisions.

## LOOKING INTO THE FUTURE

The National Wetlands Research Center has grown in the scope and depth of its research, monitoring, spatial analysis, and information science capabilities in response to stakeholder needs. This Strategic Plan represents one phase in the continued development of the Center's programs and will serve as a starting point for future strategic planning and direction that will include key stakeholders, USGS scientists, and those who depend upon USGS science to meet their mission needs. This continued planning effort, starting in FY2005, will further inform the future direction and goals of the Center.

## APPENDIX. LINKAGES TO OTHER STRATEGIC GOALS

## LINKAGES TO DOI AND USGS STRATEGIC GOALS

**DOI Strategic Goal:** RESOURCE PROTECTION: Protect the Nation's natural, cultural, and heritage resources.
**USGS Mission Goal:** Provide science for a changing world in response to present and anticipated needs to expand our understanding of environment and natural resource issues on regional, national, and global scales and enhance predictive/forecast modeling capabilities.

## LINKAGES TO CURRENT USGS NATIONAL PROGRAM GOALS

The National Wetlands Research Center addresses local, regional, national, and global scientific needs for sustainable resource management and part of the Department of the Interior stewardship responsibilities. Moreover, the Center's scientific goals directly support the USGS National Program Goals (pre-FY2005) that include:

*USGS PROGRAM: Terrestrial, Freshwater, and Marine Ecosystems: Wetland Science Plan (only draft is available at the present)*

*Goal: Develop and evaluate inventory and monitoring methods, protocols, experimental designs, analytic tools, models, and technologies to measure biological status and trends*.
• The NWRC addresses this goal under Project 83439NO: Inventory and Monitoring of Species and Habitats with Special Emphasis on DOI Lands in the Lower Mississippi Valley and Gulf Coast Ecosystems

*Goal: Quantify and understand factors influencing patterns of temporal and spatial variability in key ecosystem components.*
• The NWRC addresses this goal under Project 83439NO: Inventory and Monitoring of Species and Habitats with Special Emphasis on DOI Lands in the Lower Mississippi Valley and Gulf Coast Ecosystems

*Goal: Develop indexes of ecosystem sensitivity to change and vulnerability to potential stressors, and tools to predict ecosystem responses to environmental change.*
• The NWRC addresses this goal under Project 83439HD: Genetic and Molecular Tools for Natural Resources Problem Solving: Gulf Coastal Plain
• The NWRC addresses this goal under Project 83439O2: Lake and Wetland Ecosystems: Ecology, Status and Trends, and Management Techniques in the Lower Mississippi Valley and Gulf Coast Ecosystems

*Goal: Devise a restoration and adaptive management framework for impaired ecosystems.*
• The NWRC addresses this goal under Project 83439HA: Development and Evaluation of Best Management Practices for Sustaining Biological Communities and Habitat Integrity in the Lower Mississippi Valley and Gulf Coast Ecosystems.
• The NWRC addresses this goal under Project 83439KV: Science Information and Information Technology
• The NWRC addresses this goal under Project 83439HE: Restoration Techniques for Damaged or Degraded Ecosystems: Central U.S. River and Stream Ecosystems- Lower Mississippi Valley and Gulf Coast Ecosystems
• The NWRC addresses this goal under Project 83439O2: Lake and Wetland Ecosystems: Ecology, Status and Trends, and Management Techniques in the

Lower Mississippi Valley and Gulf Coast Ecosystems

*Goal: Model factors controlling ecosystem patterns at various scales and develop decision support systems which integrate this information with management options.*
• The NWRC addresses this goal under Project 83439HE: Restoration Techniques for Damaged or Degraded Ecosystems: Central U.S. River and Stream Ecosystems- Lower Mississippi Valley and Gulf Coast Ecosystems
• The NWRC addresses this goal under Project 83439HC: Forest and Marsh Ecology, Restoration, and Management
• The NWRC addresses this goal under Project 83439O6: Science for the Conservation of Coastal and Marine Systems, Coral Reefs, and Benthic Ecosystems: Central Region
• The NWRC addresses this goal under Project 83439OH: Spatial Analysis: Biological Characterization of the Lower Mississippi Valley and Gulf Coast Landscapes
• The NWRC addresses this goal under Project 83439HF: Biological Invasions: Southeast Forests and Gulf Coastal Plain

*USGS PROGRAM: Invasive Species:*

*Goal: Expand research to support prevention and control of invasive species.*
• The NWRC addresses this goal under:
o Project 83439HF: Biological Invasions: Southeast Forests and Gulf Coastal Plain
o Project 8343BBF: Nutria modeling, management and eradication research

*USGS PROGRAM: Status and Trends of Biological Resources:*

*Goal: Analyze and interpret the record of land use dynamics that includes land use and land cover change to enhance understanding of the physical and social drivers of land surface change.*
• The NWRC addresses this goal under Project 83439O2: Lake and Wetland Ecosystems: Ecology, Status and Trends, and Management Techniques in the Lower Mississippi Valley and Gulf Coast Ecosystems

*Goal: Develop advanced techniques to monitor land surface change and ecosystem structure and function, in a spatially explicit fashion.*
• The NWRC addresses this goal under Project 83439O6: Science for the Conservation of Coastal and Marine Systems, Coral Reefs, and Benthic Ecosystems: Central Region

*Goal: Develop and evaluate inventory and monitoring methods, protocols, experimental designs, analytic tools, models, and technologies to measure*

*biological status and trends.*
• The NWRC addresses this goal under Project 83439NO: Inventory and Monitoring of Species and Habitats with Special Emphasis on DOI Lands in the Lower Mississippi Valley and Gulf Coast Ecosystems

*USGS PROGRAM: Wildlife: Terrestrial and Endangered Resources:*

*Goal: Develop tools such as predictive models, decision support, and expert systems for science-based management of wildlife and plant populations and their habitats.*
• The NWRC addresses this goal under Project 83439HB: Application of Landscape and Population Ecology to Avian Species in the Gulf Coast and Southeastern U.S.

*USGS PROGRAM: Biological Informatics*

*Goal: Apply innovative technologies and best practices to improve the collection, description and dissemination of biological information to our customers. Provide tools and techniques for effective science.*
• The NWRC addresses this goal under Project 83439KV: Science Information and Information Technology

*Other USGS PROGRAMS: Other National Programs and Initiatives*

Additionally the Center participates in National projects and projects conducted through other disciplines at the National level that include: Amphibian Research and Monitoring Initiative (ARMI), Global Climate Change program (GCC), Science Support Program (SSP), and Coastal and Marine Geology (including the Gulf of Mexico Integrated Science Plan).

## LINKAGES TO NEW / STRATEGIC USGS NATIONAL PROGRAM GOALS

In FY2004/2005 the USGS Biology Programs developed 5-Year Plans that included National Program goals. Three of the four USGS Programs linked to the National Wetlands Research Center have issued new 5-Year Plans. The fourth Program, the *Terrestrial, Freshwater, and Marine Ecosystems*, **has only completed a draft of the Wetland Science Goals at this time**. The Center's scientific goals and agenda that directly support the new (future) USGS National Program Goals include:

*USGS PROGRAM: Terrestrial, Freshwater, and Marine Ecosystems: Wetland Science Plan (only draft is available at the present)*

*The National Wetlands Research Center has ongoing work that addresses the*

*following goals:*
*Goal 1: Increase scientific understanding of wetlands structure, dynamics, and functions in the context of linkages and interactions with the surrounding landscape.*
*Goal 2: Predict how wetland communities and processes respond to natural and anthropogenic stressors.*
*Goal 3: Assess and Communicate Wetland Ecosystem Services.*
*Goal 4: Research support and technical assistance addressing management needs and applications.*
*Goal 5. Establish reference sites and maintain long-term studies and data sets for all major wetland types to improve our understanding of wetland processes, dynamics, and management.*

*USGS PROGRAM: Invasive Species:*

*The National Wetlands Research Center has ongoing work that addresses the following goals:*

*Goal 2: Early Detection And Rapid Assessment Of New Invaders: Identify and report new invasions and assess risks to natural areas and waters.*
*Goal 3. Monitoring and Forecasting Of Established Invaders: Assess changes in populations and distributions of established invaders.*
*Goal 4. Effects of Invasive Species: Determine effects of invasive species and susceptibility of habitats to invasion.*
*Goal 6. Information Management: Provide and coordinate the collection, synthesis ,and accessibility of invasive species information.*

*USGS PROGRAM: Status and Trends of Biological Resources:*

The National Wetlands Research Center has ongoing work that addresses the following goals:

*Goal 3: Collect, manage, archive, and share critical, high-quality monitoring data in cooperation with partners to enable a determination of the status and trends of biological resources.*
*Goal 4: Produce and provide analyses and reports that synthesize information on the status and trends of our Nation's flora, fauna, and ecosystems and respond to the needs of the scientific community, land and resource managers, policymakers, and the public.*

*USGS PROGRAM: Wildlife: Terrestrial and Endangered Resources:*

The National Wetlands Research Center has ongoing work that addresses the

following goals:
*Goal 2: Provide Tools and Techniques for effective science-based management, such as predictive models, decision support systems, and expert systems.*
*Goal 4: Institute an Adaptive Science Approach to Support the Adaptive Management of Terrestrial Plants and Wildlife and to Provide Technical Assistance to Natural Resource Managers. Engage USGS partners in defining high priority research needs for wildlife conservation and work closely with these partners to identify urgent wildlife issues, conduct effective research, and deliver timely results and technical assistance for natural resource management and decision making.*
*Goal 5: Enhance USGS Wildlife Research to Meet Emerging and Future Issues. Build additional capabilities, expertise, and capacity in the WTER Program to meet the emerging needs of USGS partners as wildlife issues take on new importance in today's society.*

*USGS PROGRAM: Biological Informatics (Draft Plan not completed at the present)*

The National Wetlands Research Center has ongoing work that addresses the following goals:
*Goal: Apply innovative technologies and best practices to improve the collection, description and dissemination of biological information to our customers. Tools and Techniques for effective science.*