

Next Steps for a Healthy Gulf of Mexico Watershed

U.S. Fish and Wildlife Service

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Introduction

The greater Gulf of Mexico ecosystem contains a variety of habitats that support an amazing range of wildlife and provides Americans with abundant seafood, valuable energy resources, extraordinary outdoor recreational activities, and a rich cultural heritage. The U.S. Fish and Wildlife Service (Service) is keenly aware that a long-term, large-scale, watershed-level approach to restoration and conservation is important if we are to achieve a healthy Gulf.

This “*Next Steps for a Healthy Gulf of Mexico Watershed*” (*Next Steps*) is a companion document to the Service’s 2013 [“*Vision for a Healthy Gulf of Mexico Watershed*”](#) (*Vision*). The Service developed *Vision* in response to the restoration challenges facing the Gulf following the 2010 *Deepwater Horizon* oil spill. *Vision* set the stage for an approach that considers not only the Gulf Coast, but also the entire watershed that feeds the Gulf. In *Vision*, the Service articulated overarching restoration and conservation strategies for sustaining fish and wildlife resources and thriving communities for future generations. We also identified geographically based high-priority focal areas and conservation strategies to help align the efforts of the Service with its partners and other stakeholders.

Much has happened in the Gulf in the three years since the publication of *Vision*. State and federal agencies and other stakeholders have made major investments in Gulf restoration, and we can see progress on some of the conservation challenges we identified in the document. Many more investments, however, will be made over the next two decades as more than \$20 billion in *Deepwater Horizon*-related settlement funds come available for restoration work. We believe the unprecedented amount of funding and the enormity of the challenge require a level of collaboration never before seen in an ecosystem restoration effort.

The Service recognizes that in order to be an effective partner and to meet our mission — to conserve, protect and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American people — we need to provide a greater level of specificity to our recommendations. *Next Steps* is intended to refine and put on paper the perspectives, priorities and preferred courses of action held by the Service. It is a representation of our collective understanding and a tool for us and our partners to use in developing, promoting and securing specific restoration across the watershed.

Next Steps highlights specific courses of action for the development and implementation of conservation and restoration initiatives in each of the geographic

focal areas included in the Service's *Vision*. *Next Steps* grows out of themes and action items raised in *Vision*. It also reflects the constantly changing Gulf conservation landscape by updating and including refinements and additions to the earlier document, such as two new focal areas in Florida. It is a "living document" that we intend to revise in the future as conditions change and the results of choices taken become apparent. As such, *Next Steps* illustrates the Service's iterative and adaptive approach to conservation and restoration.

The actions outlined in this document are not the only options for good conservation in the Gulf. In fact, we are hopeful that by articulating our perspective, we will open the door for conversations with present and future partners focused on discovery and the development of desirable collaborations; creative problem solving; and increased transparency and coordination. We believe such dialogue will also ensure that we are leveraging our contributions in science, conservation, restoration and environmental compliance with that of our partners. Our intention is to present quantitative targets for restoration of natural resources where we have them, and where we do not, to seek a better understanding of which restoration actions will be most broadly supported and most effectively benefit the greatest diversity of fish and wildlife. Those common restoration opportunities are important to the Service. They represent opportunities to garner broad support for restoration and further partnerships intent on far-reaching and sustainable goals, significantly increasing the probability of successful Gulf restoration outcomes.

[Download the Overview of *Next Steps for a Healthy Gulf of Mexico*.](#)

Background

When the *Deepwater Horizon* oil rig exploded off the coast of Louisiana on April 20, 2010, the Service's response was robust and included taking on myriad responsibilities, incident command work, wildlife reconnaissance and recovery, sensitive habitat and endangered species protection, finance and other administrative tasks, safety and more. But the Service has been active in the Gulf watershed for years; we see ourselves as one of the many stakeholders in Gulf restoration, and we are thoroughly engaged within the communities and landscapes of the Gulf. For example, the Service has been managing millions of acres on 235 national wildlife refuges (NWRs) in the Gulf watershed, with the 45 located in the Gulf Coast states covering more than 2.15 million acres of managed lands alone. In fact, the first NWR established anywhere was located in the Gulf states with the establishment of Pelican Island NWR in Vero Beach, Florida, in 1903. The first refuge on the Gulf Coast itself followed soon afterwards with the establishment of Breton Island Reservation (now Breton NWR) to protect important bird-nesting islands located off the coast of Louisiana. Additionally, the Service has field and regional representation in all 31 states in the Gulf of Mexico watershed. Throughout the watershed, the Service has long provided a combination of planning and on-the-ground contributions to natural resource protection and conservation.

[Call-out Box on Natural Resource Damage Assessment (NRDA)]

The *Deepwater Horizon* oil spill injured lands managed by the Service throughout the Gulf (e.g., Bon Secour, St. Vincent, Grand Bay, Delta, Breton, Big Branch Marsh and McFaddin NWRs). The Service seeks to restore federal lands at the locations where injury occurred while considering approaches that provide coastal resiliency and sustainability. If restoration cannot be implemented at these sites, the Service will look to other federally managed lands in the Gulf of Mexico watershed. Through NRDAR, emphasis will be placed on restoring habitat such as wetlands, dunes and beaches, submerged aquatic vegetation and barrier islands located on federal lands.

Similarly, signs of serious ecosystem degradation had been documented in the Gulf of Mexico watershed well before the *Deepwater Horizon* disaster. For decades, countless stressors altered and degraded the Gulf ecosystem. The Service and National Oceanic and Atmospheric Administration (NOAA) recently calculated that the Gulf of Mexico coastal region overall experienced a [net wetland loss](#) of 257,150 acres in just the five years between 2004 and 2009. In fact, the swamps and marshes of coastal Louisiana are among the nation's most fragile. [U.S. Geological Survey \(USGS\) trend analyses](#) from 1985 to 2010 show a wetland loss rate that, if it were to occur at a constant rate, would equate to Louisiana losing an area the size of one football field per hour. The degradation of this monumentally important watershed became even worse, however, after the *Deepwater Horizon* oil spill.

Between 2011 and 2017, approximately \$2 billion has been invested in Gulf restoration efforts through money dedicated to that purpose by civil and criminal settlements reached with the parties responsible for the 2010 disaster. The Service's role in the Gulf has continued through our membership in, and involvement with, the key groups and processes overseeing many of these funds. A prime example of this is the role the Service plays in the *Deepwater Horizon* Natural Resource Damage Assessment and Restoration (NRDAR) process. The U.S. Department of the Interior (Department) is designated as the Lead Administrative Trustee on the [Deepwater Horizon NRDAR Trustee Council](#). The Service's Southeast Regional Director, as the Authorized Official for the Department, represents the trusteeship interests of the Secretary of the Department of the Interior in conducting the work of the Trustee Council.

The Trustee Council, which includes representatives of three other federal agencies and five Gulf Coast states, began its work by first assessing the injury caused by the oil spill to natural resources and the services they provide, and then planning and implementing restoration projects based on information gleaned from the injury assessment. The Service led a large part of the injury assessment since 2010 and has invested millions of dollars quantifying injuries to Service trust resources (migratory birds, listed species, etc.). By working with our co-trustees to fully describe these injuries, we are able to plan and implement strategies and projects to restore injured resources to the condition they would have been had the oil spill not occurred. Since 2012, the Service has already led the Trustees' effort to work with

the public to develop and finalize five restoration plans that together include 65 projects designed to restore identified injuries. These projects have a combined cost of approximately \$868 million to date.

In late 2012 and early 2013, settlements and other *Deepwater Horizon*-related agreements with parties responsible for the oil spill directed a total of \$2.544 billion to the [National Fish and Wildlife Federation \(NFWF\)](#) to fund projects benefiting the natural resources of the Gulf Coast that were impacted. They also directed \$500 million to go to the [National Academy of Sciences](#) to develop a program focused on enhancing oil system safety, human health and environmental resources. The Service serves on the advisory boards for NFWF's Gulf Environmental Benefit Fund and the science program, as well as provides technical assistance and environmental clearances for projects they fund. The Service also plays an important role with respect to the North American Wetlands Conservation Act (NAWCA) Program, which is to receive \$100 million as part of the 2013 settlement with one of the responsible parties. The Service reviews proposals and recommends projects for the NAWCA Program focused on wetlands restoration and conservation in the United States, Canada and Mexico, and then administers those projects chosen for funding by the North American Wetlands Conservation Council. By the end of 2016, NFWF had invested approximately \$870 million, and the NAWCA Program had invested approximately \$56.5 million, in projects supporting the restoration of the Gulf watershed.

Another major funding process involving the Department through which the Service plays a key role is the [Gulf Coast Ecosystem Restoration Council \(RESTORE Council\)](#), a federal entity created by the 2012 Resources and Ecosystem Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act (RESTORE Act). The RESTORE Council oversees part of a trust fund that will receive 80 percent of the civil and administrative penalties paid to the federal government under the Clean Water Act by all the parties responsible for the *Deepwater Horizon* oil spill. In 2016, \$4.4 billion was directed to the trust fund through a criminal settlement with one of the responsible parties; the RESTORE Council has responsibilities with respect to 60 percent of these funds. The Department's Secretary is one of six federal members, and the Service's Southeast Regional Director acts as the Secretary's representative, on the body. The Service is also one of four Department bureaus that play significant roles in advising the Department on restoration priorities and in working collaboratively with other RESTORE Council members to achieve restoration and conservation goals. To date, the RESTORE Council has invested approximately \$156 million in Gulf restoration projects.

Gulf restoration received a significant boost when the presiding judge gave final approval on April 4, 2016, to a global legal settlement with BP, the party primarily responsible for the *Deepwater Horizon* oil spill. The settlement adds billions of dollars to state and federal efforts over the next two decades to rehabilitate and improve the natural resources of the Gulf region. Given the scope and scale of what

is possible with all of this funding support, the Service acknowledges that this is the time to reassess conservation and restoration needs, build upon existing successful efforts to address ongoing needs, and generate fresh ideas and innovative approaches. With *Next Steps*, the Service is articulating its recommendations for moving forward with Gulf restoration into the future.

[Call-out Box on Approximately \$2 Billion Invested in *Deepwater Horizon* Oil Spill-Related Gulf Conservation and Restoration Projects (April 2010 - January 2017)]

- \$868 million invested in Gulf restoration projects through NRDA
- \$156.6 million invested in Gulf restoration projects through the RESTORE Council
- \$870 million invested in Gulf restoration projects through NFWF
- \$56.5 million invested in Gulf restoration projects (in the United States) through the North American Wetlands Conservation Act (NAWCA) Program
- \$20 million invested in Supplemental Environmental Projects focused on land acquisition and habitat protection through a civil settlement with MOEX Offshore 2007 LLC (one of the responsible parties)

Experience has taught us that the most durable solutions are cooperative ones, and working in the Gulf watershed is no exception. This means, in part, that we must leverage and promote existing partnerships as well as seek out and develop new and nontraditional ones to more effectively design, deliver and monitor our efforts. We will work with, and welcome input from, all interested parties in order to assess and improve our efforts and identify new opportunities.

To effectively maximize outcomes and ensure that our collective endeavors are connected over time and across the entire watershed, we will build on existing conservation efforts by working with individuals, organizations, federal agencies and governments, many who are involved in both informal and formal partnerships such as the Gulf of Mexico Alliance, the Southeastern Association of Fish and Wildlife Agencies, Landscape Conservation Cooperatives (LCCs), Migratory Bird Joint Ventures, Fish Habitat Partnerships, National Estuary Programs, Beneficial Uses Groups, and the Partnership for Gulf Coast Land Conservation. These partnerships (and many others) help inform the many federal and state representatives who also serve as trustees on the *Deepwater Horizon* NRDAR Trustee Implementation Groups and as members of the RESTORE Council. This interwoven network of relationships and partners will strengthen the ecological foundation of Gulf-wide restoration across the different restoration funding opportunities.

Projects will necessarily cross many governmental and institutional boundaries, so collaboration and leadership among all involved is essential. Pursuing actions in partnership is likely to lead to consistency in approaches, increased efficiencies, broader consensus, and therefore stronger restoration outcomes than those achieved through independent, uncoordinated processes. Greater restoration success will also result from using and supporting the best available science throughout the planning and implementation of Gulf restoration efforts.

The Service is committed to using and supporting the best available science. This commitment will guide our understanding of how fish and wildlife are connected to other natural, as well as cultural and economic, resources. Solid science will also make clear the roles fish and wildlife play within different geographic areas and across the Gulf watershed as a whole and provide a foundation to help us understand the best use of available restoration investments to achieve sustainable outcomes. Throughout the planning and implementation of Gulf restoration efforts, we cannot overemphasize the need for all stakeholders to: 1) use and advance the collection of the best empirical data; and 2) develop, utilize and adaptively refine over time through targeted monitoring the best science-based decision-support tools, such as the Gulf Coast Vulnerability Assessment, the Sea Level Rise Affecting Marshes Model, and the Conservation Design and associated Blueprint efforts of LCCs.

[Call-out Box on Gulf Coast Vulnerability Assessment (GCVA)]

The four LCCs initiated an effort to evaluate the effects of climate change, sea level rise, and urbanization on four Gulf coastal ecosystems and 11 species that depend on them. The GCVA used an expert opinion approach to qualitatively assess the vulnerability of each and identified management strategies for them. The range in vulnerability for species was fairly wide, with blue crab being the least vulnerable and Kemp's ridley sea turtle being the most vulnerable. Ecosystem vulnerability across the four systems differed less than it did for species, with mangroves being the least vulnerable and tidal emergent marsh being the most vulnerable. The GCVA received support/guidance from many partners, including the Service, USGS, NOAA, the Northern Gulf Institute, the Gulf of Mexico Alliance, and the Louisiana Coastal Protection and Restoration Authority.

Science excellence and its application to adaptive management of natural resources are hallmarks of the Service. We continually seek to be strategic, efficient, accountable and adaptive by coordinating and collectively pursuing science-based conservation planning, design and monitoring. Because management of natural systems is not always predictable, especially one as large and complex as the Gulf, having specific and measurable biological objectives that summarize existing scientific knowledge and present testable hypotheses is essential for effective restoration planning. As the objectives are empirically tested and refined over time through implementation of adaptive management, we will be able to measure progress and continually refine our approaches toward our goal of a healthy Gulf ecosystem. This is the fundamental approach underlying the Service's *Vision*, and now, *Next Steps*.

One example of the Service's commitment to both partnerships and science-based restoration can be found in our current effort to compile existing biological objectives from across the Gulf Coast. These biological objectives (i.e., population objectives and the associated habitat objectives needed to meet them) have been

previously established through collaborative planning processes facilitated by Migratory Bird Joint Ventures, LCCs, and Recovery Teams, among others. These objectives define the “how much,” “how much more,” and “where” of the required conservation and restoration action needed to sustain species at desired levels. To date, most efforts to define quantifiable objectives have focused on birds through the science and coordination capacities of the various Migratory Bird Joint Ventures. This discrepancy between objectives for birds and other species groups is reflected in the Target Species sections of this document. Motivated, in part, by this deficiency, a team comprised of individuals from across the Service is working in concert with experts in LCCs, Migratory Bird Joint Ventures, Fish Habitat Partnerships and the USGS in collating population and habitat objectives for both bird and non-avian priority species in the focal areas of the Service’s Vision. Armed with a list of widely recognized priority species and agreed upon population objectives, this team is also developing through the “Biological Objectives to Guide Strategic Habitat Conservation for the Gulf Coast” (Biological Objectives Project) a number of species-habitat models and applying these in a spatially explicit way to help quantify geographic information system environment to help quantify the biological return on investment of alternative restoration scenarios.

[Call-out Box on Birds]

At least 93 species of both resident and migratory birds were exposed to Deepwater Horizon oil in multiple habitats across all five Gulf states, including open water, islands, beaches, bays and marshes. Restoration planning will address the broad diversity of injured bird species; in doing so, we will identify where restoration would provide the greatest benefits within their geographic ranges. For example, approaches to restoring injured bird species include conserving bird nesting and foraging habitat; creating, restoring, and enhancing coastal wetlands; restoring and enhancing dunes and beaches; creating, restoring and enhancing barrier and coastal islands and headlands; restoring and enhancing submerged aquatic vegetation; protecting and conserving marine, coastal, estuarine, and riparian habitats; establishing or re-establishing breeding colonies; and preventing incidental bird mortality.

While the Biological Objectives Project currently focuses only on a subset of the Service’s trust resource species, it is not our intent to limit the scope of restoration to the Service’s priorities. Rather, by translating population objectives for our trust resource species into habitat objectives, we are placing our priorities into the context of habitat that is the common currency of many Gulf partners’ interests. In this way, we can more easily identify and communicate to others where our specific objectives overlap on the landscape and we can participate in more productive partnerships around shared goals. As additional shared priorities emerge, our intent is to expand this work to additional species and habitats.

Focal Areas

The Gulf of Mexico watershed exhibits a great ecological richness due to diverse influences of geomorphology, climate and hydrology. This diversity is illustrated in *Vision's* focal areas for restoration and conservation — areas that include everything from hypersaline lagoons to freshwater springs, and submerged seagrass beds to upland pine forests. Each focal area that follows this introduction starts with “Landscape at a Glance,” a thumbnail sketch of some of the elements and challenges that make the area of particular interest with respect to Gulf restoration. Among the factors the Service considered in choosing these focal areas were unique ecological features, regional conditions and trends, existing conservation/restoration plans and collaborative efforts.

In *Vision*, we displayed the focal areas with “fuzzy” boundaries to avoid limiting opportunities for collaboration; our intention was to tap into broad programmatic and partnership synergies across the watershed. At this point, we are beginning the transition to Biological Planning Units in the Gulf because explicit and quantitative biological objectives necessitate explicit boundaries. We compiled and aligned existing lines and boundaries to form these planning units similar to the way we compiled existing biological objectives. The boundaries reflect important ecological, political and legislative divisions. The Biological Planning Units now cover the entire Gulf Coast region, resulting in the addition of two new focal areas, Tampa Bay and Florida Keys. The transition to Biological Planning Units has also led us to redefine focal areas along the Texas Mid-Coast, North-Central Gulf Coast (now Central Gulf Lands), and Panhandle Beaches (now Central Gulf and Florida Panhandle Coast), among others. Again, though, these refinements to our fuzzy boundaries do not reflect “new” lines on the map. Rather, they represent an evolution in our thinking and a convergence to boundaries already recognized by others.

[Call-out Box on SCA]

One collaborative science-based effort is the “Gulf Land Conservation Tool” project, also known as the “Strategic Conservation Assessment Framework” project. This three-year effort is being led by the Department through the RESTORE Council and the four LCCs in the Gulf Coast to develop a suite of tools that RESTORE Council members can use to identify and evaluate land conservation opportunities in the Gulf Coast region. Many of the existing land conservation plans are limited to a particular geographic or administrative boundary. The goal of project is to combine these previously existing plans into a set of decision-support tools that span the entire Gulf Coast. This set of tools and the subsequent analyses will provide RESTORE Council members information regarding land conservation actions that could provide the greatest benefit to current and future ecosystem sustainability and resilience within the states and across the Gulf. All RESTORE Council members will participate in the development of these tools, and the four Gulf LCCs will provide the science support for the project.

Just as there are differences in topography and hydrology that shape a particular landscape, there naturally are differences in the factors that led to the formulation of the Service’s recommendations for action. These include such factors as the

quantity and quality of habitats and associated fish and wildlife populations, the ability to partner and leverage restoration capacity, and the immediacy of restoration actions needed to address threats. As a result, the number of recommended next steps for focal areas varies, and some of the recommendations come from a helicopter-high view while others are dirt-level in their directness and specificity. In addition, the recommended steps listed in this document understandably vary in their level of completion, ranging from the conceptualization stage to actualization as long-term, ongoing conservation actions.

We are intentionally building on existing work; we are not recreating the wheel or coming up with new objectives. Many of the recommended next steps resemble or reinforce recommendations from other efforts, initiatives or plans. These include Migratory Bird Joint Venture strategies, state-based Gulf restoration plans (e.g., [the Louisiana Coastal Master Plan](#)), state wildlife action plans, NWR Comprehensive Conservation Plans, National Estuary Program Comprehensive Conservation and Management Plans, and [the NRDAR Trustees' Programmatic Damage Assessment and Restoration Plan/Programmatic Environmental Impact Statement](#). Each of these efforts has specific planning processes, stakeholder engagement and implementing features that will determine lead agencies and organizations for those efforts or initiatives. In many cases the Service will not be the lead, but will be a partner in planning and implementation where appropriate.

Target Species

We have chosen to identify target species for each focal area. These target species are federal trust resource species on which the Service is currently concentrating its science and on-the-ground restoration efforts to strategically address conservation and restoration needs. Often, these species are among the most recognizable and iconic within the focal area due to their status as a flagship, keystone, indicator or other surrogacy approach. Although these species were identified by collating the plans and priorities of a wide range of partners within each focal area (through the Biological Objectives Project previously described), we recognize that they may not reflect everyone's opinion about the most important species within each area. They do, however, capture a significant contribution of the Service's restoration efforts for particular resources. Similarly, while these species are the focus of current efforts and immediate next steps, there may be other species that emerge as conservation issues evolve, the landscape changes and we learn more. We believe that by identifying target species and biological objectives we can more clearly connect restoration actions with desired outcomes. Lastly, while many of the proposed actions identified throughout the document specifically target trust resource species, we recognize and acknowledge how implementation of these actions will be advantageous to other species as well. Our approach to Gulf restoration fundamentally includes crosscutting awareness of collateral benefits, and we strive to find restoration actions that will help a wide range of species.

[Call-out Box on Sea Turtles]

The Deepwater Horizon spill affected sea turtles throughout the Gulf in all phases of life including that of nesting, small juvenile, large juvenile and adult. Sea turtles are long-lived, migrate extensively and occupy multiple habitats over the course of their lives. All these factors are considered in restoration planning and require the use of a portfolio of restoration approaches to address all species and life stages that were injured by the spill. Approaches to sea turtle restoration include restoring coastal habitats, enhancing sea turtle hatchling productivity, and rehabilitating and conserving nesting beach habitat and robust monitoring.

For continuity, we organized the following material based on the focal areas found in the Service's Vision document. Most of the species targets we highlight, however, reflect the "Biological Planning Units" used in the Biological Objectives Project and which are based on boundaries previously identified in other partnership efforts. Elsewhere in the upper watershed, target species were derived from other federal planning processes, as noted in their respective sections.

For a complete list of species referenced in *Next Steps*, refer to [Appendix: "Scientific Names of Species Cited"](#).

"Next Steps"

The focal area profiles that follow represent our efforts to date to pull together the best information on the next steps needed to conserve, protect and restore important habitats. While conservation actions are expressed in terms of the benefit they provide to our target species, we reference specific habitat features or conditions that are important to sustaining or increasing these species' populations. We are dedicated to ensuring the protection and management not only of our federal trust resources (migratory birds, interjurisdictional fisheries, federally threatened and endangered species and public lands), but also of at-risk species and those of concern to our partners. Protecting these species means we also must conserve and protect their habitats.

This section does not, of course, list everything that needs to be done. Rather, the target objectives that we have identified and the next steps that we pose are what the Service believes to be the most compelling and have the greatest likelihood of success for our natural resource responsibilities in that focal area. We use habitat-related recommendations to paint a clearer picture for our partners to understand specific conservation actions we want to see pursued, but also so that they can more easily relate them to their own interests. The next steps are not organized by priority or sequence, but are offered as a package of actions for consideration. Some of these we will pursue ourselves; some our partners may wish to undertake on their own initiative. Many of these actions, however, will rely on the power of our partnerships to successfully implement. We invite our partners to join us in taking these next important steps in addition to helping us identify new conservation and restoration opportunities as we move forward.

Laguna Madre and Lower Rio Grande Valley

Landscape at a Glance

Located in the southernmost tip of Texas, along the U.S. border with Mexico, the Laguna Madre and Lower Rio Grande Valley form a complex mixture of both oceanic and riverine modified ecosystems. This focal area contains some of the fastest growing communities in the United States; produces significant crops (e.g., citrus); is a major nexus of international commerce with Mexico; and contains large, historic ranching operations. Natural resource-based tourism that includes hunting, fishing and natural history is a significant economic driver for the region. The international nature of the region, and its unique biodiversity, is important to Texas and the nation.

The focal area is semi-arid and subtropical in nature and represents a significant continental biodiversity hotspot for animals and plants. Native upland portions of the focal area are a mix of grassland savannas and Tamaulipan thornscrub. These native communities are important to the federally listed northern aplomado falcon that nests in the open grasslands, and endangered ocelots that live in the dense thornscrub. Additionally the Laguna Madre, one of only six hypersaline lagoons in the world, is located here and extends from South Texas into Mexico. Its expansive shallow seagrass beds are the winter home to more than 75 percent of the world's population of redhead ducks, who also depend on nearby freshwater wetlands scattered amongst the landscape. In Texas, the Laguna Madre is protected by Padre Island, the longest barrier island in the world. Padre Island contains 361 square miles of wind-tidal flats, which support millions of wintering and migrating shorebirds, including the federally listed piping plover and red knots. The Gulf beaches of the island support the highest number of nesting endangered Kemp's ridley sea turtles in the United States.

Native habitats in the focal area have been converted for agriculture or development, and remain at risk due to a rapidly growing population in the Brownsville area. Loss of coastal grasslands and native Tamaulipan thornscrub to invasive species, human encroachment and development present the greatest conservation challenge in this area. This habitat loss threatens northern aplomado falcon, mottled duck, ocelot and associated species. There is an urgent need for the Service and others to work together to protect additional native habitats, and to increase restoration capacity.

Target Species

Enhancing the connectivity of the Laguna Madre landscape, particularly between thornscrub remnants on working ranchlands and conservation lands, will help maintain the nation's only ocelot population, which occurs in Cameron and Willacy

counties. The species' recovery plan is currently under revision, and recovery criteria will include updated population and habitat targets once it's finalized.

Just as ocelot recovery will depend on thornscrub connectivity between working ranchlands and habitat owned by conservation entities, northern aplomado falcon recovery will likewise be supported by grassland restoration efforts to restore similar connectivity. In order to reduce the risk of extinction and change the species' status from endangered to threatened in the United States, 60 breeding pairs of northern aplomado falcon are needed. It is estimated that 30 breeding pairs could be supported in this focal area with successful grassland conservation and restoration. These grasslands also support populations of migrating and wintering buff-breasted sandpipers and long-billed curlews, whose winter habitat population objectives (20,599 and 11,031 individuals, respectively) have been established by the Gulf Coast Joint Venture.

Aquatic habitats in this region are equally important as terrestrial ones. Restoration efforts such as hydrologic diversions and development of wetlands are needed to meet the needs of targeted colonial waterbirds, shorebirds and waterfowl by providing vital food resources and forage fishery species. Aquatic habitat needs mesh well with objectives for numerous birds that have been established by the [Gulf Coast Joint Venture](#): the reddish egret (1,650 breeding pairs); migrant shorebirds (e.g., >170,000 western sandpipers); midwinter mottled ducks (approximately 6,600 individuals); wintering waterfowl (including >392,000 redheads and >173,000 pintail); and other colonial waterbirds that use the Laguna Madre region.

The Gulf Coast Joint Venture has assessed seagrasses in this focus area relative to target waterfowl populations that utilize them as a food resource. While existing seagrass beds appear to be sufficient to meet waterfowl demands, if disturbance and/or lack of adjacent dietary freshwater renders 44 percent of seagrasses effectively unavailable, then habitat would become insufficient. The Gulf Coast Joint Venture has similarly assessed inland palustrine wetlands in this focus area relative to the needs of target waterfowl populations, and on average only two thirds of the approximately 18,000-acre winter habitat objective is met.

The beaches and associated habitats of the Laguna Madre are also important breeding sites for the U.S. population of [Kemp's ridley sea turtle](#) and nonbreeding habitat for piping, snowy and Wilson's plovers.

While many of the proposed actions in this focal area specifically list Service trust resource species as their targets, implementation of these actions will be advantageous to other species as well. For example, we place an overall emphasis on the restoration and enhancement of freshwater wetlands in order to meet the needs of colonial waterbirds, shorebirds and waterfowl. Those actions will also benefit aquatic species like largemouth bass, crappie and alligator gar through better water quality and increased habitat. Restoration of estuary habitats likewise will improve conditions for shrimp, blue crabs, oysters, red drum and other aquatic species.

Restoring and conserving agricultural and working ranchlands will benefit not only Service trust resource species, but also many important state species like the northern bobwhite quail and the white-tailed deer.

High Priority Actions Based on the Service's Vision

Restore and conserve agricultural and working ranchlands that complement and support the connectivity of land, invasive species control and water conservation efforts.

Next Steps

- Complete landscape assessment and species modeling for ocelots and northern aplomado falcons to develop habitat restoration priorities, including potential wildlife corridors, to meet recovery goals. Meet with other interest groups and see where conservation interests overlap.
- Identify and set habitat goals for target species within the focal area to be protected, restored or created.
- Support the delivery of Farm Bill programs through the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) that are beneficial to wildlife, and restore or conserve target species habitats on agricultural and working ranchlands.
- Develop or participate in cooperative conservation projects with private landowners to help establish wildlife corridors or breeding areas on lands near, and between, important tracts of the Laguna Atascosa NWR that can contribute toward ocelot and northern aplomado falcon recovery objectives.
- Work closely with local municipalities and county governments to promote target species habitat conservation, maintenance and restoration. Continue to provide technical assistance on endangered species management to private landowners that includes a variety of methods such as habitat restoration guidance, signage, fencing, environmental education, outreach, community partnerships and law enforcement.
- Establish private-public partnerships that will result in beneficial translocation of ocelots to improve the genetics of small populations.

Enhance the existing network of conservation lands linking the Rio Grande River Valley and the South Texas coastal ecosystem to ensure that fish and wildlife resources are sustainable.

Next Steps

- Complete a Landscape Connectivity Assessment and decision-support tool for south Texas ocelots and use it to identify lands to support viable and self-sustaining ocelot populations.
- Coordinate land acquisition activities within the approved Lower Rio Grande Valley NWR acquisition boundary to establish coastal wildlife corridors from Boca Chica to Laguna Atascosa and to Northeastern Willacy County to strengthen connectivity between ocelot populations in those areas and protect existing and potential northern aplomado falcon habitat.
- Expand the network of perpetually conserved lands (via fee acquisition or conservation easement) linking the Rio Grande River Valley with other South Texas coastal ecosystems to establish wildlife corridors that connect to NWR lands and other conserved tracts needed to support ocelot and northern aplomado falcon recovery objectives.
- Support local partners working to implement specific management activities (e.g., vegetation management, predator control and human disturbance abatement) for bird-nesting rookeries, and create alternative colony sites designed to meet population objectives for colonial waterbirds.
- Install wildlife crossings that will protect ocelots from being killed by vehicles and will reduce wildlife-related accidents for motorists.
- Restore/enhance freshwater wetlands on conservation lands to meet population objectives for wintering waterfowl, mottled duck and migrant shorebirds.
- Protect through acquisition or active management, beach habitat on South Padre Island and Boca Chica Beach for nesting Kemp's ridley sea turtles, peregrine falcons, and nesting and wintering shorebirds.

Reconnect hydrology and watershed diversions, such as the Bahia Grande, and restore wetlands and aquatic habitat for fish and other aquatic and wetland dependent species.

Next Steps

- Work with partners to complete engineering and permitting for remaining interior hydrology restoration projects of the Bahia Grande and seek funding for their implementation.
- Expand the pilot channel connecting the Bahia Grande Basin to the Brownsville Ship Channel to final design specifications to increase tidal exchange within the wetland system.

- Prioritize and assess the feasibility of additional hydrology restoration projects for multiple secondary bays or lakes such as San Martín Lake, El Tular Lake, Laguna Atascosa Lake, Bayside Lake and others.
- Restore the mudflat systems of sites like West Cayo and Horse Island by enhancing tidal flows and improving water management to benefit migrating shorebirds.
- Restore freshwater resacas (former channels of the Rio Grande) and associated wetlands on conserved lands by repairing water flow or control systems to restore and maintain natural flow to this wetland system.
- Continue to pursue opportunities for acquiring water through local irrigation districts to restore natural water regimes to repaired resaca wetland systems.
- Continue support of the Texas Parks and Wildlife Department and the Seagrass Monitoring Working Group to implement measures to protect and enhance seagrass habitats in the Lower Laguna Madre and Bahia Grande per the [Seagrass Conservation Plan for Texas](#), benefitting redhead ducks and inter-jurisdictional fisheries.
- Support and participate in the implementation of action items of the [Arroyo Colorado Watershed Protection Plan](#).

Coastal Bend

Landscape at a Glance

The Texas Coastal Bend Focal Area lies primarily between the Nueces River and Corpus Christi Bay system to the west, and the Colorado River and Matagorda Bay system to the east. The focal area includes multiple rivers, including the Guadalupe River, that drain central Texas and feed productive estuaries.

The area is internationally known as the winter home of the last wild migratory population of federally endangered whooping cranes. People come from all over the world to view these federally listed cranes at the Aransas National Wildlife Refuge and other places in the focal area. The watershed has a large agricultural composition, and the area has intact barrier island systems with seagrass beds, marshes and sand flats. It also includes some of the largest coastal prairie grasslands in Texas, which are important habitat for two other federally listed bird species, the Attwater's prairie chicken and the northern aplomado falcon.

Loss of coastal grasslands to woody species encroachment and development present the greatest conservation challenge in this area. This habitat loss threatens the Attwater's prairie chicken, the northern aplomado falcon, the whooping crane, the mottled duck and a host of associated species listed below. There is an urgent need for the Service and others to work together to protect additional grasslands, and to greatly increase prescribed fire capacity, scale and frequency to restore and maintain protected grasslands.

Target Species

Biological objectives established to date have been created for a geography that includes the Coastal Bend and Texas Mid-Coast focal areas together as one unit. Conservation, restoration, and continued management of grassland and prairie habitats across these two focal areas are necessary to meet objectives for the endangered Attwater's prairie chicken (6,000 breeding adults) and a species of conservation concern, the Le Conte's sparrow (210,198 individuals). Among the most iconic wetland species in this focal area is the whooping crane. Significant work continues to ensure adequate freshwater inflows are maintained to meet the reclassification targets needed for this species outlined in its recovery plan (1,000 individuals are needed for its status to be changed from endangered to threatened).

Mottled ducks (161,326 individuals), buff-breasted sandpipers (20,545 individuals) and long-billed curlews (11,953 individuals) are dependent on an appropriate interspersion of grassland and wetland habitats in this region and benefit from practices that address both aspects of their habitat needs. Other migratory birds which have objectives established by the Gulf Coast Joint Venture and primarily benefit from those activities that produce high quality marsh and wetland habitats include migrant shorebirds like stilt sandpipers (278,292 individuals) and western sandpipers (534,226 individuals); wintering waterfowl such as pintail (775,775 individuals) and gadwall (224,926 individuals); and landbirds like seaside sparrows (a share of 65,000 individuals).

The Gulf Coast Joint Venture has assessed seagrasses in this focal area relative to target waterfowl populations that utilize them as a food resource. While existing seagrass beds appear to be sufficient to meet waterfowl demands, if disturbance and/or lack of adjacent dietary freshwater renders 42 percent of seagrasses effectively unavailable, then habitat would become insufficient. The Gulf Coast Joint Venture has similarly assessed flooded rice fields and other inland palustrine wetlands in this focal area (combined with Texas Mid-Coast) relative to the needs of target waterfowl populations, and on average only one third of the approximately 136,000-acre winter habitat objective is met.

While many of the proposed actions in this focal area specifically list trust resource species as their targets, implementation of these actions will be advantageous to other species as well. For example, among the benefits of targeting whooping cranes are the associated benefits to species known to serve as a food resource including,

but not limited to, blue crabs, red drum, speckled trout and other aquatic species. Restoring natural drainage features in grasslands will also provide habitat for the southern crawfish frog, a [Species of Greatest Conservation Need](#) in Texas. Marsh restoration will also benefit species like black rail, which is not only an at-risk bird species but one with an important breeding (and even larger non-breeding) population in the Coastal Bend Focal Area.

High Priority Actions Based on the Service's Vision

Manage non-native species, reintroduce native plants, restore natural drainage features and use frequent prescribed fire to restore grassland savannas and prairies on former farmland and working ranchlands.

Next Steps

- Complete landscape assessment and species modeling for whooping cranes. Use this decision support tool, and a similar tool recently completed for Western Gulf Coast mottled ducks, to guide conservation and restoration actions.
- Establish an invasive species control collaborative that can share resources, enhance management capabilities, and leverage funds and expertise to implement invasive species control, prairie management and restoration actions across priority focal area lands.
- Greatly increase prescribed fire application (e.g., at least 125,000 acres annually) to high priority public or private lands to meet habitat conditions for target species.
- Enhance the capability to flood active or idle rice fields and shallow water impoundments (i.e., moist soil units) for wintering waterfowl and migratory shorebirds on both conserved lands and with willing private landowners.
- Conserve interconnected grassland corridors between Attwater's prairie chicken core areas to allow for dispersal and genetic exchange.

Support water-sharing efforts to provide freshwater input to coastal ecosystems that account for the needs of people and natural resources, including commercially significant fisheries and culturally important species like the whooping crane.

Next Steps

- Facilitate conversations between water providers and user groups to identify water-sharing concepts and to understand interests, conflicts and/or concerns of the stakeholders.

- Develop a collaborative strategy to consider concerns and identify potential solutions to meet needs for wildlife and people; for example, consider the approach of the Edwards Aquifer Recovery Implementation Program.

Create a conservation network of lands through conservation easements or acquisition of grassland savanna and prairies, woodlands and riparian areas.

Next Steps

- Complete a Landscape Conservation Design for the Coastal Bend that integrates existing conservation planning tools such as the Texas' Ecological Indices Project, Grassland Decision Support Tool, Texas Ecosystem Analytical Mapper, Sea Level Rise Viewer, and other site specific and scientific sources of information.
- Work with partners to develop and implement conservation projects to reach an initial target of 10,000 - 20,000 acres in the next five years identified as sustainable habitat for whooping cranes and associated species such as the mottled duck and the seaside sparrow.

Texas Mid Coast

Landscape at a Glance

Southwest of Houston, the Colorado and Brazos Rivers run through the coastal plain and empty into the Gulf or Texas bays. Situated along their floodplains are a multitude of old river oxbows and what used to be vast bottomland forests and tallgrass prairies. This ecosystem presently encompasses bottomland hardwood wetland forests, associated wetlands and prairies. Habitats within this focal area have been adversely impacted by development, fragmentation and invasive species encroachment. Among the federally listed species found in this focal area are the whooping crane and the Attwater's prairie chicken, both of which rely upon its prairie habitat. Unfortunately, only about one percent of the coastal prairie that once covered nine million acres from Mexico through Texas and into Louisiana remains. The loss of suitable habitat is one reason why populations of Attwater's prairie chicken exist in the wild in only two locations, with one being the Attwater Prairie Chicken NWR near Eagle Lake, Texas.

This ecosystem is especially important for Nearctic migratory birds (species that nest in the United States and Canada and migrate south to the tropical regions of Mexico, Central America, South America, and the Caribbean for the winter) because it contains the only expanse of forested wetlands adjacent to the Gulf in Texas. Millions of migrants depend on its bottomland forests for rest and feeding before and after crossing the Gulf on their fall and spring migrations, respectively. Studies

have shown that 237 species of birds, totaling at least 29 million individuals, migrate through these forests every year. The forested areas are important resting, breeding, feeding and escape habitats for a great number of other birds as well. In addition, waterfowl winter in the bottomlands and prairie wetlands.

This focal area retains a rural character, with a relatively equal mix of crop and grazing operations. It is not, however, a landscape in isolation. The nearby Houston-Galveston metropolitan area is expected to nearly double in the next 40 years, and the consequences of this will spill over into the focal area. For example, water supply and apportionment problems will only increase in the region. Local and rural communities in this focal area are expected to struggle in adapting to these rapidly changing conditions. We see their challenges as real and daunting; however, we also see them as presenting opportunities for new approaches, partnerships, and solutions that can better serve the interests of multiple parties. We believe engagement at the local level can support a community-based vision of the future that supports the conservation of fish and wildlife resources as well as their recreational and industrial use.

Target Species

Species of special interest in the bottomland forests of this focal area include Nearctic migrant landbirds. In order to represent migrating songbirds, a warbler suite was chosen by the Gulf Coast Joint Venture to represent the Gulf Coast wooded habitat used by multiple species: the Swainson's, golden-winged and cerulean warbler suite. These three birds utilize different parts of these coastal forests and provide a good example of total forest health for other species. Although conservation targets for these are still under development, actions will be pursued to conserve healthy bottomland forests for hundreds of species that depend on them during migration.

Conservation, restoration, and continued management of native grassland prairie habitats across the Coastal Bend and Texas Mid-Coast are necessary to meet objectives for the federally listed Attwater's prairie chicken (6,000 breeding adults) and a species of conservation concern, the LeConte's sparrow (210,198 individuals). Meeting the reclassification goal for whooping cranes outlined in its recovery plan (1,000 individuals are needed for its status to change from endangered to threatened) will require viable coastal wetlands and upland prairies in this focal area for them.

Species objectives for mottled ducks (161,326 individuals), buff-breasted sandpipers (20,545 individuals) and long-billed curlews (11,953 individuals) are also dependent on an appropriate interspersion of grassland and wetland habitats in this region and benefit from practices that address both aspects of their habitat needs. Gulf Coast Joint Venture objectives for other birds that are primarily supported by activities that produce high quality marsh and wetland habitats include: migratory birds, most notably migrant shorebirds like stilt sandpipers

(278,292 individuals) and western sandpipers (534,226 individuals); wintering waterfowl such as pintail (775,775 individuals) and gadwall (224,926 individuals); and landbirds like seaside sparrows (a share of 65,000 individuals).

While proposed actions specifically target our trust resource species, they can have a broader positive impact on the landscape and benefit many other species. Priority actions in this focal area feature habitat improvements to coastal and freshwater marshes, rivers and hardwood forests. Whooping cranes will ultimately profit from enhanced freshwater flow and tidal connectivity to estuaries that provides foundational benefits to many other coastal species like blue crabs, shrimp, oysters and red drum. Beyond migratory species, bottomland forest conservation, reforestation and drainage improvements will recharge aquifers, improve freshwater flow and reduce sedimentation in inland rivers and wetlands, to the benefit of aquatic fauna (e.g., largemouth bass, spotted bass, alligator gar, freshwater mussels) and terrestrial wildlife (e.g., southern flying squirrel, the white-tailed deer and many amphibian species).

High Priority Actions Based on the Service's *Vision*

Protect critical bottomland habitat adjacent to the Trinity, San Bernard and Brazos Rivers that represent significant stopover destinations and staging areas for millions of songbirds and landbirds during their migration across the Gulf.

Next Steps

- Describe and quantify how much bottomland is required to support the Gulf Coast Joint Venture's woodland migrant focal species suite.
- Identify key areas that provide the ecosystem services that overlap with priority conservation targets in major watersheds such as those of the Trinity, Brazos and San Bernard Rivers.
- Protect near-coastal and bottomland forest habitats through fee or easement acquisitions focusing on mature forests along the Brazos and San Bernard Rivers. Conservation of intact forests enable surface waters to recharge ground water, and filters waters that make their way to the Gulf.
- Work with partner agencies and organizations to restore bottomland hardwoods that will increase the ability to sequester carbon and stabilize stream bank habitats, and use retention areas to reduce nutrients entering coastal streams and rivers.
- In addition to bottomlands, protect associated habitats such as coastal prairie and wetlands through fee acquisition or conservation easements.

- Restore habitat that was converted for agricultural purposes and that complement existing conservation lands through invasive species control, supplemental planting and restoring natural hydrological flow.

Protect and restore coastal prairie in its historic upland and wetland complex on former rice cultivation fields to support pollinators, grassland and wetland dependent species like the mottled duck and the bobwhite quail, as well as wintering waterfowl, water birds and shorebirds.

Next Steps

- Identify and set habitat goals for target species within the Texas Mid-Coast Bottomlands, Prairie and Wetlands Focal Area to be protected, restored or created.
- Identify remnant coastal prairie sites and integrated freshwater wetlands in the former extent of the Gulf coastal prairie; use this information to explore easement, acquisition or restoration opportunities with willing private landowners and restore/conserves coastal prairie habitat on both public and private lands.
- Consider the development of a prairie restoration cooperative that provides opportunities for members for restoration-related equipment sharing, and reference donor sites for native seed, cultivation and propagation (including of upland and wetland plant stocks needed for restoration).
- Implement prescribed fire on coastal grasslands to promote a healthy landscape for prairie dependent wildlife and maintain coastal prairie plant species diversity.
- Provide incentive-based opportunities for private landowners to work with conservation partners and water management entities to develop and integrate wetlands with agricultural activities so that habitat is provided for wildlife, water quality improvement and reduced flood risks in coastal wetlands. These agriculture-wetland systems are one alternative to restore wetland systems historically present in the coastal prairie.
- Monitor and inventory shifts in species composition within prairie habitats due to a changing climate and/or other influences (e.g., contaminants, catastrophic events and disease).

Reconnect hydrology and watershed diversions to restore and enhance coastal wetlands and aquatic habitats to enhance fisheries and habitat for wetland dependent species.

Next Steps

- Identify areas where hydrology can be restored or diversions modified to have the greatest potential to support target species population and habitat objectives and remove barriers and enhance tidal connectivity.
- Where applicable, use dredged material to restore degraded wetlands and offset losses to erosion and subsidence. Restore freshwater wetland functions on the landscape through approaches that can include restoration or creation of wetland basins to improve water quality and reduce flooding risks; restoration of landscape geomorphology; and the provision of wintering habitat on private and public lands.
- Control invasive species within wetland habitats that degrade value for wildlife and interfere with waterways.
- Develop opportunities with drainage and flood management districts to restore hydrology on conservation lands, improve water quality of associated receiving waters, and reduce flooding risks to landowners and communities.
- Work with navigation partners, private and public landowners to protect Gulf Intracoastal Waterway shorelines from erosion using breakwaters or other methods that may also help reduce the frequency of dredging.
- Work with local municipalities to control and ameliorate erosion of shorelines along bay and water margins by using living shoreline techniques that improve habitats for fish and wildlife and reduce turbidity.

Chenier Plain

Landscape at a Glance

The Chenier Plain Focal Area is a rich and complex mixture of wetlands, uplands and open water that extends roughly 200 miles from Galveston Bay, Texas, to Vermilion Bay, Louisiana. It runs from the expansive coastal marshes bordering the Gulf shore through the coastal prairie into areas of intensive crop cultivation.

The Chenier Plain is a popular destination for nature watchers, anglers and hunters, who come from around the world to experience the abundance and diversity of its natural resources. With its location at the terminus of the Central and Mississippi Flyways, coastal wetlands in this focal area are extremely important for waterfowl and serve as the primary wintering site for up to 5.8 million ducks. The area also has productive estuaries, nearby forests and grasslands, and expansive tidal wetland systems. The coastal waters of the Chenier Plain Focal Area contribute substantially to the nation's commercial fishery landings, particularly for shrimp, blue crab,

oysters and Gulf menhaden operations. Large numbers of migrating birds also use the Chenier Plain ecosystem, with its bottomland hardwood forests, oak islands, and agricultural areas serving as important stopover habitat for songbirds and shorebirds.

Despite the region's rich bounty, alterations of the natural processes that formed it have changed the landscape in unanticipated and undesirable ways. These alterations include the construction and management of navigation channels and locks, drainage and irrigation canals, and diversions. While these alterations of the landscape have resulted in important benefits for society, the changes to the natural character of the landscape have also resulted in a loss in the abundance and diversity of plants and animals. For example, when sediments are removed from navigation channels, they are usually sequestered in placement areas or disposed of offshore. The resulting channel enables ships passage to a port, but tons of sediment that help build deltas, shorelines and beaches are lost from the system. Similarly, typical flood mitigation strategies convert natural streams into single purpose landscape features, which reduces flood risk but simultaneously remove fish and wildlife habitat, reducing recreational opportunities and degrading water quality. Much of the landscape on the northern edge of the Chenier Plain has been converted from coastal tallgrass prairie for agricultural purposes, increasing the nation's food supply but decreasing habitat for grassland and wetland plants and animals.

Recent storms and the resulting loss of ecotourism visitation have provided a sobering reminder to all stakeholders that natural resource infrastructure is not only important for the viability of fish and wildlife, but to people and their communities as well. The Service believes that integrating social and environmental perspectives to appreciate how people and wildlife are interlinked is perhaps the greatest conservation need in this focal area. Developing such an approach to problem-solving and making investments towards collaborative actions would allow us to conserve wildlife while simultaneously meeting the resource needs of the human population.

Target Species

Hydrologic restoration in the Chenier Plain – particularly those targeting freshwater wetlands and bottomlands – supports population objectives that have been established by the Gulf Coast Joint Venture for many wetland-dependent species in the region. These include migrant shorebirds such as stilt sandpipers (476,690) and western sandpipers (349,332); and resident or wintering waterfowl such as mottled ducks (259,505), green-winged teal (1,602,248), gadwall (>972,000), mallards (>560,000) and pintails (>520,000). Numerous colonial waterbirds, like little blue herons, roseate spoonbills and white-faced ibises are also beneficiaries of wetland restoration work, along with secretive marshbirds like king rails and least bitterns. The grassland habitats of this region provide habitat for the species of conservation concern, the LeConte's sparrow (132,939 individuals), and other grassland-dependent species like loggerhead shrikes and eastern meadowlarks.

The Gulf Coast Joint Venture has assessed flooded rice fields and other inland palustrine wetlands in the Texas and Louisiana portions of this focus area relative to the needs of target waterfowl populations, and on average only 37 percent of the approximately 64,000-acre winter habitat objective for Texas is met, while the approximately 49,000-acre objective for Louisiana is consistently attained.

While many of the proposed actions in this focal area specifically list trust resource species as their targets, implementation of these actions will be advantageous to many other species. For example, large-scale hydrologic restoration efforts to improve conditions in coastal wetlands to benefit birds will also benefit fisheries species such as estuarine fish, shrimp, blue crabs and oysters by improving habitat and water quality. Restoring coastal prairie habitat will not only benefit grassland dependent birds but also provide habitat for other declining species such as the Northern scarlet snake, ornate and three-toed box turtle, muskrat, crayfish and pig frog as well as a wide array of plant species characteristic of the coastal prairie.

High Priority Actions Based on the Service's *Vision*

Restore hydrologic processes including watersheds and diversions (e.g., [Salt Bayou Project](#)) to restore and enhance wetlands and aquatic habitats to enhance fisheries and habitat for wetland dependent species.

Next Steps

- Develop approaches for restoring sustainable beach and dune barrier systems within the focal area to combat sediment loss, relative sea level rise and erosion.
- Develop and implement approaches to reduce flow velocity, and restore historical tidal flux of high salinity waters into the estuarine systems, in order to ensure productivity of coastal wetlands. These can include installing siphons; restoring historic channel dimensions; enabling high flow diversions that reduce and or minimize flood risk; and placing sediment in subsided submerged and emergent lands.
- Restore freshwater inputs into estuarine habitats that can restore and extend the duration of the hydroperiod (i.e., the period in which the soil area is waterlogged). On conservation lands, explore opportunities to redirect high flow waters onto landscapes where drainage improvement projects have reduced hydroperiod intensity and duration. This can result in higher quality wetland habitats, as well as possibly improve water quality and reduce flooding risks.

- Study the landward migration of tidal waters, sea-level rise, sediment aggradation and vegetation changes and develop strategies to proactively adapt to maintain tidal habitats on the coastal landscape in the future.
- Stabilize seasonal salinity patterns to reduce or eliminate rapid changes within the system that lead to the loss of stable vegetation communities.
- Work with willing landowners to conserve coastal floodplain bottomlands along rivers that allow for high flow events and long-term maintenance of riverine bottomlands.
- Identify lands for conservation through voluntary easement or acquisition that can then be used for hydrologic restoration projects supported by landowners and/or drainage and flood management districts to yield significant benefits for the public through wildlife conservation, water quality improvements, beneficial use of dredged material and reduced flooding risks.
- Work with drainage and flood management districts to restore hydrology on conservation lands and improve flood risk reduction efforts.

Restore landscapes and interrupted sedimentary processes by incorporating beneficial use of dredged material, direct dredging and erosion protection with willing public and private land managers.

Next Steps

- Work specifically with navigation interests to encourage sediment management practices that retain sediment in the coastal and nearshore environment rather than disposed of in offshore placement areas.
- Design and develop sites that would be available to receive sediments removed for navigation purposes and promote the beneficial use of dredge material to restore important fish and wildlife habitats, such as tidal marsh, bird islands and barrier island headlands.
- Work with partners to investigate possible impacts on society from changes that would result from the re-establishment of natural sedimentary and hydrologic processes.
- Work with navigation partners and landowners along the Gulf Intracoastal Waterway and other navigational channels to more effectively use dredged material to enhance degraded wetlands, thereby protecting shorelines and potentially reducing the dredging frequency.

- Where applicable, apply living shorelines treatments or other methods to reduce erosion and rebuild degraded wetlands.

Conserve coastal prairie landscapes by recovering historic wetland pothole and mound complexes and re-introducing native prairie species on former agricultural (rice) lands to support pollinators, grassland and wetland dependent species like the mottled duck and bobwhite quail, and wintering waterfowl, waterbirds and shorebirds.

Next Steps

- Identify remnant coastal prairie sites with intact geomorphology of mounds and freshwater marsh wetlands in the former range of the coastal prairie. This information can be used to explore easement, acquisition or restoration opportunities with willing private landowners.
- Develop a strategy to conserve and restore coastal prairie habitat on high priority private and public lands to meet habitat objectives for target species, including the application of prescribed fire.
- Coordinate the implementation of a strategy and apply prescribed fire to coastal prairies and marshes to sufficiently maintain target species population and habitat objectives with partners.
- Utilize cooperative prairie management associations to maintain seral stages needed for grassland, prairie and wetland dependent species. Management activities can include prescribed fire, mowing, invasive species control, and grazing methods and approaches.
- Where they do not exist, establish new prairie restoration cooperatives that provide opportunities for members for restoration-related equipment sharing, and reference donor sites for native seed, cultivation and propagation (including of upland and wetland plant stocks needed for restoration).
- Develop opportunities with drainage and flood management districts to restore hydrology on conservation lands, improve water quality of associated receiving waters and reduce flooding risks to landowners and communities.
- Employ monitoring efforts to understand the range of results that different management actions have for target species and taxa.
- Provide incentive-based opportunities for private landowners to work with conservation partners and water management entities to develop and integrate wetlands with agricultural activities so that habitat is provided for wildlife, water quality improvement and reduced flood risks in coastal wetlands. These agriculture-wetland systems are one alternative to replacing

converted wetland systems historically present in the coastal prairie and Chenier Plain region.

- Encourage the expansion of the USDA's NRCS Migratory Bird Habitat Initiative program and work with private landowners in Texas and Louisiana to provide food and critical wetland habitat for migratory bird populations in support of existing Gulf Coast Joint Venture objectives for these species.

Atchafalaya Basin

Landscape at a Glance

The Atchafalaya River originates in south-central Louisiana as the largest distributary of the Mississippi River and flows south for approximately 140 miles, emptying into the Gulf at Atchafalaya Bay, approximately 15 miles south of Morgan City, Louisiana. The Atchafalaya River Basin is home to the largest contiguous river swamp in the United States, which is maintained by receiving approximately 30 percent of the flow of the sediment rich waters of the Mississippi River. This focal area is characterized by extensive and diverse wetland habitats ranging from bottomland hardwoods and cypress-tupelo swamp, to freshwater marshes that transition to brackish and saline marshes as the river forms the only accreting delta system (Wax Lake and Atchafalaya) in the Gulf. Nourished by annual floodwater inputs, the wetland ecosystems of the Atchafalaya River Basin Focal Area support an abundance of resident and migratory fish and wildlife species.

The abundant natural resources of the area have been integral to the history and culture of Native Americans and Acadians, and continue to support local economies through commercial fishing, timber harvest, oil and gas development, navigation, outdoor recreation and tourism. These activities and resource interests also present challenges to the long-term ecological health of this focal area. Ecological threats arise from hydrological alterations for navigation and flood control, which include hypoxia; extremes in sedimentation (i.e., too little or too much); habitat fragmentation; lack of connectivity between the river and floodplain; and the proliferation of invasive species.

The Service believes that focusing efforts on habitat connectivity through the Atchafalaya River system, restoring hydrology within the floodplain, enhancing regeneration of forested wetlands, and conserving habitat for resident and migratory wildlife will support resiliency of the ecosystem and the region's endemic culture.

Target Species

The Atchafalaya River Basin is a subcomponent of the Mississippi Alluvial Valley (MAV) ecosystem and many of its species objectives are derived and shared with the broader MAV focal area. However, unlike the broader MAV, this focal area is predominantly forested. As a result, conservation actions here are primarily focused on forest-dependent species. Conservation of these forested systems is important to maintain the forest patch sizes necessary to sustain populations of swallow-tailed kites (320 breeding pairs for entire MAV) and songbirds, as well as to maintain the habitat connectivity and population viability required to sustain the recovery status of the recently delisted Louisiana black bear. Management actions can improve the structure and composition of these forests for the benefit of these species as well as many wintering migratory birds (e.g., the American woodcock, which require access to early successional habitats at some time during the winter). In addition to maintaining forest block size and conducting management practices to improve forest habitat, another priority management need in the Atchafalaya River Basin includes the restoration of water flows for the benefit of both fish and the cypress regeneration that provides important nesting habitat for bald eagles and colonial water birds.

While many of the proposed actions in this focal area are specifically included for their benefits to our target species, improving water and sediment distribution in the floodplain will improve crawfish production and freshwater sportfish (e.g., alligator gar and Gulf Coast striped bass) populations. Similarly, freshwater and marine species of sportfish, shrimp, and blue crabs will benefit from healthy coastal wetlands as a result of freshwater diversion. These same species will also benefit from invasive species management. Restoration in these swamps also benefit a number of important game species, including the American alligator, the white-tailed deer, and the wild turkey.

High Priority Actions Based on the Service's Vision

Protect and restore bottomland hardwood and cypress-tupelo forests for increased habitat buffer and connectivity to benefit the Louisiana black bear, neotropical migrant landbirds, and other forest species, and to provide habitat for wading birds, aquatic species and waterfowl.

Next Steps

- Partner with the U.S. Army Corps of Engineers and other stakeholders to strategically implement the congressionally authorized 2007 Atchafalaya Basin Floodway System in collaboration with state and federal agencies, private landowners, conservation organizations and other Atchafalaya River Basin stakeholders. Key elements include working with willing sellers to acquire 70,000 acres for public access and 367,000 acres of environmental easements.

- Work with willing sellers to protect and restore wildlife habitat within the approved acquisition boundaries of the Atchafalaya and Bayou Teche NWRs through a combination of fee acquisitions, conservation easements and agreements; and through land exchanges with other federal agencies.
- Implement land conservation and associated forest management practices (e.g., timber harvest, thinning and regeneration) that provide a mix of habitats necessary for the suite of forest species and ensure high quality wintering habitat for American woodcock.
- Focus on increasing contiguous forested habitat and providing forested corridors between intact habitat blocks, such as securing wildlife (e.g., Louisiana Black Bear) movement corridors across U.S. Highway 90.
- Identify potential sites to improve swamp habitat and health of forest stands for wildlife, such as lands in agricultural production (e.g., areas of the Morganza Spillway that have potential for conversion back into bottomland hardwoods) and cypress-tupelo wetland forest that could be restored through plantings and regeneration.
- Work with the Louisiana Department of Wildlife and Fisheries to implement their [green infrastructure network](#) for Wildlife Management Area and NWRs.

Restore hydrology and improve water and sediment distribution in the Atchafalaya River floodplain and to coastal wetlands by implementing sediment management practices and hydrological features that aid in the redirection of sediment and water to areas where those resources are in deficit or are in excess.

Next Steps

- Partner with USGS, U.S. Army Corps of Engineers, the state of Louisiana and stakeholders to evaluate current science and information regarding hydrology and sediment dynamics to provide a basis for developing restoration science needs.
- Support existing water monitoring gauges and increase overall real-time monitoring to enhance understanding of basin hydrology; explore the potential to expand the [Coastwide Reference Monitoring System](#) into the basin.
- Work with the state of Louisiana to implement Atchafalaya Basin projects for water management, including activities such as removing/reducing local flow obstructions (e.g., sediment accumulation) to restore interaction between the river and the swamp and increasing freshwater inputs to improve water quality, fisheries health and forest condition.

- Restore natural flooding and drying cycles in forested wetlands within the floodway and outside the protection levees while working in partnership with flood control and navigation interests.
- Work with the state of Louisiana, U.S. Army Corps of Engineers, parishes, nongovernmental organizations (NGOs) and private landowners to find common ground for basin management among flood control, commercial/recreational fisheries, navigation, oil and gas, recreational and cultural interests.
- Monitor wetland vegetation and aquatic invertebrates during spring and fall migration to assess whether food availability needs of migratory birds are being met.
- Manage oil and gas development on NWRs through comprehensive monitoring and operator coordination to prevent and/or limit the adverse impact of spills and leaks on wetlands and refuge habitats.

Control the extent and density of invasive non-native plant and animal species within the Atchafalaya River Basin to enhance native habitat, navigation and water quality.

Next Steps

- Acquire better information on the distribution and management of hydrilla, salvinia, water hyacinth and other aquatic invasive plants in order to prioritize locations for management actions (e.g., improving water circulation to reduce how invasive plants in ponded areas restrict access to many areas in the basin and exacerbate hypoxic conditions in the swamps).
- Conduct periodic drawdowns in areas where water levels are controlled or floodplains can be dewatered to manage aquatic invasives such as hydrilla, and install water control structures at sites that provide opportunities for drawdown benefits.
- Review and update the Integrated Pest and Invasive Species Management Plans to address the habitat needs of NWRs and conservation partners in the basin. Work with landowners adjacent to NWRs and other partners to control non-native Chinese tallow tree and mimosa infestation in bottomland hardwood forest to restore natural wetland habitat conditions.
- Work with and support efforts of partners and stakeholders throughout the basin to control Asian carp, feral hogs, nutria and other invasive wildlife species that range through the focal area.

- Restore water management capabilities on NWR moist soil units and greentree reservoirs by improving the outer bank levees, upgrading water management infrastructure and removing invasive plants.

Mississippi River Coastal Wetlands and Barrier Islands

Landscape at a Glance

The Mississippi River Delta, Coastal Wetlands and Barrier Islands Focal Area is located in the coastal parishes of southeast Louisiana, from the Vermilion Bay east to the Pearl River on the state line with Mississippi, and includes the offshore barrier islands and the associated bays and estuaries along the coast. These highly productive coastal habitats support millions of birds and a diverse assemblage of fish and wildlife species.

The focal area was historically formed through the active delta building process of the Mississippi River, and is continually being reshaped and reformed as freshwater and sediment makes its way into the Gulf. This confluence of the world's third largest river with the Gulf has created vast stretches of fresh, intermediate, brackish and saline marshes; cypress swamps; bottomland hardwood forests; coastal flatwoods; sandy beaches and dunes; bayous; river channels and open water. This once seemingly boundless wetland ecosystem also supports thriving shipping, energy, seafood and recreation industries. However, this engine of economic and ecological productivity is threatened by the staggering annual losses of coastal wetlands and ongoing disruption of delta formation processes.

Levees, navigation channels, canals and dams have limited the Mississippi River's ability to distribute sediments to the coast at the rate necessary to balance natural erosion, leading to extensive land loss. The diversity, productivity, and even the existence of coastal habitats are being further compromised by the increasing impacts of saltwater intrusion, sea level rise and more frequent tropical storms. These factors are responsible for Louisiana having the highest coastal wetland loss rate of any state in the nation, with a loss of approximately 16.6 square miles per year (more than 1,900 square miles since 1932). Ongoing restoration efforts are being funded through various means, including under the [Coastal Wetlands Planning, Protection and Restoration Act \(CWPPRA\)](#) and the state's [Comprehensive Master Plan for a Sustainable Coast](#). The Service supports and is engaged in these monumental restoration efforts which are directed at reducing, and ultimately reversing, coastal land loss.

Target Species

Restoration of marsh habitats through sediment diversion, terracing and beneficial use of dredge material in this focal area are important for achieving population

objectives for breeding mottled ducks (217,642 individuals) and wintering waterfowl (e.g., > 1.2 million individual blue-winged and green-winged teal, and > 700,000 gadwall). Significant populations of colonial waterbirds (e.g., snowy egrets, white ibis and tricolored herons) and seaside sparrows also occur in the fresh, brackish and salt marshes in this region. Offshore barrier islands provide important nesting habitats for significant populations of brown pelicans (objective of 21,000 pairs) and wintering shorebirds (notably the federally listed red knot and piping plover). The Gulf Coast Joint Venture has established objectives for many migrant shorebirds in this area as well, including: buff-breasted sandpipers (4,487 individuals), stilt sandpipers (45,076 individuals), and western sandpipers (96,060 individuals).

When restoring barrier islands, we recognize the need to incorporate a mosaic of habitat types that will not only benefit our trust resource species but also multiple other species. For example, a comprehensive restoration approach would not only include placing sediment and establishing vegetation that will provide loafing and nesting areas for colonial waterbirds such as brown pelicans, but would also incorporate components such as seagrass beds and protective nearshore reefs that will attract many species to these shallow habitats, including recreationally popular species like red drum, speckled trout, sharks and young tarpon. Appropriate river diversions that provide freshwater inputs and sediments will help to stabilize coastal marshes where egrets, ibis, and herons thrive as well as provide important spawning and nursery habitat for alligator gar. In addition, such diversions would help to re-build tidal marsh that provides cover and forage habitat for waterbirds as well as striped mullet, red drum, Gulf Coast striped bass and the diamondback terrapin (a [Species of Greatest Conservation Need](#) in Louisiana).

High Priority Actions Based on the Service's Vision

Restore barrier island habitat such as the Chandeleur Islands to provide nesting habitat for brown pelicans and other colonial waterbirds, and to protect back barrier tidal flats to promote establishment and growth of seagrass beds.

Next Steps

- Restore Breton Island NWR by pumping offshore sand to reconstruct 352 acres of beach, dune and marsh habitat to support nesting brown pelicans and other colonial nesting waterbirds (currently in engineering and design phase funded under NRDA early restoration).
- Protect shoreline along the Breton Sound and Gulf by constructing a hardened "reef" barrier on the Breton Island NWR perimeter for wave attenuation; fill behind the barrier to the vegetated marsh with dredged material and then plant to provide additional erosion protection.

- Coordinate with the state of Louisiana’s ongoing Barrier Island Comprehensive Monitoring (BICM) and System-Wide Assessment and Monitoring Programs (SWAMP) to develop monitoring programs to evaluate the long-term effects of restoration of barrier islands and associated habitats, such as the status of at-risk species and other species of federal responsibility; the success of colonial nesting waterbirds (e.g., brown pelicans); marsh loss and creation; change in water depths; submerged aquatic plants; living shorelines (as the result of the beneficial use of dredge material); and the impacts of public use activities on natural resources.
- Perform dedicated dredging to restore marsh elevations within the Delta NWR. This restoration will greatly benefit nesting, loafing and feeding habitat for waterfowl and other water birds.
- Restore Barataria Bay barrier islands between Barataria Pass and Sandy Point to provide dune and back barrier marsh habitat and to provide storm surge and wave attenuation for the Barataria Basin.

Reconnect hydrology and construct river diversions into sediment-starved areas of the Mississippi River “Bird’s Foot Delta” to restore and enhance marsh habitat.

Next Steps

- Construct narrow cuts through berms or levees (crevasses) wherever feasible within the lower Mississippi River basin, to divert fresh water and sediment into shallow, open-water receiving areas to promote deltaic splay growth and nourishment of existing marsh. Using information from previous projects, construct crevasses at key locations to allow sediment-loaded water to flow into ponds or bays formerly closed off in order to build new splays, allowing these areas to become vegetated coastal habitats that support diverse populations of fish and wildlife.
- Dredge Main Pass to increase the flow of sediment into canals and crevasses on the Delta NWR to encourage marsh establishment and create beneficial splays that will culminate in hundreds of acres of new emergent marsh and increased erosion protection.
- Design and construct crevasses and dredge disposal projects to enhance and direct inputs and movement of freshwater within the Delta NWR and other lands influenced by Mississippi River flows. The objective is to create or restore emergent marsh and encourage low salinities for creation of stable freshwater spawning habitat for the alligator gar and other species dependent upon freshwater for part or all of their life histories.
- Construct projects such as sediment diversions into middle Barataria and Breton Sound Basins to build and maintain land (currently planned for

75,000 and 35,000 cfs capacity, respectively), in support of the [*Louisiana's Comprehensive Master Plan for a Sustainable Coast*](#).

Restore marsh and submerged aquatic vegetation within coastal bay and wetland systems through actions such as the placement of dedicated dredge sediment.

Next Steps

- Partner with the U.S. Army Corps of Engineers and the Louisiana Coastal Protection and Restoration Authority to use beneficial dredged materials from the Mississippi River to fill an open water bay that was originally marshland, and create new emergent marsh, on the Delta NWR just north of Pass-a-Loutre.
- Restore marsh in open pond areas over five acres in size, thereby fortifying the shoreline of the Delta NWR to ensure healthy and viable plant and animal communities, and the long-term resiliency of the refuge's habitats.
- Dredge as much as seven miles of the Sauvage Bayou channel to increase aquatic habitats and deep water shelter and beneficially use the sediment on the Bayou Sauvage NWR to create new marsh and benefit aquatic species.
- Conduct reforestation and marsh planting projects in Blind Lagoon with the help of volunteers to restore damaged and eroded areas of the marsh and to provide colonial waterbird rookery habitat.
- Create approximately 550 acres of estuarine tidal marsh in northern Breton Sound in the vicinity of Hopedale, and approximately 8,510 acres of marsh in the New Orleans East Landbridge, to create new wetland habitat, restore degraded marsh and reduce wave erosion, in support of the *Louisiana's Comprehensive Master Plan for a Sustainable Coast*.
- Restore approximately 450 acres of estuarine tidal marsh through beneficial use of dredge material along the north shore of Lake Pontchartrain on Big Branch Marsh NWR to benefit aquatic species and waterfowl.

Mississippi Alluvial Valley

Landscape at a Glance

The Mississippi Alluvial Valley (MAV) Focal Area stretches from the confluence of the Ohio and Mississippi Rivers in southern Illinois to the tidally influenced freshwater swamps along the Mississippi River as it drains towards the Gulf of Mexico. The MAV once supported 24 million acres of floodplain forest, swamps,

sloughs and riverine habitat. However, this region's fertile soils have proven to be its undoing; it now has the distinction of being the Southeast's most deforested region. More than 75 percent of its forest has been lost since European settlement, mostly to agriculture, and much of the remnant forest occurs in small, isolated tracts of limited conservation value. Implementation of flood control measures and the resulting system of levees, dikes, diversions and canals have significantly altered the landscape. For much of its length, the MAV is cut off from the Mississippi River's natural flood cycles, which further impairs its ecological integrity and directly impacts the Gulf ecosystem by altering hydrologic regimes and sediment budgets that sustain Gulf habitats.

The MAV is critically important as a major migration corridor for many bird species that can be found along the Gulf Coast. More than 40 percent of the waterfowl that breed in North America use the MAV as migratory stopover, wintering or breeding habitat; the alluvial land between the Lower Mississippi River at low-water stage and levees (i.e., batture) is an important corridor for songbird migration north and south. Additionally, at least 107 species of landbirds breed in the MAV geographic region, with 70 of those depending upon bottomland hardwood forests for most or all of their life cycle. Furthermore, more than 100 species of fish occur in the Lower Mississippi River, and numerous threatened and endangered species (e.g. the pallid sturgeon, and the Interior least tern) depend on these valuable habitats. In light of the ecological value of this geography and the myriad stressors it endures, there has been a significant conservation investment in this region over the last few decades. Coupling these values with the economic and societal values of the region offers great promise for continued success. Indeed, the MAV is identified as a key multi-function conservation investment area by the [multi-LCC Gulf Hypoxia Initiative-Precision Conservation Blueprint](#) with opportunities for co-production of wildlife, water quality and agricultural benefits. The Service believes that conservation gains from reforestation (>1 million acres since 1992) and hydrologic restoration efforts have been significant and provide momentum for optimism in the decades ahead.

Target Species

Restoration in the MAV occurs along three primary fronts: bottomland hardwood conservation and restoration to benefit breeding landbirds and the recently delisted Louisiana black bear; hydrologic restoration of wetland habitats to support migrating shorebirds and wintering waterfowl; and engineering of the flood control and transportation infrastructure along the mainstem river to benefit threatened and endangered Interior least terns, fat pocketbook mussels and pallid sturgeon.

The Lower Mississippi Valley Joint Venture has taken the lead on establishing population and habitat objectives for most birds in the region. For migrating shorebirds, these objectives include targets for the killdeer (98,039), the least sandpiper (161,323), the lesser yellowlegs (22,546), the pectoral sandpiper (129,252) and the semipalmated sandpiper (40,259). For wintering waterfowl,

these objectives include targets for the American black duck (53,000), the American wigeon (288,000), the canvasback (43,000), the gadwall (430,000), the scaup (1,354,000), the green-winged teal (476,000), the mallard (3,239,000), the northern pintail (329,000), the northern shoveler (89,000), the redhead (60,000), the ring-necked duck (277,000), the ruddy duck (55,000) and the wood duck (1,622,000). The Lower Mississippi Valley Joint Venture also has established objectives for numbers of breeding pairs of landbirds such as the Swainson's warbler (187,500) and the swallow-tailed kite (320) – which includes both the Atchafalaya Basin and the Mississippi Alluvial Valley.

The Lower Mississippi River Conservation Committee and the Service have cooperated extensively with state and other federal agencies (notably the U.S. Army Corps of Engineers) to develop and implement restoration and recovery plans that outline objectives for other species: supporting a stable population of 2,500 adults of the Interior least tern for 10 years; maintaining a viable population of fat pocketbook mussels in the Lower Mississippi River; and ensuring a self-sustaining, genetically diverse population of 5,000 adult pallid sturgeons.

Beyond the benefit to our trust resource species, restoring the function of river floodplains will provide better spawning and nursery habitat for commercially important floodplain-spawning fish like buffalo and alligator gar. Channel improvements will enhance channel and blue catfish habitat, improve spawning conditions for prey species like gizzard shad and skipjack herring, and increase angling opportunities for Gulf Coast striped bass and other recreational fish species. Improving conditions and land management practices on agricultural lands will reduce erosion, sedimentation, and the amount of nitrates that create hypoxic conditions in the Gulf, ultimately benefiting many marine species. Restoring natural hydrology and bottomland hardwood forest habitats will also benefit numerous frogs, including chorus frogs and tree frogs; bats, like the Rafinesque's big-eared bat and the southeastern myotis; and crayfish species currently listed as "at risk" (e.g., Yazoo crayfish). Similarly, numerous upland game species will benefit from these restoration practices including the white-tailed deer, the wild turkey, and both the gray and the fox squirrel.

High Priority Actions Based on the Service's Vision

Permanently conserve and restore large patches of bottomland hardwood forest through voluntary conservation easements and fee acquisition.

Next Steps

- Continue to work with USDA's NRCS and Farm Service Agency through partnerships, such as the Conservation Delivery Networks established by the Lower Mississippi River Valley Joint Venture, to collaboratively use existing decision support tools (e.g., Forest Breeding Bird Decision Support Model) to identify opportunities for bottomland hardwood forest conservation and

restoration in support of area-sensitive breeding songbirds and waterfowl population objectives.

- Facilitate and participate in development of Landscape Conservation Design efforts (e.g., the Gulf Coastal Plains & Ozarks LCC Conservation Blueprint) that reflect partnership-driven conservation and restoration priorities.
- Permanently protect and restore habitats within approved NWR acquisition boundaries, including Cache River and Dale Bumpers White River NWRs, where greater connectivity among protected areas along the Cache River, Bayou DeView, and White River is needed. Work with willing sellers to acquire fee title lands and conservation easements to provide important wildlife habitat, connect conservation lands and protect aquatic resources.
- Engage in restoration of bottomland hardwood forest in areas embedded in large forested landscapes, such as Cache River and White River NWRs, to include planting native oaks, bald cypress, sweetgum and pecan trees to enhance wildlife diversity and prevent soil loss from erosion.
- Engage in hydrological restoration in areas embedded in large forested landscapes, such as Cache River and Dale Bumpers White River NWRs, to improve water flow and quality while simultaneously contributing to the overall health of the Gulf by reducing sediment, nutrient and pollutant runoff.
- Promote the use of Lower Mississippi Valley Joint Venture's compilation of forested wetland restoration and management recommendations (i.e., "Desired Forest Conditions for Wildlife") focused on diversifying tree species composition and forest structure within bottomland hardwood stands in the Lower Mississippi Alluvial River Valley to provide productive habitat to sustain populations of priority migratory birds and other forest-dependent wildlife (e.g., Louisiana black bears) in concert with sustainable forestry on both public and private lands.

Restore natural hydrology via re-meandering streams, removing artificial impediments to natural flow, restoring ridge and swale topography, etc.

Next Steps

- Support and implement restoration activities identified by the [Lower Mississippi River Conservation Committee](#). These include the creation, rehabilitation and diversification of main and secondary channels to provide habitat for the endangered pallid sturgeon, the Interior least tern and the fat pocketbook mussel; the restoration of floodplain water bodies; the augmentation of aquatic connectivity with the floodplain; and the enhancement of tributaries and terrestrial habitats (particularly wetland

restoration on batture lands, which is the land between a river at low-water stage and a levee).

- Work with state agencies throughout the focal area to develop restoration objectives for floodplain-spawning fish (e.g., the alligator gar) to support strategic conservation of these species and their habitats.
- Educate private landowners on potential options for water management improvements to benefit waterfowl, shorebirds and waterbirds on existing NRCS Wetland Reserve Easements and explore opportunities to help implement these enhancements where they also meet the objectives of individual landowners.
- Leverage the capacity of Lower Mississippi Valley Joint Venture Conservation Delivery Network and the Service's Partners for Fish and Wildlife Program, and utilize existing USDA NRCS programs and expertise to address shallow water wetland and critical forest management needs on private lands through additional Wetland Reserve Easements in Arkansas, Louisiana and Mississippi.
- Implement habitat maintenance activities such as disking of nuisance vegetation and flooding in moist-soil management units on publicly managed lands to provide habitat for early migratory shorebirds, wading birds, and early migrant waterfowl (July – September).
- Coordinate with the Lower Mississippi River Conservation Committee to implement recommendations from the Congressionally authorized Lower Mississippi River Resource Assessment to maintain navigation and abate flooding while enhancing river-related recreation and public access along with the river's natural habitats and the species they support.
- Recommendations include the creation of a Lower Mississippi River Science Technology and Information Center; the study of sediment budgets; the development of a water-quality monitoring program; the compilation of an inventory of ecological resources to support restoration; and the implementation of an invasive species program (particularly for the Asian carp).

Enhance wildlife habitat values and water quality on agricultural and other working lands by improving water management capacity, installation of filter strips and buffers, and other appropriate soil and water conservation measures.

Next Steps

- Expand USDA's NRCS Migratory Bird Habitat Initiative program and work with private landowners in Louisiana and Mississippi to provide food and

critical wetland habitat for migratory bird populations in support of existing Lower Mississippi River Valley Joint Venture objectives for these species.

- Work within the MAV pilot area established by multiple LCCs (through the Mississippi River Basin/Gulf Hypoxia effort) to implement USDA's NRCS Mississippi River Basin Initiative and other Farm Bill programs (e.g., Agricultural Conservation Easement Program, Environmental Quality Incentives Program, Conservation Reserve Program) to implement nutrient reduction strategies that benefit shorebird and waterfowl species compatible with sustaining agricultural economies.
- Promote the implementation of water conservation practices (e.g. irrigation water recovery systems, improved irrigation delivery techniques) to reduce aquifer depletion and ensure a sustainable water supply for all users.

Central Gulf Lands

Landscape at a Glance

While representing less than six percent of the Gulf Coast frontage, Mississippi and Alabama nonetheless contribute significantly to the Gulf ecosystem. The watersheds that stretch inland within these two states ultimately impact to the overall health of the adjacent bay and estuarine systems by contributing freshwater and nutrient inputs to habitat and passage for the endangered Gulf sturgeon. The overall focal area is a crucial buffer in response to potential effects from sea level rise; it provides flood and erosion protection for wildlife and human communities, and landscape for potential habitat migration. It is also a critical stopover point for migrants (birds and butterflies) crossing the Gulf.

This focal area includes the sixth largest watershed in the United States (Mobile Bay), the [largest undammed river](#) in the lower 48 states (Pascagoula River), and some of the most biologically diverse systems of their kind in the United States. Mobile Bay watershed covers approximately two-thirds of the state of Alabama and portions of Mississippi, Georgia and Tennessee. Other significant watersheds throughout the focal area include those of the Pearl, Biloxi and Perdido Rivers, which terminate into estuaries and bays like Bay St. Louis, Biloxi and Perdido. The [Mobile delta floodplain](#) covers more than 300,000 acres and represents one of the largest and best-preserved deltaic systems in the lower 48 states – including more than 160 species of freshwater fishes, 75 species of freshwater mussels, 120 freshwater snail species and 17 turtle species historically occurring there.

The wet longleaf pine prairies in this landscape are among the most species-rich forest types in North America and influence the quantity and quality of water that ultimately enters the Gulf. The once vast longleaf pine ecosystem in the southeast is

now less than three percent of what once covered 90 million acres. Reduced by fragmentation, lack of fire, and invasive non-native species, what remains provides important habitat for the federally listed Mississippi sandhill crane and red-cockaded woodpecker, the Bachman's sparrow, the Henslow's sparrow, the yellow rail, the gopher tortoise, carnivorous plants such as sundews and bladderworts, and up to nine different species of pitcher plants along with a suite of other imperiled species.

Conservation efforts capitalizing on collaboration with stakeholders are very successful in this focal area, and many efforts to develop local watershed-driven management plans decision support tools are underway or have been recently completed. For example, Mississippi's Department of Environmental Quality developed the Comprehensive Ecosystem Restoration Tool ([MCERT](#)) provides data that describe landscape conditions for all watersheds that drain into the Mississippi Sound. This science-based tool will help decision makers identify restoration actions that best address various conditions while achieving priorities identified in the [Mississippi Gulf Coast Restoration Plan](#). The [Coastal Stream and Habitat Initiative project](#) in Mississippi will generate conservation and restoration design plans for nine coastal watersheds in communities along the Mississippi Gulf Coast. The [Mobile Bay National Estuary Program](#) is also in the process of completing comprehensive plans for 31 coastal watersheds that directly feed into Mobile Bay, the Mississippi Sound and the Gulf of Mexico. Collectively, these tools will help guide future funds towards appropriate habitat restoration and water quality improvement projects, as well as enhance the ecosystem functions and resilience of the coastal counties of Mississippi and Alabama. The Service supports such long-term, large-scale species and habitat management strategies, including monitoring them for success and applying adaptive management. We can support these strategies by including actions such as prescribed fire, invasive species control, living shorelines, land acquisition/conservation, beneficial use of dredged material and other techniques, all while addressing climate change, sea level rise and coastal resilience.

Target Species

Long-term upland habitat management efforts – particularly prescribed fire – will help establish additional suitable habitat throughout the focal area and, in turn, achieve population objectives that aid in the recovery of endangered wildlife like the Mississippi sandhill crane (>130 cranes, with 60 nesting cranes per season for 10 years); the dusky gopher frog (six metapopulations that include a minimum of 12 breeding ponds); and the red-cockaded woodpecker (nine populations with >250 potential breeding groups from among 10 designated secondary core populations, one of which is the Desoto National Forest, with each breeding group not dependent on artificial cavities to remain at or above this population size). These and other habitat conservation and management efforts will also help provide suitable habitat for the gopher tortoise (56,400 individuals) and species with population objectives identified by the Gulf Coast Joint Venture such as the LeConte's sparrow (2,964

individuals), the loggerhead shrike (9,364), and wintering waterfowl; as well as species with population objectives identified in the [North American Landbird Conservation Plan](#) such as the Henslow's sparrow (168,000 individuals) and other pine savanna-dependent bird species (e.g., the Bachman's sparrow and the yellow rail).

Large numbers of Gulf sturgeon from a number of different river populations were exposed to *Deepwater Horizon* oil and a substantial number of these fish were affected by this exposure. Restoration approaches used to restore this injury will be consistent with the [Gulf Sturgeon Recovery Plan](#). These approaches include removing instream barriers, promoting sufficient instream flow, and restoring spawning habitat; reducing nutrient loads to coastal watersheds; and protecting and conserving marine, coastal, estuarine and riparian habitats.

Population objectives for the threatened Gulf sturgeon are couched as catch-per-unit-effort during monitoring, with a short-term target of no decline from the baseline level over a three-to-five-year period; and a long-term target of having efforts underway to restore lost or degraded habitat and the population demonstrated to be self-sustaining. Recent assessments indicate there is potential for increasing the amount of Gulf sturgeon habitat in this focal area. Continued efforts to increase habitat availability for Gulf sturgeon could also benefit other aquatic resources, particularly paddlefish, freshwater mussels and anadromous fish like the Alabama shad, the American eel and the Gulf Coast striped bass.

[Call-out Box Strategic Habitat Units (SHUs)]

The Service, the Geological Survey of Alabama and the Alabama Department of Conservation and Natural Resources began in 2006 to collaboratively focus conservation activities for managing, recovering and restoring populations of federally listed and/or state imperiled fishes, mussels, snails and crayfishes in targeted watersheds and river segments in the state known as [Strategic Habitat Units \(SHUs\)](#) and [Strategic River Reach Units \(SRRUs\)](#). The selection of SHUs and SRRUs facilitates the coordination of watershed management and restoration efforts, as well as focuses funding to address habitat and water-quality issues threatening the areas. The 51 SHUs and SRRUs include a substantial part of Alabama's remaining high-quality waterways, and reflect the variety of habitats historically and presently occupied by the aquatic species of conservation concern in Alabama.

While many of these actions are proposed for the benefits they provide to our trust resource species, removal of river and stream barriers and improvements to stream flow also benefit riverine species like Gulf Coast striped bass, largemouth bass and other host fish species and invertebrates such as crawfish and mussels that depend on suitable water flow and unrestricted access to river resources. At-risk species like the Alabama map turtle and the Pascagoula map turtle will also benefit from stream flow improvements. Improving distribution, quantity, and quality of water to coastal Mississippi, and Alabama will improve conditions for shrimp, blue

crabs, oysters, and saltwater fish species. Improving the quality of upland habitats of this region will also benefit [Species of Greatest Conservation Need](#) like the eastern coachwhip or the slender and the mimic glass lizards. At-risk plants — particularly the sweet pitcher plant and Boykin’s lobelia — would also benefit from management of the longleaf flatwoods in this region.

High Priority Actions Based on the Service’s *Vision*

Continue to develop Strategic Habitat Units (SHU) and complete other coastal watershed management planning efforts (including those involving longleaf pine), and then pursue conservation actions in those areas.

Next Steps

- Implement the SHU concept through the [Alabama Rivers and Streams Network](#) (ARSN) by: identifying threats to aquatic species and riverine biological communities (including factors that reduce connectivity, e.g., dams culverts, etc.); conducting baseline surveys; developing outreach protocols; restoring impacted habitats; and, where applicable, promoting species recovery through reintroductions.
- Work through the ARSN and other partners in Alabama to support the development of statewide water policy and other decision making mechanisms that influence the timing, magnitude, and duration of inflows into the Mobile Delta benefiting migratory fishes (anadromous, diadromous, and riverine), and other estuarine resources (e.g., shrimp, oysters, brackish water fishes, and turtles).
- In Alabama, complete the [11 previously funded \(four are complete\) and 19 recently funded](#) comprehensive watershed plans that identify desired conservation outcomes. Then prioritize and implement conservation projects that will restore and maintain a healthy estuarine ecology in Mobile Bay and the adjacent Gulf waters.
- Using strategies identified from efforts such as the [Coastal Stream and Habitat Restoration and Management Initiative](#), the Alabama Coastal Comprehensive Plan, the [Mississippi Coastal Improvements Program](#) and the [Mississippi Gulf Coast Restoration Plan](#), implement restoration projects to decrease threats to priority coastal streams in Mississippi and Alabama and restore associated habitat and improve water quality in the Mississippi Sound and Mobile Bay.
- Explore the potential to have the Longleaf Partnership Council designate the Mobile Bay Watershed as a Significant Geographic Area. Such a designation would allow partners in the area to form a Local Implementation Team that would be eligible for additional funding from the Longleaf Stewardship Fund

to conduct longleaf restoration/protection and provide a vital connection between the existing Significant Geographic Areas, ultimately benefiting trust resource species.

Remove impediments and integrate bypass structures to improve fisheries access.

Next Steps

- Work with partners (e.g., ARSN and the [Southeast Aquatic Resources Partnership](#)) to improve surveys for fish passage barriers and opportunities for restoration throughout the focal area (e.g., dams on the Conecuh, Alabama, Tombigbee, Choctawhatchee and Pea Rivers in Alabama; the Pearl and Pascagoula in Mississippi; and the Tangipahoa and Tickfaw in Louisiana) for target species.
- Complete the removal of the Pools Bluff sill and Bogue Chitto sill, which collectively block access to more than 300 miles of potential Gulf sturgeon spawning habitat.
- Replace/enlarge undersized culverts that are acting as barriers to enhance passage for managed fishery species and improve water quality for other fish, wildlife and their habitats.
- Using recent telemetry information from the post-*Deepwater Horizon* assessments and additional Service monitoring that indicate significant Gulf sturgeon occupancy beyond areas designated as critical habitat, conduct habitat and population assessments of the following rivers: the Pearl, the Pascagoula, the Tchefuncte, the Tangipahoa, the Tickfaw, Amite and the Comite.
- Prioritize reforestation to strategically improve filtration of runoff within watersheds and to promote aquifer recharge in the interest of stabilizing in-stream flow to maintain suitable substrate composition for Gulf sturgeon and other species known to spawn in the Pearl and Pascagoula rivers, and possibly the Tchefuncte, the Tangipahoa, the Tickfaw, the Amite and the Comite Rivers.
- Restore subsurface aquatic habitat and in-stream flow to natural configuration through in-channel restoration and shoreline stabilization in the Pearl, the Tangipahoa, the Tickfaw, the Tchefuncte, the Amite, the Comite, the Pascagoula and the Mobile Rivers for Gulf sturgeon restoration and to improve recovery of other species, including the inflated heelsplitter mussel, the American eel, the Pearl darter, the Alabama shad and the Gulf Coast striped bass.

Pursue voluntary land acquisition, as well as implement and sustain funding for large-scale and long-term comprehensive habitat management programs. Work with partners and private landowners to achieve large-scale connectivity of suitable habitats for species such as the Mississippi sandhill crane, the gopher tortoise, the Henslow's sparrow, the yellow rail and pitcher plants.

Next Steps

- Develop and/or support existing coordinated partnerships focusing on fire programs (e.g., prescribed fire cooperatives) and invasive species management (e.g., Cooperative Invasive Species Management Areas/Cooperative Weed Management Areas) to maximize funds and acreage outcomes. This includes working with state and other partners to implement collaborative habitat management and monitoring strategies for public lands such as the Mississippi Coastal Preserves, Alabama Forever Wild lands, State Parks and National Estuarine Research Reserves and NWRs to preserve habitat for rare, threatened or endangered species.
- Work with partners such as ARSN to identify key riparian areas for the establishment of possible conservation easements and/or enhanced streamside management zones.
- Expand prescribed burning and invasive species management as needed to maintain and enhance restored coastal savannas and evaluate target species' use of restored habitat on public and private lands (as appropriate).
- Create greater incentives to enlist private landowners in conducting long-term management activities that benefit fish and wildlife species. Possibilities could include geographically expanding programs like [Mississippi's Fire on the Forty](#) program, leveraging funds outside traditional Farm Bill programs, increased cost-sharing and greater regulatory certainty.
- Preserve working forests through voluntary conservation easements and the application of prescribed fire on a regular basis for habitat maintenance.
- Improve the connectivity between habitats for federally listed species that require intact systems for dispersal by using appropriate management techniques such as prescribed fire, invasive species control and hydrologic restoration.
- Work with willing landowners to protect important habitats within the approved acquisition boundaries of Grand Bay and Mississippi Sandhill Crane NWRs (via fee acquisition or conservation easements) to increase connectivity for wildlife and improve long-term habitat management activities and programs.

- Restore appropriate surface flow and implement habitat management activities to as much as 20,000 acres of coastal pine savanna on the Mississippi Sandhill Crane and Grand Bay NWRs using techniques such as pond creation, the installation of water control structures, mechanical treatment, prescribed fire, invasive species control, native ground cover restoration and water management.

Central Gulf and Florida Panhandle Coast

Landscape at a Glance

The complex of coastal habitats (including barrier islands, bays, bayous, beaches and coastal dunes) that span Mississippi, Alabama and extend eastward into the eight coastal counties of the Florida Panhandle are major recreational economic engines as well as the first line of defense from storms originating in the Gulf. This focal area includes some of the most natural beach areas remaining along the Gulf, numerous large bay systems with extensive salt marsh, submerged aquatic vegetation and oyster reef habitats, and a series of barrier islands that protect these coastal systems. Rare features also exist, such as the 15 coastal dune lakes in Florida (characterized by having a dynamic, intermittent connection with the Gulf and designated as “imperiled globally” by the Florida Natural Areas Inventory) located within two miles of the beach.

The habitats that make up this focal area are shaped by a number of dynamic processes including freshwater inflow and movement of sediments. The mixture of freshwater inputs and the saline Gulf waters create a series of highly biologically diverse coastal systems across all three states that support both freshwater and saltwater species. Beaches and dunes also provide wintering and nesting habitat for many wildlife species, including the federally listed piping plover, the red knot, the rare Gulf Coast solitary bee, four species of federally endangered beach mice and four species of sea turtles.

The protection, conservation, and persistence of these coastal areas and their mosaic of habitats represent some of the greatest needs in this focal area. Coastal development, extensive recreational activities, alteration of the natural longshore transport of sediments, and altered hydrology of the local bays and bayous has led to habitat fragmentation and other challenges. For example, 15% of the coastal marshes south of Interstate 10 in Mississippi and 90% of their oyster reefs have been lost since the 1950s. The Service is engaged with partners to implement existing species action and recovery plans within coastal counties that can achieve the appropriate balance between human use and a sustainable environment. In addition to the High Priority Actions presented below, implementing measures to address the High Priority Actions discussed in the Central Gulf Lands and Florida

Panhandle Lands focal areas will ultimately have cumulative landscape level benefits in the coastal systems that improve and increase habitat for foraging, nesting, migrating and wintering fish and wildlife species that use these beaches and their associated habitats.

At least 93 species of both resident and migratory birds were exposed to *Deepwater Horizon* oil in multiple habitats across all five Gulf states, including open water, islands, beaches, bays and marshes. Restoration planning will address the broad diversity of injured bird species; in doing so, we will identify where restoration would provide the greatest benefits within their geographic ranges. For example, approaches to restoring injured bird species include conserving bird nesting and foraging habitat; creating, restoring, and enhancing coastal wetlands; restoring and enhancing dunes and beaches; creating, restoring and enhancing barrier and coastal islands and headlands; restoring and enhancing submerged aquatic vegetation; protecting and conserving marine, coastal, estuarine, and riparian habitats; establishing or re-establishing breeding colonies; and preventing incidental bird mortality.

Target Species

Implementing projects that restore or maintain a more natural mosaic of coastal dunes, beach and shoreline components will benefit multiple species guilds, including foraging and nesting habitat for endangered beach mouse species, nesting substrates for breeding shorebirds and sea turtles, and valuable foraging habitat for many wintering shorebirds, including piping plovers, red knots and American oystercatchers. Natural beach habitats also provide appropriate sand compaction for the burrowing Gulf Coast solitary bee, which is endemic to a narrow band of coastline between eastern Mississippi and the Florida Panhandle.

Conserving additional acreage and reducing disturbance to sensitive beach and dune areas will improve the potential for achieving recovery goals and population objectives for the following federally listed species: the Alabama, Perdido Key, and Choctawhatchee beach mouse (self-sustaining populations in critical habitat areas; ≥ 50 percent of the critical habitat protected and occupied); the green sea turtle (average of 5,000 nests/year in Florida for at least six years, with > 25 percent of available nesting beaches in public ownership and accounting for 50 percent of nesting activity); and the loggerhead sea turtle (annual rate of increase over a generation/50 years is > 3 percent resulting in a total annual number of nests of 4,000 or greater for the Northern Gulf of Mexico recovery unit).

In addition, such actions will increase the possibility for achieving the population objectives for other species such as the black skimmer (3,408 pairs); the least tern (9,606 pairs); and the Wilson's plover (a portion of 5,000 individuals across the Southeast Coastal Plain, Peninsular Florida, and the Caribbean).

Other than sea turtles, most of our trust resource species in this focal area are terrestrial, but many of the proposed actions to protect or enhance the beach and dune habitats that support them will also have significant benefits to other species. For example, restoration actions that we view as protective measures, like creating living shorelines, oyster reefs, and seagrass beds, will improve water quality and provide better foraging and nursery habitat for blue crabs, mollusks, and many marine prey species. Those actions will also provide important angling opportunities as they attract many recreationally popular species like red drum, speckled trout, and black drum. Additionally, installing appropriately sized culverts will improve access to coastal lake resources for commercially and recreationally important fish species.

High Priority Actions based on the Service's *Vision*

Reduce disturbance in important beach mouse, shorebird and sea turtle nesting areas (e.g., implement beachfront lighting programs and control non-native and nuisance wildlife to reduce nest predation)

Next Steps

- Implement mechanisms to reduce year-round highway mortality for multiple susceptible wildlife species, especially during primary nesting seasons to prevent road kill of [shorebird species](#).
- Continue implementation of a [Wildlife Friendly Lighting Program](#) on beachfront public and private lands to reduce impacts of artificial light pollution on nocturnal species. The program should include an assessment of problem lighting, and the development of a lighting reference guide that provides recommended retrofit solutions based on the most current technology.
- Expand the scope and funding (beyond the beach) for Wildlife Friendly Lighting Programs on public and private lands to potentially benefit all nocturnal species by reducing impacts of artificial light pollution throughout coastal counties (e.g., partner with local power companies to replace traditional street lamps with improved light sources on coastal county roadways).
- Develop a permanent funding mechanism to annually operate predator and exotic species management programs for beach and dune habitat, primarily on public lands (e.g., perpetually fund the existing USDA's Animal and Plant Health Inspection Service predator control efforts that remove targeted predators and the installation of predator-proof trash receptacles at designated beach access points).

- Support and conduct public outreach to reduce human activities that result in the increased presence of common predators near nesting beaches, such as outreach efforts aimed at informing the public about the impacts of feeding gulls.
- Continue to implement annual programs (e.g. “post-and-rope,” site stewards and other outreach techniques) in targeted areas of beach and dune habitat to remove direct human disturbances.
- Continue to enforce existing protective measures (e.g., dog prohibitions and/or leash laws; violations within “post-and-rope” nesting or wintering shorebird areas; walking on dunes; and vehicle speed limits on coastal barrier island roads containing nesting shorebirds) for the benefit of important trust resource species on public lands.
- Secure funding for necessary research, data support and outreach to potentially develop a multi-species conservation approach for federally listed sea turtles, shorebirds, beach mice and the solitary bee.

Work with landowners to acquire, protect, and conserve beach and coastal dune system habitats important for nesting sea turtles, shorebirds and beach mice through voluntary agreements.

Next Steps

- Work with willing sellers to acquire (via fee acquisition or conservation easement) inholdings within the acquisition boundary of Bon Secour NWR, and lands adjacent to other public lands (e.g., Gulf State Park, Bureau of Land Management and Fort Morgan Historic Site) to protect habitat, maintain connectivity, provide storm protection and provide recreational benefits.
- Support the establishment of a coastal buyout program for willing sellers of undeveloped coastal properties and storm-threatened or damaged homes to augment conservation land across the coastal landscape.
- Establish and/or expand programs to provide native plants (e.g., Grasses in Classes, USDA’s NRCS’ Plant Materials Centers) and sand fencing for public and private lands to encourage use of landscaping that can help reduce the impacts of coastal erosion.
- Increase habitat for nesting, wintering and migratory bird use by using dredge material to create or expand existing areas, including the creation of foraging mud flats on the bayside and dune habitats (as appropriate).

- Manage and/or maintain native habitats (including on private lands) to improve habitat connectivity for federally endangered species such as beach mice that require intact systems for dispersal.
- Improve habitat conditions for coastal forested habitats and grasslands through mowing and/or prescribed fires on private and public lands within coastal counties to benefit migratory birds, marshbirds and multiple at-risk species.
- Support cooperative partnerships (e.g., Six Rivers Cooperative Invasive Species Management Area and other Cooperative Weed Management Areas) established to control invasive species throughout the focal area on both public and private lands.
- Replace/enlarge undersized culverts that are acting as barriers to enhance passage for managed fishery species and improve connectivity and water quality for other fish and wildlife species and adjacent salt marsh habitat.
- Restore habitat structure (e.g., by removing invasive woody plants), species diversity (e.g., by planting native carnivorous bog plants and orchids) and ecological processes (e.g., applying prescribed fire) to wetlands in the coastal dune lakes watersheds, thereby reestablishing historic levels of submarine groundwater discharge to the Gulf and nutrient poor soil conditions that favor seepage slope and wet prairie communities.

Work with federal, state and local governments, and other landowners to minimize detrimental impacts of beach, dune and shoreline management activities (i.e., hardening, nourishment, and wrack removal) and encourage use of living shoreline stabilization techniques to protect eroding shorelines in Gulf bays and bayous as appropriate.

Next Steps

- Create public educational media campaigns and outreach programs to increase the protection of wrack (organic material including sargassum that is cast up onto the beach by surf, tides and wind) that serves as a food source for many species is a foundation for dune establishment and an inhibitor of erosion.
- Provide outreach that encourages the use of best management practices in beach renourishment projects such as those involving natural dune restoration components and timing (e.g., conduct renourishment activities outside of sea turtle and shorebird nesting seasons).
- Promote the use of lightweight folding chairs that can be placed in overnight storage boxes during sea turtle nesting season rather than large, heavy

wooden beach loungers which impede nesting turtle access; and increase awareness of how beach trash attracts predators.

- Identify and prioritize eroding bay and estuarine segments that are susceptible to shoreline hardening for eventual voluntary application of living shoreline treatments by landowners. Develop living shoreline education and [outreach information](#) for public and private property owners, thereby steering protection towards softer alternatives and away from hardening.
- Establish best management practices for living shoreline treatments (including saltmarsh and oyster reef components) in bays and estuaries to ensure installation only where needed and appropriate and to increase probability of successful shoreline stabilization with natural habitat elements.
- Establish nursery plant supplies that include a diverse mix of native species suitable for planting along the entire wetland-to-upland living shoreline profile, as well as the sandy dune profile for beach mice (where applicable).
- Where appropriate (i.e., water quality is sufficient), restore oyster reefs to provide enhanced nursery habitat for commercially and recreationally important species.
- Establish oyster shell recycling programs to provide material for oyster restoration efforts.
- Encourage the implementation of proactive projects that could decrease post-storm related recovery and response efforts (e.g., replace gravel driveways whose materials scatter across coastal dune systems during tropical storms with more environmentally friendly materials).
- Facilitate natural recovery of seagrasses and other submerged aquatic vegetation by means such as estuary-based planning for key watersheds.

Florida Panhandle Lands

Landscape at a Glance

Generally situated inland from the Florida portion of the Alabama and Florida Coastal Beaches and Dunes focal area, this focal area's geography spans roughly across 200 miles of the five most western counties of Florida, from the mainland coast to north of Interstate 10. The Panhandle Lands focal area is known for having exceptionally high biodiversity within its longleaf pine and riparian hardwood

forests, floodplains and abundance of springs, subterranean streams and rivers. This once sparsely populated agricultural area is now experiencing accelerated population growth as it serves as a major tourist destination and is home to several large military installations. The interconnection of these habitats and human use plays a significant role in both the quality and quantity of water that enters the nearshore Gulf waters, which also contains one of the largest and most pristine seagrass beds in North America.

The six major watersheds throughout this landscape are being impacted by a variety of threats associated with increased development pressure and habitat alterations, including habitat fragmentation; nonpoint source pollution; sedimentation resulting from issues such as stream bank instability and unpaved road crossings; and drainage from domestic and industrial wastewater reuse facilities. The greatest conservation needs within the Panhandle Lands Focal Area are concentrated on improving water quality, restoring watersheds by improving hydrologic processes, and implementing additional land conservation that not only improves water quality and quantity but also creates ecological corridors and improves habitat connectivity. The Service is keen to work with partners to advance present and potential future efforts to achieve these goals.

Target Species

Despite the relatively high biodiversity of this focal area, there are relatively few target species that have established biological objectives. This lack of objectives has hampered the Service's ability to specifically tie conservation actions to resulting species benefits in this area. To move from an opportunistic to a coordinated, efficient approach to restoration and conservation here, we need scientifically solid biological objectives for more target species. Implementing actions to restore or maintain sufficient water quantity and quality levels, however, will assist in reaching the recovery goals for fish like the Okaloosa darter (one of the few species with established objectives, i.e., populations in all six stream systems remain stable or increasing for a 20-year hydrologic cycle) and the Gulf sturgeon (which has the general objective of long-term self-sustaining populations). These efforts will also benefit numerous federally listed freshwater mussels without approved recovery plans (e.g., the round ebonyshell, the southern kidneyshell, the Choctaw bean and the fuzzy pigtoe). The upland habitats of this focal area are also home to pine-dependent species, like the red-cockaded woodpecker (with recovery plan goals recognizing Eglin Air Force Base as a primary core population potentially supporting 350 breeding groups, and Blackwater River State Forest/Conecuh National Forest identified as a secondary core potentially supporting 250 breeding groups). Work in pine forests would also benefit other federally listed species for which no quantitative recovery objectives exist, including both the frosted and reticulated flatwoods salamander and the eastern indigo snake.

We propose restoration actions that will reduce instream sedimentation and chemical pollution to improve water quality and spawning habitat for our trust

resource species, but many other recreationally and ecologically important species like shoal bass, largemouth bass, Gulf Coast striped bass, catfish and invertebrate prey species will experience the same improvements. At-risk species like the coastal flatwoods crayfish and the Panama City crayfish would also benefit. Removing impediments to access like dams and culverts will expand the resource base and increase abundance for those species that depend on large areas of river like the Gulf sturgeon, but also shad and other migratory aquatic species. Coastal species like oysters, shrimp, blue crabs, red drum and reef fish will benefit from better water quality and suitable flow of freshwater into estuaries. Similar to the benefits accrued in the Central Gulf Lands Focal Area, improving the quality of the upland habitats of this region will not only benefit our trust resource species such as the red-cockaded woodpecker and flatwoods salamanders, but also [Species of Greatest Conservation Need](#) like the eastern coachwhip and both the slender and the mimic glass lizards. Terrestrial mammals like white-tailed deer, turkeys and squirrels, as well as at-risk plants — particularly the sweet pitcher plant and Boykin’s lobelia — would also benefit from management of the longleaf flatwoods in this region.

High Priority Actions Based on the Service’s *Vision*

Improve water quality and quantity for the Gulf sturgeon, shellfish (including freshwater mussels and oysters), seagrass beds, fisheries, and migratory birds.

Next Steps

- Support and encourage the development of formal partnerships focused on estuary ecosystem restoration that can use the information in updated [Surface Water Improvement and Management plans](#) (as well as outputs from other efforts described below) to prioritize restoration needs and seek funding for project implementation.
- Provide support for voluntary water quality monitoring programs to assess numeric nutrient criteria affecting listed freshwater mussels and additional at-risk aquatic species.
- Identify nutrient pollution impacts to fish and wildlife within six major watersheds (Escambia, Yellow, Choctawhatchee, Chipola, Ochlocknee and Perdido).
- In areas in which it would provide the most significant water quality benefits for fish and wildlife, retrofit current wastewater treatment technology and convert septic systems to sewer systems in targeted sub-watersheds to reduce nutrient pollution impacts.
- Use the completed Sediment Threat Assessments for Chipola, Yellow, and Choctawhatchee watersheds to create a prioritized list of unpaved road

crossings and fisheries impediments to be included for improvement in the State Water Management District Basin Restoration Plans.

- Complete Sediment Threat Assessments for the remaining major watersheds within the focal area (i.e., those of the Escambia, Ochlockonee and Perdido Rivers).
- Work with federal, state and local partners (including counties) to complete, as appropriate, the remaining full Watershed Threats Assessments (including factors such as pollutant loading and fish passage barriers) to identify and quantify habitat degradation for these six watersheds and their associated major tributaries and develop restoration recommendations for each watershed.
- Implement activities such as the paving of roads, restoration of active “borrow pits” (areas where material has been dug for use at another location), and removing other barriers to fish passage within priority areas identified in the above planning efforts to improve the quality of and access to freshwater habitats.
- Implement best management practices such as livestock exclusion devices and solar-powered wells to reduce damage incurred by livestock including bankside erosion, sedimentation and nonpoint source pollution to improve water quality and habitat affecting listed freshwater mussels and fish.

Target voluntary land conservation that buffer military lands and provide improved water quality in places such as Tyndall and Eglin Air Force Bases.

Next Steps

- Apply the [“Green Links”](#) Landscape Conservation Model to identify and prioritize Panhandle Lands that provide habitat connectivity and have the highest ecological value for restoration and conservation of 79 state-listed species known to occur within this focal area.
- Work with landowners (through voluntary fee acquisition and/or conservation easements) to connect existing conservation lands, decrease the potential for further habitat fragmentation and protect groundwater recharge areas within these high priority habitats, all of which will benefit the dozens of listed and at-risk species that occur in this area.
- Capitalize on partnerships such as the U.S. Department of Defense Readiness and Environmental Protection Integration Program, Southeast Regional Partnership for Planning and Sustainability, USDA’s NRCS’ Regional Conservation Partnership Program, and others to identify opportunities to

protect military buffer lands from development and protect water resources, habitat quality and listed species.

Work with existing partnerships to restore priority habitats such as longleaf pine in order to enhance and maintain floodplain functions, thereby increasing water quality and quantity.

Next Steps

- Work within the Eglin Air Force Base/Blackwater State Park/Conecuh National Forest Significant Geographic Area identified by the Longleaf Partnership Council to restore and maintain open multi-aged, historic pine communities.
- Support partnerships such as the Gulf Coast Plains Ecosystems Partnership to advance adaptive management through the exchange of forest management information and aquatic restoration techniques and technology.
- Coordinate and conduct prescribed fires to enhance and restore natural communities and reduce hazardous fuels.
- Increase public awareness through the development of education and outreach programs about the importance of long-term water protection investments to both humans and the environment.
- Promote partnerships and on-the-ground management/control actions that reduce the threat of terrestrial and aquatic invasive species and their impact on native habitats.
- Implement the [Coastal Headwaters project](#), a joint effort by The Conservation Fund and Resource Management Service LLC, to restore more than 200,000 acres in Florida and Alabama to longleaf pine, thus preserving ecological functions and maintaining these acres as working forests.

Greater Apalachicola Basin

Landscape at a Glance

The Apalachicola River Watershed Focal Area lies at the terminus of the Apalachicola-Chattahoochee-Flint (ACF) River system in Northwest Florida and accounts for the second largest freshwater inflow to the Gulf via the Apalachicola River – which is also 35 percent of the west coast of Florida’s total freshwater input. Approximately 75 percent of the ACF basin, however, is within the state of Georgia, beginning north of Atlanta.

In conjunction with major freshwater inputs, the Apalachicola River basin has nationally significant forests and some of the highest biological diversity east of the Mississippi River, including the greatest number of freshwater fish species in Florida (86 identified) and habitats for more than 300 bird and more than 50 mammal species. Diminished flow rates resulting from recent droughts and upstream consumptive water uses have impacted the ecology of the river systems and, subsequently, the ecology of Apalachicola Bay, which is directly influenced by the amount, timing and duration of freshwater inflow from the Apalachicola River. The coastal systems of this focal area also include critical habitat for two federally listed species, the wintering piping plover and the Gulf sturgeon. These coastal systems are nationally recognized for their important environmental resources through such designations as a State Aquatic Preserve, Outstanding Florida Waters, National Estuarine Research Reserve and a Marine Protected Area.

Perhaps the greatest overall conservation need in the ACF basin, and thus this focal area, is a coordinated approach to managing resources in a way that balances economic, ecological and social needs. Although only 14 percent of the Apalachicola River basin (approximately 2,800 square miles) is in Florida, much of this is publicly managed land that could potentially contribute to the health of the river and the bay through increased water quality and quantity. For example, nearly 11 percent of the rivers, streams, creeks and tributaries of Florida's portion of the Apalachicola basin originate in or flow through the Apalachicola National Forest.

The Service has confidence that identifying conservation measures and implementing restoration activities to achieve water efficiency -- incorporating adaptive management for fish and wildlife resources to water control operations, predictive drought management, and investment in science -- will likely offer tangible opportunities to improve water quality and quantity. We also believe it is important for partners and stakeholders to join us in considering the importance of adaptive management, given the multifaceted suite of issues and opportunities affecting this landscape. The resulting effect of increased water return will ultimately improve the area's ecosystem health and habitat for numerous threatened and endangered species.

Target Species

Efforts to ensure adequate water quantity and quality in the Apalachicola watershed will support sustainable populations of the focal area's rich diversity of aquatic biota. Numerous federally endangered mussels are found in the region, including the fat threeridge, the shinyrayed pocketbook, the Gulf moccasinshell and the oval pigtoe. The purple bankclimber and the Chipola slabshell, federally threatened species, are also found here. Such efforts will also likely benefit the recovery of the federally threatened Gulf sturgeon, whose overall population objectives are couched as catch-per-unit-effort during monitoring, with a short-term target of no decline from the baseline level over a three-to-five-year period; and a long-term target of

having efforts underway to restore lost or degraded habitat and the population demonstrated to be self-sustaining.

Similar to the uplands of the Panhandle lands, the terrestrial habitats of the Apalachicola watershed support many pine-dependent species such as the reticulated and the frosted flatwoods salamanders and the eastern indigo snake; however, quantitative population objectives do not exist for many of them. Though there is a recovery plan for red-cockaded woodpeckers, no core or secondary populations occur in this focal area. A number of plants are endemic to this region, including some that are federally threatened and for which recovery objectives have been established (e.g., the Godfrey's butterwort and the Florida skullcap, each with an objective of 15 managed and protected populations across their historic range).

We place an overall emphasis on improved water quality in this focal area to help recover species like Gulf sturgeon and endangered mussels. However, water quality and flow improvements from land conversion and enhanced wastewater treatment as well as sediment reduction features like living shorelines and improved roads will also benefit many other freshwater aquatic species like Gulf Coast striped bass, Alabama shad, shoal bass, and at-risk mussels like the Apalachicola floater and saltwater species like oysters, red drum, flounder, and more. Similarly, we promote actions that restore or enhance resilience and natural conditions of native pine communities for our target species. Those will also aid other animals such as white-tailed deer, turkeys, and squirrels through improved forest management.

High Priority Actions Based on the Service's *Vision*

Improve water quality and quantity in the Apalachicola River watershed for the Gulf sturgeon, shellfish (including freshwater mussels and oysters), seagrass beds, fisheries and migratory birds.

Next Steps

- Encourage partners to include the freshwater flow needs of the Apalachicola River, floodplain and bay in planning efforts in order to provide long-term benefits for fish and wildlife conservation.
- Support and encourage the development of additional formal partnerships focused on estuary ecosystem restoration that can use information in [Surface Water Improvement and Management Plans](#) (as well as outputs from other efforts described below) to prioritize restoration needs and seek funding for project implementation.
- Identify and prioritize eroding segments along Apalachicola Bay that degrade water quality and benthic habitat, followed by the application of living shoreline stabilization treatments where needed and appropriate by

voluntary landowners to restore natural habitat elements, control erosion and improve water quality.

- Improve water quality to Apalachicola Bay by identifying and reducing point source nutrient (nitrogen and phosphorus) pollution inputs and implementing necessary habitat restoration actions to benefit estuarine species.
- Improve water quality and habitat in the Chipola River Watershed for the Gulf sturgeon and freshwater mussels using sediment retention basins; restored runoff conveyance systems at unpaved road crossings identified as having “poor condition” and a “high sedimentation risk”; restoration of fish passage where barriers have been identified; and paving of roads at identified stream crossings contributing high sediment loads.
- Restore and maintain St. Vincent Island (part of the St. Vincent NWR) to ensure healthy and viable ecological communities, with an emphasis on migratory birds and threatened and endangered species. Activities may include hydrologic restoration through road removal in place of low water crossings and culvert placement, prescribed fire, and seasonal manipulation of water that provides or enhances habitat for migratory birds and fresh and saltwater fish species.
- Work with willing landowners to protect lands via fee acquisition and/or conservation easements within the approved acquisition boundary of St. Vincent NWR to benefit migratory birds and threatened and endangered species.
- Complete, as appropriate, the full Watershed Threats Assessment (including factors such as pollutant loading and fish passage barriers) to identify and quantify habitat degradation throughout the watershed and develop restoration recommendations.
- In areas in which it would provide the most significant water quality benefits for fish and wildlife, retrofit current wastewater treatment technology and convert septic systems to sewer systems in targeted sub-watersheds to reduce nutrient pollution impacts and improve the overall water quality of Apalachicola Bay.
- Implement best management practices such as livestock exclusion devices and solar-powered wells to reduce damage incurred by livestock including bankside erosion, sedimentation and nonpoint source pollution to improve water quality and habitat affecting listed freshwater mussels and fish.

Work with partners to identify important conservation opportunities to protect water quality including the acquisition of permanent conservation easements and/or fee title lands in vulnerable watershed areas such as the Flint River, especially Spring Creek.

Next Steps

- Explore opportunities to provide long-term forest protection through conservation easements or fee acquisitions to maintain water quality and keep healthy populations of targeted fish and wildlife species on the landscape.
- Implement existing water-use efficiency and conservation policies and practices.
- Provide incentives and opportunities to agricultural stakeholders to implement management practices (e.g., equipment retrofits, center pivot irrigation systems and sod-based rotation tillage practices) that will help increase base flows.
- Work with water users to implement actions that maximize water returns, including the targeted conversion from septic to sewer systems (i.e., in areas in which it would provide the most significant water quality benefits for fish and wildlife); the development of storm water management strategies; and minimizing land use for agriculture to increase groundwater infiltration.
- Encourage development that is both economically feasible as well as environmentally sensitive. For example, strive to meet commercial and recreational navigation needs while preserving or enhancing aquatic habitat.
- Increase the scientific knowledge throughout the focal area and overall ACF basin by completing studies identified as priority in the [Surface Water Improvement and Management Plan for the Apalachicola-Chattahoochee-Flint River Basin](#).

Florida's Big Bend

Landscape at a Glance

The Big Bend Focal Area in the northeastern Gulf extends generally from the eastern boundary of the Apalachicola-Chattahoochee-Flint River Watershed to the southern boundary of the Chassahowitzka NWR in Citrus County. This area is the largest remaining stretch of undeveloped coastline in the continental United States and includes a myriad of conservation lands managed by private landowners and public agencies, including the Service, the Department's Bureau of Land Management, the

U.S. Forest Service and the Florida Department of Environmental Protection. The ecosystem is primarily defined by water, consisting of surface water, groundwater, springs and several large rivers. Many of the focal area's rivers, such as the Ochlockonee, Wakulla, St. Marks, Aucilla and Suwannee, transition into estuaries and eventually into the Gulf. Notably, the Suwannee River Estuary System has been designated an Outstanding Florida Water and a State Seagrass Aquatic Preserve and contains a National Wildlife Refuge.

The distinctive karstic geology within the Big Bend connects the Floridan aquifer and surface waters via a dense collection of sinks (i.e., diffuse depressions in the ground that connect below the surface), swallets (i.e., natural depressions that serve as conduits for surface water to become ground water) and the densest collection of springs in the world. As such, this is an area of high groundwater recharge and the Floridan Aquifer provides the primary source of drinking water in much of the watershed. The mixture of warm temperate forests, wetlands and swamps, springs, tidal and black water rivers, and productive estuarine habitats in this focal area support a diverse assemblage of fish, wildlife and plant communities, including several protected species such as the red cockaded woodpecker, swallowtail kite, frosted flatwoods salamander, Florida salt marsh vole, piping plover, Gulf sturgeon and West Indian manatee. Other estuarine-dependent bird species in this focal area include the American oystercatcher, reddish egret (and other wading birds), and wood stork. In addition, the Suwannee River spring system contains the greatest diversity of exclusively cave-dwelling fauna in the world.

Many of the resource issues within this focal area relate to water quantity and quality, including flooding and drought situations, as well as to habitat alteration and degradation that have cumulative impacts on the overall landscape. Perhaps the greatest conservation challenge to the Big Bend's economy and rural culture is continued landscape conversion from forests and other low-intensity uses to more water-intensive land uses. These uses rely on greater groundwater withdrawals which not only mean less water is available within the system, but the potential for cascading effects such as diminished water quality (e.g., nitrogen loading that causes eutrophication problems within springs and rivers) and, subsequently, habitat alterations in the surrounding aquatic ecosystems. Improving water quality and quantity is essential to restoring and protecting the area's natural resources such as oyster bars and seagrass meadows, recreational and commercial fisheries, and numerous habitats for wetland-dependent species. Using tools such as conservation easements and payments for ecosystem services with willing private landowners to build connections to important large forested tracts and/or link to existing conservation lands are a priority for this area. Protected lands could also serve as important coastal-to-inland corridors for wildlife impacted by sea level rise. The Service is pleased to see momentum is building around the need to develop integrated water resource management within the Big Bend landscape to promote sustainable solutions in a holistic manner, focusing on environmental protection, economic development and social well-being. We support conservation partners who are beginning to act (e.g., the Suwannee

River Water Management District is in the process of updating their Surface Water Improvement and Management plan) and encourage others to do the same.

Target Species

Working with both public and private landowners to restore or maintain water quality and quantity and hydrologic connectivity across the Big Bend Focal Area will move us closer to achieving our recovery goals and meeting our population objectives for two federally listed species, the West Indian manatee (recently proposed for reclassification to threatened) and the Gulf sturgeon. Population objectives for the threatened Gulf sturgeon are a catch-per-unit-effort during monitoring, with a short-term target of no decline from the baseline level over a three-to-five-year period; and a long-term target of having efforts underway to restore lost or degraded habitat and the population is demonstrated to be self-sustaining.

Further developing a coordinated and comprehensive approach to watershed management will inform restoration planning efforts to directly and indirectly benefit the flatwoods salamander, shore and wading birds and the numerous freshwater mussels and cave fauna endemic to the region. As well, such planning efforts could potentially prevent the listing of animals such as the Gulf Coast salt marsh mink, Suwannee River alligator snapping turtle, and gopher tortoise.

The primary focus of work in this geography revolves around the immediate needs related to sustaining natural resources and ecosystem services that support local economies of the area (i.e., coastal and hardwood hammock forests for timber and aquatic resources for shellfish production). The Service recognizes the important contributions of habitats that also address our population sustainability goals for non-breeding habitat of the federally listed piping plover (3,000 individuals), the red knot (20,000 individuals) and whimbrel (18,810 individuals)(Note: these objectives are for a broader geography, including the Southeast Coastal Plain, Peninsular Florida, and the Caribbean). Population objectives also exist for open pine species like the endangered red-cockaded woodpecker.

In addition, the Service sees this focal area as a potential contributor to the recovery of species identified as federally endangered, threatened, or at risk; or as imperiled by the [state of Florida](#). This focal area also serves as an inland wildlife movement corridor, especially for large predators, that could mitigate some of the impacts of sea level rise in the Big Bend region. The Service will continue to work with partners to meet our shared objectives for priority species and habitats in the Big Bend.

Our priority on restoring water quantity, quality and hydrology stems from our mission to recover Gulf sturgeon and West Indian manatee populations and further protect and restore other trust species such as frosted flatwoods salamander, key bird species, and salt marsh vole, and averting the listing of animals such as the Gulf

Coast salt marsh mink and Suwannee River alligator snapping turtle. However, we will achieve our objective with those species by incentivizing water use practices that will more effectively recharge aquifers that supply water to local communities and maintain water levels in streams and rivers. This would lead to commercial fisheries and recreational fishing for species such as Gulf Coast striped bass, red drum, speckled trout, southern flounder, black drum, Spanish mackerel, tripletail, cobia, and tarpon also being improved. Creating oyster reefs not only improves water quality in estuaries for the Gulf sturgeon and manatees but it also provides additional angling opportunities, shellfisheries (particularly scallops) and saltwater fish habitat. Forest management would also benefit the Florida pine snake and the gopher tortoise — both [State Species of Greatest Conservation Need](#) in Florida and at-risk or candidate species in this focal area.

High Priority Actions Based on the Service's Vision

Work closely with willing private landowners, local communities, and the State of Florida to conserve working landscapes for present and future generations to ensure economic sustainability through the protection and conservation of ecosystem services that support local economies, and cultures.

Next Steps

- Develop a long-term regional strategy for the Big Bend landscape that includes conservation and restoration priorities, [economic development](#) and community outreach which support and encourage natural resource based economies.
- Create and incorporate into a regional strategy an oyster restoration plan for Dixie, Levy, Taylor and Jefferson counties that can provide guidance to restoring high quality historical oyster reefs close to freshwater sources to protect and enhance estuarine salinity regimes that will also benefit trust resource species.
- Use output from the Gulf Land Conservation Tool along with that of other strategic landscape conservation design efforts to identify priority areas (e.g., lands south of U.S. Highway 98; southeast of Panacea; south of the Ochlockonee River; and the Wacissa River drainage basin) and work with willing private landowners to support working landscapes, provide support to sustainable resource-based economic activities and improve habitat for target species. Activities may include: the development of best timber management practices; prescribed burning; marsh management; and voluntary land conservation through conservation easements or management agreements.
- Work with willing landowners and State partners to protect important coastal to inland corridors within the approved acquisition boundary of St.

Marks and Lower Suwannee NWRs, through a combination of fee acquisitions and conservation easements, which will provide benefits for wildlife and plants impacted by sea level rise.

- Develop multi-partner approaches to conservation including exploring opportunities with the [Department of Environmental Protection's Florida Forever Program](#); USDA's [NRCS Agricultural Conservation Easement and Healthy Forest Reserve Programs](#); [Florida Forest Service Rural and Family Lands Protection](#) and [Forest Legacy Programs](#); and [Florida Fish and Wildlife Conservation Commission programs such as Landowner Assistance](#) and [Aquatic Habitat Conservation and Restoration Programs](#).

Restore the watershed's natural hydrologic processes by addressing withdrawals and diversions that reduce water quantity. The goal is to restore and enhance springs, rivers, wetlands and estuarine habitats; enhance marine habitats such as oyster bars and seagrass meadows, aquaculture, and recreational and other commercial fisheries; and enhance habitat for wetland dependent species.

Next Steps

- Work through voluntary incentive programs in the Suwannee watershed, including portions of the Floridan Aquifer, to aid in sustainable water use that balances human use and the protection of ecological resources and services, particularly of freshwater mussel species. For example, utilize voluntary programs that promote practices such as tailwater recovery and irrigation improvements to conserve water.
- Create nonstructural solutions for flood management such as the purchase of floodplain lands and hydrologic restoration of drained areas to restore aquifer recharge and reduce nutrient concentrations to meet the established numeric criteria in springs.
- Achieve water quality improvement by reducing contamination loads entering into the system (e.g., assessed through monitoring of regional indicator species health).
- Work in concert with State Water Management Districts who will adopt existing minimum flows and levels for rivers and springs to ensure adequate water supply to benefit target species, and improve freshwater deliveries to coastal ecosystems by ensuring adequate aquifer storage that will support critical habitat for the Gulf sturgeon and manatee, as well as estuarine feeding areas for wading birds.
- Conduct nearshore oyster reef restoration to provide shoreline erosion protection and help improve the quality and resilience of coastal salt marsh habitat for fish and wildlife species.

- Cooperatively work with private landowners to restore natural hydrology in areas with exacerbated flooding problems or high recharge of fresh water. This could include voluntary land conservation within the [St. Marks NWR acquisition boundary](#) to protect key estuaries.

Restore water quality within the basin by working with private landowners, local communities, and the State of Florida to implement land management practices that slow runoff, filter sediment, increase submerged aquatic vegetation, and reduce pesticides and nutrients from entering the water.

Next Steps

- Increase adoption and proper implementation of agricultural best management practices within nutrient-impaired watersheds and springsheds (i.e. areas within a ground or surface water basin that contribute to the spring flow).
- Expand incentives and work with willing landowners to implement best management practices that reduce or eliminate significant water use and nutrient runoff on priority springshed lands.
- Implement habitat maintenance and restoration activities that promote a fire regime in fire-dominated ecosystems to facilitate healthy forests supporting aquifer recharge, plants and wildlife.
- Continue to develop public-private partnerships to restore natural hydrology on private lands and create incentives for private landowners to practice sustainable activities to help reduce the rate of surface water runoff and reduce pollution and flooding while rehydrating wetlands and/or increasing aquifer recharge.

Tampa Bay

Landscape at a Glance

The Tampa Bay watershed drains approximately 2,400 square miles and portions of six counties within the western-central Florida peninsula. Tampa Bay proper is Florida's largest open water estuary (400 square miles) and encompasses four Aquatic Preserves (Boca Ciega Bay, Cockroach Bay, Pinellas County and Terra Ceia Bays) and drainage from several major rivers and more than 100 tributaries. The suite of island refuges found in Tampa Bay (i.e., Passage Key, Egmont Key and the Pinellas NWRs) is important to the natural and cultural history of the area.

It is estimated that more than four million residents currently live in the three counties surrounding Tampa Bay, with at least 500 new residents moving to the area per week. This growth, coupled with the fact that one in every five jobs in the focal area depends on a healthy Tampa Bay, suggests that the greatest conservation challenge for this focal area is that of maintaining a healthy ecosystem while simultaneously balancing the need to mitigate past environmental impacts with acknowledging current and future human needs. Efforts by conservation partners over the past couple of decades have proven that this challenge is not insurmountable. In fact, the Tampa Bay Estuary Program reports that their 1995 goal of restoring seagrass acreages to levels not seen since the 1950s was exceeded in 2015. The Service recognizes, however, that now is not the time to be content as continued rapid urbanization and potential effects from climate change necessarily focus our attention looking forward.

Target Species

Despite its urban setting, Tampa Bay hosts a wide variety of habitats -- from freshwater springs and subtropical hardwood forests to beaches, dunes and extensive seagrass beds -- that are home to more than 200 species of fish and some of the most diverse colonial waterbird nesting populations in North America. More than two dozen species of nesting herons, egrets, ibis, gulls, terns and shorebirds have been documented. The Tampa Bay estuary has the largest royal and sandwich tern nesting colonies, the most nesting American oystercatchers, and the largest brown pelican rookeries in Florida. In addition, it is home to at least five species of insect-eating bats, beach-nesting sea turtles, resident dolphin pods, and up to one-sixth of Florida's West Coast manatee population during the winter months.

The Tampa Bay Estuary Program has set quantifiable habitat restoration targets based on the requirements of a suite of indicator species. Included in the assemblage of 38 indicator species are several target species for the Service: the threatened West Indian manatee, the brown pelican, the reddish egret, the roseate spoonbill, the least tern, the white ibis, and the American oystercatcher.

While many of the proposed actions in this focal area specifically list trust resource species as their targets, nutrient reduction through improvements in wastewater treatment and land use practices will enhance water quality in Tampa Bay and increase productivity of saltwater recreational fish species, and other aquatic and prey organisms. Restored seagrass beds and marsh created with dredged material will not only improve habitat conditions for the West Indian manatee, but also for aquatic invertebrates like blue crabs, shrimp, and oysters as well as refuge and nursery areas for marine fish and prey communities.

High Priority Actions Based on the Service's *Vision*

Re-establish hydrological processes and improve water quality to achieve more natural freshwater flow and sediment input, and reduce nutrients into the Tampa Bay estuary, to enhance wetlands and aquatic habitats.

Next Steps

- Continue to support, implement and/or expand (where needed) pollution prevention programs such as the [Florida Yards and Neighbors Program](#) that promotes and educates homeowners and communities on environmentally sustainable landscaping options.
- Implement integrated pest management policies to reduce chemical use and implement environmentally beneficial landscaping practices.
- Support financial and technical assistance programs (e.g., Facilitating Agricultural Resource Management System program) to help incentivize agriculture best management practices that can reduce impacts to soil and water resources while maintaining sustainable crop production levels.
- In areas in which it would provide the most significant water quality benefits for fish and wildlife, retrofit current wastewater treatment technology and convert septic systems to sewer systems in targeted sub-watersheds to reduce nutrient pollution impacts and improve the overall water quality of Tampa Bay.
- Work with the [Southwest Florida Water Management District's Surface Water Improvement and Management](#) (SWIM) program to establish minimum flow levels for rivers and springs throughout the district.

Taking a watershed approach, conserve habitats (including mangroves, tidal marsh, seagrass beds, barrier island beaches and dunes, freshwater wetlands, coastal forests and prairies) by working with partners and landowners to expand the network of conservation lands and engage in activities to restore or manage these habitats.

Next Steps

- Implement the Tampa Bay Estuary Program's Habitat Master Plan and priority projects identified in the joint National Estuary Program's [Southwest Florida Regional Ecosystem Restoration Plan](#) to restore and protect key bay habitats necessary to support bay-dependent species (e.g., oysters and seagrass), paying particular attention to restoration designs which can best accommodate projected sea level rise.
- Participate in the Florida Ecosystem Restoration Network to develop and implement regional and statewide habitat restoration and protection priorities.

- Support and provide funds for public and private land conservation programs throughout the Tampa Bay watershed where such lands could be available for restoration and stormwater treatment projects that are critical to the overall restoration and management of Tampa Bay.
- Reduce propeller scarring within seagrass beds, continue to evaluate the effectiveness of restoration techniques on scarred beds, and pursue restoration at appropriate sites to preserve the diversity of seagrass communities and provide foraging habitat for the Florida manatee and numerous other fish and wildlife species.
- Promote the use of living shorelines, where needed and appropriate, to protect against erosion and sea level rise while providing habitat to numerous fish and wildlife species, including the stabilization of island shorelines (e.g., Tarpon and Little Bird Keys) through placement of oyster shell bars and planting smooth cordgrass to encourage mangrove seeds to take root.
- Pursue beneficial habitat restoration uses for dredged material, and find efficiencies where possible, including cost-sharing and expedited permitting opportunities.
- Work with the U.S. Army Corps of Engineers and the Port of Tampa Bay to evaluate the maintenance of navigation channels (e.g., Egmont Channel) to ensure that dredging is not contributing to erosion issues, and to maximize the habitat benefits of material generated from maintenance dredging for bird species.
- Support efforts of the Southwest Florida Water Management District's SWIM program and other public-private partnerships to restore coastal and watershed habitats as well as improve the bay's water quality through stormwater treatment.

Restore resilience and natural biodiversity of wildlife habitats through control of non-native invasives and reestablishment of native species.

Next Steps

- Utilize cooperative partnerships (e.g., [Suncoast Cooperative Invasive Species Partnership](#)) to increase coordinated work that reduces or eliminates invasive animals and plants that threaten native diversity across both public and private boundaries.

- Control pervasive non-native and invasive species such as Brazilian pepper and Australian pine to restore and expand the natural upland community habitats.
- Utilize prescribed fire after the initial removal of non-native and invasive vegetation and to encourage growth of fire adapted native plant communities.
- Work with landowners to control the spread of invasive non-native plant seed sources from private lands and to increase coordinated mapping and monitoring of areas with known infestations of invasive species.

Southwest Florida

Landscape at a Glance

The Southwest Florida Focal Area includes the coastal areas, watersheds and uplands from Charlotte Harbor to the Ten Thousand Islands region. This area contains intact sub-tropical ecosystems, expansive public conservation lands and a prevalence of large agricultural operations. Southwest Florida contributes the second largest input of freshwater into the Gulf and can be divided into two major watersheds in the Greater Everglades ecosystem – the Caloosahatchee basin and the Big Cypress basin. A third source of freshwater input in southwest Florida is the Peace-Myakka basin, which like the Caloosahatchee basin, drains into the Charlotte Harbor estuary.

Scattered throughout this focal area are numerous natural resources of regional, national and international significance. [Corkscrew Swamp](#), a vital link between several Florida watersheds, has the world’s largest remaining virgin bald cypress forest and is designated as a Wetland of International Importance. The Ten Thousand Islands NWR is part of the largest expanse of mangrove forest in North America. [Fakahatchee Strand Preserve State Park](#) is the orchid and bromeliad capital of the continent with 44 native orchids and 14 native bromeliad species, while Yucca Pens is the largest area of hydric pine flatwoods remaining in Southwest Florida. Other vital public lands in the focal area include J. N. “Ding” Darling NWR, Big Cypress National Preserve, Rookery Bay National Estuarine Research Reserve, Picayune Strand and the Florida Panther NWR. Southwest Florida provides the only remaining contiguous habitat for the endangered Florida panther.

In the Southwest Florida Focal Area, the highest conservation need involves the restoration of hydrologic processes and landscapes. Intensive urban and agricultural development in this region of Florida has led to drastic disruptions of the natural hydrologic regime (and subsequent damage to coastal estuaries from large, rapid pulses of freshwater in the wet season and reduced flows in the dry

season); degradation of water quality; and habitat loss and fragmentation that significantly threatens the ecological integrity of the region. Another critical conservation need is the management of non-native plants and animals that have invaded upland and coastal habitats, causing negative impacts to ecosystem functions and posing threats to imperiled species. This represents a great challenge for conservation management in Florida; it is estimated that as much as one quarter of taxa living in Florida are non-native, and millions of acres of land and water are dominated by nonindigenous species. The Service supports the synergistic benefits of multidisciplinary, collaborative efforts by our partners to implement large-scale landscape restoration and combat the threats of invasive species.

Target Species

Improving water quality and managing water quantity through restoration of sheetflow will benefit colonial waterbirds, a key group of priority species in this focal area. Tying the extent of these actions to the population objectives for these species helps identify the magnitude of effort necessary to meet our goals. This focal area supports a significant portion of the population objectives established for the whole of Peninsular Florida for many species, including the federally listed wood stork (10,000 pairs); the little blue heron (5,000 pairs); the reddish egret (275 pairs); and the white ibis (40,000 pairs). Similarly, a primary interest in restoring and managing forested habitats will assist in the recovery of the endangered Florida panther (3 viable populations of >240 individuals maintained for >12 years).

Although habitat management in support of colonial waterbirds and the Florida panther are the highest priorities for the Service in this focal area, we also recognize the value of this region for many other species. Of particular interest are two endangered species, the West Indian manatee and the smalltooth sawfish (managed by NOAA National Marine Fisheries Service), as well as beach-nesting birds. The Service will continue to work with partners in support of efforts to achieve the population objectives for these species as well.

While the Florida panther and other terrestrial and avian trust resource species draw the majority of our attention in this focal area, the Service also has been committed to restoring hydrology in Southwest Florida for many years. The area is hydrologically altered far beyond restoration that can be developed specific to the needs of the West Indian manatee or the smalltooth sawfish. As such, our trust resource species stand to benefit from a watershed scale restoration effort that includes improvements in water quality, increases in freshwater flow to the estuary, better practices for wastewater treatment, and more efficient agriculture and municipal water use. Additionally, these actions will improve conditions for many commercially and recreationally important marine fish like red drum and tarpon; invertebrate species like blue crabs, shrimp and oysters; and inland aquatic species like largemouth bass. Managing the forests in this region under appropriate hydrologic regimes will aid species like the state-threatened Big Cypress fox squirrel

and the Everglades mink. The benefits accrued in marsh habitats and along coastal islands will benefit endemic at-risk subspecies like the Sanibel Island rice rat, the insular hispid cotton rat and the Sherman's short-tailed shrew.

High Priority Actions Based on the Service's Vision

Complete key projects in the Comprehensive Everglades Restoration Plan such as the C-43, Tamiami Trail and Central Everglades Planning projects to improve freshwater inflows from the Caloosahatchee River.

Next Steps

- Continue phased construction of the C-43 West Basin Storage Reservoir Project that was authorized for funding by Congress in 2014. The South Florida Water Management District has initiated the first phases of the construction, including the demolition of structures, the clearing of forests and the preloading of pump stations.
- Complete Phase 2 of the Tamiami Trail Project, which would add an additional 2.6 miles of elevated roadway (i.e., bridge) in the western project area. Phase 1 of the project, which constructed a one-mile bridge in the eastern project area, was completed in 2013.
- Construct and implement the Central Everglades Planning Project to divert up to 200,000 acre-feet of water per year from Lake Okeechobee south to the Everglades, thus reducing harmful lake water discharges to the Caloosahatchee River Estuary. Completion of the Tamiami Trail Project is essential to facilitating the movement of water diverted by the Central Everglades Planning Project south to Everglades National Park.

Restore hydrologic processes of larger watersheds to restore and enhance wetlands and aquatic habitats for wetland-dependent species. This may require acquisition through fee acquisition or easements of properties in some cases to facilitate restoration actions such as restoration of sheetflow.

Next Steps

- Implement the Charlotte Harbor Flatwoods Initiative project that will increase base flows, create water storage capacity for wet season runoff, reduce pollutant loads to tidal waters and restore sheetflow to more than 55,000 acres, which will ultimately improve habitat for estuarine species.
- Restore as much as 57,000 acres of habitat in the Belle Meade Flowway by hydrologic improvements and water quality treatment features to improve water quantity and quality in coastal areas such as Rookery Bay National

Estuarine Research Reserve, Collier Seminole State Park and Ten Thousand Islands NWR.

- Establish freshwater flows to coastal areas to maintain targeted annual average salinity for adjacent estuaries and provide direct benefits to several listed species.
- Achieve yearly reductions in the amount of total nitrogen entering waterways thereby improving the overall water quality of the focal area.
- Restore and protect headwater and tributary flows to the Estero Bay Aquatic Preserve by implementing the Estero Creek and Headwaters Flowway project, including the connection of the inland Corkscrew Swamp, tidal Caloosahatchee watersheds and elements of the J.N. Ding Darling NWR.
- Complete the Fakahatchee Flowway project to positively impact 9,800 acres and downstream estuaries by: restoring hydrologic and fire regimes; increasing biological, hydrological and landscape connectivity and productivity; increasing sheetflow; eliminating point source discharges; and minimizing non-native species.

Continue to work with partners to restore habitat for imperiled species (such as the endangered Florida panther) by using frequent prescribed fire and invasive species control.

Next Steps

- Using the Southwest Florida [Cooperative Invasive Species Management Area](#) partnership model, foster public-private relationships for the treatment of invasive plants on public and private lands.
- Reduce invasive plants by 95 percent after initial treatment using mechanical or chemical means within the Service's Florida Panther Recovery Focus Areas and dry prairie habitats on lands spanning private-public land boundaries.
- Utilize and/or create financial incentive programs to treat invasive species along privately owned canals and coastal areas in order to reduce the impact of invasive plant seed sources from private lands onto adjacent conservation lands.
- Create and implement Early Detection and Rapid Response procedures for areas newly infested with non-native species. Using such an approach that addresses smaller infestations of new invasives is often an easier and cheaper way to increase the likelihood of successful eradication.

- Improve education and outreach through the use of workshops, workdays and other outreach events on the impacts of invasive plants on the fragile habitat and overall Southwest Florida focal area ecosystem that is home to 15 listed or candidate plants and animals.
- Provide technical and financial assistance to private landowners to develop and implement an integrated land management approach (e.g., using both mechanical roller chopping and prescribed fire) for dry prairie and pine flatwood habitats (especially those adjacent to public conservation lands) that benefit imperiled species who rely on healthy, fire maintained habitats for food and cover.

Florida Keys

Landscape at a Glance

The Florida Keys are a coral cay archipelago that extends about 100 miles from the southern tip of the Florida peninsula in an arc to the southwest and then west into the Gulf. The islands lie along the Florida Straits, dividing the Atlantic Ocean to the east from the Gulf to the northwest, and defining one edge of Florida Bay. Even though most of the land area in the focal area lies between two to three feet above high tide, the combination of marine and tropical upland habitats supports a wealth of biological diversity and habitats, including numerous endemic plants and animals. The coral reefs of the Florida Keys are the most extensive living coral reef system in North America and the third largest coral reef system in the world. Much of this system is protected as part of the Florida Keys National Marine Sanctuary, encompassing 2,800 square nautical miles of state and federal waters in the Keys. This marine protected area shares its conservation footprint with State Wildlife Management Areas, National Parks and NWRs that conserve the habitats that are home to federally listed species such as the Key deer, the American crocodile, the Lower Keys marsh rabbit, the silver rice rat and sea turtles, as well as native and migratory birds, butterflies and plants.

Major vegetation cover types include pine rockland, tropical hardwood hammock, freshwater wetland, mangrove forest and seagrass beds. The West Indian hardwood hammocks and pine rocklands are imperiled upland communities that include more than 120 species of hardwood trees, shrubs and plants. These forests are home to several endangered and threatened species including the Key Largo woodrat, the Key Largo cotton mouse, the Schaus swallowtail butterfly, the eastern indigo snake and the Stock Island tree snail. The mangrove forest ecosystem along the shoreline provides food and shelter to a myriad of marine organisms and shelter for diverse avian life. The shallow protected waters of Florida Bay and nearshore Atlantic waters support lush seagrass beds that serve as important nurseries for marine life and foraging grounds for wading birds.

The Keys have become less resilient over time and are losing ecosystem integrity due to the increasing environmental impact of factors such as climate change, invasive species, habitat fragmentation and poor water quality. Perhaps the greatest conservation challenge facing the Keys stems from rising sea levels; data show that the sea level in the area has risen nine inches in the last 100 years, and is expected to rise an additional three to six feet by the year 2100. Impacts from such a rapid rise in sea level include increasingly fewer upland areas as marine and intertidal habitats move upslope and displace native species, as well as diminished property values as inundation becomes more widespread and increasingly common. Additionally, an increase in nutrient loading in nearshore waters from land-based sources over the past few decades has resulted in decreased water clarity and unnatural algal growth, which greatly adversely affects nearshore coral reef communities. The Service believes that it is imperative that we quickly and collectively act on adaptive and sustainable conservation strategies to address these immediate threats to the Florida Keys.

Target Species

The Florida Keys are home to a whole host of flora and fauna uniquely adapted to its insular environment. Many of these are distinctive subspecies that have evolved in isolation from their mainland congeners, are found nowhere else in the world, and are now endangered or threatened. Strategic land conservation and habitat management, particularly with potential climate change effects in mind, can aid in accomplishing recovery targets in these dynamic systems for several of these endangered species. Such targets are focused on stable populations with positive growth rates over time, such as for the Key deer (seven-year running), the Key Largo woodrat (three-year running average for six years), and the Lower Keys marsh rabbit (three-year running average for six years).

Numerous invertebrate species (e.g., the endangered Miami blue butterfly and the threatened Stock Island tree snail) and plants (e.g., the endangered Key tree-cactus and the threatened Garber's spurge) are also endemic to the Keys and their habitats (e.g., tropical hammock and pine) need to be restored and conserved.

The subtropical climate of the Florida Keys also represents the northern range extent of even more species that are either federally listed or rare in the United States but that may occur more commonly in the neotropics, such as the American crocodile, the West Indian manatee, the white-crowned pigeon, the mangrove cuckoo, and two threatened coral species, the staghorn and elkhorn. Restoring hydrology and protecting water quality will not only benefit some of these species, but will also benefit many waterbirds (e.g., the great white heron, the roseate tern and the brown pelican) with important nesting areas within the focal area.

Similar to aquatic restoration in the Southwest Florida Focal Area, the Service also has committed to restoring hydrology in the Keys for many years. Federal trust

resource species like staghorn and elkhorn coral stand to benefit from a watershed scale restoration effort that includes improvements in water quality and restores functional freshwater flow to the estuary by removing old roadbeds and promoting better practices for wastewater treatment. These actions and others that are already outlined in existing state-federal collaborative plans will improve conditions for many commercially and recreationally important marine fish like red drum, bonefish, and tarpon as well as invertebrate species like blue crabs, shrimp, and oysters. A large number of at-risk species also occur in the Florida Keys (e.g., sawgrass skipper, Key ringneck snake, Florida Keys mole skink, and the Lower Keys population of the striped mud turtle, among others); most would benefit from the priority actions described below.

High Priority Actions based on the Service's *Vision*

Continue strategic land conservation efforts to ensure sustainable plant communities and quality wildlife habitats, particularly mangrove and pine rocklands habitat, and to build resiliency in preparation of accelerated effects of climate change and sea level rise.

Next Steps

- Coordinate with the state of Florida and Monroe County on their conservation land acquisition programs to strategically identify high-quality parcels and optimize land protection efforts to foster landscape conservation on private and public lands.
- Work with willing sellers to protect important wildlife habitats within approved acquisition boundaries of NWRs in the Keys.
- Work with partners to apply land conservation tools, such as conservation easements, partnership agreements, mitigation banks and technical assistance to protect, restore and manage priority habitats throughout the Florida Keys ecosystem.
- Work with the Peninsular Florida LCC, state and federal agencies, and other stakeholders to develop a Florida Keys adaptation strategy to anticipate the conservation needs of the future in light of increasing sea level rise and urbanization.
- Initiate planning for potential “ex-situ” or off-site conservation strategies to prevent extinction of species and subspecies endemic to the Florida Keys if conservation partners are unable to protect adequate habitat from impacts of sea level rise.
- Implement long-term monitoring of any translocated species and assess their impacts on their new habitat and associated species.

Enhance the biological diversity and resiliency of the fire-dependent pine rocklands and restore natural conditions and resilience of diverse habitats through frequent prescribed fire and/or control of invasive species.

Next Steps

- Work with state, federal, NGO and private land partners to implement frequent prescribed fire in fire-dependent habitats, especially pine rocklands where numerous federally listed plant species exist.
- Identify alternative treatments for maintaining stands of pine rocklands and reducing organic fuels where prescribed burning is no longer feasible due to adjacent, high-density urban areas.
- Through coordination with the Florida Keys Invasive Exotics Task Force and its member organizations, detect and monitor the presence, spread and damage caused by invasive non-native plants, particularly upon listed native plant and wildlife species, in order to develop priorities for eradication and/or control.
- Replace non-native plant species known to destabilize dunes and other coastal habitats with native species that are a natural defense against storm surge and coastal erosion that is likely to be exacerbated by sea level rise.
- Work towards the eradication of selected non-native plant specimens that represent exceptional threats to native habitats (e.g., mature individuals of white leadtree, Australian pine and Brazilian pepper found in hammock canopy openings).
- Work with landowners to control non-native seed sources from private lands and to increase coordinated mapping and monitoring of areas with known infestations of non-native plant species.

Restore hydrologic processes to improve water quality, water flow and tidal connections, and to enhance reef and adjacent coastal habitats, including mangrove forests, for the benefit of native fish and wildlife.

Next Steps

- Support implementation of landscape-level actions found in the [Comprehensive Everglades Restoration Plan](#) to enhance the water quality of Florida Bay, which will improve the overall health of the Florida Keys marine ecosystem, particularly seagrass and coral community habitats.
- Remove backfill from historic wetlands and restore hydrologic connectivity in degraded wetlands.

- Fill and plug ditches (e.g., former mosquito ditches) identified as essential to prevent unnaturally rapid infiltration of interior freshwater wetland, transitional and upland habitats by saltwater.
- Restore hydrological connectivity by removing obsolete roadbeds and installing culverts under actively used roads to facilitate the rapid drainage of storm surge waters, especially important in places where storm surge has become impounded and is causing damage to freshwater-dependent habitats and species. These restoration actions are also effective at reviving and restoring degraded mangrove forests.
- Monitor and assess the quality and quantity of subterranean freshwater lenses (i.e., layers of fresh groundwater that float on top of denser saltwater that arise when rainwater seeps down through a soil surface and then gathers over a layer of seawater at or down to about five feet below sea level) to determine the effects on fish, wildlife, and their habitats by saltwater intrusion caused by sea level rise.

Upper Mississippi River Watershed

Landscape at a Glance

This focal area is within the watershed of the Upper Mississippi River System, which includes the Mississippi River and its tributaries above Cairo, Illinois. The focal area encompasses a geography of watersheds that contribute the bulk of nutrients to the main stem of the Mississippi River above the confluence of the Ohio River that are associated with the hypoxic conditions in the Gulf. Based on nutrient yield modeling, the two states contributing the highest nitrogen loads to the river, and eventually the Gulf, are Iowa and Illinois. As part of the USDA's Mississippi River Basin Initiative (MRBI), priority watersheds for agricultural nutrient reduction have been identified in these states as well as 10 other states in the Upper Mississippi River Watershed. Reduction in nutrient loading in the Upper Mississippi watershed is expected to have a positive effect on Gulf marine resources by reducing the size of the hypoxic zone.

The focal area lies in what was once the Eastern tallgrass prairie, and is characterized by deep prairie soils, flat to rolling terrain and a temperate climate. These attributes make the focal area, as well as the entire watershed, ideal for agriculture. In fact, Iowa and Illinois rank at the top in the nation for corn and soybean production. The costs of this agricultural dominance are high, primary among them being the reduction of native prairies and their associated wetlands to small fractions of their original extent. For instance Iowa, Illinois and Indiana each only have approximately one-tenth of one percent of their original grasslands. Iowa

and Illinois have each lost 90 percent of their original wetlands, and Indiana 85 percent. Since row crop agriculture is the predominant land use, much landcover is seasonal. This includes approximately 2.4 million acres of large river floodplain with a mix of urban, private, state and federal lands. Private lands on the floodplain are generally farmed, while state and federal lands consist of a mix of floodplain forest wetland and open water. Conservation lands on the Illinois and Mississippi Rivers include two Ramsar Wetlands of International Importance. The focal area spans the Mississippi Flyway, a migration corridor for half of all bird species and up to 40 percent of North American waterfowl. It is also within the flyway for the eastern population of the Monarch butterfly, whose decline highlights the significance of habitat loss in the focal area.

The Service believes conservation priorities include perennial native landcover and hydrology restoration on public and private lands to benefit migratory birds and water quality; strategic land interest acquisition to support these conservation priorities; pollinator habitat restoration and enhancement to benefit native bees, monarch butterflies and other pollinators; and continued engagement in the Upper Mississippi River Restoration Program. We applaud the fact that the agricultural community in the watershed has stepped up efforts to address water quality and nutrient issues, and industry groups are assisting landowners with basic stream water quality monitoring to inform decisions regarding timing and amount of chemical applications, resulting in lower cost to producers and less nutrients lost to stream systems.

Target Species

Biological objectives for the Upper Mississippi River Watershed Focal Area are available in documents such as state wildlife action plans; the Service's [*Surrogate Species Version 1.0: Eastern Tallgrass Prairie and Big Rivers Population Objectives Status Report*](#); other federal plans for the Upper Mississippi River Restoration Program; Fish Habitat Partnership Strategic Plans; Integrated Management Plan for the Illinois River Watershed; the U.S. Army Corps of Engineers' [*Upper Mississippi River Systems Ecosystem Restoration Objectives 2009*](#); and the [*Upper Mississippi River and Great Lakes Region Joint Venture's Conservation Strategies for Landbirds, Waterbirds, and Waterfowl*](#).

Restoring and enhancing native landcover in the focal area, as well as the entire upper Midwest, will improve sustainability of fish, wildlife and pollinator species of concern. The following surrogate species were selected for the Eastern Tallgrass Prairie and Big Rivers LCC geography. Population estimates presented here are for the Iowa and Illinois portions of the LCC geography (obtained from the Partners-in-Flight Population Estimates Database, version 2.0). Translated into habitat objectives, the Upper Mississippi River and Great Lakes Region Joint Venture estimates that protection and/or maintenance of 1,235,363 acres of grassland habitat and restoration and/or enhancement of an additional 1,235,363 acres are required to achieve the following population targets for grassland birds in the target

geography: the Henslow's sparrow ($\geq 57,000$ breeding adults); the grasshopper sparrow (1,800,000); the bobolink (400,000); the marsh wren (3,600); the green-winged teal (annually provide a network of seasonally to semi-permanently flooded emergent habitats adequate to support 12 percent of the continental population for spring and fall migration periods); the mallard (annually provide a network of seasonally to semi-permanently flooded emergent habitats adequate to support 22 percent of the continental population for spring and fall migration periods).

[Call-out Box on Landscape-scale Collaboration to Address Hypoxia]

Since 2010, the average size of the Gulf's summer "dead zone" has been 5,500 square miles — about the size of Connecticut. Over the past three years, multiple Landscape Conservation Cooperatives within the Gulf watershed have been pursuing the development of [decision-support tools](#) and research to fight the hypoxia problem by guiding conservation in areas that are sending high nutrient loads (e.g., excess nitrogen from fertilizer) to the Gulf. The partners in this multi-LCC project hope to optimize their respective initiative or program investments over time by targeting specific geographies that have the most potential for water quality and habitat improvement with the cooperation of willing landowners. Midwest Fish Habitat Partnerships are also active, completing fish habitat assessment models and decision-support tools to strategically place fish habitat projects on private lands that will not only improve fish habitat for native fish, but also improve water quality in priority watersheds across the Upper Mississippi River Basin.

Restoration efforts that contribute to nutrient reduction goals of the [Hypoxia Task Force](#) and the states' nutrient reduction strategies will directly improve water quality and further population objectives for aquatic species such the greater redhorse (increase the distribution and connectivity among locations where the species is known to occur) and the paddlefish (self-sustaining population that provides for continued recreational and commercial harvest and maintains an annual 30-40 percent spawning potential of the un-fished population).

We place an overall emphasis on High Priority Actions throughout the Upper Mississippi River watershed that will result in positive changes in hydrology, soil health, desirable landcover (habitat), general ecosystem functions and the number of different species represented in the landscape. Many of the proposed actions in this focal area benefit our trust resource species like interjurisdictional fish species, however implementation of these actions will be advantageous to other species, specifically those that are dependent on water quality in the Gulf where hypoxia is currently a limiting factor in habitat suitability. Marine species like red snapper, grouper species, shrimp, blue crabs and many other commercially and recreationally important species will benefit as our proposed actions contribute to reducing the size and duration of the hypoxic zone.

Since the release of the Service's Vision, priorities for this focal area have shifted both for the Service and for many of our conservation partners. We must turn our

immediate attention to the downward trends in pollinators. This pressing conservation concern is most visibly represented by the precipitous decline in the monarch butterfly and rusty patched bumble bee populations, which will require an all-hands effort to stem the decline, and turn the population trend line for all pollinators to the positive. The White House's National Pollinator Strategy has as an objective 225 million monarchs in the eastern migratory population by the year 2020.

High Priority Actions Based on the Service's Vision

Work in targeted watersheds with farmers and other private landowners to restore native grasses and prairie hydrology to reverse declines in grassland birds such as Henslow's sparrow, and reduce the amount of nutrients transported to the main stem of the Mississippi River.

Next Steps

- Work with regional watershed planning groups to apply the decision-support tool developed through the [multi-LCC Mississippi River Basin Gulf Hypoxia Initiative](#) and examine the alignment of habitat restoration, water quality initiatives and agricultural productivity to inform targeted delivery of complementary programs. Evaluate the analysis tool and further refine it as necessary to meet the needs of the conservation delivery community.
- Build collaborative relationships between landowners, agriculture and conservation organizations; promote information exchanges and provide educational programs that help landowners understand the tradeoffs in ecosystem services provided under alternative land and water management plans and through habitat restoration projects for wildlife and aquatic resources (e.g., Illinois Council on Best Management Practices' Keep it for the Crop program, the Illinois Nutrient Research Council, and the Fishers & Farmers pilot project to build a Watershed Leaders Network in watersheds across the Upper Mississippi River Basin).
- Promote managed grazing to increase perennial cover; improve soil health and hydrology of the focal area landscape; decrease runoff, sediment and nutrient loss; decrease farm equipment, seed and chemical costs to farmers; and stimulate rural economies.
- Develop incentives for landowners to maintain participation in [existing USDA programs](#) such as the Conservation Reserve program, the Conservation Reserve Enhancement Program and the Wetland Reserve Program during market fluctuations.
- Seek funding for and work closely with USDA field/district office staff to identify high priority areas to provide incentives for and guide

implementation and potential cost-sharing for specific conservation practices such as cover crops, crop rotations, nutrient management and other best management practices.

- Develop additional long-term conservation stewardship goals for landowners in targeted watersheds that can be leveraged as incentives with partners such as the local Soil and Water Conservation District, a State agency, or nongovernmental organization (NGO).
- Encourage expansion of NRCS' Migratory Bird Habitat Initiative by adding a focus area connecting the Mississippi Alluvial Valley and Prairie Pothole Region focus areas to work with private landowners in the Midwest to provide food and critical wetland habitat for migratory bird populations in support of existing Upper Mississippi River & Great Lakes Joint Venture objectives.
- Provide technical assistance to private landowners such as monitoring of enrollment cycles to encourage continued participation in conservation practices as land ownership changes or enrollment periods expire.
- Work with the agricultural community to identify and manage key parcels across the conservation area to improve and maintain landscape connectivity that meets life cycle requirements for the greater prairie chicken and other wildlife.
- Create wetlands at the end of tile lines and use other Drainage Water Management techniques to reduce nitrate-nitrogen loads into adjacent streams (e.g., [The Nature Conservancy project in the Mackinaw River Watershed](#), near Franklin, Illinois).
- Work with federal, state and county governments, universities, NGOs and farmers to restore oxbows in priority watersheds in Iowa and Minnesota. Restored oxbows provide a number of benefits, including: a return to a more natural hydrology by connecting streams with their floodplains; a way to improve water quality by holding sediment and providing "filters" that reduce nitrogen and phosphorus; and the creation of habitat critical to many fish and wildlife species, including the federally listed Topeka shiner.
- Using the [Science-based Trials of Rowcrops Integrated with Prairie Strips \(STRIPS\)](#) program at Neal Smith NWR as a model, conduct similar projects on private lands throughout the focal area to provide an easily-integrated and low-cost management option to improve both aquatic and terrestrial habitat, soil health, hydrology, and water quality.

Collaborate with agencies, organizations and individual landowners to restore or enhance monarch butterfly habitat in the Upper Mississippi Watershed.

Next Steps

- In collaboration with Monarch Joint Venture partners and others, identify priority tracts for pollinator conservation to acquire, and restore native prairie in perpetuity through easement or acquisition.
- Enhance pollinator habitat on Service-owned lands, through partnerships on state-owned lands, and on private lands through the Partners for Fish and Wildlife, Coastal, and Farm Conservation Programs.
- Explore new opportunities to promote habitat conservation in urban and rural areas near the Interstate 35 corridor through partnerships with U.S. Department of Transportation Federal Highway Administration and state departments of transportation.
- Engage partners to increase the availability and distribution of regionally appropriate native milkweed and nectar plant seed.
- Engage state departments of transportation, county road departments, township road associations and levee districts to encourage modifying mowing and spraying practices to benefit pollinators and other wildlife.
- Enlist National Fishery Friends Partnership and Regional Conservation Education Coordinators to assist in encouraging local Fishery Friends Groups to support monarch habitat conservation and education activities.
- Support public outreach to promote monarch and pollinator conservation, including a public awareness campaign regarding the National Pollinator Strategy and the regional role in that strategy.

Rainwater Basin

Landscape at a Glance

The Rainwater Basin Focal Area is a 6,150 square mile wetland complex located in south-central Nebraska that includes parts of 21 counties. The focal area has expansive rolling loess plains formed by deep deposits of windblown silt with a high density of clay-pan playa wetlands. These wetlands are annually filled by overland runoff from intense summer storms and melting winter snowfall. Historic surveys suggest that at one time there were approximately 11,000 individual playa wetlands totaling about 204,000 acres. There were also more than 10,000 temporary and another 1,000 semi-permanent wetlands. Today, approximately 82 percent of the major wetlands have been converted to agriculture, and today playa wetlands comprise about one percent of the total Rainwater Basin landscape. Because of

extensive loss and continued degradation, these wetlands were given a Priority 1 ranking, the most imperiled status, in the [Nebraska Wetlands Priority Plan](#).

Despite the extensive wetland loss, the Rainwater Basin Focal Area still hosts one of the greatest wildlife migration spectacles on earth. This region is often described as “the neck of the hour glass” due to the constriction of the Central Flyway through this region during spring migration. During this migration, the focal area provides roosting, loafing and foraging habitat for millions of migratory waterfowl and other wetland-dependent species that have wintered along the Gulf coast, across Texas and Mexico and farther south. It provides essential staging habitat for approximately 8.6 million waterfowl and nearly 500,000 shorebirds. The Rainwater Basin Focal Area also serves as an important stopover habitat for many of the 400+ endangered whooping cranes migrating Aransas NWR on the Gulf coast of Texas to nesting grounds on Woods Buffalo National Park, Alberta, Canada. Approximately 50 percent of the mid-continent mallard and 30 percent of the continental northern pintail population use this region. More than twenty species listed in the Deepwater Horizon Programmatic Damage Assessment and Restoration Plan are estimated to use focal area sometime during their annual cycle, 11 of which are priorities for conservation action by the Service.

Almost 99 percent of the lands within the focal area are under private ownership, with land use that is dominated row-crop agriculture (predominantly a corn and soybean rotation). Grasslands make up approximately 20 percent of the region, with the remainder being savannas, woodlands and forest communities that are confined to steeper drainages associated with the Republican and Blue River systems. Riverine wetlands associated with these systems comprise about two percent of the landscape.

Wetland function across the Rainwater Basin landscape continues to decline as a result of intentional human activity that has added to natural and agriculturally accelerated sedimentation. For example, this focal area is a major source of the Platte River’s nutrient runoff into the Mississippi River. Wetland modifications, such as concentration/irrigation reuse pits, land leveling, culturally accelerated sediment and drainage ditches have directly impacted wetlands by limiting the amount of natural runoff reaching them. The combination of sedimentation and altered watershed hydrology subsequently contributes to conditions that promote invasive species growth. While the scale of the conservation challenge in this focal area is great, the Service believes in the possibility of equally significant conservation successes through a more concerted approach in engaging partners and the wider public, especially in support of voluntary land acquisition and easement practices. The combination of wetland habitat restoration and the protection of lands through fee title and easement acquisition with willing landowners in the Rainwater Basin Focal Area could provide about 80 percent of the total forage capacity needed to meet population objectives for waterfowl, the whooping crane, the least tern and the piping plover.

Target Species

Eleven priority duck species identified by the *North American Waterfowl Management Plan* (NAWMP) use the Rainwater Basin through some portion of their annual cycle. Seven of these are listed as “high” or “moderately high” in continental priority, and five (i.e., northern pintails, American wigeons, blue-winged teals, canvasbacks and redheads) commonly use wintering habitat within the tidal zone of Gulf coastal marshes. When continental waterfowl are at the long-term average as described in the NAWMP goals, an estimated 8.6 million waterfowl will migrate through the basin (i.e., approximately 4.2 million mallards and 800,000 northern pintail, with the remainder being a combination of blue-winged teals, green-winged teals, northern shovelers, American wigeons and gadwalls). In addition, 500,000 mid-continent white-fronted geese, 400,000 Canada geese and millions of snow geese use the region. These birds would require 15.6 billion kcals, with 4.4 billion kcals coming from wetland-derived foraging resources. In addition to waterfowl that use migration habitat, an estimated 275,000 waterfowl rely on Nebraska’s Sandhills (comprised of 34 percent mallards, 27 percent blue-winged teals, 20 percent gadwalls, 14 percent northern shovelers and six percent northern pintails).

There are 24 priority shorebird species identified in the U.S. Shorebird Conservation Plan that rely on habitat within the Rainwater Basin Focal Area and associated areas. Many of these species will frequently use tidal zones of Gulf coastal marshes for brief periods during spring and fall migration. The Rainwater Basin Joint Venture has targeted providing habitat for a non-breeding population estimate of 2.9 million shorebirds such as the Wilson’s phalarope (2.1 million), the buff breasted sandpiper (216,000), the killdeer (122,000), the lesser yellowlegs (92,700), the semipalmated sandpiper (91,098), and the least sandpiper (35,026). In addition, the Rainwater Basin Joint Venture has set breeding habitat for another 400,000 shorebirds such as the Wilson’s phalarope (241,490), the long-billed curlew (22,474) and the upland sandpiper (15,746). It is estimated that it will require an estimated 2.1 billion kilocalories (kcals) of foraging resources to meet the nutritional needs of 2.9 million migrating and breeding shorebirds when the Rainwater Basin Focal Area is at the population goal.

Waterbirds are probably the least understood of all the bird groups. The Rainwater Basin Joint Venture identified 52 species within the region, but sufficient information was only available to plan for Interior least terns, sandhill cranes and whooping cranes. Using bioenergetics modeling, the Rainwater Basin Joint Venture estimated that the 560,000 sandhill cranes that use the focal area for staging while migrating would require 10.8 billion kcals of foraging resources. It was assumed if sufficient habitat were available for sandhill cranes along the Platte River, there would also be sufficient habitat for breeding Interior least terns (1,120 birds) and piping plovers (2,300 pairs in Northern Great Plains), as well as for the millions of waterfowl and the endangered whooping cranes (1,000 birds of the Wood Buffalo Population). According to the Rainwater Basin Joint Venture, enhancement and restoration of wetlands on public lands within the focal area could provide more

than 50 percent of the natural forage resources needed to sustain focal area target populations of whooping cranes, least terns and piping plovers.

While many of the proposed actions in this focal area specifically target benefits to migratory birds, implementation of these actions will be advantageous to other species as well. For example, we place an overall emphasis on land conservation in order to meet the needs of whooping cranes, least terns and piping plovers. Those actions will also benefit northern bobwhite quail, ring-necked pheasant, white-tailed deer, and potentially wild turkey through protection of valuable wetland and grassland habitats. Similarly, we promote working with private landowners to restore or sustain food resources for our trust resource species which, in turn, will also supply sufficient resources to meet the energetic demands of upland game species, amphibians, reptiles, insects, and other mammals.

High Priority Actions Based on the Service's *Vision*

Focus public lands conservation delivery on habitat restoration and/or enhancements to support migrating birds that stage in the Rainwater Basin enroute to southern wintering areas or spring breeding areas.

Next Steps

- Maintain 80 percent of public wetland acres in early successional plant communities and increase ponding frequency under average natural moisture conditions to optimize moist-soil seed production.
- Restore wetland and watershed function so public properties exhibit a ponding frequency of 45 percent under average weather conditions. Restore wetland and watershed function so that perpetually protected wetlands privately owned exhibit a ponding frequency of 33 percent under average weather conditions.
- Restore and maintain wetland vegetation communities on perpetually protected public lands (NWRs, NE Game and Parks, etc.) at 60 percent early-successional, 30 percent cropland (farmed), and 10 percent late-successional in wetlands created in partnership with federal and/or NGO conservation programs such as NAWCA.
- Maintain wetland vegetation communities on lands protected by perpetual wetland easements that are 30 percent early-successional, 50 percent cropland (farmed), and 20 percent late-succession.
- Encourage or expand the development of short-term conservation programs for the establishment of grassland buffers around these wetlands. This may be accomplished through the establishment of Conservation Reserve

Program easements or other compatible national-, state- or nongovernmental organization-sponsored farm programs.

Work with willing landowners to target land acquisition and easement opportunities to target high priority habitats for whooping crane, least tern and piping plover.

Next Steps

- Acquire an additional 17,225 acres of wetlands and adjacent uplands through fee title acquisition, most of which would be “roundouts” to existing public lands, that will facilitate restoration and management of the existing public wetlands (managed by the Service or Nebraska Game and Parks Commission) in the Rainwater Basin.
- Protect and restore 13,585 additional acres of wetlands and uplands through perpetual conservation easements.
- Conduct outreach with landowners to incentivize, restore and maintain 7,350 acres of wetlands enrolled in short term conservation programs (> 30 years).

Focus private lands conservation actions on habitat restoration and other programs to ensure the approximately 62,500 acres of functional wetland habitat needed, along with postharvest waste grain, to meet the food requirements of the whooping crane, the least tern, the piping plover and waterfowl.

Next Steps

- Work with partners to ensure sufficient and appropriately placed wet-meadow habitat to provide high-quality foraging habitat for sandhill and whooping cranes in the Central Platte River and the North Platte River Valley.
- Monitor harvested cornfields along the Rainwater Basin’s Central and North Platte River valley with a goal to maintain sufficient acreage (~80,000 acres at 35.6 kg/ac) waste grain.
- Develop resources for geospatial analysis to that permit development of decision support tools that quantify and map current nesting habitat for least terns and piping plovers to facilitate targeting of conservation efforts.
- Work with partners to assist federal, state and NGO land managers in prioritizing restoration and management projects to provide the greatest biological return for priority nesting species.

Prairie Potholes

Landscape at a Glance

The broad delineation of the Prairie Pothole Region extends across five U.S. states and three Canadian provinces. For our purposes, this focal area includes about one-third (100,000 square miles) of the overall region, specifically the northern plains of Iowa, Minnesota, North Dakota, South Dakota and Montana. It constitutes one of the richest wetland systems on earth, characterized by millions of depressional wetlands known as “potholes.” The complex of highly productive freshwater wetlands and surrounding grasslands are critically important to nesting waterfowl, shorebirds and grassland birds. The area is often referred to as North America’s “duck factory” because it is estimated that about one-third of the continent’s waterfowl breeding population nest within it, many of which spend the winter months in the coastal marshes along the Gulf.

Prairie wetlands along North and South Dakota’s Missouri Coteau (plateau) provide valuable spring and fall stopover habitat for a majority of the endangered whooping cranes in the Wood-Buffalo/Aransas population. In addition, the focal area also provides breeding habitat for a wide diversity of wetland- and grassland-dependent birds, as well as stopover habitat for significant numbers of spring and fall avian migrants and native pollinators such as the monarch butterfly.

Once a vast grassland system, the Prairie Pothole Region is now an agrarian system dominated by cropland. Changes in land use practices have, for the most part, negatively impacted the availability of foraging and nesting habitat for migratory birds using the region. Many wetlands have been drained or degraded, and wetland losses continue today with technological advances like pattern tile drainage systems. The extensive loss of native prairie with the conversion to row crop agriculture, particularly in the eastern portion of the focal area, has further compromised this region’s ability to provide resources necessary to meet the needs of the vast array of migratory birds that depend upon it sometime during their annual cycle. Despite these losses, millions of wetlands and large tracts of native prairie still remain to make the Prairie Pothole Focal Area “one of the most altered — yet one of the most important — migratory bird habitats in the Western Hemisphere,” as noted in the Prairie Pothole Joint Venture’s [2005 Implementation Plan](#). The Service believes this illustrates that the fundamental needs of local agrarian communities and wildlife are not mutually incompatible. We believe that by joining partners in addressing factors that impact both, we can advance the interests of both communities and conservation.

Target Species

Six duck species (the blue-winged teal, the gadwall, the mallard, the northern pintail, the northern shoveler and the redhead) commonly nest within the Prairie Pothole Focal Area. These six species comprise about 60 percent of the total duck

harvest taken by hunters in the five Gulf coast states. The harvest figure identifies an important nexus between duck production in this focal area and winter use by ducks in the Gulf coastal states, and supports the necessity of strategic habitat conservation delivery in both the Prairie Pothole Focal Area and the Gulf coastal zone.

Protecting and restoring wetlands in the focal area will ensure sufficient foraging habitat for 40 species of breeding waterbirds, including the federally listed Interior least tern and whooping crane, as well as species of high conservation concern like the American bittern, the black tern, the horned grebe, the king rail, the yellow rail and the Franklin's gull (the largest Franklin's gull nesting colonies in the world are located within this focal area). Additional benefits will include higher quality breeding and/or migration stopover habitat for 37 of the 50 waterbird species that regularly occur in the United States; breeding habitat for 13 of 20 species that nest in the lower 48 states; and important stopover habitat for 30 of 37 Arctic nesting species, including the federally listed piping plover, as well as the American avocet, the long-billed curlew, the upland sandpiper, the willet and the Wilson's phalarope. Most these species stage on Gulf coastal habitats as they move to and from South America during their migrations.

Grassland bird populations are in a persistent decline that is steeper than that for any other guild of North American bird species. Restoration of all three grassland systems found in this focal area (shortgrass, mixed and tallgrass) will benefit twelve of the 17 native landbird species declining in the focal area, including the Baird's sparrow and Sprague's pipit. These two priority grassland bird species migrate to the Gulf Coast but nest within grassland ecosystems of the Prairie Pothole Region. Many pollinator populations (e.g., bees, wasps, butterflies, bats and birds) are in serious decline for a variety of reasons, including habitat loss, insecticide use and climate change. The important contribution pollinators provide to the economy and environmental health is recognized in the recent White House National Strategy to Promote the Health of Honey Bees and other Pollinators. This strategy has set goals of restoring and/or enhancing seven million acres of habitat over the next five years through federal actions and public-private partnerships across the United States and increasing the Eastern population of monarch butterflies to 225 million over that period. The restoration and enhancement of grasslands and croplands enrolled in the USDA's conservation reserve program within the Prairie Pothole Focal Area will greatly contribute to that goal.

While the focal area is best known for its "pothole" wetlands, the Missouri River and associated prairie drainages provide important habitat for two endangered fish, the pallid sturgeon and the Topeka shiner. Today farming practices and/or dams have greatly impacted both species across their range. Conversion of native prairie coupled with loss of lands enrolled in the Conservation Reserve Program to row crops has contributed increased sedimentation and nutrient loadings that is degrading critical stream habitat as well as adding to the nutrient loads entering the Mississippi River and subsequently the Gulf. Implementing projects to improve

water quality and restore stream habitat will benefit both federally listed species as well as benefit other aquatic species.

While migratory birds that overwinter on the Gulf Coast are the primary target for many of the proposed actions in this focal area, implementation of these actions will be beneficial to other species as well. For example, we place an overall emphasis on restoring or enhancing grassland and wetland habitats in order to meet the needs of numerous waterfowl species. Those actions will also benefit ring-necked pheasants, sharp-tailed grouse, greater prairie chickens and white-tailed deer through additional cover and foraging opportunities. Similarly, we promote the use of decision support tools to facilitate strategic habitat conservation of grassland and wetland habitats for breeding redheads. Execution of on-the-ground actions prioritized by these tools may also benefit other animals such as upland game species, and amphibians (e.g., northern leopard frog), reptiles (e.g., Eastern garter snake, Eastern painted turtle), insects (pollinators including various species of moths and butterflies), and other mammals (e.g., muskrat, mink, raccoon, red fox, coyote and striped skunk) by providing habitat important to various life history stages of these species.

High Priority Actions Based on the Service's *Vision*

Restore and enhance grassland and wetland habitats in areas identified as important for the recovery of high priority fish and wildlife species.

Next Steps

- Deliver programs that continue to build upon the goal to perpetually protect 1.4 million acres of high priority wetlands and 10.4 million acres of priority grasslands to support about 10 million breeding ducks, with an emphasis on blue-winged teals, canvasbacks, gadwalls, lesser scaups, northern pintails and redheads.
- Purchase habitat conservation easements from willing private landowners to conserve wetland and grassland habitat.
- Protect (through fee acquisition or conservation easements) existing or restored wetland and grassland habitat that provide stopover and foraging habitat for migrating whooping cranes.
- Identify opportunities and develop programs that protect, restore and/or enhance grassland habitats for the benefit of pollinators, with special consideration given to achieving the continental goal for monarch butterflies. Protect existing or restored grassland corridors associated with prairie drainages to meet objectives and potentially reclassify to threatened or delist the Topeka shiner and the pallid sturgeon in those waters listed as critical habitat for the two species.

Use existing maps and models developed by the Service's Habitat and Population Evaluation Team (HAPET) to estimate biological benefits realized by the funded conservation actions.

Next Steps

- Apply existing abundance and probability of occurrence models to protected and/or restored wetland and grassland habitats to estimate the biological benefits realized by completed conservation activities.
- Develop models to assess benefits of conservation actions that would occur if Gulf restoration dollars were sent to the region. Such models may be based on those that currently exist to estimate biological benefits realized from both the Service's easement and Partners for Fish and Wildlife Program. Models developed by the USGS and revised to include diving ducks by the Service's HAPET office are used and USGS to estimate the waterfowl breeding pair abundance for wetlands of known type, location and size in the Prairie Pothole Region. These models can be adapted and used to estimate biological benefits for Gulf restoration efforts.
- Additionally, probability of occurrence models for migrating whooping crane and several species of breeding shorebirds and grassland passerines have been developed by the HAPET office and, similar to the waterfowl pair models, can be used to estimate the biological benefits of protected and/or restored grassland and wetland habitat. Use of these models also has relevance to estimate the biological benefits of protected or restored grassland and wetland habitat for those species also dependent upon restoration efforts.

Use recently developed decision support tools to facilitate strategic habitat conservation of grassland and wetland habitats for breeding redheads.

Next Steps

- Deliver voluntary conservation assistance programs (e.g., those offered by other federal/state agencies or NGOs) to help interested private landowners restore and enhance wetland and grassland habitat. Actions could include restoration of hydrology, seeding of perennial vegetation, and supplying infrastructure to enhance grassland habitat used for grazing.

Conclusion

From the farm fields of the Upper Midwest and Plains to the Gulf Coast, the Service maintains an impressive field presence and long-standing history of Gulf watershed restoration. The urgency of our work in the Gulf and our leadership responsibilities increased dramatically after the 2010 *Deepwater Horizon* oil spill. Billions of dollars in settlement funds, Clean Water Act penalties and NRDAR damages have been, and will continue to be, directed to Gulf restoration. The Service will be directly involved on a daily basis at the local, regional and national levels, working with our partners to implement restoration and conservation projects for natural resources.

Based on our mission to restore and protect the nation's trust resources on behalf of the American people, the Service is a key federal agency that can strategically connect restoration efforts throughout the entire Gulf watershed. Working together, we can merge existing conservation issues with proposed projects to help guide and prioritize restoration and meet mutual restoration goals.

Neither the Gulf ecosystem nor the state of science is static. Just as the Service's *Vision* lays the groundwork for *Next Steps*, we will continue with this iterative and partnership-driven approach as the Gulf changes and new information becomes available. We intend to refine the *Next Steps* and biological targets found in this document as science and restoration move forward and as we receive input from our partners. Our evaluations and recommendations, however, will remain based on the original need (emphasized in *Vision*) to maintain a Gulf-wide perspective. A national investment toward a sustainable Gulf will be at risk fail to take a holistic, watershed-based approach.

Through conversations informed by the contents in documents such as the Service's *Vision* and *Next Steps*, we can help in the early planning stages of projects to evaluate the risks and benefits of proposed activities to species and their habitats, and contribute the best available science and expertise to assist in the decision-making process regarding the allocation of funds.

Together, our collaborative, science-based efforts will result in conservation landscapes that help reduce the impacts from tropical storms and flood events, allow for mitigation and adaptation to the impacts of climate change and sea-level rise, sustain healthy populations of fish and wildlife, support robust economies, keep working lands working, and preserve the Gulf's rich cultural heritage. Together, we will achieve a Healthy Gulf of Mexico Watershed.

[Call-out Box on Partnership]

The Service and its partners — sharing an understanding of Gulf restoration challenges, and developing collaborative solutions to these challenges.

Resources

Introduction

- [U.S. Fish and Wildlife Service. 2013. Vision for a Healthy Gulf of Mexico Watershed. 24 pages.](#)
- [Dahl, T.E. and S.M. Stedman. 2013. Status and trends of wetlands in the coastal watersheds of the Conterminous United States 2004 to 2009. U.S. Department of the Interior, Fish and Wildlife Service and National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 46 pages.](#)
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Background

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Laguna Madre and Lower Rio Grande Valley

- [Arroyo Colorado Watershed Partnership. 2007. A Watershed Protection Plan for the Arroyo Colorado Phase I. A Report of the Arroyo Colorado Watershed Partnership and The Texas SeaGrant Pursuant to a 2003 US EPA Clean Water Act Section 319\(h\) Grant Awarded through Texas Commission on Environmental Quality Contract Agreement 583-4-65616. 212 pages.](#)
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 - [Onuf, C., W. Pulich, K. Dunton, P. Larkin, B. Hardegrege, P. Carangelo, J. Tunnell, and K. Meador. 2012. Seagrass Conservation Plan for Texas: Ten-Year Review and Update -2012. Product of the Texas Seagrass Monitoring Working Group. 51 pages + appendices.](#)
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Species List

Trust Resources

Trust resources include migratory birds, species listed as threatened and endangered under the Endangered Species Act, interjurisdictional fishes, marine mammals, wetlands, and lands managed by the U.S. Fish and Wildlife Service, such as national wildlife refuges.

Common Name	Scientific Name	Taxa
Alabama beach mouse	<i>Peromyscus polionotus ammobates</i>	Mammal
Alabama shad	<i>Alosa alabamae</i>	Fish
Alligator gar	<i>Atractosteus spatula</i>	Fish
American avocet	<i>Recurvirostra americana</i>	Bird
American bittern	<i>Botaurus lentiginosus</i>	Bird
American black duck	<i>Anas rubripes</i>	Bird
American crocodile	<i>Crocodylus acutus</i>	Reptile
American eel	<i>Anguilla rostrata</i>	Fish
American oystercatcher	<i>Haematopus palliatus</i>	Bird
American wigeon	<i>Anas americana</i>	Bird
American woodcock	<i>Scolopax minor</i>	Bird
Attwater's greater prairie chicken	<i>Tympanuchus cupido attwateri</i>	Bird
Bachman's sparrow	<i>Peucaea aestivalis</i>	Bird
Baird's sparrow	<i>Ammodramus bairdii</i>	Bird
Bald eagle	<i>Haliaeetus leucocephalus</i>	Bird
Black rail	<i>Laterallus jamaicensis</i>	Bird
Black skimmer	<i>Rynchops niger</i>	Bird
Black tern	<i>Chlidonias niger</i>	Bird
Bladderworts	<i>Utricularia spp.</i>	Plant
Blue-winged teal	<i>Anas discors</i>	Bird
Bobolink	<i>Dolichonyx oryzivorus</i>	Bird
Brown pelican	<i>Pelecanus occidentalis</i>	Bird
Buff-breasted sandpiper	<i>Calidris subruficollis</i>	Bird
Canada goose	<i>Branta canadensis</i>	Bird

Common Name	Scientific Name	Taxa
Canvasback	<i>Aythya valisineria</i>	Bird
Cerulean warbler	<i>Setophaga cerulea</i>	Bird
Chipola slabshell	<i>Elliptio chipolaensis</i>	Mussel
Choctaw bean	<i>Villosa choctawensis</i>	Mussel
Choctawhatchee beach mouse	<i>Peromyscus polionotus allophrys</i>	Mammal
Dusky gopher frog	<i>Rana sevosia</i>	Amphibian
Eastern indigo snake	<i>Drymarchon corais couperi</i>	Reptile
Eastern meadowlark	<i>Sturnella magna</i>	Bird
Elkhorn coral	<i>Acropora palmata</i>	Corals
Fat pocketbook	<i>Potamilus capax</i>	Mussel
Fat threeridge	<i>Amblema neislerii</i>	Mussel
Florida panther	<i>Puma concolor coryi</i>	Mammal
Florida salt marsh vole	<i>Microtus pennsylvanicus dukecampbelli</i>	Mammal
Florida skullcap	<i>Scutellaria floridana</i>	Plant
Franklin's gull	<i>Leucophaeus pipixcan</i>	Bird
Frosted flatwoods salamander	<i>Ambystoma cingulatum</i>	Amphibian
Fuzzy pigtoe	<i>Pleurobema strodeanum</i>	Mussel
Gadwall	<i>Anas strepera</i>	Bird
Garber's spurge	<i>Chamaesyce garberi</i>	Plant
Godfrey's butterwort	<i>Pinguicula ionantha</i>	Plant
Golden-winged warbler	<i>Vermivora chrysoptera</i>	Bird
Gopher tortoise	<i>Gopherus polyphemus</i>	Reptile
Grasshopper sparrow	<i>Ammodramus savannarum</i>	Bird
Great white heron	<i>Ardea herodias occidentalis</i>	Bird
Greater redhorse	<i>Moxostoma valenciennesi</i>	Fish
Green sea turtle	<i>Chelonia mydas</i>	Reptile
Green-winged teal	<i>Anas crecca</i>	Bird
Gulf Coast solitary bee	<i>Hesperapis oraria</i>	Insect
Gulf Coast striped bass	<i>Morone saxatilis</i>	Fish
Gulf moccasinshell	<i>Medionidus penicillatus</i>	Mussel

Common Name	Scientific Name	Taxa
Gulf sturgeon	<i>Acipenser oxyrinchus desotoi</i>	Fish
Heelsplitter	<i>Lasmigona spp.</i>	Mussel
Henslow's sparrow	<i>Ammodramus henslowii</i>	Bird
Horned grebe	<i>Podiceps auritus</i>	Bird
(Interior) least tern	<i>Sterna antillarum</i>	Bird
Kemp's ridley sea turtle	<i>Lepidochelys kempii</i>	Reptile
Key deer	<i>Odocoileus virginianus clavium</i>	Mammal
Key Largo cotton mouse	<i>Peromyscus gossypinus allapaticola</i>	Mammal
Key Largo woodrat	<i>Neotoma floridana smalli</i>	Mammal
Key tree-cactus	<i>Pilosocereus robinii</i>	Plant
Killdeer	<i>Charadrius vociferus</i>	Bird
King rail	<i>Rallus elegans</i>	Bird
Laughing gull	<i>Larus atricilla</i>	Bird
Le Conte's sparrow	<i>Ammodramus leconteii</i>	Bird
Least bittern	<i>Ixobrychus exilis</i>	Bird
Lesser yellowlegs	<i>Tringa flavipes</i>	Bird
Little blue heron	<i>Egretta caerulea</i>	Bird
Loggerhead sea turtle	<i>Caretta caretta</i>	Reptile
Loggerhead shrike	<i>Lanius ludovicianus</i>	Bird
Long-billed curlew	<i>Numenius americanus</i>	Bird
Louisiana black bear	<i>Ursus americanus luteolus</i>	Mammal
Lower Keys marsh rabbit	<i>Sylvilagus palustris hefneri</i>	Mammal
Mallard	<i>Anas platyrhynchos</i>	Bird
Mangrove cuckoo	<i>Coccyzus minor</i>	Bird
Marsh wren	<i>Cistothorus palustris</i>	Bird
Miami blue butterfly	<i>Cyclargus thomasi bethunebakeri</i>	Insect
Mississippi sandhill crane	<i>Grus canadensis pulla</i>	Bird
Mottled duck	<i>Anas fulvigula</i>	Bird
Northern aplomado falcon	<i>Falco femoralis septentrionalis</i>	Bird
Northern pintail	<i>Anas acuta</i>	Bird
Northern shoveler	<i>Anas clypeata</i>	Bird

Common Name	Scientific Name	Taxa
Ocelot	<i>Leopardus pardalis</i>	Mammal
Okaloosa darter	<i>Etheostoma okaloosae</i>	Fish
Oval pigtoe	<i>Pleurobema pyriforme</i>	Mussel
Paddlefish	<i>Polyodon spathula</i>	Fish
Pallid sturgeon	<i>Scaphirhynchus albus</i>	Fish
Pearl darter	<i>Percina aurora</i>	Fish
Pectoral sandpiper	<i>Calidris melanotos</i>	Bird
Perdido Key beach mouse	<i>Peromyscus polionotus trissyllepsis</i>	Mammal
Peregrine falcon	<i>Falco peregrinus</i>	Bird
Piping plover	<i>Charadrius melodus</i>	Bird
Purple bankclimber	<i>Elliptoideus sloatianus</i>	Mussel
Red knot	<i>Calidris canutus rufa</i>	Bird
Red-cockaded woodpecker	<i>Picoides borealis</i>	Bird
Reddish egret	<i>Egretta rufescens</i>	Bird
Redhead	<i>Aythya americana</i>	Bird
Reticulated flatwoods salamander	<i>Ambystoma bishopi</i>	Amphibian
Ring-necked duck	<i>Aythya collaris</i>	Bird
Roseate spoonbill	<i>Platalea ajaja</i>	Bird
Roseate tern	<i>Sterna dougallii dougallii</i>	Bird
Round ebonyshell	<i>Fusconaia rotulata</i>	Mussel
Royal tern	<i>Thalasseus maximus</i>	Bird
Ruddy duck	<i>Oxyura jamaicensis</i>	Bird
Sandwich tern	<i>Thalasseus sandvicensis</i>	Bird
Lesser scaup	<i>Aythya affinis</i>	Bird
Schau swallowtail	<i>Heraclides aristodemus ponceanus</i>	Insect
Seaside sparrow	<i>Ammodramus maritimus</i>	Bird
Semipalmated sandpiper	<i>Calidris pusilla</i>	Bird
Shinyrayed pocketbook	<i>Lampsilis subangulata</i>	Mussel
Silver rice rat	<i>Oryzomys palustris natator</i>	Mammal
Smalltooth sawfish	<i>Pristis pectinata</i>	Fish

Common Name	Scientific Name	Taxa
Lesser snow goose	<i>Anser caerulescens caerulescens</i>	Bird
Snowy egret	<i>Egretta thula</i>	Bird
Snowy plover	<i>Charadrius nivosus</i>	Bird
Southern kidneyshell	<i>Ptychobranthus jonesi</i>	Mussel
Sprague's pipit	<i>Anthus spragueii</i>	Bird
Staghorn coral	<i>Acropora cervicornis</i>	Corals
Stilt sandpiper	<i>Calidris himantopus</i>	Bird
Stock Island tree snail	<i>Orthalicus reses</i>	Snail
Sundew	<i>Drosera spp.</i>	Plant
Swainson's warbler	<i>Limnothlypis swainsonii</i>	Bird
Swallow-tailed kite	<i>Elanoides forficatus</i>	Bird
Topeka shiner	<i>Notropis topeka</i>	Fish
Tricolored heron	<i>Egretta tricolor</i>	Bird
Upland sandpiper	<i>Bartramia longicauda</i>	Bird
West Indian manatee	<i>Trichechus manatus</i>	Mammal
Western sandpiper	<i>Calidris mauri</i>	Bird
Whimbrel	<i>Numenius phaeopus</i>	Bird
White-crowned pigeon	<i>Patagioenas leucocephala</i>	Bird
White ibis	<i>Eudocimus albus</i>	Bird
White-faced ibis	<i>Plegadis chihi</i>	Bird
Greater white-fronted goose	<i>Anser albifrons</i>	Bird
Whooping crane	<i>Grus americana</i>	Bird
Willet	<i>Tringa semipalmata</i>	Bird
Wilson's plover	<i>Charadrius wilsonia</i>	Bird
Wilson's phalarope	<i>Phalaropus tricolor</i>	Bird
Wood duck	<i>Aix sponsa</i>	Bird
Wood stork	<i>Mycteria americana</i>	Bird
Yellow rail	<i>Coturnicops noveboracensis</i>	Bird

Non-Trust Resources

In addition to the federal trust resource species identified in the document, we identify numerous other species that are rare, state-listed or of commercial or recreational importance to the Gulf of Mexico.

Common Name	Scientific Name	Taxa
Alabama map turtle	<i>Graptemys pulchra</i>	Reptile
American alligator	<i>Alligator mississippiensis</i>	Reptile
Apalachicola floater	<i>Anodonta heardi</i>	Mussel
Asian (silver) carp	<i>Hypophthalmichthys molitrix</i>	Fish
Australian pine	<i>Casuarina equisetifolia</i>	Plant
Bald cypress	<i>Taxodium distichum</i>	Plant
Big Cypress fox squirrel	<i>Sciurus niger avicennia</i>	Mammal
Crappie	<i>Pomoxis spp.</i>	Fish
Black drum	<i>Pogonias cromis</i>	Fish
Black mangrove	<i>Avicennia germinans</i>	Plant
Blue catfish	<i>Ictalurus furcatus</i>	Fish
Blue crab	<i>Callinectes sapidus</i>	Crustacean
Bonefish	<i>Albula vulpes</i>	Fish
Boykin's lobelia	<i>Lobelia boykinii</i>	Plant
Brazilian pepper tree	<i>Schinus terebinthifolius</i>	Plant
Brown shrimp	<i>Farfantepenaeus aztecus</i>	Crustacean
Buffalo	<i>Ictiobus spp.</i>	Fish
Channel catfish	<i>Ictalurus punctatus</i>	Fish
Chinese tallow tree	<i>Triadica sebifera</i>	Plant
Chorus frog	<i>Pseudacris spp.</i>	Amphibian
Coastal flatwoods crayfish	<i>Procambarus apalachicola</i>	Crustacean
Cobia	<i>Rachycentron canadum</i>	Fish
Coyote	<i>Canis latrans</i>	Mammal
Southern crawfish frog	<i>Rana areolata areolatus</i>	Amphibian
Diamondback terrapin	<i>Malaclemys terrapin</i>	Reptile
Eastern coachwhip	<i>Masticophis flagellum flagellum</i>	Reptile
Eastern garter snake	<i>Thamnophis sirtalis</i>	Reptile

Common Name	Scientific Name	Taxa
Eastern gray squirrel	<i>Sciurus carolinensis</i>	Mammal
Eastern oyster	<i>Crassostrea virginica</i>	Mussel
Eastern painted turtle	<i>Chrysemys picta</i>	Reptile
Everglades mink	<i>Neovison vison evergladensis</i>	Mammal
Feral pig	<i>Sus scrofa</i>	Mammal
Florida Keys mole skink	<i>Plestiodon egregius egregius</i>	Reptile
Florida pine snake	<i>Pituophis melanoleucus mugitus</i>	Reptile
Southern flounder	<i>Paralichthys lethosigma</i>	Fish
Eastern fox squirrel	<i>Sciurus niger</i>	Mammal
Gizzard shad	<i>Dorosoma cepedianum</i>	Fish
Greater prairie chicken	<i>Tympanuchus cupido</i>	Bird
Grouper	<i>Mycteroperca spp.</i>	Fish
Gulf coast salt marsh mink	<i>Mustela vison halilimnetes</i>	Mammal
Gulf menhaden	<i>Brevoortia patronus</i>	Fish
Hydrilla	<i>Hydrilla verticillata</i>	Plant
Insular hispid cotton rat	<i>Sigmodon hispidus insulicola</i>	Mammal
Key ringneck snake	<i>Diadophis punctatus acricus</i>	Reptile
Largemouth bass	<i>Micropterus salmoides</i>	Fish
Leadtrees	<i>Leucaena leucocephala</i>	Plant
Longleaf pine	<i>Pinus palustris</i>	Plant
Milkweed	<i>Asclepias spp.</i>	Plant
Mimic glass lizard	<i>Ophisaurus mimicus</i>	Reptile
Mimosa (Silk tree)	<i>Albizia julibrissin</i>	Plant
Mink	<i>Neovison vison</i>	Mammal
Monarch butterfly	<i>Danaus plexippus plexippus</i>	Insect
Muskrat	<i>Ondatra zibethicus</i>	Mammal
Northern bobwhite quail	<i>Colinus virginianus</i>	Bird
Northern leopard frog	<i>Lithobates pipiens</i>	Amphibian
Northern scarlet snake	<i>Cemophora coccinea copei</i>	Reptile
Nutria	<i>Myocastor coypus</i>	Mammal

Common Name	Scientific Name	Taxa
Ornate box turtle	<i>Terrapene ornata ornata</i>	Reptile
Panama City crayfish	<i>Procambarus econfinae</i>	Crustacean
Pascagoula map turtle	<i>Graptemys gibbonsi</i>	Reptile
Pecan tree	<i>Carya illinoensis</i>	Plant
Pig frog	<i>Lithobates grylio</i>	Amphibian
Raccoon	<i>Procyon lotor</i>	Mammal
Rafinesque's big-eared bat	<i>Plecotus rafinesquii</i>	Mammal
Red drum	<i>Sciaenops ocellatus</i>	Fish
Red fox	<i>Vulpes vulpes</i>	Mammal
Red mangrove	<i>Rhizophora mangle</i>	Plant
Red snapper	<i>Lutjanus campechanus</i>	Fish
Ring-necked pheasant	<i>Phasianus colchicus</i>	Bird
Rusty patched bumble bee	<i>Bombus affinis</i>	Insect
Salvinia	<i>Salvinia molesta</i>	Plant
Sanibel Island rice rat	<i>Oryzomys palustris sanibeli</i>	Mammal
Sawgrass skipper	<i>Euphyes pilatka klotsi</i>	Insect
Bay Scallop	<i>Argopecten irradians</i>	Crustacean
Sharp-tailed grouse	<i>Tympanuchus phasianellus</i>	Bird
Sherman's short-tailed shrew	<i>Blarina brevicauda shermani</i>	Mammal
Shoal bass	<i>Micropterus cataractae</i>	Fish
Sweetgum	<i>Liquidambar styraciflua</i>	Plant
Pink shrimp	<i>Litopenaeus setiferus</i>	Crustacean
Skipjack herring	<i>Alosa chrysochloris</i>	Fish
Slender glass lizard	<i>Ophisaurus attenuatus</i>	Reptile
Smooth cordgrass	<i>Spartina alterniflora</i>	Plant
Southeastern myotis	<i>Myotis austroriparius</i>	Mammal
Southern flying squirrel	<i>Glaucomys volans</i>	Mammal
Spanish mackerel	<i>Scomberomorus maculatus</i>	Fish
Spotted bass	<i>Micropterus punctulatus</i>	Fish
Spotted seatrout (speckled trout)	<i>Cynoscion nebulosus</i>	Fish
Keys striped mud turtle	<i>Kinosternon bauri bauri</i>	Reptile

Common Name	Scientific Name	Taxa
Striped mullet	<i>Mugil cephalus</i>	Fish
Striped skunk	<i>Mephitis mephitis</i>	Mammal
Suwannee River alligator snapping turtle	<i>Macroclemys temminckii</i>	Reptile
Sweet pitcher plant	<i>Sarracenia rubra rubra</i>	Plant
Atlantic Tarpon	<i>Megalops atlanticus</i>	Fish
Three-toed box turtle	<i>Terrapene carolina triunguis</i>	Reptile
Tree frog	<i>Hyla spp.</i>	Amphibian
Tripletail	<i>Lobotes surinamensis</i>	Fish
Water hyacinth	<i>Eichhornia crassipes</i>	Plant
Water tupelo	<i>Nyssa aquatica</i>	Plant
White-tailed deer	<i>Odocoileus virginianus</i>	Mammal
Eastern wild turkey	<i>Meleagris gallapavo</i>	Bird
Yazoo crayfish	<i>Orconectes hartfieldi</i>	Crustacean

Glossary

Adaptive Management is a process that promotes flexible decision-making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding, and helps adjust policies or operations as part of an iterative learning process. Adaptive management also recognizes the importance of natural variability in contributing to ecological resilience and productivity. It is not a 'trial and error' process; it emphasizes learning while doing, and adapting based on what's learned.

Anadromous Fish are born in fresh water, spend most of their life in the sea, and return to freshwater to spawn. Gulf Coast striped bass and Gulf sturgeon are examples of anadromous fish found in the Gulf watershed.

At-risk Species includes species that are proposed for listing, candidates for listing and petitioned for listing. At-risk species are under the authority of state wildlife agencies and conservation of these species is led by the states. Many of the at-risk species share habitat with currently listed species and will benefit from conservation of those species. Other at-risk species may require new conservation approaches and actions. The Service's ongoing collaboration with SEAFWA's Wildlife Diversity Committee is one way we consider at-risk species in the development of conservation plans and actions; as needs are identified they will be incorporated into plans for focal areas.

Base Flow is the portion of stream flow that is not runoff and results from seepage of water from the ground into a channel slowly over time. This is the primary source of running water in a stream during dry weather.

Beneficial Use (of dredged material) is a way of utilizing sediment resources from dredging to accomplish restoration initiatives by keeping dredged sediments within the natural system. Using dredged materials in the construction of restoration projects can improve environmental conditions, provide storm damage protection, and contribute to habitat creation and restoration.

Beneficial Uses Groups are made up of federal, state and private partners that promote the use of the material dredged from ports, harbors and waterways in a beneficial manner rather than being disposed of as waste. Dredged material such as sand, silt and soft clay can be used beneficially to create topsoil, nourish beaches, and create or restore habitat.

Best Management Practices (BMPs) include soil and water conservation practices, other management techniques and social actions that are developed for a particular region as effective and practical tools for environmental protection. (Source: USDA 2006 Best Management Practices To Minimize Agricultural Phosphorus Impacts on Water Quality).

Connectivity involves the protection, retention and rehabilitation of natural connections among habitats within ecosystems at the landscape level. The goal is interconnected habitat that allows for the movement of wildlife. See “Wildlife Corridors.”

Conservation Easements are voluntary legal agreements between landowners and a land trust or government agency that limits uses of a piece of land in order to protect its conservation values (e.g., water quality, migration routes). Landowners retain many of their rights, including the right to use the land in other ways, sell it and pass it on to heirs. Each easement is individually tailored to meet conservation objectives and the needs of the landowner. Thus the terms of conservation easements can vary greatly: one could forbid or substantially constrain subdivision and other real estate development, while another might allow continued farming and the building of additional agricultural structures. Conservation easements are almost always permanent, designed to protect natural resources in perpetuity.

Critical Habitat is a term defined and used in relation to Endangered Species Act. It refers to a specific geographic area that contains features essential for the conservation of a threatened or endangered species, and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery.

Diadromous Fish spend portions of their life cycles partially in fresh water and partially in salt water. This category covers both anadromous and catadromous fish. Anadromous fishes spend most of their adult lives at sea, but return to fresh water to spawn; catadromous is a term used for a special category of marine fishes who spend most of their adult lives in fresh water, but must return to the sea to spawn.

Diversions are temporary ridges or excavated channels (or combinations of ridges and channels) constructed to divert water from or around one area to another. River diversions offer a mechanism by which sediment-laden waters can be introduced into basins and bays to build new land that provides a substrate for wetland growth.

Fee Acquisitions are transactions that transfer full ownership of property, including the underlying title, to another party. A fee acquisition may be a purchase or the result of a donation.

[Fish Habitat Partnerships](#) are modeled after Migratory Bird Joint Ventures. These partnerships are formed around important aquatic habitats and distinct geographic areas (e.g., Southeast Aquatic Resources Partnership) “keystone” fish species (e.g., alligator gar), or system types (e.g., large-river floodplain habitat).

Flagship Species are iconic species that provide a focus for raising awareness and action to fund broader conservation efforts.

Greentree Reservoirs are stands of bottomland hardwood forest that are equipped with water-control structures (e.g., a levee system, wells and/or pumps) so that they can be flooded in late fall, when oaks and other trees are dormant, to provide crucial wintering habitat for waterfowl.

Gulf Coast Vulnerability Assessment is a project initiated by the four Landscape Conservation Cooperatives along the Gulf, in partnership with the Service and others, which used an expert opinion approach to evaluate the effects of climate change, sea level rise, and urbanization on four Gulf of Mexico coastal ecosystems and 11 species that depend on them.

Gulf of Mexico Alliance (GOMA) is a nonprofit organization led by the five Gulf states with a mission to collaboratively enhance the ecological and economic health of the region through six priority issues: Water Resources, Habitat Resources, Community Resilience, Data & Monitoring, Wildlife & Fisheries, and Education & Engagement. GOMA's members make up a broad partner network that includes state and federal agencies, academic organizations, businesses, and other nonprofits in the region.

Hypoxia, or oxygen depletion, is an environmental phenomenon where the concentration of dissolved oxygen in the water decreases to a level that can no longer support living aquatic organisms. Hypoxia can be caused by a variety of factors, including excess nutrients (primarily nitrogen and phosphorus), and waterbody stratification (layering) due to saline or temperature gradients. With excess nutrients, the problem begins when they overstimulate algal growth. As the algae die, they decompose, and oxygen is consumed in the process. This results in the low levels of oxygen in the water; hypoxia in the northern Gulf of Mexico is defined as a concentration of dissolved oxygen less than 2 mg/L (2 ppm). The nutrients can come from many sources, including fertilizers from agriculture, golf courses and suburban lawns; erosion of soil full of nutrients; discharges from sewage treatment plants; and the deposition of atmospheric nitrogen.

Interjurisdictional Fish are fish populations whose management and allocation of use are the collective responsibility of two or more states, tribes and/or other nations. The Gulf menhaden (*Brevoortia patronus*) is an example of an interjurisdictional fish species, as these fish range during their lifetimes from the Yucatan Peninsula in Mexico, across the western and northern Gulf to Tampa Bay, Florida.

Indicator Species are species whose presence, absence or abundance reflect a specific environmental condition. An indicator species can signal a change in the biological condition of a particular ecosystem, and thus may be used as a proxy to diagnose the health of an ecosystem.

Invasive Species are not native to an ecosystem and cause, or are likely to cause, harm to the economy, environment and/or human health. An invasive species can originate in a foreign country, or be native and benign in one part of the country but invasive in another part.

Keystone Species are species that play unique and crucial roles in the way an ecosystem functions. Without this species, an ecosystem would be dramatically different.

Landcover is commonly defined as the vegetation (natural or planted) or man-made constructions (buildings, etc.) which occur on the earth surface. Water, ice, bare rock, sand, asphalt and similar surfaces also count as land cover.

Landscape Conservation Cooperatives (LCCs) are self-directed partnerships between federal agencies, states, tribes, non-governmental organizations, universities and other entities that collaboratively define science needs and jointly address broad-scale conservation issues (e.g., sea-level rise) in a defined geographic area.

Landscape Conservation Design involves combining geospatial data with biological information and models to create tools (e.g., maps) that evaluate the potential of every acre of habitat of a landscape to support a species' population. Using these tools, one can determine what the current habitat-acre capability of the landscape is -- and what it needs to be -- to achieve specific biological objectives or outcomes.

Living Shorelines are stabilization projects constructed along estuarine shorelines designed to minimize erosion and maximize habitat for plants and animals by maintaining natural coastal processes through strategic placement of natural components along the shoreline profile from uplands to wetlands. Living shorelines represent a greener, more environmentally friendly alternative to traditional shoreline hardening techniques (e.g., bulkheads and seawalls) by using native plants (e.g., marsh grasses, mangroves, seagrasses, and upland, salt-tolerant species), oysters, coir fiber logs, and other natural materials (with limited use of rock only when necessary). They can provide a host of ecological benefits by trapping sediment, filtering runoff, providing habitat for aquatic and terrestrial species, buffering storms, improving water quality, allowing for tidal exchange, preserving coastal resiliency, mitigating sea level rise, as well as increasing aesthetic and recreational values.

Migratory Bird Joint Ventures (JVs) are collaborative, regional partnerships of government agencies, non-profit organizations, corporations, tribes and individuals that conserve habitat for the benefit of priority bird species, other wildlife and people. Migratory Bird Joint Ventures bring these diverse partners together to design and implement landscape-scale conservation efforts in support of the North American Waterfowl Management Plan and other bird management plans.

[National Estuary Programs \(NEPs\)](#) were established by Congress in 1987 under the auspices of the Environmental Protection Agency as non-regulatory programs that bring together citizens, scientists, businesses and government entities to develop and implement science-based action plans that enhance estuaries as vital environmental and economic resources benefiting local communities and the entire nation. Seven NEPs have been established in the Gulf Coast region.

Natural Resource Damage Assessment and Restoration (NRDAR) relates to a natural resource damage assessment (NRDA), which is the process that federal, state and tribal governments use in their role as “trustees” to determine the injury that an oil spill has caused to natural resources. A natural resource damage assessment and restoration (NRDAR) process adds restoration planning to the NRDA. The goal of the NRDA/NRDAR processes is to develop an injury assessment-based claim that supports restoration which will return injured natural resources to the condition they would have been in had the oil spill not occurred.

[Partnership for Gulf Coast Land Conservation](#) is a coalition of 34 local, regional and national conservation organizations that work in the Gulf Coast region within the five states bordering the Gulf of Mexico. The Gulf Partnership’s mission is to increase the pace, quality and permanence of voluntary land and water conservation within the Gulf Coast region.

Prescribed Fire is a fire that is intentionally set under controlled conditions to achieve specific management objectives such as the suppression of invasive plant species, or to reduce dangerously overgrown vegetation that could lead to a devastating wildfire that could threaten people, fish, wildlife and plants.

Recovery is an improvement in the status of a listed species to the point at which listing is no longer appropriate under the criteria set out in section 4(a)(1) of the Endangered Species Act.

Recovery Plan is a “road map” drafted by the Service, NOAA Fisheries, or other knowledgeable individuals or groups that serve as a guide for activities to be undertaken to recover and conserve endangered or threatened species.

A recovery plan includes a description of the needed management actions; objective, measurable criteria which when met would lead to the species being removed from Federal protection; and an estimate of the time required and cost to carry out those measures. Recovery plans may include brief discussions of the species’ biology, life history and threats to it.

Recovery Team is a group of people appointed by the lead Service Regional Director or NOAA Assistant Administrator to guide the recovery of a listed species through such actions as developing a recovery plan or providing guidance on recovery implementation. Members of the recovery team generally include species

experts from the Service, NOAA, state governments, conservation organizations and the private sector, as well as stakeholders.

[Southeast Association of Fish and Wildlife Agencies \(SEAFWA\)](#) is an organization whose members are the state agencies with primary responsibility for management and protection of the fish and wildlife resources in 15 states, Puerto Rico and the United States Virgin Islands. Member states are Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. SEAFWA members are working towards developing a more comprehensive and collective vision for conservation in the southeast United States by, among other things, identifying the most important lands and waters that will meet the needs of fish and wildlife for future generations.

[Southeastern Conservation Adaptation Strategy \(SECAS\)](#) is a regional, multi-partner initiative led by members of the Southeastern Association of Fish and Wildlife Agencies, supported by federal leaders in the Southeast Natural Resources Leadership Group, and developed through partners comprising the southeastern network of Landscape Conservation Cooperatives (South Atlantic, Peninsular Florida, Appalachians, Gulf Coastal Plains & Ozarks, Caribbean and Gulf Coast Prairies LCCs). These existing forums bring together landowners, businesses, and governmental and conservation organizations to collectively develop and implement a compelling conservation strategy for each Landscape Conservation Cooperative region. The goal of SECAS is to collaboratively define the conservation landscape of the Southeast United States of the future.

Species of Greatest Conservation Need is a category identified in state Wildlife Action Plans that includes animal species whose populations are rare, declining or vulnerable. This set is dynamic and can change over time as new information becomes available or the status of a species changes.

[State Wildlife Action Plans \(SWAP\)](#) guide proactive conservation planning in each state by assessing the health of wildlife and habitats, identifying problems they face, and outlining actions needed to conserve them long-term. In order to receive funds through the Wildlife Conservation and Restoration Program and the State Wildlife Grants Program, a state must develop a SWAP, technically known as “comprehensive wildlife conservation strategies”.

Surrogate Species are species that can be used as proxies to represent a broader set of species to support conservation or management strategies when the objective is to provide appropriate ecological conditions for the full set of species characteristic of a defined landscape or geographic area.

Download the Service’s 2015 **[Technical Reference on Using Surrogate Species for Landscape Conservation](#)**

Tailwater Recovery and reuse systems (tailwater systems) are applicable to any irrigated agricultural system in which significant quantity of irrigation water, as a result of the irrigation method, runs off the end of the irrigated field.

A tailwater system consists of ditches or pipelines that collect tailwater and deliver it to a storage reservoir, and includes a pumping and pipeline system that conveys the water to irrigated fields for reuse. Most tailwater systems also collect rainfall that may run off of the irrigated field. Capture and reuse of tailwater can improve the water quality of downstream reaches of rivers, streams and waterways.

Trust Resources are species and land for which the Service has a legal mandate to protect, conserve and/or enhance on behalf of the American people. These include migratory birds; species listed under the Endangered Species Act; interjurisdictional fishes; specific marine mammals; and National Wildlife Refuge lands.

Wildlife Corridors are tracts of land or habitat that provide linkages which allow wildlife to travel from one location to another to find food, shelter, a mate and/or a place to raise their young. They are especially important because they ensure genetic exchange between wildlife populations.