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Report to the Committee on Transportation and Infrastructure, House of Representatives

May 2007

SOUTH FLORIDA ECOSYSTEM

Restoration Is Moving Forward but Is Facing Significant Delays, Implementation Challenges, and Rising Costs

GAO-07-520

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Highlights

Highlights of GAO-07-520, a report to the Committee on Transportation and Infrastructure, House of Representatives

Why GAO Did This Study

The South Florida ecosystem covers about 18,000 square miles and is home to the Everglades, a national resource. Over the past 100 years, efforts to manage the flow of water through the ecosystem have jeopardized its health. In 2000, a strategy to restore the ecosystem was set; restoration was expected to take at least 40 years and cost $15.4 billion. The restoration comprises hundreds of projects, including 60 key projects known as the Comprehensive Everglades Restoration Plan (CERP), to be undertaken by a partnership of federal, state, local, and tribal governments.

Given the size and complexity of the restoration, GAO was asked to report on the (1) status of project implementation and expected benefits, (2) factors that determine project sequencing, (3) amount of funding provided for the effort and extent that costs have increased, and (4) primary mathematical models that guide the restoration.

What GAO Recommends

GAO is recommending actions to ensure that agencies apply the established sequencing criteria when making implementation decisions for some projects and that the development of models and their interfaces is better coordinated. The agencies generally agreed with these recommendations, although the state was concerned that the first recommendation could lead to further delays and cost increases.

www.gao.gov/cgi-bin/getrpt?GAO-07-520.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Anu K. Mittal at (202) 512-3841 or mittala@gao.gov.

What GAO Found

While many of the restoration effort's 222 projects have been completed or are ongoing, a core set of projects that are critical to the success of the restoration are behind schedule or not yet started. Specifically, 43 projects have been completed, 107 are being implemented, and 72 are in design, in planning, or are not yet started. The completed projects will provide improved water quality and additional habitat for wildlife, and the ongoing projects will also help restore wildlife habitat and improve water flow within the ecosystem. However, the projects most critical to the restoration's overall success—the CERP projects—are among those that are currently being designed, planned, or have not yet been started. Some of these projects are behind schedule by up to 6 years. Despite project delays, officials believe that significant progress has been made in acquiring land, constructing water quality projects, and restoring a natural water flow to the Kissimmee River—the headwater of the ecosystem. In addition, many of the policies, strategies, and agreements required to guide the restoration in the future are now in place. To help provide further momentum to the restoration, Florida recently began expediting the design and construction of eight key projects, with the hope that they would immediately benefit the environment, enhance flood control, and increase water supply.

There are no overarching sequencing criteria that restoration officials use when making implementation decisions for all 222 projects that make up the restoration effort. Instead, decisions for 162 projects are driven largely by the availability of funds. For the remaining 60 projects—which are among the most critical to the success of the restoration effort—the Corps of Engineers and the Congress established criteria to ensure the goals and purposes of CERP are achieved. However, the sequencing plan developed for these projects in 2005 is not consistent with the criteria established by the Corps. Therefore, there is little assurance that the plan will be effective.

From fiscal years 1999 through 2006, the federal government contributed $2.3 billion, and Florida contributed $4.8 billion, for a total of about $7.1 billion for the restoration. However, CERP funding was about $1.2 billion short of the funds originally projected for this period. In addition, the total estimated costs for the restoration have increased by 28 percent—from $15.4 billion in 2000 to at least $19.7 billion in 2006. More importantly, these cost estimates do not represent the true costs for the overall restoration effort because they do not include all cost components for a number of projects.

There are 27 primary mathematical models that guide the restoration effort. These include (1) hydrological, (2) water quality, and (3) ecological models. Although 21 of the 27 models are able to interface with other models and provide a more comprehensive picture of the impact of restoration efforts on the ecosystem, many agency officials stated that additional interfaces are needed. Because coordinating the development of these interfaces is resource intensive, it has been a low priority for the agencies.

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Abbreviations

BSWCD	Broward Soil and Water Conservation District
CERP	Comprehensive Everglades Restoration Plan
Corps	U.S. Army Corps of Engineers
Decomp	Water Conservation Area 3 Decompartmentalization and Sheetflow Enhancement
DOI	U.S. Department of the Interior
EPA	Environmental Protection Agency
FDCA	Florida Department of Community Affairs
FDEP	Florida Department of Environmental Protection
FDEP (OGT)	Florida Department of Environmental Protection—Office of Greenways and Trails
FWS	U.S. Department of the Interior—U.S. Fish and Wildlife Service
MISP	Master Implementation Sequencing Plan
Mod Waters	Modified Water Deliveries
NEWTT	Noxious Exotic Weed Task Team
NOAA	U.S. Department of Commerce—National Oceanic and Atmospheric Administration
NPS	U.S. Department of the Interior—National Park Service
RECOVER	Restoration Coordination and Verification
SFERC	South Florida Ecosystem Restoration Council
SFRPC	South Florida Regional Planning Council
SFWMD	South Florida Water Management District
USDA (ARS)	U.S. Department of Agriculture—Agricultural Research Service
USDA (NRCS)	U.S. Department of Agriculture—Natural Resources Conservation Service
WRDA	Water Resources Development Act

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United States Government Accountability Office
Washington, DC 20548

May 31, 2007

The Honorable James L. Oberstar
Chairman
The Honorable John Mica
Ranking Republican Member
Committee on Transportation and Infrastructure
House of Representatives

The South Florida ecosystem, which covers about 18,000 square miles, extends from the Kissimmee Chain of Lakes south of Orlando, Florida, to the reefs southwest of the Florida Keys. This vast ecosystem is home to the Everglades, one of the world's unique environmental resources, and to the only living coral reef in North America. The South Florida ecosystem is also home to a rapidly growing population of more than 6 million people and supports a large agriculture-, tourism-, and recreation-based economy. Over the past 100 years, engineering projects designed to control floods and supply water to the residents of South Florida have diverted water from the Everglades. This alteration of the water flow, coupled with agricultural and industrial activities and urbanization, has jeopardized the ecosystem's health and reduced the Everglades to about half its original size. In 2000, when the strategy for restoring the South Florida ecosystem was set, the restoration effort was expected to take at least 40 years and cost $15.4 billion.

In response to growing signs of ecosystem deterioration, federal agencies established the South Florida Ecosystem Restoration Task Force in 1993 to coordinate ongoing federal restoration activities. The Water Resources Development Act of 1996 formally established the Task Force and expanded its membership to include state, local, and tribal representatives, and charged it with coordinating and facilitating efforts to restore the ecosystem.[1] To accomplish the restoration, the Task Force established the following three goals:

[1]The Task Force consists of 14 members representing 7 federal agencies, 2 American Indian tribes, and 5 state or local governments. Representatives from the state's major industries, environmental groups, and other stakeholders provide comments to the Task Force through public meetings and forums.

- *Get the water right.* The purpose of this goal is to deliver the right amount of water, of the right quality, to the right places, at the right times. However, restoring a more natural water flow to the ecosystem while providing adequate water supplies and controlling floods will require efforts to expand the ecosystem's freshwater supply and improve the delivery of water to natural areas. Natural areas of the ecosystem are made up of federal and state lands, and coastal waters, estuaries, bays, and islands.

- *Restore, preserve, and protect natural habitats and species.* To restore lost and altered habitats and recover the endangered or threatened species native to these habitats, the federal and state governments will have to acquire lands and reconnect natural habitats that have become disconnected through growth and development, and halt the spread of invasive species.

- *Foster compatibility of the built and natural systems.* To achieve the long-term sustainability of the ecosystem, the restoration effort has the goal of maintaining the quality of life in urban areas while ensuring that (1) development practices limit habitat fragmentation and support conservation and (2) traditional industries, such as agriculture, fishing, and manufacturing, continue to be supported and do not damage the ecosystem.

To achieve these three overall goals, agencies participating in the restoration effort are implementing 222 ecosystem restoration projects. These 222 projects comprise a full spectrum of restoration activities and include the following:

- *Water storage and flow.* These types of projects include (1) constructing reservoirs and underground wells to store rainwater that would otherwise flow to the ocean through Florida's canal system; (2) removing barriers such as canals, levees, and roads to allow this stored water to flow naturally throughout the ecosystem; (3) reducing seepage of groundwater from natural areas; and (4) developing new protocols for managing water levels and flows across South Florida to ensure that the right quantity of water gets to the right places at the right times.

- *Water quality.* These types of projects involve (1) constructing man-made wetlands that can function as stormwater treatment areas and help reduce contaminants such as phosphorus and nitrogen in urban and agricultural runoff and (2) developing regulatory approaches and

promoting best management practices that can further help reduce these contaminants.

- *Water supply.* These types of projects help reduce the amount of water used by the public and in commerce, landscaping, and agriculture as well as increase water resources. These projects include revising water permitting procedures, encouraging the reuse of wastewater in regions throughout the ecosystem, and developing alternative technologies.

- *Habitat acquisition and improvement.* These types of projects include federal and state purchases of land tracts or easements, or improvements made to lands already in public ownership, that can be used to preserve habitat for native plants and animals, provide sites for reservoirs, and act as buffers near existing natural areas.

- *Invasive species control.* These types of projects include efforts to eradicate invasive plants that have displaced native plant and animal species throughout the South Florida ecosystem.

One of the key components of the restoration effort is the Comprehensive Everglades Restoration Plan (CERP)—the primary means by which the goal of "getting the water right" will be achieved. Approved by the Water Resources Development Act of 2000 (WRDA 2000), CERP is one of the most ambitious restoration efforts the federal government has ever undertaken. It currently encompasses 60 individual projects that will be designed and implemented over approximately 40 years.[2] These projects are intended to increase the water available for the natural areas by capturing much of the water that is currently being diverted, storing the water in many different reservoirs and storage wells, and releasing it when it is needed. The cost of implementing CERP will be shared equally between the federal government and the state of Florida and will be carried out primarily by the U.S. Army Corps of Engineers (the Corps) and the South Florida Water Management District (SFWMD), which is the state

[2]The original number of individual projects in CERP was 68. In addition to these 68, CERP included 6 pilot projects and 3 proposed feasibility studies. Since CERP's approval in 2000, the Corps and the South Florida Water Management District have reorganized the projects to group those that are logically connected into broader projects. For example, several projects around Lake Okeechobee have been combined into one project. At the time of this review, CERP consisted of 60 projects, but the total number of projects that make up CERP may continue to change as implementation progresses and projects are added, combined, divided into multiple parts or phases, or deleted.

authority that manages water resources for South Florida.[3] After the Corps and SFWMD complete the initial planning and design for individual CERP projects, they must submit the proposed projects to the Congress to obtain authorization and funding for construction.

In addition to the CERP projects, another 162 projects are also part of the overall restoration effort. Twenty-eight of these projects, when completed, will serve as the foundation for many of the CERP projects and are intended to restore a more natural water flow to Everglades National Park and improve water quality in the ecosystem. Nearly all of these "CERP-related" projects were already being designed or implemented by federal and state agencies, such as the Department of the Interior and SFWMD, in 2000 when the Congress approved CERP. The remaining 134 projects include a variety of efforts that will, among other things, expand wildlife refuges, eradicate invasive species, and restore wildlife habitat, and are being implemented by a number of federal, state, and tribal agencies, such as the U.S. Fish and Wildlife Service, the Florida Department of Environmental Protection (FDEP), and the Seminole Tribe of Florida. Because these projects were not authorized as part of CERP and do not serve as CERP's foundation, for the purposes of this report we refer to them as "non-CERP" projects.

Success in completing the restoration effort to achieve the expected benefits for the ecosystem as quickly as possible and in the most cost-effective manner depends on the order, or sequencing, in which many of the 222 projects will be designed and completed. Appropriate sequencing is also important to ensure that interdependencies among restoration projects are not ignored. For example, projects that will construct water storage facilities and stormwater treatment areas need to be completed before undertaking projects that remove levees and restore a more natural water flow to the ecosystem.

The Task Force has identified a set of key guiding principles for managing the restoration effort and its many related projects. One of the key principles is that decisions about restoration projects will be based on sound scientific information. A tool that can provide agencies with this kind of scientific information is the use of mathematical models that

[3]Although SFWMD is CERP's primary nonfederal sponsor, the Florida Department of Environmental Protection as well as three county governments and two American Indian tribes also serve as nonfederal sponsors for portions of the plan.

simulate hydrological, ecological, and water quality processes and shows how restoration projects will change, or have changed, the ecosystem. The models also help identify project adjustments that are needed to achieve the restoration goals. Because no single model can comprehensively predict and assess all of the effects of a project, models may need to be designed to interface with other models so that they can exchange information for a more holistic simulation of a project's impact.

Given the complexity and enormity of the South Florida ecosystem restoration, you asked us to review the current status of the effort, focusing specifically on the (1) status of restoration projects and their expected benefits; (2) factors that influence the sequencing of project implementation; (3) amount of funding provided to the restoration effort since 1999; (4) extent to which cost increases have occurred and the reasons for these increases; and (5) primary mathematical models used to guide the restoration effort and the extent to which these models have interfaces.

To determine the extent to which restoration projects have been completed and to identify their expected benefits, we obtained and analyzed documents from the Task Force and agencies participating in the restoration effort and interviewed agency and Task Force officials. On the basis of this information, we compiled a master list of completed, ongoing, and planned restoration projects and their benefits. For this review, we generally categorized projects and expected benefits by their primary purpose, as identified by the Task Force.

To determine the factors that participating agencies considered when deciding on the sequence for implementing restoration projects, we contacted the agencies responsible for the largest number of restoration projects—the Corps, the Department of the Interior, SFWMD, and FDEP. We also selected certain CERP projects for more detailed analysis, obtained and reviewed documents and related material, and conducted interviews with the Corps and SFWMD officials responsible for sequencing decisions related to these projects. In addition, we reviewed comments by other agencies and external stakeholders about the appropriateness of the factors used to determine the sequencing of CERP projects. To determine the amount of funding that participating agencies provided and the extent to which restoration costs have increased, we asked participating federal and state agencies to provide funding information for fiscal years 1999 through 2006 and estimated project costs through June 30, 2006. We interviewed agency officials about the factors contributing to cost increases. All funding and cost data presented in this report are in

constant 2006 dollars. We assessed the reliability of the funding and cost data and determined that the data were sufficiently reliable for the purposes of our study. To determine the primary models that can be used to guide the restoration effort and the interfaces among them, we compiled a universe of models available for the restoration effort, and then asked managers and scientists familiar with modeling and the restoration effort to identify those primary models and their interfaces. We also reviewed academic and agency Web sites to obtain supplemental information about these models and their interfaces.

A more detailed description of our scope and methodology is presented in appendix I. We performed our work between January 2006 and April 2007 in accordance with generally accepted government auditing standards.

Results in Brief

Although many of the projects that make up the South Florida ecosystem restoration effort are either completed or ongoing, a core group of projects that are critical to the overall success of the effort are behind schedule or not yet started. Of the 222 projects that currently make up the restoration effort, 43 have been completed, 107 are being implemented, and 72 are either being designed, being planned, or have not yet started. Of the 43 projects, 9 were completed before 2000, and 34 between 2000 and 2006. The 34 projects completed since the beginning of 2000 represent only a third of the 91 projects originally scheduled for completion between 2000 and 2006. Many of the completed projects will either improve water quality in natural areas or provide additional habitat for wildlife. The 107 projects currently being implemented will generally restore wildlife habitat and include some key CERP-related projects that will improve water flow to the natural areas. The remaining 72 projects currently being designed, being planned, or that have not yet started, include primarily CERP projects, which are the projects most critical to achieving the overall restoration goals. Some of these CERP projects are significantly behind their original implementation schedule. For example, nine CERP projects—in implementation, in design, or in planning—were originally planned for completion between 2001 and 2006, but instead will be completed as many as 6 years behind schedule. According to restoration officials, CERP project delays have occurred because it took longer than expected to develop the procedures and legal assurances that WRDA 2000 required and because the projects lacked congressional authorization and federal funding, among other reasons. Nevertheless, these officials believe that significant progress has been made, particularly in acquiring land, constructing water quality projects, and restoring a more natural water flow to the Kissimmee River, which is the headwater of the ecosystem. In

addition, many of the policies, strategies, and agreements required to guide the overall restoration in the future are now in place. Given the continuing delays in implementing critical CERP projects, the state has begun expediting the design and construction of some of these projects with its own resources. The state hopes that its efforts will provide some immediate environmental, flood control, and water supply benefits and will help jump-start the larger CERP effort once the Congress authorizes individual projects.

There are no overarching criteria to ensure that the 222 projects that make up the restoration effort are implemented in a sequence that would ensure the achievement of environmental benefits as early as possible. Instead, implementation decisions about the 28 CERP-related and 134 non-CERP projects are largely driven by available funding; for the 60 CERP projects, sequencing decisions have been made without fully complying with the clearly defined criteria established for these projects in the federal regulations. Recognizing the criticality of the CERP projects to the restoration effort, both the Congress and the Corps established criteria to ensure the goals and purposes of CERP are achieved. However, when the Corps developed a sequencing plan for CERP projects in 2005, it did not have key data and other information to fully apply the criteria established in its regulations. Consequently, the decisions in the plan were based primarily on technical dependencies among projects and funding availability. Recently, the Corps began a process to revise its existing CERP project schedules and sequencing plan, but it still does not have the key information needed to fully apply the established criteria and meet the regulatory requirements. As a result, there is little assurance that the Corps' revised sequencing plan, when it is final, will lead to a CERP project implementation plan that will provide restoration benefits as early as possible and in the most cost-effective manner. We are, therefore, recommending that the Corps obtain the information it needs, and once obtained, comprehensively reassess its sequencing decisions to ensure that CERP projects have been appropriately sequenced to maximize the achievement of the restoration goals. In commenting on a draft of this report, the Department of Defense concurred with our recommendation. However, Florida expressed concern that our recommendation might lead to further delays and increased costs. While we understand the state's concerns, we believe, given the delays that have already occurred and the criticality of CERP sequencing decisions to the success of the restoration effort, that implementation of this recommendation is necessary.

Participating federal and state agencies provided a total of $7.1 billion for the restoration effort from fiscal years 1999 through 2006. Since 1999, the

federal government contributed about $2.3 billion to the restoration effort and Florida contributed about $4.8 billion. Allocations from the $7.1 billion total by type of project funded were: $2.3 billion for CERP projects, nearly $2.0 billion for CERP-related projects, and $2.8 billion for non-CERP projects. Allocations from the total by type of activity funded were: $2.6 billion for land acquisition; over $1.9 billion for construction; and $2.6 billion for restoration support activities, such as controlling invasive species, conducting feasibility studies, and developing habitat or water management plans. Although the federal and state governments provided $2.3 billion for CERP projects, this amount was about $1.2 billion less than the amount of funding that participating agencies had estimated they would need from fiscal years 1999 through 2006. Specifically, participating agencies had estimated that they would need approximately $3.5 billion for implementing CERP projects from fiscal years 1999 through 2006. However, the federal government's contribution for CERP projects was short by $1.4 billion, primarily because CERP projects did not receive the congressional authorization and appropriations that the agencies had expected would occur during this period. The overall shortfall was reduced to $1.2 billion because Florida increased its contribution for CERP projects by $250 million during this period.

The total projected cost of the restoration effort has increased by 28 percent—from $15.4 billion in 2000 to at least $19.7 billion in 2006—but neither total reflects the true cost of the restoration effort, which could be significantly higher. The growth in total projected costs between 2000 and 2006 occurred, in large part, because of cost increases in CERP projects, from $8.8 billion in 2000 to $10.1 billion in 2006. According to Corps officials, the overall cost increases are due to project scope changes, increased construction costs, and higher land costs. However, the projected total cost estimates of the restoration effort do not reflect its true costs because the full cost of most CERP projects is not yet known. This is because most CERP projects are still in the conceptual phase—that is, detailed design and implementation has not yet been undertaken or completed. Until the design is finalized and construction begins, a more complete estimate of the costs of these projects will not be known and captured in the total estimated restoration cost. For example, in the conceptual phase, the cost estimate for the Site 1 Impoundment project—a CERP project in southern Palm Beach County to capture and store local runoff during wet periods and then use the water to supplement water deliveries during dry periods—was $46 million. Once preliminary planning and design work was completed, however, the Corps' estimate for this project increased to $81 million. If similar kinds of cost increases occur for the remaining CERP projects for which initial planning and design work

has not yet been undertaken or completed, the cost of CERP, as well as the overall restoration effort, could increase significantly.

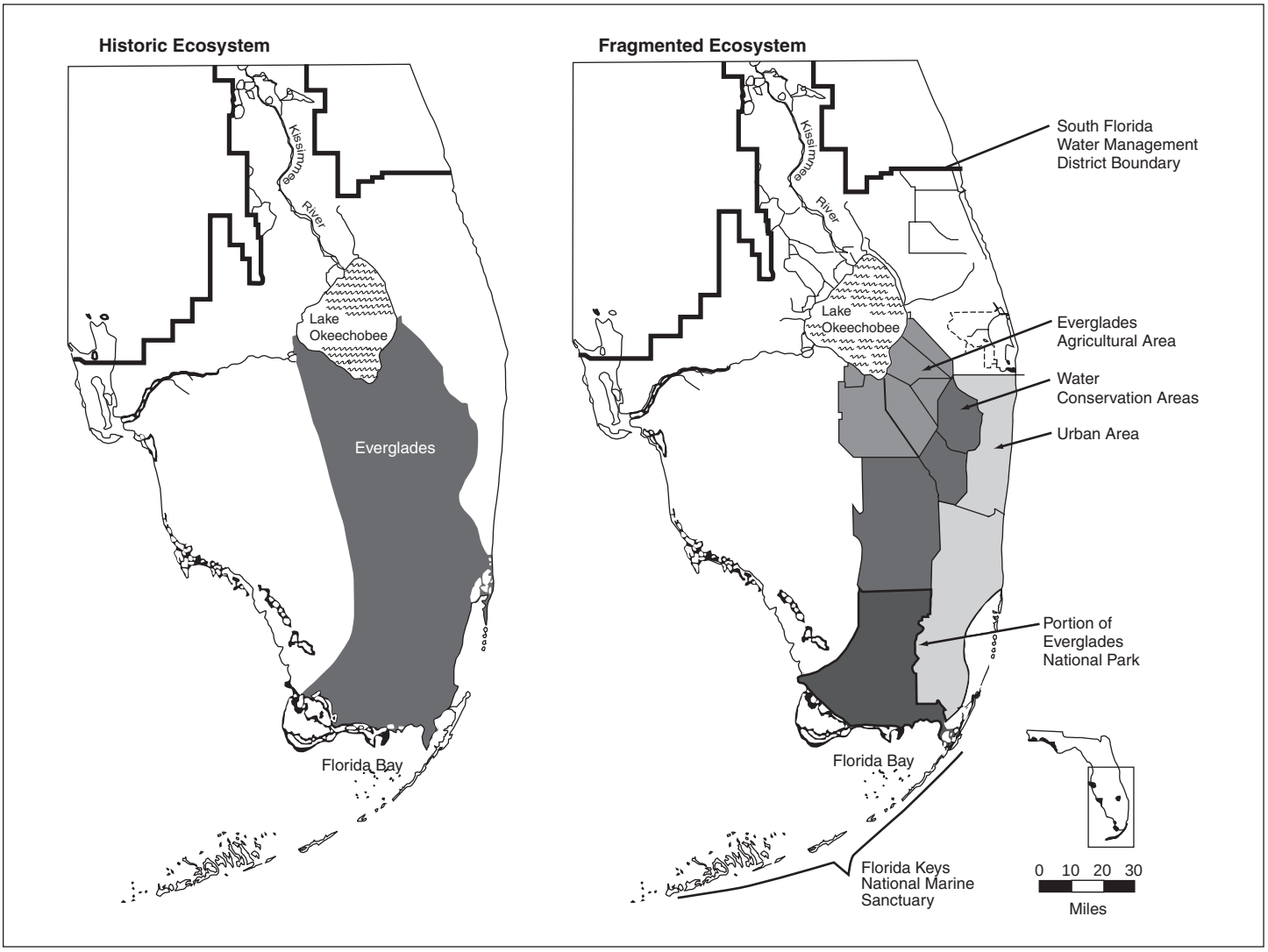
There are 27 primary mathematical models that can be used to guide the restoration effort, and while many of these models have interfaces, many restoration experts believe that additional interfaces are needed to provide more comprehensive information that can better guide the restoration effort. These 27 models include (1) hydrological models, which simulate processes such as runoff, the movement of groundwater, and the flow of surface water in rivers, lakes, estuaries, and oceans; (2) water quality models that simulate the migration of pollutants in both surface water and groundwater systems; and (3) ecological models that simulate how plant and animal communities interact with their habitat. At least 21 of the 27 models have some interfaces that allow the models to share information with some of the other models and thereby provide restoration officials with a better understanding of the restoration's impact on the ecosystem. However, many agency officials we spoke with stated that additional interfaces are needed to provide them with a more comprehensive and accurate understanding of the ecosystem, but developing these interfaces would require improved coordination among agencies. Currently, coordinating their efforts to develop models and interfaces has been a low priority for the participating agencies. Given the importance of models and interfaces in helping officials manage the restoration effort, we are recommending that the Task Force, as the coordinating body for the restoration effort, should take the lead on helping participating agencies better coordinate the development of models and their interfaces. In commenting on a draft of this report, the Department of the Interior and the state of Florida supported our recommendation. The Department of Defense did not support this recommendation and stated that the Interagency Modeling Center, established by the Corps and SFWMD to coordinate and oversee the modeling needs of CERP, should serve as the single point of responsibility for modeling services. While we recognize that the Interagency Modeling Center plays an important role in supporting and coordinating modeling for CERP, it does not provide support for the entire restoration effort. As a result, we continue to believe that the Task Force should take the lead in helping all of the participating agencies, including the Corps and SFWMD, better coordinate the development of models and interfaces needed for the overall effort.

Background

The South Florida ecosystem covers about 18,000 square miles in 16 counties and extends from the Kissimmee Chain of Lakes south of Orlando to Lake Okeechobee, and continues south past the Florida Bay to the reefs

southwest of the Florida Keys. The ecosystem is in jeopardy today because of past efforts that diverted water from the Everglades to control flooding and to supply water for urban and agricultural development. The Central and Southern Florida project, a large-scale water control project begun in the late 1940s, constructed more than 1,700 miles of canals and levees and over 200 water control structures that drain an average of 1.7 billion gallons of water per day into the Atlantic Ocean and the Gulf of Mexico. This construction resulted in insufficient water for the natural system and for the growing population, along with degraded water quality. Today, the Everglades has been reduced to half its original size and the ecosystem continues to deteriorate because of the alteration of the water flow, impacts of agricultural and industrial activities, and increasing urbanization. Figure 1 shows the South Florida ecosystem before and after the Central and Southern Florida project construction.

Figure 1: Map of the South Florida Ecosystem before and after Construction of the Central and Southern Florida Water Control Project



Source: GAO's adaptation of an illustration prepared by the South Florida Water Management District.

South Florida Ecosystem Restoration Task Force

In an effort to stem the deterioration of the ecosystem and restore the Everglades to a more natural state, federal agencies created the South Florida Ecosystem Restoration Task Force (Task Force) in 1993, an interagency partnership to coordinate federal restoration activities. The Congress formally established the Task Force and expanded its

membership in 1996 to include state and local agencies and two American Indian tribes and charged the Task Force with the following responsibilities for restoring the South Florida ecosystem:

- coordinating the development of consistent policies, strategies, plans, programs, projects, activities, and priorities for addressing the restoration, preservation, and protection of the ecosystem;
- exchanging information on programs, projects, and activities of the agencies and entities represented on the Task Force to promote ecosystem restoration and maintenance;
- facilitating the resolution of interagency and intergovernmental conflicts associated with the restoration of the ecosystem among the agencies and entities represented on the Task Force;
- coordinating scientific and other research associated with the restoration effort; and
- providing assistance and support to agencies and entities represented on the Task Force in their restoration activities.

Comprehensive Everglades Restoration Plan

The centerpiece for achieving the goal to get the water right is the CERP, approved by the Congress in WRDA 2000. CERP provides a conceptual framework for increasing freshwater volume and improving the delivery and quantity of water to natural areas in the South Florida ecosystem. It also provides for the region's other water-related needs, such as water supply and flood protection in urban and agricultural areas. The estimated cost for CERP in 2000 was $8.8 billion, to be shared on an equal basis between the Corps and the state of Florida. Table 1 details the primary purposes for the 60 CERP projects.

Table 1: Primary Purposes and Number of Associated CERP Projects

Primary project purpose	Number of CERP projects
Water storage and flow (including five pilot projects)	33
Habitat acquisition and improvement	9
Water quality	8
Feasibility studies	4
Water supply (including one pilot project)	5
Invasive species control	1
Total	**60**

Source: GAO's analysis of project documents prepared by Task Force and participating agencies.

Before the Corps can proceed with implementing a CERP construction project, WRDA 2000 requires that the Corps obtain congressional authorization by submitting a detailed report on the project's design, cost, and other information (known as a project implementation report). WRDA 2000 also required the Corps to issue programmatic regulations for implementing CERP projects. These regulations, effective in December 2003, required the Corps, among other things, to take the following actions:

- Issue no later than December 13, 2004, a master implementation sequencing plan (MISP) that establishes the order in which CERP projects will be planned, designed, and constructed, and periodically update the plan.

- Issue an interim goals agreement, no later than December 13, 2004, signed by the Secretaries of the Army and of the Interior and the Governor of Florida,[4] for evaluating the restoration's success and for assessing improvements in the quantity, quality, timing, and distribution of water to restore the natural system.

- Establish an adaptive management program, which is an approach for addressing the uncertainty associated with project decisions by continuously incorporating new and updated information. Where performance is determined to be less than anticipated, the adaptive management approach allows for making needed changes to the interim goals, projects, and the overall CERP program. Many of the program's

[4]The Secretary of the Army signs the agreement on behalf of the Corps.

efforts are led by a federal and state interagency science group known as the Restoration Coordination and Verification (RECOVER) team. RECOVER's responsibilities under the program include assessing and reporting whether interim goals are being achieved, developing monitoring and assessment programs, and preparing technical reports.

CERP-Related and Non-CERP Projects

Agencies participating in the restoration effort are also implementing a number of projects that serve as CERP's foundation (CERP-related) as well as projects that are not as closely related to CERP (non-CERP). The CERP-related projects are a group of 28 projects, carried out primarily by the Corps and SFWMD, that lay the foundation for the CERP projects. The projects are being constructed throughout the ecosystem and are related to storing, treating, and moving water. The 28 CERP-related projects also include some projects that were authorized in WRDA 1996 and are referred to as Critical Projects for the restoration of the South Florida ecosystem. These water quality and related projects are essential to successfully achieving the goal of getting the water right.

The non-CERP projects are a group of 134 projects that are being sponsored by federal, state, local, and tribal agencies in South Florida. A number of these projects had started—and some were completed—prior to WRDA 2000. The projects vary in their purposes, with some involving feasibility studies or plans to control invasive species and others focusing on land acquisition for conservation and restoring habitat. Although these projects are part of the overall restoration of the South Florida ecosystem, their implementation generally does not depend upon other projects. However, certain CERP and CERP-related projects will incorporate portions of non-CERP land acquisitions into their project footprints as the restoration progresses.

Use of Mathematical Models in Decision Making

Among the guiding principles of the South Florida ecosystem restoration initiative is a commitment to managing projects and making decisions on the basis of sound scientific information. Models, particularly mathematical models, are among the tools that agency managers and scientists use to support decision making on the basis of sound science. These models are important to simulate ecosystem changes resulting from restoration activities and to provide managers and scientists with assurance that projects will work as intended to achieve environmental benefits. Managers and scientists use mathematical hydrological, ecological, and water quality models to predict regional or systemwide

impacts of project alternatives and to predict benefits that may result from various possible alternatives.

To increase the ability of hydrological, ecological, and water quality models to effectively predict environmental benefits and evaluate changes to possible project alternatives, interfaces are needed. Interfaces allow models to share and exchange data and simulate the impact of projects on the ecosystem more comprehensively and effectively. The term interface can cover a variety of mechanisms that allow a model to interact with other models, such as computer software that allows users to simultaneously view the results of multiple individual models, and programs that allow for the exchange of input or output data between models, or allow for hydrological, water quality, and ecological processes to be simulated simultaneously in real time.

Although Many Restoration Projects Have Been Completed or Are Ongoing, Key Restoration Benefits Are Expected to Come from Projects Not Yet Implemented

Forty-three of the 222 projects that constitute the South Florida ecosystem restoration effort have been completed, while the remaining projects are currently being implemented or are either in design, being planned, or have not yet started. Many of the completed projects are intended primarily to improve water quality in natural areas or to acquire or improve tracts of land in order to preserve wildlife habitat. The projects now being implemented also emphasize the restoration of wildlife habitat by acquiring or improving land, as well as the construction of key CERP-related projects that will improve water flow to natural areas. The projects not yet implemented are largely CERP projects that are crucial to realizing the restoration's overall goals, but these projects are progressing slowly. However, both agency and Task Force officials report a number of achievements, such as finalizing key CERP agreements and restoring a more natural water flow to the Kissimmee River. Table 2 shows the status of the 222 restoration projects.

Table 2: Status of the 222 Restoration Projects by Project Group

			Not yet implemented		
	Completed	In implementation	Planning/design	Not yet started	Total
CERP	0	7	21	32	**60**
CERP-related	15	10	3	0	**28**
Non-CERP	28	90	2	14	**134**
Total	**43**	**107**	**26**	**46**	**222**

Source: GAO analysis of documents provided by Task Force and participating agencies.

Completed Restoration Projects Primarily Improve Water Quality or Provide Wildlife Habitat

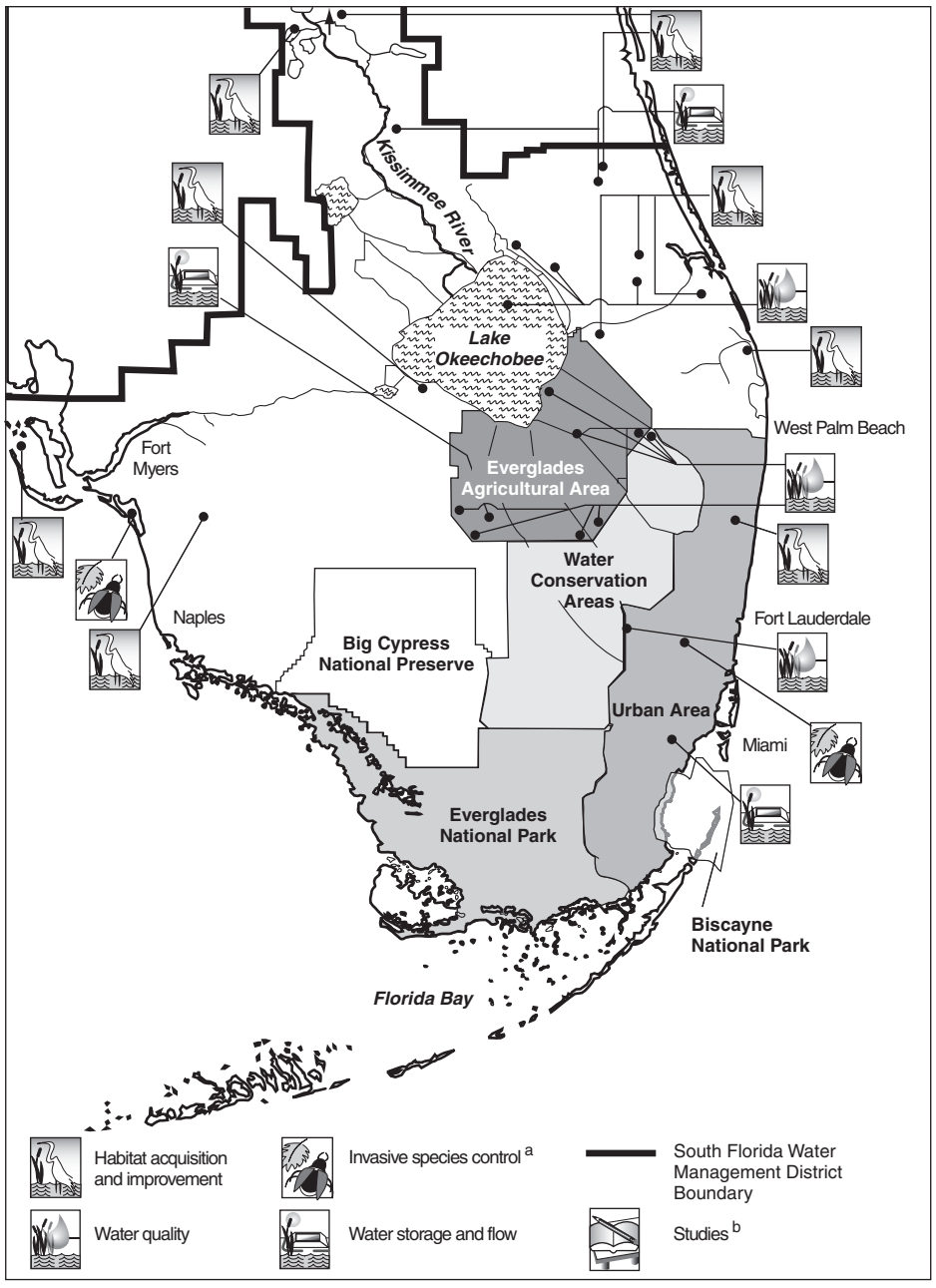
Of the 222 projects the Task Force and participating agencies identified as part of the South Florida ecosystem restoration, 43 have been completed since the beginning of the restoration effort: 9 before 2000 (including 1 as early as 1986), and 34 between 2000 and 2006. However, this latter total is far short of the 91 projects the Task Force and participating agencies reported in 2000 would be completed by 2006.[5] The nine projects completed before 2000 are expected to provide benefits primarily in the area of habitat acquisition and improvement. The primary purposes of the 34 projects completed between 2000 and 2006 range from the construction of stormwater treatment areas, to the acquisition or improvement of land for habitat, to the drafting of water supply plans. (App. II includes detailed information on the 43 completed projects, their sponsors, primary purposes, completion dates, and reported costs; the only projects completed to date belong to the CERP-related and non-CERP categories.)

For the 43 completed projects, the three most common primary purposes were water quality, habitat acquisition and improvement, and related studies. For example, to improve water quality SFWMD constructed Stormwater Treatment Areas 1, 2, 3/4, 5, and 6 within the Everglades Agricultural Area located south of Lake Okeechobee. Similarly, for the Cayo Costa project—a habitat acquisition and improvement project—Florida purchased a total of 1,954 acres, over 24 years, in southwestern Florida off the coast of Fort Myers. This purchase is located within a small chain of barrier islands that provide protection for Charlotte Harbor, one of the state's most productive estuaries. The project's natural areas

[5]South Florida Ecosystem Restoration Task Force, *Coordinating Success: Strategy for Restoration of the South Florida Ecosystem, Volume 2* (Miami, Fla.: July 31, 2000).

demonstrate high species diversity, including some species that may be unique to the islands. Figure 2 shows the types and locations of the 43 completed projects and their primary purposes.

Figure 2: Types and Locations of Completed Restoration Projects and Their Primary Purposes



Source: GAO analysis of documents provided by Task Force and participating agencies.

[a]One completed invasive species control project was a statewide effort (not pictured).

[b]Twelve plans and studies were also completed (not pictured).

Projects Being Implemented Primarily Include Land Acquisitions to Preserve Wildlife Habitat and Two Key CERP-Related Projects

Of the 222 ecosystem restoration projects, 107 are now being implemented.[6] Seven of the 107 are CERP projects, 10 are CERP-related projects, and 90 are non-CERP projects. Five of the seven CERP projects are being built by the state in advance of the Corps' completion of the necessary project implementation reports and submission of them to the Congress for authorization and appropriations. Nonetheless, some of the CERP projects currently in implementation are significantly behind schedule. For example, four of the seven CERP projects in implementation were originally scheduled for completion between November 2002 and September 2006, but instead will be completed from 1 to 6 years behind their original schedule, because it has taken the Corps longer than originally anticipated to design and obtain approval for CERP projects. Overall, 19 of the 107 projects currently being implemented have expected completion dates by or before 2010. Of the remaining 88 projects, most are non-CERP habitat acquisition and improvement projects that have no firm end date because the land will be acquired from willing sellers as it becomes available. Of the 24 non-CERP projects being implemented that have established end dates, at least 9 are expected to be completed by or before 2010. (App. II presents detailed information on the sponsor, primary purpose, expected completion date, and estimated cost of each of the 107 projects that are currently being implemented.)

More than half—65—of the 107 projects being implemented will acquire or improve land for habitat, and at least 12 of these projects are on federal lands. For example, the U.S. Fish and Wildlife Service is purchasing land in the Big Cypress-Everglades region to provide additional habitat for the endangered Florida panther, as part of its Florida Panther National Wildlife Refuge acquisition. Other ongoing projects combat invasive species on federal lands—such as the Hole-in-the-Donut, a non-CERP project that is expected to restore approximately 6,000 acres within Everglades National Park by eradicating Brazilian pepper, an invasive plant species.

Among the projects currently being implemented are two key CERP-related construction projects that are expected to benefit Everglades National Park as well as the natural areas outside of the park. The first is the Modified Water Deliveries to Everglades National Park (Mod Waters)

[6]Some projects have multiple components, and while the entire project cannot be counted as completed, important components of it may be finished. Unless all components of the project were complete, we counted these projects as being implemented.

project, which is expected to restore natural hydrologic conditions across 190,000 acres of habitat in Everglades National Park and assist in the recovery of threatened and endangered plants and wildlife. According to Everglades National Park officials, this project is crucial to the park's rehydration and subsequent restoration. When we reported on the restoration in 1999, Mod Waters was expected to be completed in 2003 at a total cost of $157 million;[7] the project is currently scheduled for completion in 2009 at a total cost of $410 million, according to its most recent capital asset plan (though agency officials do not expect the 2009 date to be met). The second project is known as C-111 South Dade, which involves modifications to a north-south canal system (C-111) that runs parallel to Florida's east coast and provides flood protection and water supply for urban and agricultural areas east of Everglades National Park. The Corps and SFWMD are modifying the canals in the Miami-Dade County area so that increases in freshwater and more natural flows will enter the eastern panhandle of the park and Florida Bay. This project will help restore the park's natural vegetation, while maintaining flood protection for urban and agricultural interests in south Miami-Dade County. A combined operating plan will integrate the goals of this project with those of Mod Waters. The Corps and SFWMD expect to complete the C-111 South Dade project in 2012.

Projects Not Yet Implemented Are Largely Part of CERP and Are Crucial to Achieving Overall Restoration Goals

Of the 72 restoration projects not yet implemented—in other words that are in design, planning, or not yet started—53 are CERP projects that are expected to be completed in the later years of the restoration effort and will provide benefits such as increased habitat for native species, improved water flow, and additional water for restoration as well as other water-related needs. The other 19 projects not yet implemented include 3 CERP-related and 16 non-CERP projects. (App. II includes detailed information about all 72 projects not yet implemented, including their sponsors, primary purposes, expected completion dates, and estimated costs.) All CERP-related and non-CERP projects in this grouping that have established end dates are expected to be completed by or before 2013. In contrast, CERP projects in design, planning, or not yet started will be implemented over the next 30 years. Consequently, the full environmental

[7]GAO, *South Florida Ecosystem Restoration: An Overall Strategic Plan and a Decision-Making Process Are Needed to Keep the Effort on Track*, GAO/RCED-99-121 (Washington, D.C.: Apr. 22, 1999).

benefits for the South Florida ecosystem restoration that the CERP projects were intended to provide will not be realized for several decades.

Several of the projects now in planning and design directly benefit federal lands and are representative of the significant natural system benefits that were expected from CERP. One of the most important projects of this kind is the Water Conservation Area 3 Decompartmentalization and Sheetflow Enhancement (Decomp) project. This project involves filling canals, removing levees, and building bridges along the road north of Everglades National Park to allow water to flow more naturally through the water conservation areas above the park and into the park itself. This project is also designed to increase the connectivity between portions of the Everglades habitat, thus improving the quantity and quality of this habitat for native vegetation and wildlife. Officials from the park and other participating agencies stressed Decomp's importance to natural system restoration. In addition, park officials told us that the full realization of benefits from the Mod Waters project depends upon Decomp, which WRDA 2000 does not allow to be constructed until Mod Waters is completed. Decomp has been divided into three phases, and the Corps has recently proposed a major revision to its conceptual design. Pending this re-design, phase 1 is currently scheduled for completion in 2015.

As with CERP projects currently being implemented, progress has also been slow on CERP projects in design, in planning, or not yet begun. For example, five projects that are not yet implemented were originally planned for completion between December 2001 and December 2005, but instead will be completed from 2 to 6 years behind their original schedule. According to officials from the Corps, SFWMD, and other participating agencies, CERP project delays have occurred for the following reasons:

- It took longer than expected to develop the appropriate policy, guidance, and regulations that WRDA 2000 requires for the CERP effort.

- Some federal and state officials we spoke with noted design delays that were caused by the need to modify the conceptual design of some projects to comply with the requirements of WRDA 2000's savings clause. According to this clause, CERP projects cannot transfer or eliminate existing sources of water unless an alternate source of comparable

quantity and quality is provided, and they cannot reduce existing levels of flood protection.[8]

- Less federal funding than expected and a lack of congressional authorization for some of the CERP projects have limited CERP progress.

- The extensive modeling that accompanies the design and implementation of each project in addition to the "cumbersome" project review process can contribute to delays, as well as stakeholder comment, dispute resolution, and consensus-building that occurs at each stage of a project. However, other restoration participants valued this opportunity for input and noted that it could prevent costly litigation.

- Delays have occurred in completing Mod Waters, which is a major building block for CERP. These delays, in turn, have delayed CERP implementation.

While the completion of the CERP projects is expected to provide comprehensive environmental benefits to the ecosystem, concerns remain about how the water will be allocated between the natural, urban, and agricultural areas for many of these projects, and who will ultimately benefit from these water allocation decisions. Corps regulations require that the allocation decisions are to be included in the project implementation reports submitted to the Congress for authorization of each CERP project. These allocations are determined by each project's design team—which would normally include the Corps, SFWMD, and other participating agencies. The allocation decisions are constrained by a federal-state agreement that promises to allocate each CERP project's stored water in a manner that provides a sufficient amount for restoring the natural system before water is made available for the region's other water-related needs, such as urban and agricultural water supply. Once these water allocations are finalized, they are to be enacted into state law. Until these water allocation decisions are agreed upon by federal and state agencies and enacted into law by the state government, the distribution of benefits that the CERP projects will deliver remains unclear.

[8]The sources of water and levels of flood protection that must be protected are those that were in existence on the date of WRDA 2000's enactment—December 11, 2000.

Officials Report Progress in Several Areas, Including Key CERP Agreements and State Efforts to Advance Overall Restoration Goals

Although construction progress for the restoration effort has been uneven, restoration officials report progress in other areas that they expect will provide a solid foundation for the wider restoration effort in the future. These officials identified the following developments that they expect will improve the prospects for future success for the overall restoration effort:

- *Acceler8.* Acceler8 is a state effort intended to expedite the implementation of CERP projects. Many of the CERP projects advanced by Acceler8 are among WRDA 2000's 10 initially authorized projects, whose costs were to be shared by the federal government and the state. According to Florida officials, by advancing the design and construction of these projects with its own funds, the state hopes to more quickly realize restoration benefits for both the natural and human environments and to jump-start the overall CERP effort once the Congress begins to authorize individual projects. The Acceler8 projects include seven that are affiliated with CERP and an eighth that expands existing stormwater treatment areas. The state expects to spend more than $1.5 billion to design and construct these projects by 2011.

- *Kissimmee River restoration.* The Corps and SFWMD have completed phase 1 of this project to restore the ecological integrity of the South Florida ecosystem's headwater—the historical Kissimmee River and its surrounding floodplain. State officials report promising results from the restored areas, such as improved water quality and flow, the return of fish-eating birds, and the reappearance of shoreline vegetation.

- *Land acquisition.* For the ecosystem restoration projects that are solely or partially federally funded, including CERP, the Task Force estimates that 62 percent of the land needed for getting the water right (goal 1) and 99 percent of the land needed for restoring, preserving, and protecting natural habitats and species (goal 2) has already been acquired.[9] Moreover, 55 percent of the land needed for CERP projects, 98 percent of Acceler8 project land, and all 102,061 acres needed for the Kissimmee River restoration have been acquired. Restoration land acquisition is ahead of schedule because the state accelerated its acquisition efforts in order to acquire land before it was lost to development. Similarly, the federal government provided early support to the effort through its Farm Bill

[9]The Task Force did not estimate the percentage of land acquired to foster compatibility of the built and natural systems (goal 3), but did note that participating agencies have secured easements on 15,370 acres and another 4,265 acres have been acquired. Percentages do not include state, local government, or nongovernmental organization land acquisition projects undertaken without federal funding, many of which are part of goal 2.

funding,[10] and local governments have made significant land contributions as well.

- *State water quality projects*. In addition to the stormwater treatment areas south of Lake Okeechobee, the state's Lake Okeechobee Protection Program and Lake Okeechobee and Estuary Recovery Plan expand the water quality effort to mitigate nutrient discharges from urban and agricultural lands north of the lake and within its watershed. The state is also implementing pollution reduction strategies for other impaired surface waters within SFWMD's boundaries.

- *CERP's administrative framework.* In accordance with WRDA 2000 and subsequent requirements, CERP's participating agencies have formulated key policies, strategies, and agreements intended to guide the program during its three decades of implementation.

- *RECOVER's efforts.* CERP's interagency science team—known as RECOVER—prepared a Monitoring and Assessment Plan for CERP implementation, among other important products. This plan is the primary tool that RECOVER will use to assess the ecosystem's response to CERP projects.

The Overall Restoration Effort Has No Sequencing Criteria, and While CERP Projects Have Criteria, These Criteria Have Not Been Fully Applied

No overall sequencing criteria guide the implementation of the 222 projects that comprise the South Florida ecosystem restoration effort. For the 60 CERP projects, the Corps has issued regulations, as directed by WRDA 2000, that identify the criteria to be applied when making CERP project sequencing decisions so that restoration benefits will be achieved as early as possible and in the most cost-effective manner. However, the Corps and SFWMD did not follow these criteria when they developed the 2005 master implementation sequencing plan for CERP projects (the MISP). The Corps has recently started to revisit priorities for CERP projects' and alter project schedules that were established in the 2005 MISP (this process is referred to as CERP-reset). However, because the Corps continues to lack certain key data for making sequencing decisions, the revised plan, when completed, will also not fully adhere to the criteria. Furthermore, while CERP-related projects provide the foundation for many CERP projects, there are no established criteria for determining the implementation schedule for these projects and their estimated start and completion dates largely depend upon available funds. Similarly, for non-

[10]Federal Agriculture Improvement and Reform Act of 1996, Pub. L. No. 104-127, § 390, 110 Stat. 888, 1022.

CERP projects, agencies reported that they do not have any sequencing criteria; instead, they decide on the scheduling and timing of these projects primarily if and when funding becomes available.

Required Sequencing and Other Criteria Have Been Developed for CERP Projects, but the Corps Has Not Fully Applied the Criteria

The Corps has clearly defined criteria to be considered in determining the scheduling and sequencing of CERP projects.[11] As laid out in the CERP program regulations,[12] the Corps and SFWMD should consider the following factors to maximize opportunities for achieving the plan's goals and purposes:

- *Technical dependencies and constraints.* Because many projects are interdependent, they have to be designed and constructed either before or after other CERP and CERP-related projects, depending on engineering and structural requirements.
- *Project benefits.* Projects should be constructed in an order that achieves environmental benefits as early as possible.
- *Land availability.* If land is available, a CERP project can be scheduled earlier.
- *Legal constraints.* The Corps must ensure that CERP projects do not eliminate or transfer current sources of water from urban and agricultural water supplies, and for fish and wildlife, or reduce flood protection.
- *Funding constraints.* The regulations also state that funding constraints may be taken into account in determining the timing and order of projects.

In addition, CERP program regulations require the Corps and the SFWMD to revise the project sequencing that had been originally developed in 2000 to reflect new scientific, technical, and other information. Examples of such information include population growth, additional data on the topography of the South Florida ecosystem, rainfall data, and existing sources of water and flood controls. According to the regulations, the restoration partners were to conduct model simulations and revise, among other things, their sequencing decisions if the models indicated that

[11]The program regulations required the MISP to be issued by December 13, 2004, and to be revised at least every 5 years.

[12]Programmatic Regulations for the Comprehensive Everglades Restoration Plan, 33 C.F.R. pt. 385 (effective Dec. 12, 2003).

changes to the sequence of project implementation were warranted to achieve environmental benefits sooner. The CERP program regulations also required that the sequencing decisions include a consideration of whether the projects, as sequenced, would meet interim goals. These goals were to be established in an agreement signed by the Secretaries of the Army and the Interior and the Governor of Florida no later than December 2004.[13]

However, when the Corps and SFWMD developed the 2005 MISP for CERP projects, they did not comply with the requirements of the Corps regulations. Specifically, the MISP was not based on new information because the model used to run the simulations and generate the data—the South Florida Water Management Model—had not been updated by the Corps as anticipated when the sequencing decisions were made. As a result, the Corps and SFWMD staff used outdated modeling data from 1999.[14] In addition, the Secretaries of the Army and the Interior, and the Governor of Florida did not sign an agreement that established interim goals for the restoration effort until late April/early May 2007—over 2 years after the program regulations deadline.[15] Consequently, the 2005 MISP was developed without the benefit of the interim goals that the regulations required to help guide interagency planning, monitoring, assessment, and project sequencing.

Because the agencies lacked updated environmental benefits data and lacked interim goals, the 2005 MISP for CERP projects was primarily based on an assessment of the technical dependencies and constraints among projects and available funding. Specifically, Corps and SFWMD officials first considered whether the technical constraints laid out in the 2000 CERP conceptual plan were still appropriate or whether new information had changed those constraints and, hence, the sequence of projects. Based on these technical dependencies and constraints, all CERP projects were placed in one of seven 5-year periods covering 2005 to 2040. Once Corps and SFWMD officials completed their technical constraints

[13]The Secretary of the Army is to sign the agreement on behalf of the Corps.

[14]The CERP Final Integrated Feasibility Report and Programmatic Environmental Impact Statement of 1999 laid out the conceptual plan and an initial schedule for implementing the projects based on modeling and other information known at the time.

[15]The Department of the Army and the state of Florida reported that they signed an Interim Goals Agreement on April 27, 2007, and the Secretary of the Interior signed the agreement on May 2, 2007.

analysis, they reviewed the costs of projects scheduled for completion in each 5-year interval and the estimated funding available for that period, as well as available staff resources. When resources—primarily funding—were insufficient to complete projects within the initial designated 5-year period, the projects were delayed and scheduled for completion at a later date. Table 3 shows the number of projects in the MISP and their primary purpose, by 5-year increments, over the life of CERP. As the table shows, the ultimate benefits from the CERP projects will not be fully realized until 2040.

Table 3: Type of Project, Primary Purpose, Timing, and Number of CERP Projects Scheduled for Completion, 2005-2040

	Timing and number of projects by completion date[a]					
Type of project and purpose[b]	**2005-10**	**2010-15**	**2015-20**	**2020-25**	**2025-30**	**2035-40**
Water storage and flow pilots	4		1			
Water storage and flow	4	5	11	3[c]	1	2
Water quality (stormwater treatment and management operations)	2	1	4	1		
Water supply pilot			1			
Water supply				2		
Habitat acquisition and improvement	4	2		1		
Invasive species control	1					
Feasibility studies		1				
Total—51	**15**	**9**	**17**	**7**	**1**	**2**

Source: GAO's analysis of Corps and SFWMD MISP and project data.

Note: The total number of projects in the table is 51, which differs from the 60 current CERP projects discussed earlier in this report. The difference occurs because nine projects, primarily operational and study projects, did not have a planned start date when the MISP was developed.

[a] The CERP partners did not list projects for 2030 through 2035 because no projects were scheduled for completion during this time.

[b] Projects may have multiple purposes and some are defined as phases where construction may take several 5-year periods to complete.

[c] The schedule for the Indian River Lagoon-South project includes the construction of water storage components in the first 10 years, with the natural lands acquisition component scheduled for completion by 2020.

Owing to delays in meeting its commitments for implementing CERP projects in a timely manner, as well as its commitment to support the state's Acceler8 effort, the Corps is revising its schedules and sequencing of CERP projects. For example, in an October 2004 letter to the state, the Corps had committed to a list of dates for completing the project implementation reports necessary to obtain project approval by the Corps'

management and the Congress for the CERP projects that were being implemented through the state's Acceler8 effort. However, the Corps has not met the dates outlined in that letter. To address these delays and other project implementation issues, the Corps is revising the sequencing plan and schedules for CERP projects (known as CERP-reset). As part of this restructuring, they are planning to incorporate the National Academy of Sciences' recommendation to use an incremental adaptive management approach that allows projects to move forward with incremental steps. However, we are concerned that the Corps' current effort is also being undertaken without key information on updated environmental benefits for these projects. As a result, the revised schedules for sequencing the CERP projects will most likely still not meet all of the sequencing criteria outlined in the Corps regulations, and the revised CERP sequencing plan, when issued, will continue to be based largely on technical dependencies and funding availability.

Implementation Decisions for CERP-Related and Non-CERP Projects Are Based Largely on Available Funding

Decisions about starting and completing CERP-related and non-CERP projects largely depend upon when and if the implementing agency will have sufficient funding to implement the project. Specifically, implementation of the 162 CERP-related and non-CERP projects is to be carried out by over 14 different federal, state, local, and tribal agencies as part of their larger missions. Many of these agencies do not have a specific program focused on the South Florida ecosystem restoration effort. Consequently, the priorities assigned to many of the CERP-related and non-CERP projects are driven by the agencies' overall priorities and available funding in any given year, not necessarily the sequencing needs of the restoration effort. For example, the construction of the CERP-related Mod Waters project has been delayed several times since 1997 because, among other things, Interior did not receive enough funding to complete the construction of this project. While currently scheduled for completion in 2009, agency officials stated that they do not expect this project to be completed until at least 2011. However, because completion of this project is critical to the implementation of the CERP Decomp project, these delays have caused completion dates for Decomp to be pushed back as well. Similarly, FDEP has a land acquisition program to acquire lands for conservation and habitat preservation throughout the state, including for some non-CERP projects that are part of the South Florida ecosystem restoration effort. FDEP has identified lands and added them to a list of priority projects proposed for acquisition throughout the

state.[16] However, whether or not these lands will be acquired for non-CERP projects is dependent on whether there is available funding in the annual budget, there are willing sellers, and the land is affordable based on the available funding.

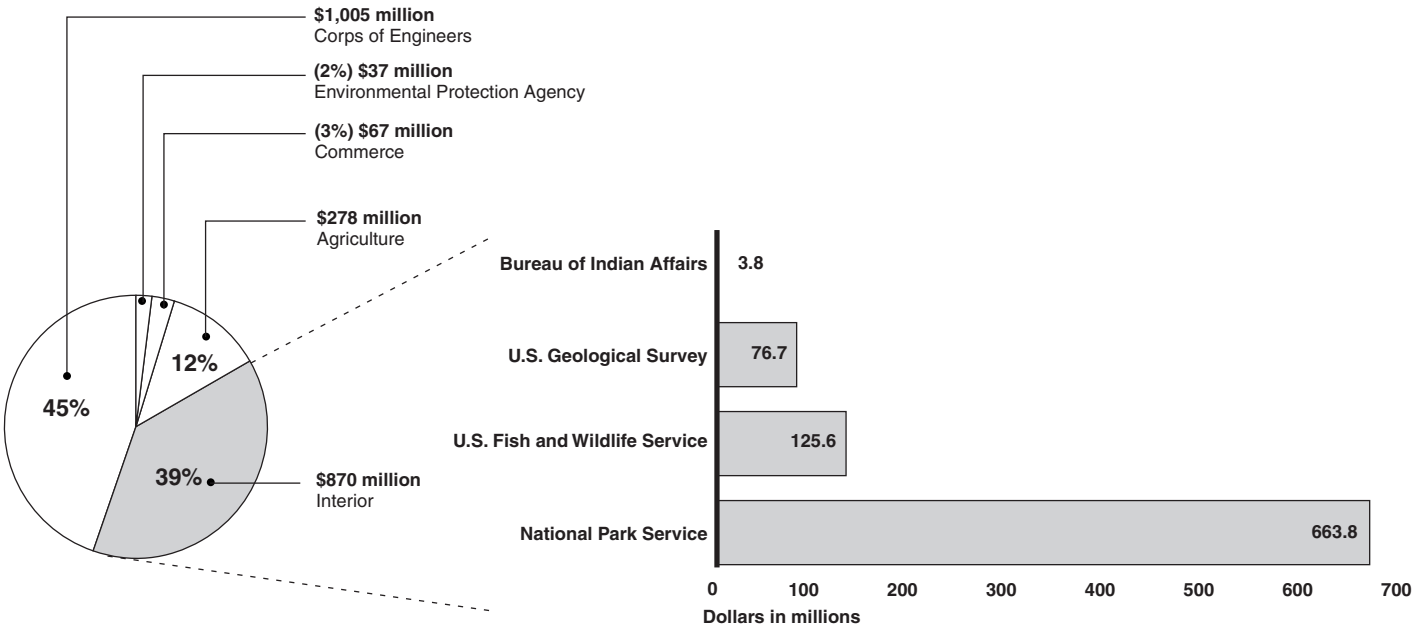
Federal Agencies and Florida Have Provided over $7 Billion for a Variety of Restoration Activities Since 1999

From fiscal year 1999 through fiscal year 2006, federal and state agencies participating in the restoration of the South Florida ecosystem provided $7.1 billion. Of this total, federal agencies provided $2.3 billion and Florida provided $4.8 billion. Two agencies—the Corps and the Department of the Interior—provided over 80 percent of the federal contribution. Figure 3 shows each federal agency's contribution.[17]

[16]FDEP contracts with willing sellers to acquire land at an agreed price in advance of the actual purchase. Depending upon funding, FDEP may commence with partial purchases of the land over the period of the contract.

[17]While funding documents show that $1 billion was allocated for restoring the ecosystem during fiscal years 1999 through 2006, the Corps only received $735 million primarily because of its internal funding polices and practices. Before fiscal year 2006, the Corps reprogrammed individual project funding by moving excess funds from projects which did not require all the funds to complete the projects or that had fallen behind in their construction schedules so that the projects did not require the funding allocated to them. The Corps agreed to limit this practice beginning with its fiscal year 2006 budget in response to GAO recommendations. See GAO, *Army Corps of Engineers: Improved Planning and Financial Management Should Replace Reliance on Reprogramming Actions to Manage Project Funds*, GAO-05-946 (Washington, D.C.: Sept. 16, 2005). For example, for fiscal years 1999 through 2006, the Corps received $292 million for CERP. However, the Corps reduced that amount—reprogrammed it—by $39 million, so that the CERP received only $251 million after a rescission of $2 million.

Figure 3: Federal Funding Provided for the Restoration Effort, Fiscal Years 1999-2006

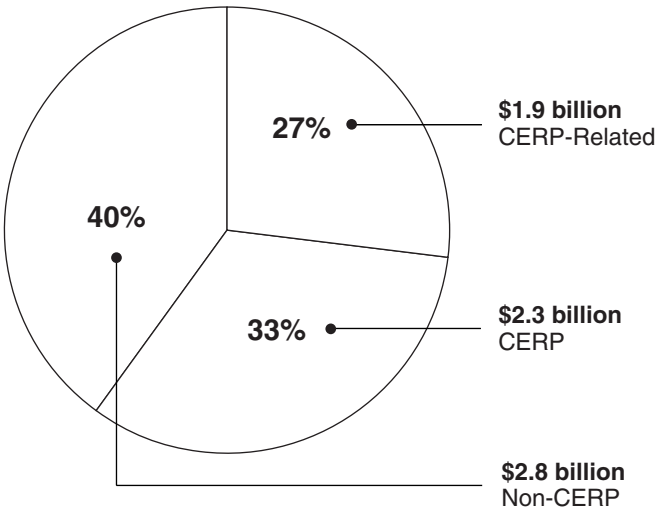


Source: GAO's analysis of federal and state agencies restoration funding data.

Note: Percentages do not equal 100 due to rounding.

As figure 4 shows, federal and state agencies allocated the largest portion of the $7.1 billion to non-CERP projects for fiscal years 1999 through 2006.

Figure 4: Federal and State Funding Provided for CERP, CERP-Related, and Non-CERP Projects and Activities, Fiscal Years 1999-2006



Source: GAO's analysis of federal and state agencies restoration funding data.

Note: Amounts do not total to $7.1 billion due to rounding. The amounts are $1.93 billion for CERP-related, $2.35 billion for CERP, and $2.80 billion for non-CERP.

Table 4 shows how the federal and state agencies used the funds allocated to CERP, CERP-related, and non-CERP projects and activities. As the table shows, while federal and state funding was used to support a range of activities, land acquisition alone accounted for about 36 percent of the $7.1 billion. Land acquisition is such a large category primarily because Florida has devoted significant resources to purchase land for restoration projects.

Table 4: Project Purpose and Funding Allocated among CERP, CERP-Related, and Non-CERP Projects and Activities, Fiscal Years 1999-2006

Dollars in millions

	CERP projects		CERP-relatedprojects		Non-CERP projects		Total		
Type of project	**Federal[c]**	**State[d]**	**Federal[c]**	**State[d]**	**Federal[c]**	**State[d]**	**Federal**	**State**	**Total**
Land acquisition[a,e]	0	$1,788.6	0	0	$283.4	$485.5	$283.4	$2,274.1	**$2,557.5**
Project construction	0	25.7	835.7	1,097.4	0	0	835.7	1,123.1	**$1,958.7**
Support activities[b]	341.4	191.7	0	0	795.6	1,230.1	1,137.0	1,421.9	**$2,558.9**
Total	**$341.4**	**$2,006.0**	**$835.7**	**$1,097.4**	**$1,079.0**	**$1,715.7**	**$2,256.1**	**$4,819.0**	**$7,075.1**

Source: GAO's analysis of federal and state agencies restoration funding data.

[a]Certain judgments were made in allocating the funding by purpose based on the available funding data. As a result, land costs for some fiscal years are only for a partial fiscal year and do not include the entire fiscal year.

[b]Support activities included RECOVER efforts, adaptive assessment and monitoring, the Interagency Modeling Center, program coordination, and science- and mission-related activities that indirectly benefit the restoration, such as invasive species control. In addition, for the Corps and SFWMD, support activities include, $74.4 million and $36.8 million, respectively for project design; $13.1 million and $11.8 million for pilot project design; and $9.0 million and $6.7 million for feasibility studies.

[c]Federal funding data were provided by the agencies in response to a GAO data request, except for the National Oceanic and Atmospheric Administration, for which we used the funding data from the Task Force's annual cross-cut budgets.

[d]State funding data used were found in the Task Force's annual cross-cut budgets, except for SFWMD, which provided funding data in response to a GAO data request.

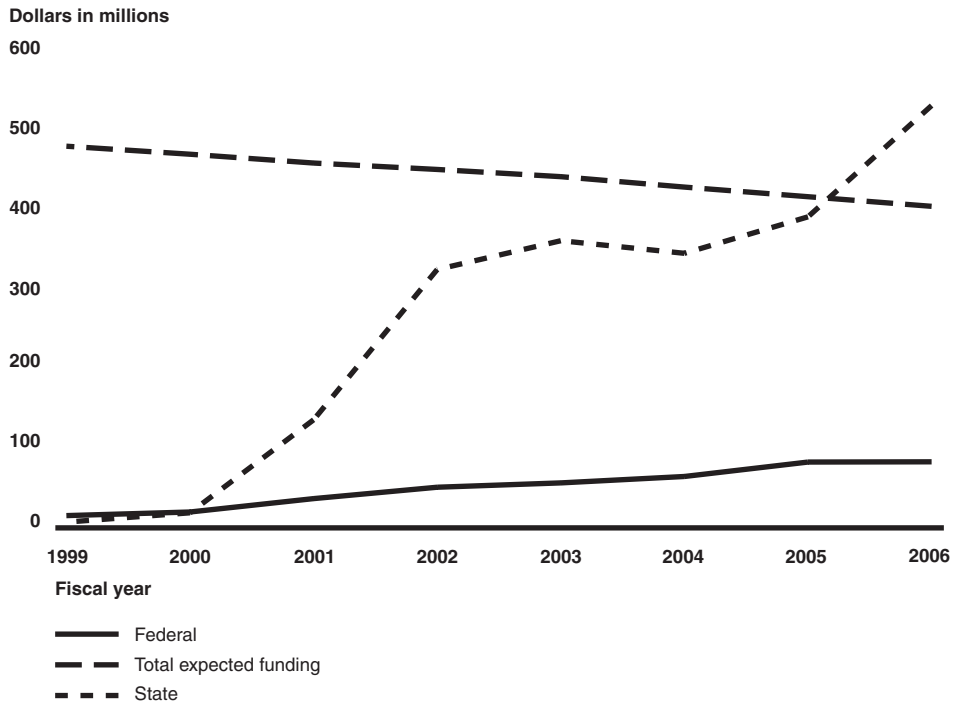
[e]Local government entities spent $207 million on non-CERP land acquisition projects currently identified as restoration projects and $213 million on other land acquisition projects that will become restoration projects.

CERP projects. As table 4 shows, most CERP funds have been used to purchase land—210,642 acres over the last 8 years. The state is responsible for acquiring all land for CERP projects; the federal agencies have not purchased any land for CERP. The Corps and Florida spent $533 million on support activities primarily to meet the administrative framework requirements of WRDA 2000.

While federal agencies and Florida provided about $2.3 billion during fiscal years 1999 through 2006 for CERP projects, this amount was about $1.2 billion less than they had estimated needing for these projects over this period. Although the federal contribution was significantly less than expected when the CERP project list was developed in 1999, the state contribution increased significantly later in the period, partially closing the funding shortfall. Initially, federal and state agencies anticipated that they would receive a total of $400 million each year if the funding was to keep

pace with the planned project schedule. Restoration partners reported that it was expected that this amount would be provided equally—$200 million annually from federal agencies and $200 million from the state. As figure 5 shows, however, federal CERP funding fell significantly short in each year during fiscal years 1999 through 2006—by a total of $1.4 billion. This shortfall occurred primarily because CERP projects did not receive the congressional authorization and appropriations that the agencies had expected. In contrast, Florida provided a total of $2.0 billion over the period, exceeding its expected contribution to CERP by $250 million.

Figure 5: Total Expected and Actual Federal and State Funding for CERP, Fiscal Years 1999-2006



Source: GAO's analysis of federal and state agencies restoration funding data.

CERP-related projects. Project construction activities constituted the only allocation of restoration funding to CERP-related projects, with federal agencies providing a total of $836 million and the state $1,097 million. For example, the Corps provided $170 million for removing levees and filling a drainage canal among other things that altered the natural flow of the Kissimmee River. Florida provided $404 million to complete construction

of six stormwater treatment areas, totaling 41,089 acres, between Lake Okeechobee and the Everglades National Park.

Non-CERP projects. The largest portion of federal and state funding for non-CERP projects was used for support activities, followed by land acquisition. Interior bureaus, such as the U.S. Fish and Wildlife Service, provided a total of $283 million to purchase land for habitat. For example, the U.S. Fish and Wildlife Service provided $15 million to purchase 913 acres in the J.N. "Ding" Darling National Wildlife Refuge to help preserve and protect endangered and threatened species; feeding, nesting, and roosting areas for migratory birds; and habitat for over 220 species of birds. Florida provided $486 million for land purchases for non-CERP projects, such as the $28 million provided to buy Cayo Costa Island.

Appendix III contains additional information on funding provided by federal and state agencies for the various restoration activities of the South Florida ecosystem restoration effort.

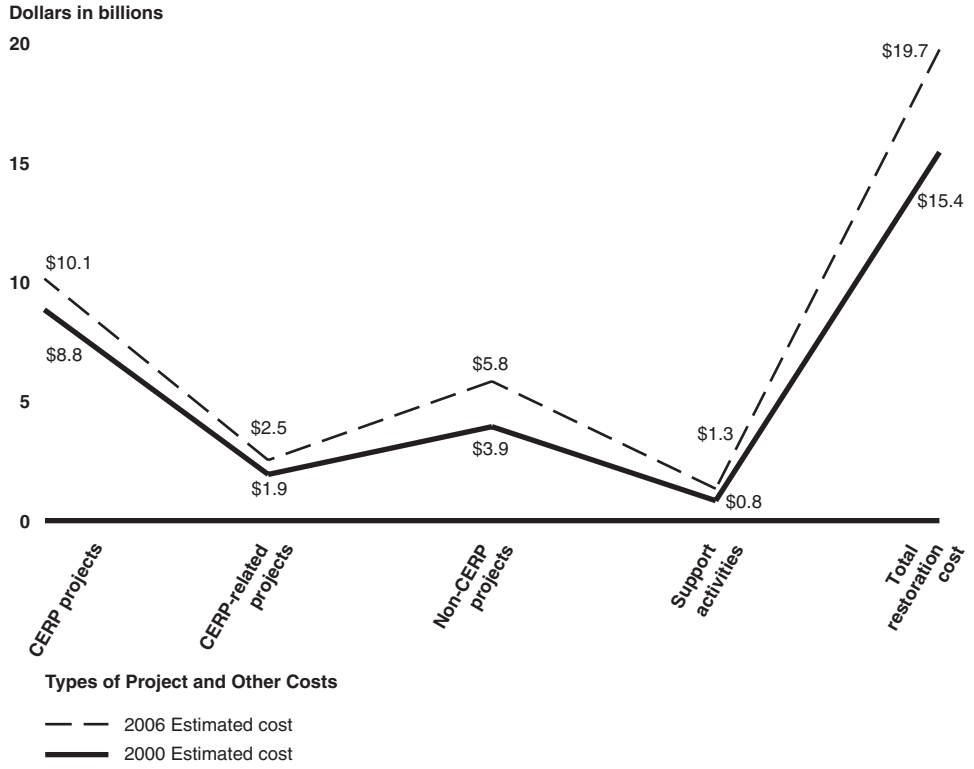
Although Estimated Restoration Costs Have Increased Since 2000, Total Cost Estimates Are Incomplete and Likely to Rise

Between July 31, 2000, and June 30, 2006, the total estimated cost for the South Florida ecosystem restoration effort grew by 28 percent, from $15.4 billion to $19.7 billion. This increase occurred primarily because of project scope changes, increased construction costs, and higher land costs. However, the cost estimate for the restoration effort is likely to increase even more, in part because the current estimate does not include the costs for the remaining land acquisitions and final design cost estimates for CERP projects, which are not yet known.

Estimated Restoration Costs Have Increased

Between July 31, 2000, and June 30, 2006, the total estimated cost for the South Florida ecosystem restoration grew from $15.4 billion to $19.7 billion, or by 28 percent. As figure 6 shows, estimated costs increased for all categories of projects and for support activities, such as the WRDA 2000 administrative requirements.

Figure 6: Total Estimated Increases in Restoration Costs for CERP, CERP-Related, and Non-CERP Projects, and Support Activities, 2000 to 2006



Source: GAO's analysis of federal and state agencies restoration cost data.

As the figure also shows, estimated CERP project costs increased from $8.8 billion to $10.1 billion. This 15-percent increase represents nearly 31 percent of the increase in the total estimated cost for the restoration. However, the most significant project cost increase—47 percent—was for non-CERP projects.

Federal and state officials reported that estimated CERP costs increased primarily because of inflation and changes in the scope of work for two CERP projects with completed project implementation reports. For example, in the conceptual phase, the cost estimate for the Site 1

Impoundment project—a CERP project in southern Palm Beach County to capture and store local runoff during wet periods and then use the water to supplement water deliveries during dry periods—was $46 million. Once the initial planning and design was complete, however, the Corps' estimate increased to $81 million to include changes in the scope of the project and increased cost of construction. In addition, the Picayune Strand Restoration project—a CERP project to restore and enhance wetlands and distribute water across a larger area—was $53 million in the conceptual phase. Once the initial planning and design was complete, however, the Corps' estimate increased to $363 million in part to include the cost of acquiring the 55,247 acres of land needed for the project. Similarly, the scope of the Indian River Lagoon-South project was expanded to include the acquisition of over 92,000 acres of natural lands that will provide water storage and habitat restoration. The scope expansion increased the project's estimated cost by $354 million. For CERP-related projects, estimated costs increased primarily because of inflation and delays in receiving federal funding, which led to additional increases in the costs of labor and materials beyond that attributed to inflation, according to federal officials.

Increases in Total Restoration Costs Are Likely to Continue for Multiple Reasons

The costs of restoring the South Florida ecosystem are likely to continue to increase for a number of reasons. First, the estimated costs for some of the projects are not known or fully known. Specifically, for eight nonconstruction CERP projects—addressing water management operations and water supply plans—the estimated costs were not known as of September 2006. These nonconstruction projects seek to improve the delivery of water to areas such as the water conservation areas and Everglades National Park, the St. Lucie and Caloosahatchee estuaries, and the Rotenberger and Holey Land Wildlife Management Areas. For the remaining 44 CERP projects that require construction, the full estimated cost is likely to rise if they, like other CERP projects, have higher completion costs than originally anticipated. For example, as mentioned above for one project that we examined—the Site 1 Impoundment project—after the project implementation report was completed the estimated total costs grew by $36 million, from $46 million to $81 million.[18] If other CERP projects, for which initial planning and design have not yet been completed, also experience similar increases in project costs then the estimated total costs of not only CERP but the overall restoration

[18]Total does not add due to rounding.

effort will grow significantly. Since the federal government provides 50 percent of the cost for CERP and for certain CERP-related projects, its contribution to cover these rising costs will also continue to increase.

Second, the full cost of acquiring land for the restoration effort is not known. For 56 non-CERP land projects, expected to total 862,796 acres, land acquisition costs have not been reported. Costs are not estimated due to price escalation and also to avoid adversely impacting ongoing negotiations of land acquisitions. For these non-CERP land acquisitions, the Task Force computed an estimated range of land costs from $2.5 billion to $4.1 billion based on the 779,000 acres remaining to be acquired as of 2004. However, the higher cost may be more realistic, and could be a conservative estimate, given the rising costs of land in Florida. According to state officials, Florida land prices are escalating rapidly, owing primarily to development pressures. Consequently, future project costs are likely to rise with higher land costs. While land acquisition costs for CERP projects are included as part of the total estimated project costs, thus far, the state has acquired only 54 percent of the land needed for CERP projects, at a cost of $1.4 billion. An additional 178,000 acres have yet to be acquired; the cost of these purchases is not yet known and is therefore not fully reflected in the cost of CERP and overall restoration costs.

Third, the cost of using new technologies for the restoration effort is unknown. The Congress authorized pilot projects in 1999 and 2000 to determine the feasibility of applying certain new technologies for storing water, managing seepage, and reusing treated wastewater. Under this authority, the Corps implemented six pilot projects that are estimated to cost a total of $123 million. While the pilot projects have been authorized, the cost to construct or implement projects based on the results of the pilots is not yet known. For example, one of the key water storage technologies proposed is the use of aquifer storage and recovery (ASR). Using ASR technology would require the Corps and SFWMD to drill many wells deep into an aquifer to store water and then to pump it out as needed. While ASR technology has been used successfully in the state in the past, the restoration agencies plan to create water storage reservoirs that are larger than any previously created. Three ASR pilot projects have been approved to address the technical uncertainties related to the implementation of these large scale ASRs. The agencies reported that the ASR pilot costs constitute approximately 20 percent of the cost of CERP, but they do not know what the ASR technology on the scale envisioned will cost or what the costs would be for alternative water storage if the ASR technology proves to be infeasible.

Twenty-Seven Primary Models Guide the Restoration Effort, but Additional Interfaces Are Needed to Enhance Their Usefulness

Of more than 100 available mathematical models, 27 primary models guide the restoration effort. At least 21 of the 27 have some interfaces, but agency officials told us that they need additional interfaces to make the most effective use of the models. However, current agency efforts are focused on meeting the modeling needs of individual agencies, not on coordinating the efforts and needs of all the agencies involved in the restoration effort. Agency officials recognize the need for better coordination, but given other demands for their time, this has not been a high priority for them.

Twenty-Seven of More Than 100 Models Are Primary to the Restoration Effort

Although there is no comprehensive list of all the mathematical models available for guiding the restoration of South Florida's ecosystem, we identified more than 100 such models. Of these 100 models, 27 are primary for the restoration effort, according to federal and state officials.[19] Federal and state agencies, private organizations, and academic institutions have developed the 27 models. These 27 models can be used to represent the unique characteristics of the South Florida ecosystem. For example, according to federal and state officials the South Florida Water Management Model, which was developed by SFWMD, is one of the most valuable modeling tools used for the restoration. This regional model is used to simulate the hydrology and management of water resources over a 7,600 square mile area in South Florida and to evaluate CERP's performance. However, a RECOVER modeling task team reported that the current model does not provide the level of precision and detail needed to simulate flow rates of surface and ground water; cannot predict the effects of restoration alternatives on the salinity levels of coastal wetlands and aquifers; and does not provide detailed enough information about the different habitat types that exist within the analyzed area. To address these shortcomings, SFWMD is developing the Regional Simulation Model to replace this model, which is expected to be ready for use in 2008. Table 5 shows the primary models used in the South Florida ecosystem restoration effort by model type and study area.

[19]Federal and state officials pointed to the 2006 *RECOVER Report on Evaluation Tools, Models, Work Plans, and Budgets*, which lists 29 models, for a list of models that are primary. However, two models—the Regional Engineering Model for Ecosystem Restoration (REMER) and the Regional Simulation Model (RSM)—are not yet developed; therefore, we concluded that only 27 models are primary.

Table 5: Model Types and Study Areas of the 27 Primary Models That Guide the South Florida Ecosystem Restoration Effort

Model types and study areas	Number of models
Model type	
Hydrological	11
Hydrological/water quality	8
Water quality	5
Ecological	3
Study area	
Regional/sub-regional and project	17
Project	7
Regional/sub-regional	3

Source: GAO's analysis of model Web sites, agency interviews, and the 2006 *RECOVER Report on Evaluation Tools, Models, Work Plans, and Budgets.*

As table 5 shows, there are a total of 19 primary models that can be used in the restoration effort to simulate hydrological processes—such as water runoff, the movement of groundwater in aquifers, and the force of water flow in rivers, lakes, estuaries, and oceans. These models take into account different aspects of the unique hydrology of South Florida—flat topography, a high water table, sandy soils, and the easy movement of water through the aquifer system. A total of 13 primary models simulate water quality processes—such as the migration of pollutants in both surface water and groundwater systems. The three primary ecological models simulate how plant and animal species interact with their habitat. For example, an ecological model might simulate changes in the population of an endangered species, like the Cape Sable Seaside Sparrow, in relation to changes in hydrological conditions and the availability of food. The 27 models may simulate changes that could occur in a region or sub-region of the ecosystem as a result of multiple restoration activities or changes that could occur as a result of a specific restoration project.

Additional Interfaces Are Needed to Enhance Models' Usefulness

We determined that at least 21 of the 27 primary models have interfaces that allow the models to interact with other models and provide a more comprehensive and accurate assessment of the ecosystem. Agency scientists and officials identified three broad types of interfaces. The first type enables the models to share data with other models. This type of interface requires less hands-on data processing and, according to a Corps official, yields immediate returns for guiding the restoration effort in terms of facilitating and expediting the exchange of required data among models.

The second type of interface allows scientists to run multiple models and then layer the results of each model onto a single graphic. This process expedites the review of simulation results and enables scientists and managers to better understand the results of different project activities. The third type of interface—known as an integrated interface—allows scientists to simultaneously run multiple hydrological, water quality, and ecological models. This type of interface provides the most holistic approach for simulating the long-term responses of the landscape and habitat to the restoration effort, although it is the most complex and time-consuming to develop.

However, scientists and agency officials we spoke with noted the need for additional interfaces for these 27 models. According to agency officials and reports by the National Academy of Sciences and the RECOVER interagency science team, the existing model interfaces do not allow them to provide the most comprehensive and accurate understanding of the impact of the restoration effort. These sources identified the need for multiple interfaces between and across the hydrological, ecological, and water quality models and the regional, sub-regional, and project-specific models. Such interfaces would (1) improve model predictions; (2) expedite project-related simulations; and (3) streamline efforts for planning, evaluation, monitoring, and adaptive management.

Although agency scientists and officials recognize the need for additional interfaces, neither the individual agencies nor the Task Force, as the coordinating body for science-related activities, have compiled a list of interfaces needed for the entire restoration effort. Instead, agency scientists and managers focus on their specific needs to carry out their agency's mission. For example, the Corps and SFWMD are each focusing on certifying the reliability of the models that they developed through a peer review process, while Interior is setting priorities for ecological science activities that affect the development of ecological models. However, because the agencies do not have a formal, restoration-wide coordination effort, they rely on an informal network to coordinate model development, create interfaces, and set science research priorities. As a result, the agencies' mission-related activities may not support the overall restoration effort. The National Academy of Sciences has stated that improved coordination would enhance the restoration effort by helping to

identify and reduce scientific uncertainties.[20] To improve coordination, the Corps and SFWMD established the Interagency Modeling Center in 2003 as the single point of responsibility for CERP modeling services. However, the Interagency Modeling Center focuses primarily on applying models to CERP projects, and does not focus on developing and coordinating models and interfaces for the entire restoration effort. Agency officials agree that coordination and communication across agencies involved in identifying interfaces could be improved. However, they also stated that agency staff involved with the restoration efforts have other duties that take precedence over the coordination of modeling interface activities.

Conclusions

Restoring the South Florida ecosystem is a vast and complex undertaking that will ultimately depend on the successful implementation of more than 200 different projects. In particular, the successful achievement of the restoration's three overall goals depends to a large degree on the effective implementation of approximately 88 key CERP and CERP-related projects. In this context, therefore, the order in which these projects are implemented becomes critical to ensuring that the maximum environmental benefits are achieved as quickly as possible in the most cost-effective manner. However, the process that participating agencies have used so far to make sequencing decisions for these projects, and in particular for the CERP projects, has been governed largely by funding availability and technical dependencies and constraints among projects, not the full range of criteria that the Corps developed under WRDA 2000. These criteria were not fully applied when sequencing decisions were made for the CERP projects in 2005. This happened because key data, such as updated benefits information and interim goals for CERP, which are needed to fully apply these criteria were not available. In this regard, the Secretaries of the Army and the Interior, in conjunction with the Governor of Florida, did not reach agreement on CERP interim goals until late April/early May 2007—more than 2 years after the date required by the regulations.

Moreover, from the outset, the restoration effort has sought to use a science-based approach to guide its decision-making processes. A significant contributor to this approach has been the use of mathematical

[20]Committee on Independent Scientific Review of Everglades Restoration Progress, National Research Council, National Academy of Sciences, *Progress Toward Restoring the Everglades: The First Biennial Review, 2006* (Washington, D.C.: 2006).

models that help agencies gauge the effects of the restoration effort on the ecosystem. However, the effectiveness of these models is reduced by the limited number of interfaces between and among them. Without additional interfaces, these models cannot provide the participating agencies with the comprehensive information that they need. The current informal network that agency officials rely on to coordinate their model and interface development efforts may not be the most effective approach to ensure that the needs of the overall restoration effort are met. In this context, we believe that the Task Force as the coordinating body for the overall restoration effort could provide the needed direction and emphasis.

Recommendations for Executive Action

Because the correct sequencing of CERP projects is essential to the overall success of the restoration effort, we are recommending that the Secretary of the Army direct the Corps of Engineers to obtain the key data that are needed to ensure that all required sequencing factors are appropriately considered when deciding which projects to implement. Once this information is available, the Corps should comprehensively reassess its sequencing decisions to ensure that CERP projects have been appropriately sequenced to maximize the achievement of restoration goals.

In addition, given the importance of modeling and interfaces to managing the restoration effort, we are recommending that, as chair of the Task Force, the Secretary of the Interior take the lead on helping participating agencies better coordinate their efforts to develop models and their interfaces.

Agency Comments and Our Evaluation

We provided a draft of this report to the Departments of Defense and the Interior and the state of Florida for review and comment. We received written comments from both federal agencies and the state of Florida.

The Department of Defense generally concurred with our recommendation that the Corps obtain the key data needed to ensure all sequencing factors are considered in its project sequencing decisions and to comprehensively reassess its decisions so as to ensure CERP projects maximize the achievement of restoration goals. The state of Florida, however, expressed concerns that our recommendation would serve to delay restoration and increase costs and stated that it supports the Incremental Adaptive Restoration process recommended by the National Research Council. While we understand the state's concerns, we do not believe that implementing the adaptive management approach recommended by the Council is incompatible with our recommendation.

In fact, our report discusses the Corps' plans to incorporate this approach and allow CERP projects to move forward in incremental steps. Furthermore, given the delays that have already occurred and the criticality of CERP to the success of the restoration, we believe that it is even more important for the Corps to apply the full set of sequencing factors, as outlined in the program regulations, to ensure that CERP sequencing decisions will achieve maximum restoration benefits as early as possible and in the most cost-effective manner.

In responding to our recommendation that the Departments of Defense and the Interior reach an agreement on interim goals with the Governor of Florida, both federal agencies and the state of Florida reported that the Secretaries of the Army and the Interior and the Governor of Florida signed an Interim Goals Agreement in late April/early May 2007. Because this happened after our report was sent to the agencies and the state for comment, we have revised our report and removed the recommendation to reflect this recent action. We believe that having the interim goals in place will provide a way of measuring the progress made in implementing CERP and achieve its goals as early as possible and in a cost-effective manner.

The Department of the Interior and the state of Florida agreed with our recommendation that the Secretary of the Interior, as chair of the Task Force, take the lead on helping participating agencies better coordinate their efforts to develop models and their interfaces and that such an effort should include the Interagency Modeling Center. Interior said that it agreed that coordination in the area of modeling will be beneficial and that the Task Force's Science Coordination Group and the Interagency Modeling Center could assist in this effort. Interior also said that it will make such a recommendation to the Task Force. The state of Florida said that it is important that the Task Force provide direction to the model development process and that interfaces for models are important. The state also recognized that while coordination of modeling could be improved, it is important that the Interagency Modeling Center continue to provide policy guidance. Although this recommendation was not addressed to the Department of Defense, in its comments the department stated that it did not agree with the recommendation because the Interagency Modeling Center has responsibility for coordinating and developing models and interfaces. We have included information in the report to recognize the role of the Interagency Modeling Center. However, we believe that because the Interagency Modeling Center's responsibilities pertain primarily to CERP, and not the whole restoration effort, the Task Force as the science and research coordinating body for the overall restoration is the most appropriate body for coordinating the development of models and their interfaces.

We also received technical comments from the state of Florida, which we have incorporated, as appropriate, throughout the report. The Department of Defense's written comments are presented in appendix V, the Department of the Interior's written comments are presented in appendix VI, and the state of Florida's written comments are presented in appendix VII.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies of this report to interested congressional committees and Members of Congress; the Secretary of the Interior; the Secretary of Defense; the Secretary of the Army; the Secretary of Commerce; the Secretary of Agriculture; the Administrator, EPA; and the Governor of Florida. We will also make copies available to others upon request. In addition, the report will be available at no charge on GAO's Web site at http://www.gao.gov.

If you have any questions about this report, please contact me at (202) 512-3841 or mittala@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix VIII.

Anu K. Mittal
Director, Natural Resources and Environment

Appendix I: Objectives, Scope, and Methodology

Given the complexity and enormity of the South Florida ecosystem restoration, we were asked to review the current status of the effort, focusing specifically on the (1) status of restoration projects and their expected benefits; (2) factors that influence the sequencing of project implementation; (3) amount of funding provided to the restoration effort since 1999; (4) extent to which cost increases have occurred and the reasons for these increases; and (5) primary mathematical models used to guide the restoration effort and the extent to which these models have interfaces.

To determine the status of restoration projects and to identify their expected benefits, we first met with the South Florida Ecosystem Restoration Task Force (Task Force) and representatives from many of its participating agencies to determine how best to collect project status and benefit information. On the basis of these interviews, we determined that the most complete list of current restoration projects was found in the Task Force's 2005 Integrated Financial Plan.[1] This list, updated annually, is intended to contain all of the restoration projects completed, implemented, and planned by the federal, state, local, and tribal entities participating in the South Florida ecosystem restoration. The list is supplemented by project profile sheets that give additional details about each project. Using the Task Force's list as a baseline and supplementing it with research and agency interviews, we identified 222 restoration projects. We requested and received information on these projects from the participating agencies that sponsor nearly all of the 222 projects: the Army Corps of Engineers (Corps); the Departments of Agriculture (USDA)—including the Agricultural Research Service (ARS) and Natural Resources Conservation Service (NRCS); Commerce—including the National Oceanic and Atmospheric Administration (NOAA); and the Interior—including the U.S. Fish and Wildlife Service (FWS) and National Park Service (NPS); the Florida Department of Environmental Protection (FDEP); Miami-Dade County; the Miccosukee Tribe; the Seminole Tribe; and the South Florida Water Management District (SFWMD).

Specifically, we requested data on project status, project start and end dates, and related information. We conducted follow-up interviews where appropriate to clarify the project information we received. On the basis of

[1]South Florida Ecosystem Restoration Task Force, *Tracking Success: 2005 Integrated Financial Plan for the South Florida Ecosystem Restoration Task Force* (Miami, Fla.: undated).

this information, we compiled a master list of completed, ongoing, and planned restoration projects. Using the information collected regarding project status, we grouped the projects into the following four categories: (1) completed, (2) in implementation, (3) in planning or design, and (4) not yet started.

To separate the 222 projects into smaller groups for further analysis, we relied upon the project information in the Task Force's 2005 Integrated Financial Plan, as well as in the Comprehensive Everglades Restoration Plan (CERP) 2005 report to the Congress.[2] On the basis of our analysis of these two documents and verification provided by responses on project status from participating agencies, we developed the following three project groups: (1) CERP projects—60 individual projects approved by the Water Resources Development Act (WRDA) of 2000 to restore, preserve, and protect the South Florida ecosystem while providing for other water-related needs of the region, including water supply and flood control; (2) CERP-related projects—28 projects that provide a foundation for CERP—many of these were authorized before WRDA 2000; and (3) non-CERP projects—134 restoration projects that are not as closely related to CERP.

To identify project benefits, we generally categorized expected benefits for each project by its primary purpose, as identified by the Task Force in its 2005 Integrated Financial Plan. According to the Task Force, these primary purposes are identified by communications between the Task Force and each project's sponsor(s). We reviewed the project descriptions as reported by the Task Force, as well as other available project information, to assess the reasonableness of the Task Force's determination for each project's primary purpose. For projects that did not appear in the 2005 Integrated Financial Plan, or for those that appeared in the plan but did not have a supporting project profile sheet, we requested and reviewed project information from the project's sponsor(s) where available. Through this analysis, we developed broad categories of expected benefits—water storage, habitat acquisition and improvement, and water quality, among others—and assigned each project to one of them on the basis of its primary purpose.

[2]U.S. Army Corps of Engineers and U.S. Department of the Interior, *Central and Southern Florida Project, Comprehensive Everglades Restoration Plan: 2005 Report to Congress* (Washington, D.C.: undated).

Following our initial data collection, we conducted additional outreach through April 2007 to ensure that our master project list was as complete as possible and incorporated any changes that may have occurred. We (1) reviewed the Task Force's draft 2006 Integrated Financial Plan to incorporate newly completed projects and other relevant changes; (2) requested the Task Force's assistance in reconciling our project list with the original project list that it published in 2000 to incorporate projects that may have been completed and then removed from the Integrated Financial Plans issued between 2000 and 2005;[3] and (3) contacted participating agencies and followed up on ongoing projects with estimated end dates that were reported as "2006" in the agencies' original status response to determine if these projects had in fact been completed.

To determine the factors that influence the sequencing of project implementation for the restoration projects, we obtained and reviewed available agency guidance, regulations, and related material from the Corps; the Department of the Interior (including NPS and FWS); FDEP; and SFWMD. We selected these agencies because they are responsible for the largest number of CERP, CERP-related, and non-CERP projects. To learn about sequencing criteria and to determine whether there are any overarching criteria for all of the restoration projects, we interviewed officials at these agencies, as well as officials at the Department of Agriculture's Agricultural Research Service and Natural Resources Conservation Service; Department of Commerce's National Oceanic and Atmospheric Administration; Department of the Interior's U.S. Geological Survey; the Seminole and Miccosukee tribes; Miami-Dade County; and the South Florida Regional Planning Council. Once we determined that only the CERP projects have clearly established criteria, we met with Corps and SFWMD officials to determine the extent to which they applied these criteria in making the sequencing decisions listed in the 2005 sequencing plan and to identify other factors and considerations that they took into account. In doing so, we selected certain CERP projects for more detailed discussion and reviewed Corps documentation in support of its sequencing decisions. Finally, we reviewed comments by other agencies and external stakeholders about the appropriateness of the factors used to determine the sequencing of CERP projects.

[3]South Florida Ecosystem Restoration Task Force, *Coordinating Success: Strategy for Restoration of the South Florida Ecosystem, Volume 2* (Miami, Fla.: July 31, 2000).

To determine the amount of funding federal and state agencies have contributed to the restoration effort for fiscal years 1999 through 2006, we obtained information from the following lead project sponsors: the Department of Agriculture, the Corps, the Department of the Interior, SFWMD, and Florida Department of Environmental Protection. We also obtained information from the Environmental Protection Agency. Federal agencies account for their funds independently, and therefore no complete and consolidated financial data on the restoration were available. For the other agencies participating in the restoration effort, we used the funding data for this period that these agencies had provided in the Task Force's annual cross-cut budgets. These agencies included the Department of Commerce, Florida Fish and Wildlife Conservation Commission, Florida Department of Agriculture and Consumer Affairs, Florida Department of Community Affairs, Florida Department of Transportation, and Florida Department of Environmental Protection. In reporting the funding data in total and by category type, we used funding amounts that were sometimes rounded to the nearest million and sometimes rounded to the nearest billion, and as a result, the amounts we report may not always equal the funding totals originally provided by each agency. We made certain judgments in allocating the funding based on the available funding data. As a result, land costs for some fiscal years are only for a partial fiscal year and do not include the entire fiscal year. We converted all funding data to constant 2006 dollars. To assess the reliability of the funding data the agencies provided, we asked the agencies to provide appropriation or budget allocation documents that supported their funding contributions; the lead project sponsors listed above provided supporting documentation. Our review of the funding and the supporting documentation indicated that the funding data were sufficiently reliable for the purposes of this review.

To determine any increases in estimated project costs and the reasons for these increases, we used as our baseline the list of projects and their associated costs in the Task Force's 2000 Integrated Financial Plan. We updated this project list for any changes in projects from July 31, 2000, through June 30, 2006. We then submitted the updated project list to the participating federal and state agencies that were the lead project sponsors and co-sponsors and asked them to provide the total estimated cost for each project as of June 30, 2006, and identify factors that contributed to increases in project costs. However, in 2000, the state of Florida discontinued reporting acquisition costs for lands not yet acquired for habitat protection. Therefore, the Task Force did not include these costs in its 2002 through 2006 reports. Instead, to account for future land costs in its 2004 Biennial Report, the Task Force computed a range of

estimated costs for future land acquisitions using a low and a high price per acre. Moreover, the 2000 Task Force restoration cost estimate consisted of total estimated costs for some projects, and total remaining costs for other projects. In some instances where the cost estimate provided a total remaining project cost, this was listed as "to be determined," because the Task Force did not identify a cost for land still to be purchased. The 2006 restoration cost estimate we developed also includes total estimated costs for some projects, and total remaining costs for other projects. However, we developed cost estimates for some projects whose costs were previously listed as "to be determined." Specifically, we conservatively estimated total remaining project costs for uncompleted land acquisitions by multiplying the remaining acreage to be purchased using the same low price per acre that the Task Force used in computing these land costs in 2004. This difference in methodology could account for some part of the estimated cost increase we report; however, we did not assess the potential impact of this difference. In addition, for the lead agencies that did not or could not provide estimated project costs as of June 30, 2006, we used the estimated project costs these agencies had provided in the 2005 Integrated Financial Plan and converted the costs to constant 2006 dollars. We realize that converting these 2005 project costs to 2006 dollars may not capture all of the factors that may contribute to increases in project costs, but given the small number of projects involved—30—we do not believe the omission of some contributing factors would significantly alter the total estimated cost of the restoration. In arriving at a total estimated cost for the restoration for 2000 and 2006, we added together the estimated project costs, future land costs, and non-project estimated costs for each year. Having calculated total estimated restoration costs for 2000 and 2006, we subtracted the 2000 total estimated restoration cost from the 2006 total estimated restoration cost to determine the increase in the total estimated cost of the restoration. In reporting the cost data in total and by category type, we used cost amounts that were sometimes rounded to the nearest million and sometimes to the nearest billion.

In determining the reliability of the project and program support cost estimates, we researched and reviewed audit reports prepared by agencies' internal auditors, inspectors general, and outside independent auditors for fiscal years 1999 through 2006 for information on actual costs incurred. For estimated costs, we reviewed the processes and policies the Corps and SFWMD used to estimate the costs for completing the projects. We limited our data reliability review to the following agencies that were lead project sponsors because they are responsible for tracking and reporting project costs. These agencies were the Department of

Agriculture, the Corps, the Department of the Interior, SFWMD, and FDEP. Our review of the audit reports and cost estimation policies and procedures indicated that the cost data were sufficiently reliable for the purposes of this review.

To identify the primary models that can be used to guide the restoration and their interfaces, we obtained and analyzed key documents from managers and scientists at the Corps, the Department of the Interior, SFWMD, and other participating agencies. We also researched academic and model Web sites to identify additional information related to models and interfaces for the restoration. From these sources, we compiled a universe of over 100 mathematical models available for the restoration effort. Additionally, we conducted interviews with agency scientists and managers, and other stakeholders, including the external scientific community, to determine which models are considered primary to guide the restoration and to obtain additional information about these models. We defined primary models as those that have broad application for use at the project, sub-regional, or regional level. Through our conversations with agency scientists and managers, and our analysis of agency documents and academic and model Web sites, we identified 27 primary models. We also determined who developed the models, the type, and study area of the models, and the interfaces for each of the models. We did not independently assess the reliability or adequacy of the models we reviewed.

We performed our work between January 2006 and April 2007 in accordance with generally accepted government auditing standards.

Appendix II: Project Status and Cost by CERP, CERP-Related, and Non-CERP Categories

This appendix provides detailed information on the 222 projects that comprise the restoration effort. Table 6 shows the projects by project category—CERP, CERP-related, and non-CERP. Tables 7, 8, and 9 provide information on the status of the restoration projects—completed, being implemented, or not yet implemented (planning, design, or not yet started).

Table 6: 222 Restoration Projects, Sponsor, Primary Purpose, Completion Date, and Project Cost

Dollars in millions

Project name	Sponsor(s)	Primary purpose	Completion date	Cost[a]
60 CERP projects				
Acme Basin B Discharge	Corps/SFWMD	Habitat acquisition and improvement	2008[b]	$26.5
Aquifer Storage and Recovery Regional Study	Corps/SFWMD	Study	2010	73.4
Big Cypress / L-28 Interceptor Modifications	Corps/SFWMD	Water quality	2022	51.4
Biscayne Bay Coastal Wetlands	Corps/SFWMD	Habitat acquisition and improvement	2011[b]	386.9
Broward County Secondary Canal System	Corps/SFWMD	Water storage and flow	2014	15.5
Broward County Water Preserve Areas	Corps/SFWMD	Water quality	2009[b]	408.3
C-4 Structure	Corps/SFWMD	Water storage and flow	2013	2.8
C-43 Basin Storage Reservoir - Part 1	Corps/SFWMD	Water storage and flow	2011[b]	530.6
C-43 Basin Aquifer Storage and Recovery - Part 2	Corps/SFWMD	Water storage and flow	2019	[c]
C-111 Spreader Canal	Corps/SFWMD	Water quality	2015[b]	117.6
Caloosahatchee Backpumping with Stormwater Treatment	Corps/SFWMD	Water quality	2018	99.7
Caloosahatchee River (C-43) Aquifer Storage and Recovery Pilot	Corps/SFWMD	Water storage and flow (pilot)	2009	7.9
Central Lake Belt Storage	Corps/SFWMD	Water storage and flow	2035	155.4
Change Coastal Wellfield Operations	Corps/SFWMD	Water supply	To be decided	[d]
Comprehensive Integrated Water Quality Feasibility Study	Corps/FDEP	Study	2014	9.3
Environmental Water Supply Deliveries to St. Lucie Estuary	Corps/SFWMD	Habitat acquisition and improvement	To be decided	[d]
Environmental Water Supply Deliveries to the Caloosahatchee Estuary	Corps/SFWMD	Habitat acquisition and improvement	To be decided	[d]
Everglades Agricultural Storage Reservoir	Corps/SFWMD	Water storage and flow	2015[b]	542.2
Everglades National Park Seepage Management	Corps/SFWMD	Water storage and flow	2015	390.9
Everglades Rain Driven Operations	Corps/SFWMD	Water storage and flow	To be decided	[d]

Dollars in millions

Project name	Sponsor(s)	Primary purpose	Completion date	Cost[a]
Florida Bay and the Florida Keys Feasibility Study	Corps/SFWMD	Study	2012	6.3
Florida Keys Tidal Restoration	Corps/SFWMD	Water storage and flow	2010	1.5
Flow to Northwest and Central Water Conservation Area 3A	Corps/SFWMD	Water storage and flow	2018	36.3
Flows to Eastern Water Conservation Area	Corps/SFWMD	Water storage and flow	2017	8.0
Henderson Creek / Belle Meade Restoration	Corps/FDEP	Water quality	2011	5.8
Hillsboro Aquifer Storage and Recovery - Phase 2	Corps/SFWMD	Water storage and flow	2020	[c]
Hillsboro Aquifer Storage and Recovery Pilot	Corps/SFWMD	Water storage and flow (pilot)	2009	9.4
Indian River Lagoon-South	Corps/SFWMD	Water storage and flow	2022[b,e]	1,309.7
L-31N (L-30) Seepage Management Pilot	Corps/SFWMD	Water storage and flow (pilot)	2010	11.3
Lake Belt In-Ground Reservoir Technology Pilot	Corps/SFWMD	Water storage and flow (pilot)	2026	26.5
Lake Okeechobee Aquifer Storage and Recovery	Corps/SFWMD	Water storage and flow	2027	1,223.4
Lake Okeechobee Aquifer Storage and Recovery Pilot	Corps/SFWMD	Water storage and flow (pilot)	2009	32.3
Lake Okeechobee Regulation Schedule	Corps/SFWMD	Water storage and flow	2007	1.1
Lake Okeechobee Watershed	Corps/SFWMD	Water storage and flow	2014	575.5
Lakes Park Restoration	Corps/Lee County	Habitat acquisition and improvement	2009	6.0
Lower East Coast Utility Water Conservation	Corps/SFWMD	Water supply	To be decided	[d]
Loxahatchee National Wildlife Refuge Internal Canal Structures	Corps/SFWMD	Water storage and flow	2015	9.1
Melaleuca Eradication and Other Exotic Plants	Corps/SFWMD	Invasive species control	2025	6.6
Miccosukee Water Management Plan	Corps/Miccosukee	Water quality	2016	29.0
Modify Holey Land Wildlife Management Area Operation Plan	Corps/SFWMD	Water storage and flow	2011	[d]
Modify Rotenberger Wildlife Management Area Operation Plan	Corps/SFWMD	Water storage and flow	2009	[d]
North Lake Belt Storage Area	Corps/SFWMD	Water storage and flow	2035	308.2
North Palm Beach County - Part 1	Corps/SFWMD	Water quality	2015[f]	533.2
North Palm Beach County - Part 2	Corps/SFWMD	Water storage and flow	2019	203.9
Operational Modification to Southern Portion of L-31N and C-111	Corps/SFWMD	Water storage and flow	To be decided	[d]
Palm Beach County Agriculture Reserve Reservoir - Part 1	Corps/SFWMD	Water storage and flow	2016	154.4

Dollars in millions

Project name	Sponsor(s)	Primary purpose	Completion date	Cost[a]
Palm Beach County Agriculture Reserve Aquifer Storage and Recovery - Part 2	Corps/SFWMD	Water storage and flow	2018	[c]
Picayune Strand Restoration	Corps/SFWMD	Habitat acquisition and improvement	2009[b,g]	362.6
Restoration of Pineland and Hardwood Hammocks in C-111 Basin	Corps/Miami-Dade County	Habitat acquisition and improvement	2021	0.7
Seminole Tribe Big Cypress Reservation Water Conservation Plan	Corps/Seminole	Water quality	2021	89.5
Site 1 Impoundment	Corps/SFWMD	Water storage and flow	2009[b,h]	153.7
South Miami-Dade Reuse	Corps/Miami-Dade County	Water supply	2022	430.6
Southwest Florida Feasibility Study	Corps/SFWMD	Study	2009	12.0
Strazzulla Wetlands	Corps/SFWMD	Habitat acquisition and improvement	2010	70.4
Wastewater Reuse Technology Pilot	Corps/SFWMD	Water supply (pilot)	2021	35.4
Water Conservation Area 2B Flows to Everglades National Park	Corps/SFWMD	Water storage and flow	2021	539.4
Water Conservation Area 3 Decompartmentalization and Sheetflow Enhancement (Decomp)	Corps/SFWMD	Water storage and flow	2020	253.4
Water Preserve Area Conveyance	Corps/SFWMD	Water storage and flow	2016	331.7
West Miami-Dade Reuse	Corps/Miami-Dade County	Water supply	2022	518.1
Winsberg Farm Wetlands Restoration	Corps/Palm Beach County	Habitat acquisition and improvement	2008	17.1
28 CERP-related projects				
C-111 (South Dade)	Corps/SFWMD	Water storage and flow	2012	287.6
Chapter 298 Districts / Lease 3420 Improvements	SFWMD	Water quality	2005	24.1
Critical Project: Additional Water Conveyance Structures Under Tamiami Trail	Corps/SFWMD	Water storage and flow	To be decided[i]	16.5
Critical Project: East Coast Canal Structures (C-4)	Corps/SFWMD	Water storage and flow	2003	3.7
Critical Project: Keys Carrying Capacity Study	Corps/FDCA	Study	2003	6.0
Critical Project: Lake Okeechobee Water Retention / Phosphorus Removal	Corps/SFWMD	Water quality	2006	21.9
Critical Project: Lake Trafford	Corps/SFWMD	Water quality	2007	30.0
Critical Project: Seminole Big Cypress Reservation Water Conservation Plan	Corps/Seminole	Water storage and flow	2010	52.2
Critical Project: Southern CREW	Corps/SFWMD	Water storage and flow	To be decided	33.3
Critical Project: Ten Mile Creek	Corps/SFWMD	Water storage and flow	2006	40.7

Dollars in millions

Project name	Sponsor(s)	Primary purpose	Completion date	Cost[a]
Critical Project: Western C-11 Water Quality Treatment	Corps/SFWMD	Water quality	2006	18.1
East Water Conservation Area 3A Hydropattern Restoration	SFWMD	Water storage and flow	2012	5.3
Everglades Agricultural Area (EAA) Stormwater Treatment Areas Expansion	SFWMD	Water quality	2010	226.7
Indian River Lagoon Restoration Feasibility Study	Corps/SFWMD	Study	2002	7.9
Kissimmee River Restoration	Corps/SFWMD	Water storage and flow	2016[j]	575.4
Manatee Pass Gates	Corps/SFWMD	Habitat acquisition and improvement	2010	13.8
Melaleuca Quarantine Facility	USDA (ARS)	Invasive species control	2004	8.0
Modified Water Deliveries to Everglades National Park (Mod Waters)	NPS/Corps	Water storage and flow	2009	398.4
Rotenberger Restoration	SFWMD	Water storage and flow	2005	3.6
Stormwater Treatment Area 1 Inflow and Distribution Works	SFWMD	Water quality	2005	12.7
Stormwater Treatment Area 1 West Works and Outflow Pump Station (G-310)	SFWMD	Water quality	2000	82.1
Stormwater Treatment Area 2 Works and Outflow Pump Station (G-335)	SFWMD	Water quality	2000	100.4
Stormwater Treatment Area 3/4 Works	SFWMD	Water quality	2005	170.4
Stormwater Treatment Area 5 Works	SFWMD	Water quality	2005	36.2
Stormwater Treatment Area 6 (includes Sections 1 and 2)	SFWMD	Water quality	2006	14.6
Water Conservation Area 2A Hydropattern Restoration	SFWMD	Water storage and flow	2012	4.9
West Palm Beach Canal (C-51) and Stormwater Treatment Area 1E	Corps/SFWMD	Water quality	2008	288.6
West Water Conservation Area 3A Hydropattern Restoration	SFWMD	Water storage and flow	2012	7.4
134 Non-CERP projects				
2002 Farm Bill	USDA (NRCS)	Other	2007	100.4
A.R.M. Loxahatchee National Wildlife Refuge	FWS	Habitat acquisition and improvement	To be decided	30.1
A.R.M. Loxahatchee National Wildlife Refuge Prescribed Fire Program	FWS	Habitat acquisition and improvement	To be decided	[d]
Achieve “Maintenance Control” Status for Brazilian Pepper, Melaleuca, Australian Pine, and Old World Climbing Fern in All Natural Areas Statewide by 2020	FWS/SFWMD/FDEP	Invasive species control	2020	64.1
Agriculture and Rural Area Study	Miami-Dade	Study	2001	[d]

Dollars in millions

Project name	Sponsor(s)	Primary purpose	Completion date	Cost[a]
Allapattah Flats / Ranch	FDEP	Habitat acquisition and improvement	2005	[d]
Alternative Water Supply Grant	SFWMD	Water supply	To be decided	466.0
Aquatic and Upland Invasive Plant Management	FDEP	Invasive species control	To be decided	[d]
Atlantic Ridge Ecosystem	FDEP/SFWMD	Habitat acquisition and improvement	To be decided	[d]
Babcock Ranch	FDEP	Habitat acquisition and improvement	To be decided	[d]
Belle Meade	FDEP	Habitat acquisition and improvement	To be decided	[d]
Best Management Practices (BMPs) for Agriculture	USDA (NRCS)	Water quality	2011	145.4
Big Bend Swamp / Holopaw Ranch	FDEP	Habitat acquisition and improvement	To be decided	[d]
Big Cypress National Preserve Addition	NPS	Habitat acquisition and improvement	To be decided	75.5
Big Cypress National Preserve Mineral Rights	NPS	Habitat acquisition and improvement	To be decided	[d]
Big Cypress National Preserve Private Inholdings	NPS	Habitat acquisition and improvement	To be decided	244.1
Big Pine and No Name Keys Multi-Species Habitat Conservation Plan	FDCA	Study	2001	[d]
Biscayne Bay Feasibility Study	Corps/Miami-Dade County	Study	2010	6.4
Biscayne Coastal Wetlands Land Acquistion	SFWMD/Miami-Dade County	Habitat acquisition and improvement	To be decided	[d]
Bombing Range Ridge	FDEP	Habitat acquisition and improvement	To be decided	[d]
C-4 Flood Mitigation Projects	SFWMD	Flood protection	2008	4.3
Caloosahatchee Ecoscape	FDEP	Habitat acquisition and improvement	To be decided	[d]
Catfish Creek	FDEP	Habitat acquisition and improvement	To be decided	[d]
Cayo Costa	FDEP	Habitat acquisition and improvement	2004	29.2
Charlotte Harbor Estuary / Flatwoods / Cape Haze	FDEP	Habitat acquisition and improvement	To be decided	[d]
Complete an Invasive Exotics Plant Prevention, Early Detection, and Eradication Plan by 2005	NEWTT/FDEP/NPS	Invasive species control	To be decided	5.2
Complete Land Acquisition for Biscayne National Park	NPS	Habitat acquisition and improvement	To be decided	33.7
Coordinate the Development of Management Plans for Top 20 South Florida Exotic Pest Plants	NEWTT	Invasive species control	2011	0.6
Corkscrew Regional Ecosystem Watershed (CREW)	FDEP	Habitat acquisition and improvement	To be decided	[d]
Corkscrew Regional Mitigation Bank	SFWMD	Habitat acquisition and improvement	1999	2.7
Coupon Bight / Key Deer / Big Pine Key	FDEP	Habitat acquisition and improvement	To be decided	[d]

Dollars in millions

Project name	Sponsor(s)	Primary purpose	Completion date	Cost[a]
Crocodile Lake National Wildlife Refuge	FWS	Habitat acquisition and improvement	To be decided	15.4
Cypress Creek / Loxahatchee	SFWMD	Habitat acquisition and improvement	To be decided	[d]
Cypress Creek / Trail Ridge	SFWMD	Habitat acquisition and improvement	To be decided	[d]
Devil's Garden	FDEP	Habitat acquisition and improvement	To be decided	[d]
Dupuis Reserve Land Acquistion	SFWMD	Habitat acquisition and improvement	1986	23.7
East Coast Buffer / Water Preserve Areas	FDEP/SFWMD	Habitat acquisition and improvement	To be decided	[d]
East Everglades Addition to Everglades National Park	NPS	Habitat acquisition and improvement	To be decided	109.9
Eastward Ho! Brownfields Partnership	SFRPC	Other	2010	[d]
Eastward Ho! Corridor Rival Development Trends Fiscal Impact Analysis	FDCA	Study	1998	[d]
Estero Bay	FDEP	Habitat acquisition and improvement	To be decided	[d]
Estero Bay Aquatic Preserve and Buffer Reserve Enhancement and Exotic Removal Project	FDEP	Invasive species control	2004	[d]
Everglades Agricultural Area (EAA) / Talisman Land Acquistion	SFWMD/DOI	Habitat acquisition and improvement	To be decided	[d]
Everglades National Park Exotic Control Program	NPS	Invasive species control	To be decided	[d]
Everglades National Park Water and Wastewater	NPS	Water quality	2008	19.0
Everglades Regulation Division	SFWMD	Water quality	2016	[d]
Exotic Species Removal	Seminole	Invasive species control	2020	1.0
Exotic Vegetation Control (Critical) Big Cypress National Preserve	NPS	Invasive species control	To be decided	4.1
Fakahatchee Strand	FDEP	Habitat acquisition and improvement	To be decided	[d]
Fisheating Creek	SFWMD/FDEP	Habitat acquisition and improvement	To be decided	[d]
Florida Aquifer Restoration	USDA (NRCS)	Water quality	2006	0.9
Florida Greenways and Trails Designation Project	FDEP (OGT)	Other	2009	4.6
Florida Keys Ecosystem	FDEP	Habitat acquisition and improvement	To be decided	[d]
Florida Keys National Wildlife Refuge Complex	FWS	Habitat acquisition and improvement	To be decided	55.0
Florida Keys Overseas Heritage Trail	FDEP	Other	2009	41.2
Florida Panther National Wildlife Refuge	FWS	Habitat acquisition and improvement	To be decided	12.9
Frog Pond / L-31N	FDEP/SFWMD	Habitat acquisition and improvement	To be decided	[d]
Half Circle L Ranch	SFWMD	Habitat acquisition and improvement	To be decided	[d]
Hen Scratch Ranch	SFWMD	Habitat acquisition and improvement	To be decided	[d]
Hobe Sound National Wildlife Refuge	FWS	Habitat acquisition and improvement	To be decided	5.8

Dollars in millions

Project name	Sponsor(s)	Primary purpose	Completion date	Cost[a]
Hole-in-the-Donut	NPS	Invasive species control	2017	123.8
Indian River Lagoon Blueway	FDEP/SFWMD	Habitat acquisition and improvement	To be decided	[d]
Integration of Federal, State, and Local Agency Invasive Exotic Control Programs into Florida-wide Strategy	NPS	Invasive species control	2006	[d]
J.N. “Ding” Darling National Wildlife Refuge	FWS	Habitat acquisition and improvement	To be decided	71.8
Juno Hills / Dunes	FDEP	Habitat acquisition and improvement	To be decided	[d]
Jupiter Ridge	FDEP	Habitat acquisition and improvement	To be decided	[d]
Kissimmee Basin Water Supply Plan (KB Plan)	SFWMD	Study	2006	5.5
Kissimmee Prairie (Ecosystem)	FDEP/SFWMD	Water storage and flow	1997	22.6
Kissimmee River (Lower Basin)	SFWMD	Habitat acquisition and improvement	To be decided	[d]
Kissimmee River (Upper Basin)	SFWMD	Habitat acquisition and improvement	To be decided	[d]
Kissimmee-St. Johns Connector	FDEP	Habitat acquisition and improvement	To be decided	[d]
Lake Hatchineha Watershed / Parker-Poinciana	SFWMD	Habitat acquisition and improvement	To be decided	[d]
Lake Okeechobee Fast-Track Projects	SFWMD	Water quality	2009	200.0
Lake Okeechobee Protection Program	SFWMD	Water quality	2015	1,300.0
Lake Okeechobee Scenic Trail	FDEP	Other	To be decided	25.8
Lake Okeechobee Sediment Removal Feasibility Study and Pilot Project	SFWMD	Water quality (pilot)	2003	1.0
Lake Okeechobee Tributary Sediment Removal Pilot Project	SFWMD	Water quality (pilot)	2004	0.5
Lake Wales Ridge Ecosystem	FDEP	Habitat acquisition and improvement	To be decided	[d]
Lake Walk-in-Water	SFWMD	Habitat acquisition and improvement	1998	4.1
Long Term Plan (LTP) Projects	SFWMD	Water quality	2016	580.9
Lower East Coast Regional Water Supply Plan (LEC Plan)	SFWMD	Study	2006	12.1
Lower West Coast Regional Irrigation Distribution System Master Plan Study	SFWMD	Study	2002	[d]
Lower West Coast Water Supply Plan (LWC Plan)	SFWMD	Study	2006	10.4
Loxahatchee Impoundment Landscape Assessment (LILA)	FWS	Habitat acquisition and improvement (pilot)	2012	6.1
Loxahatchee River	SFWMD	Habitat acquisition and improvement	2001	13.5
Loxahatchee Slough	SFWMD	Habitat acquisition and improvement	To be decided	[d]
Miami-Dade County Archipelago	FDEP	Habitat acquisition and improvement	To be decided	[d]
Miccosukee Water Resources Management	Miccosukee	Water quality	To be decided	26.0

Dollars in millions

Project name	Sponsor(s)	Primary purpose	Completion date	Cost[a]
Model Lands	SFWMD/Miami-Dade County	Habitat acquisition and improvement	2007	[d]
Monitoring of Organic Soils in the Everglades	USDA (NRCS)	Other	2017	1.3
Nicodermus Slough	SFWMD	Habitat acquisition and improvement	1988	2.0
North Fork St. Lucie River	FDEP/SFWMD	Habitat acquisition and improvement	To be decided	[d]
North Key Largo Hammocks	FDEP	Habitat acquisition and improvement	To be decided	[d]
Northern Palm Beach County and Southern Martin County Reclaimed Water Master Plan	SFWMD	Study	2002	[d]
North Savannas	SFWMD	Habitat acquisition and improvement	To be decided	[d]
Okaloacoochee Slough	FDEP/SFWMD	Habitat acquisition and improvement	To be decided	[d]
Okeechobee Battlefield	FDEP	Habitat acquisition and improvement	To be decided	[d]
Orlando / Kissimmee Area Regional Reclaimed Water Optimization Plan	SFWMD	Study	2004	[d]
Osceola Pine Savannas	FDEP	Habitat acquisition and improvement	To be decided	[d]
Pal-Mar	FDEP/SFWMD	Habitat acquisition and improvement	To be decided	[d]
Panther Glades	FDEP	Habitat acquisition and improvement	To be decided	[d]
Paradise Run	SFWMD	Habitat acquisition and improvement	To be decided	[d]
Pine Island Slough Ecosystem	FDEP	Habitat acquisition and improvement	To be decided	[d]
Pineland Site Complex	FDEP	Habitat acquisition and improvement	To be decided	[d]
Planning and Implementation of the Tortugas Ecological Reserve	NOAA	Habitat acquisition and improvement	To be decided	[d]
Ranch Reserve	SFWMD	Habitat acquisition and improvement	To be decided	[d]
Rookery Bay	FDEP	Habitat acquisition and improvement	To be decided	[d]
Rotenberger-Holey Land Tract	FDEP	Habitat acquisition and improvement	To be decided	[d]
S-5A Basin Runoff Diversion Works	SFWMD	Water quality	2005	12.8
Seminole Tribe Best Management Practices for the Big Cypress Reservation	Seminole	Water quality	2012	4.9
Seminole Tribe Best Management Practices for the Brighton Reservation	Seminole	Water quality	2012	0.3
Seminole Tribe Comprehensive Surface Water Management System for the Brighton Reservation	Seminole	Water storage and flow	2010	16.3
Seminole Tribe Water Conservation Project for Big Cypress Reservation	Seminole	Water quality	2012	50.5
Shingle Creek	SFWMD	Habitat acquisition and improvement	To be decided	[d]
Six Mile Cypress I and II	SFWMD	Habitat acquisition and improvement	To be decided	[d]
Soil Survey Update for the Everglades Agricultural Area	USDA (NRCS)	Other	2012	1.5

Dollars in millions

Project name	Sponsor(s)	Primary purpose	Completion date	Cost[a]
Soil Survey Update for the Everglades National Park, Big Cypress National Preserve, and Water Conservation Areas	USDA (NRCS)	Other	2013	5.8
South Florida Ecosystem Restoration Earth Team	USDA (NRCS)	Other	To be decided	1.6
South Florida Ecosystem Restoration Non Point Source Pollution and Disease Prevention Project	BSWCD/SFERC/ USDA (NRCS)	Other	To be decided	15.5
South Florida Multi-Species Recovery Plan	FWS	Habitat acquisition and improvement	2010	386.1
South Fork St. Lucie River	SFWMD	Habitat acquisition and improvement	1996	2.6
South Savannas	FDEP/SFWMD	Habitat acquisition and improvement	To be decided	[d]
Southern Glades	SFWMD/Miami-Dade County	Habitat acquisition and improvement	To be decided	[d]
Southern Golden Gate Estates	FDEP	Habitat acquisition and improvement	To be decided	[d]
Technical Assistance to Seminole and Miccosukee Indian Reservations	USDA (NRCS)	Water quality	2011	15.5
Ten Mile Creek (Land Acquisition)	SFWMD	Habitat acquisition and improvement	2004	5.5
Tibet-Butler Preserve	SFWMD	Habitat acquisition and improvement	1999	3.7
Total Maximum Daily Load (TMDL) for South Florida	FDEP	Water quality	2011	[d]
Twelve Mile Slough	SFWMD	Habitat acquisition and improvement	To be decided	[d]
Upper East Coast Regional Water Supply Plan (UEC Plan)	SFWMD	Study	2006	4.4
Upper Lakes Basin Watershed	SFWMD	Habitat acquisition and improvement	To be decided	[d]
Water Conservation Area 2A Regulation Schedule Review	Corps	Study	To be decided	[d]
Water Conservation Areas 2 and 3	SFWMD	Habitat acquisition and improvement	To be decided	[d]
Yamato Scrub	FDEP	Habitat acquisition and improvement	1996	26.7

Source: GAO analysis of documents provided by Task Force and participating agencies.

Note: Ten projects had primary purposes—such as recreation or soil monitoring—that fell outside of our established categories. These project purposes are designated "Other" in this table and in tables 7, 8, and 9.

[a]Project cost shown is reported cost for completed projects and estimated cost for all other projects.

[b]SFWMD is expediting the design and construction of this project with its own funds in advance of congressional authorization, which may result in earlier project completion.

[c]The estimated cost of this aquifer storage and recovery (ASR) project is included in the cost estimate for the project's initial part or phase. Specifically, the estimated cost of the C-43 Basin ASR is included in the cost estimate for the C-43 Basin Storage Reservoir; the estimated cost of the Hillsboro ASR is included in the cost estimate for the Site 1 Impoundment; and the estimated cost of the Palm Beach County Agriculture Reserve ASR is included in the cost estimate for the Palm Beach County Agriculture Reserve Reservoir.

[d]We did not receive cost information for this project.

[e]A project implementation report was submitted to the Congress in 2005 for this project, but it has not yet received authorization.

[f]SFWMD is expediting a portion of this project with its own funds in advance of congressional authorization. It is constructing a water storage reservoir that it expects to finish by 2008.

[g]This project is currently being reviewed by the Office of Management and Budget before its project implementation report is submitted to the Congress for authorization.

[h]This project is currently being reviewed by the Assistant Secretary of the Army before its project implementation report is submitted to the Congress for authorization.

[i]Phase 1 of this project has been completed; phase 2 is on hold pending additional funding.

[j]This date encompasses construction completion and several years of post-construction monitoring.

Table 7: 43 Completed Restoration Projects, Sponsor, Primary Purpose, Completion Date, and Reported Cost

Dollars in millions

Project name	Sponsor(s)	Primary purpose	Completion date	Cost
15 CERP-related projects				
Chapter 298 Districts / Lease 3420 Improvements	SFWMD	Water quality	2005	$24.1
Critical Project: East Coast Canal Structures (C-4)	Corps/SFWMD	Water storage and flow	2003	3.7
Critical Project: Keys Carrying Capacity Study	Corps/FDCA	Study	2003	6.0
Critical Project: Lake Okeechobee Water Retention / Phosphorus Removal	Corps/SFWMD	Water quality	2006	21.9
Critical Project: Ten Mile Creek	Corps/SFWMD	Water storage and flow	2006	40.7
Critical Project: Western C-11 Water Quality Treatment	Corps/SFWMD	Water quality	2006	18.1
Indian River Lagoon Restoration Feasibility Study	Corps/SFWMD	Study	2002	7.9
Melaleuca Quarantine Facility	USDA (ARS)	Invasive species control	2004	8.0
Rotenberger Restoration	SFWMD	Water storage and flow	2005	3.6
Stormwater Treatment Area 1 Inflow and Distribution Works	SFWMD	Water quality	2005	12.7
Stormwater Treatment Area 1 West Works and Outflow Pump Station (G-310)	SFWMD	Water quality	2000	82.1
Stormwater Treatment Area 2 Works and Outflow Pump Station (G-335)	SFWMD	Water quality	2000	100.4
Stormwater Treatment Area 3/4 Works	SFWMD	Water quality	2005	170.4
Stormwater Treatment Area 5 Works	SFWMD	Water quality	2005	36.2
Stormwater Treatment Area 6 (includes Sections 1 and 2)	SFWMD	Water quality	2006	14.6
28 Non-CERP projects				
Agriculture and Rural Area Study	Miami-Dade	Study	2001	[a]
Allapattah Flats / Ranch	FDEP	Habitat acquisition and improvement	2005	[a]
Big Pine and No Name Keys Multi-Species Habitat Conservation Plan	FDCA	Study	2001	[a]
Cayo Costa	FDEP	Habitat acquisition and improvement	2004	29.2
Corkscrew Regional Mitigation Bank	SFWMD	Habitat acquisition and improvement	1999	2.7
Dupuis Reserve Land Acquistion	SFWMD	Habitat acquisition and improvement	1986	23.7
Eastward Ho! Corridor Rival Development Trends Fiscal Impact Analysis	FDCA	Study	1998	[a]
Estero Bay Aquatic Preserve and Buffer Reserve Enhancement and Exotic Removal Project	FDEP	Invasive species control	2004	[a]

Dollars in millions

Project name	Sponsor(s)	Primary purpose	Completion date	Cost
Florida Aquifer Restoration	USDA (NRCS)	Water quality	2006	0.9
Integration of Federal, State, and Local Agency Invasive Exotic Control Programs into Florida-wide Strategy	NPS	Invasive species control	2006	[a]
Kissimmee Basin Water Supply Plan (KB Plan)	SFWMD	Study	2006	5.5
Kissimmee Prairie (Ecosystem)	FDEP/SFWMD	Water storage and flow	1997	22.6
Lake Okeechobee Sediment Removal Feasibility Study and Pilot Project	SFWMD	Water quality (pilot)	2003	1.0
Lake Okeechobee Tributary Sediment Removal Pilot Project	SFWMD	Water quality (pilot)	2004	0.5
Lake Walk-in-Water	SFWMD	Habitat acquisition and improvement	1998	4.1
Lower East Coast Regional Water Supply Plan (LEC Plan)	SFWMD	Study	2006	12.1
Lower West Coast Regional Irrigation Distribution System Master Plan Study	SFWMD	Study	2002	[a]
Lower West Coast Water Supply Plan (LWC Plan)	SFWMD	Study	2006	10.4
Loxahatchee River	SFWMD	Habitat acquisition and improvement	2001	13.5
Nicodermus Slough	SFWMD	Habitat acquisition and improvement	1988	2.0
Northern Palm Beach County and Southern Martin County Reclaimed Water Master Plan	SFWMD	Study	2002	[a]
Orlando / Kissimmee Area Regional Reclaimed Water Optimization Plan	SFWMD	Study	2004	[a]
S-5A Basin Runoff Diversion Works	SFWMD	Water quality	2005	12.8
South Fork St. Lucie River	SFWMD	Habitat acquisition and improvement	1996	2.6
Ten Mile Creek (Land Acquisition)	SFWMD	Habitat acquisition and improvement	2004	5.5
Tibet-Butler Preserve	SFWMD	Habitat acquisition and improvement	1999	3.7
Upper East Coast Regional Water Supply Plan (UEC Plan)	SFWMD	Study	2006	4.4
Yamato Scrub	FDEP	Habitat acquisition and improvement	1996	26.7

Source: GAO analysis of documents provided by the Task Force and participating agencies.

[a]We did not receive cost information for this project.

Table 8: 107 Restoration Projects Now Being Implemented, Sponsor, Primary Purpose, Expected Completion Date, and Estimated Cost

Dollars in millions

Project name	Sponsor(s)	Primary purpose	Completion date	Cost
7 CERP projects				
Acme Basin B Discharge	Corps/SFWMD	Habitat acquisition and improvement	2008[a]	$26.5
Everglades Agricultural Storage Reservoir	Corps/SFWMD	Water storage and flow	2015[a]	542.2
Hillsboro Aquifer Storage and Recovery Pilot	Corps/SFWMD	Water storage and flow (pilot)	2009	9.4
Indian River Lagoon-South	Corps/SFWMD	Water storage and flow	2022[a,b]	1,309.7
Lake Okeechobee Aquifer Storage and Recovery Pilot	Corps/SFWMD	Water storage and flow (pilot)	2009	32.3
North Palm Beach County - Part 1	Corps/SFWMD	Water quality	2015[c]	533.2
Picayune Strand Restoration	Corps/SFWMD	Habitat acquisition and improvement	2009[a,d]	362.6
10 CERP-related projects				
C-111 (South Dade)	Corps/SFWMD	Water storage and flow	2012	287.6
Critical Project: Additional Water Conveyance Structures Under Tamiami Trail	Corps/SFWMD	Water storage and flow	To be decided[e]	16.5
Critical Project: Lake Trafford	Corps/SFWMD	Water quality	2007	30.0
Critical Project: Seminole Big Cypress Reservation Water Conservation Plan	Corps/Seminole	Water storage and flow	2010	52.2
Critical Project: Southern CREW	Corps/SFWMD	Water storage and flow	To be decided	33.3
Everglades Agricultural Area (EAA) Stormwater Treatment Areas Expansion	SFWMD	Water quality	2010	226.7
Kissimmee River Restoration	Corps/SFWMD	Water storage and flow	2016[f]	575.4
Manatee Pass Gates	Corps/SFWMD	Habitat acquisition and improvement	2010	13.8
Modified Water Deliveries to Everglades National Park (Mod Waters)	NPS/Corps	Water storage and flow	2009	398.4
West Palm Beach Canal (C-51) and Stormwater Treatment Area 1E	Corps/SFWMD	Water quality	2008	288.6
90 Non-CERP projects				
2002 Farm Bill	USDA (NRCS)	Other	2007	100.4
A.R.M. Loxahatchee National Wildlife Refuge	FWS	Habitat acquisition and improvement	To be decided	30.1
A.R.M. Loxahatchee National Wildlife Refuge Prescribed Fire Program	FWS	Habitat acquisition and improvement	To be decided	[g]
Achieve “Maintenance Control” Status for Brazilian Pepper, Melaleuca, Australian Pine, and Old World Climbing Fern in All Natural Areas Statewide by 2020	FWS/SFWMD/FDEP	Invasive species control	2020	64.1

Dollars in millions

Project name	Sponsor(s)	Primary purpose	Completion date	Cost
Alternative Water Supply Grant	SFWMD	Water supply	To be decided	466.0
Aquatic and Upland Invasive Plant Management	FDEP	Invasive species control	To be decided	[g]
Atlantic Ridge Ecosystem	FDEP/SFWMD	Habitat acquisition and improvement	To be decided	[g]
Belle Meade	FDEP	Habitat acquisition and improvement	To be decided	[g]
Best Management Practices (BMPs) for Agriculture	USDA (NRCS)	Water quality	2011	145.4
Big Bend Swamp / Holopaw Ranch	FDEP	Habitat acquisition and improvement	To be decided	[g]
Big Cypress National Preserve Addition	NPS	Habitat acquisition and improvement	To be decided	75.5
Big Cypress National Preserve Private Inholdings	NPS	Habitat acquisition and improvement	To be decided	244.1
Biscayne Bay Feasibility Study	Corps/Miami-Dade County	Study	2010	6.4
Biscayne Coastal Wetlands Land Acquistion	SFWMD/Miami-Dade County	Habitat acquisition and improvement	To be decided	[g]
Bombing Range Ridge	FDEP	Habitat acquisition and improvement	To be decided	[g]
C-4 Flood Mitigation Projects	SFWMD	Flood protection	2008	4.3
Caloosahatchee Ecoscape	FDEP	Habitat acquisition and improvement	To be decided	[g]
Catfish Creek	FDEP	Habitat acquisition and improvement	To be decided	[g]
Charlotte Harbor Estuary / Flatwoods / Cape Haze	FDEP	Habitat acquisition and improvement	To be decided	[g]
Complete Land Acquisition for Biscayne National Park	NPS	Habitat acquisition and improvement	To be decided	33.7
Coordinate the Development of Management Plans for Top 20 South Florida Exotic Pest Plants	NEWTT	Invasive species control	2011	0.6
Corkscrew Regional Ecosystem Watershed (CREW)	FDEP	Habitat acquisition and improvement	To be decided	[g]
Coupon Bight / Key Deer / Big Pine Key	FDEP	Habitat acquisition and improvement	To be decided	[g]
Crocodile Lake National Wildlife Refuge	FWS	Habitat acquisition and improvement	To be decided	15.4
Cypress Creek / Loxahatchee	SFWMD	Habitat acquisition and improvement	To be decided	[g]
Cypress Creek / Trail Ridge	SFWMD	Habitat acquisition and improvement	To be decided	[g]

Dollars in millions

Project name	Sponsor(s)	Primary purpose	Completion date	Cost
East Coast Buffer / Water Preserve Areas	FDEP/SFWMD	Habitat acquisition and improvement	To be decided	[g]
East Everglades Addition to Everglades National Park	NPS	Habitat acquisition and improvement	To be decided	109.9
Eastward Ho! Brownfields Partnership	SFRPC	Other	2010	[g]
Estero Bay	FDEP	Habitat acquisition and improvement	To be decided	[g]
Everglades Agricultural Area (EAA) / Talisman Land Acquistion	SFWMD/DOI	Habitat acquisition and improvement	To be decided	[g]
Everglades National Park Exotic Control Program	NPS	Invasive species control	To be decided	[g]
Everglades National Park Water and Wastewater	NPS	Water quality	2008	19.0
Everglades Regulation Division	SFWMD	Water quality	2016	[g]
Exotic Species Removal	Seminole	Invasive species control	2020	1.0
Exotic Vegetation Control (Critical) Big Cypress National Preserve	NPS	Invasive species control	To be decided	4.1
Fakahatchee Strand	FDEP	Habitat acquisition and improvement	To be decided	[g]
Fisheating Creek	SFWMD/FDEP	Habitat acquisition and improvement	To be decided	[g]
Florida Greenways and Trails Designation Project	FDEP (OGT)	Other	2009	4.6
Florida Keys Ecosystem	FDEP	Habitat acquisition and improvement	To be decided	[g]
Florida Keys National Wildlife Refuge Complex	FWS	Habitat acquisition and improvement	To be decided	55.0
Florida Keys Overseas Heritage Trail	FDEP	Other	2009	41.2
Florida Panther National Wildlife Refuge	FWS	Habitat acquisition and improvement	To be decided	12.9
Frog Pond / L-31N	FDEP/SFWMD	Habitat acquisition and improvement	To be decided	[g]
Hobe Sound National Wildlife Refuge	FWS	Habitat acquisition and improvement	To be decided	5.8
Hole-in-the-Donut	NPS	Invasive species control	2017	123.8
Indian River Lagoon Blueway	FDEP/SFWMD	Habitat acquisition and improvement	To be decided	[g]
J.N. “Ding” Darling National Wildlife Refuge	FWS	Habitat acquisition and improvement	To be decided	71.8
Juno Hills / Dunes	FDEP	Habitat acquisition and improvement	To be decided	[g]

Dollars in millions

Project name	Sponsor(s)	Primary purpose	Completion date	Cost
Jupiter Ridge	FDEP	Habitat acquisition and improvement	To be decided	[g]
Kissimmee River (Lower Basin)	SFWMD	Habitat acquisition and improvement	To be decided	[g]
Kissimmee River (Upper Basin)	SFWMD	Habitat acquisition and improvement	To be decided	[g]
Lake Okeechobee Protection Program	SFWMD	Water quality	2015	1,300.0
Lake Okeechobee Scenic Trail	FDEP	Other	To be decided	25.8
Lake Wales Ridge Ecosystem	FDEP	Habitat acquisition and improvement	To be decided	[g]
Long Term Plan (LTP) Projects	SFWMD	Water quality	2016	580.9
Loxahatchee Impoundment Landscape Assessment (LILA)	FWS	Habitat acquisition and improvement (pilot)	2012	6.1
Loxahatchee Slough	SFWMD	Habitat acquisition and improvement	To be decided	[g]
Miami-Dade County Archipelago	FDEP	Habitat acquisition and improvement	To be decided	[g]
Model Lands	SFWMD/Miami-Dade County	Habitat acquisition and improvement	2007	[g]
Monitoring of Organic Soils in the Everglades	USDA (NRCS)	Other	2017	1.3
North Fork St. Lucie River	FDEP/SFWMD	Habitat acquisition and improvement	To be decided	[g]
North Key Largo Hammocks	FDEP	Habitat acquisition and improvement	To be decided	[g]
Okaloacoochee Slough	FDEP/SFWMD	Habitat acquisition and improvement	To be decided	[g]
Okeechobee Battlefield	FDEP	Habitat acquisition and improvement	To be decided	[g]
Osceola Pine Savannas	FDEP	Habitat acquisition and improvement	To be decided	[g]
Pal-Mar	FDEP/SFWMD	Habitat acquisition and improvement	To be decided	[g]
Panther Glades	FDEP	Habitat acquisition and improvement	To be decided	[g]
Paradise Run	SFWMD	Habitat acquisition and improvement	To be decided	[g]
Pineland Site Complex	FDEP	Habitat acquisition and improvement	To be decided	[g]
Planning and Implementation of the Tortugas Ecological Reserve	NOAA	Habitat acquisition and improvement	To be decided	[g]
Ranch Reserve	SFWMD	Habitat acquisition and improvement	To be decided	[g]

Dollars in millions

Project name	Sponsor(s)	Primary purpose	Completion date	Cost
Rookery Bay	FDEP	Habitat acquisition and improvement	To be decided	[g]
Rotenberger-Holey Land Tract	FDEP	Habitat acquisition and improvement	To be decided	[g]
Seminole Tribe Best Management Practices for the Big Cypress Reservation	Seminole	Water quality	2012	4.9
Seminole Tribe Best Management Practices for the Brighton Reservation	Seminole	Water quality	2012	0.3
Seminole Tribe Water Conservation Project for Big Cypress Reservation	Seminole	Water quality	2012	50.5
Shingle Creek	SFWMD	Habitat acquisition and improvement	To be decided	[g]
Six Mile Cypress I and II	SFWMD	Habitat acquisition and improvement	To be decided	[g]
South Florida Ecosystem Restoration Earth Team	USDA (NRCS)	Other	To be decided	1.6
South Florida Ecosystem Restoration Non Point Source Pollution and Disease Prevention Project	BSWCD/SFERC/ USDA (NRCS)	Other	To be decided	15.5
South Florida Multi-Species Recovery Plan	FWS	Habitat acquisition and improvement	2010	386.1
South Savannas	FDEP/SFWMD	Habitat acquisition and improvement	To be decided	[g]
Southern Glades	SFWMD/Miami-Dade County	Habitat acquisition and improvement	To be decided	[g]
Southern Golden Gate Estates	FDEP	Habitat acquisition and improvement	To be decided	[g]
Technical Assistance to Seminole and Miccosukee Indian Reservations	USDA (NRCS)	Water quality	2011	15.5
Total Maximum Daily Load (TMDL) for South Florida	FDEP	Water quality	2011	[g]
Twelve Mile Slough	SFWMD	Habitat acquisition and improvement	To be decided	[g]
Upper Lakes Basin Watershed	SFWMD	Habitat acquisition and improvement	To be decided	[g]
Water Conservation Areas 2 and 3	SFWMD	Habitat acquisition and improvement	To be decided	[g]

Source: GAO analysis of documents provided by Task Force and participating agencies.

[a]SFWMD is expediting the design and construction of this project with its own funds in advance of congressional authorization, which may result in earlier project completion.

[b]A project implementation report was submitted to the Congress in 2005 for this project, but it has not yet received authorization.

[c]SFWMD is expediting a portion of this project with its own funds in advance of congressional authorization. It is constructing a water storage reservoir that it expects to finish by 2008.

[d]This project is currently being reviewed by the Office of Management and Budget before its project implementation report is submitted to the Congress for authorization.

[e]Phase 1 of this project has been completed; phase 2 is on hold pending additional funding.

[f]This date encompasses construction completion and several years of post-construction monitoring.

[g]We did not receive estimated cost information for this project.

Table 9: 72 Restoration Projects Not Yet Implemented, Sponsor, Primary Purpose, Expected Completion Date, and Estimated Cost

Dollars in millions

Project name	Sponsor(s)	Primary purpose	Completion date	Cost
53 CERP projects				
Aquifer Storage and Recovery Regional Study	Corps/SFWMD	Study	2010	$73.4
Big Cypress / L-28 Interceptor Modifications	Corps/SFWMD	Water quality	2022	51.4
Biscayne Bay Coastal Wetlands	Corps/SFWMD	Habitat acquisition and improvement	2011[a]	386.9
Broward County Secondary Canal System	Corps/SFWMD	Water storage and flow	2014	15.5
Broward County Water Preserve Areas	Corps/SFWMD	Water quality	2009[a]	408.3
C-4 Structure	Corps/SFWMD	Water storage and flow	2013	2.8
C-43 Basin Storage Reservoir - Part 1	Corps/SFWMD	Water storage and flow	2011[a]	530.6
C-43 Basin Aquifer Storage and Recovery - Part 2	Corps/SFWMD	Water storage and flow	2019	[b]
C-111 Spreader Canal	Corps/SFWMD	Water quality	2015[a]	117.6
Caloosahatchee Backpumping with Stormwater Treatment	Corps/SFWMD	Water quality	2018	99.7
Caloosahatchee River (C-43) Aquifer Storage and Recovery Pilot	Corps/SFWMD	Water storage and flow (pilot)	2009	7.9
Central Lake Belt Storage	Corps/SFWMD	Water storage and flow	2035	155.4
Change Coastal Wellfield Operations	Corps/SFWMD	Water supply	To be decided	[c]
Comprehensive Integrated Water Quality Feasibility Study	Corps/FDEP	Study	2014	9.3
Environmental Water Supply Deliveries to St. Lucie Estuary	Corps/SFWMD	Habitat acquisition and improvement	To be decided	[c]
Environmental Water Supply Deliveries to the Caloosahatchee Estuary	Corps/SFWMD	Habitat acquisition and improvement	To be decided	[c]
Everglades National Park Seepage Management	Corps/SFWMD	Water storage and flow	2015	390.9
Everglades Rain Driven Operations	Corps/SFWMD	Water storage and flow	To be decided	[c]
Florida Bay and the Florida Keys Feasibility Study	Corps/SFWMD	Study	2012	6.3

Dollars in millions

Project name	Sponsor(s)	Primary purpose	Completion date	Cost
Florida Keys Tidal Restoration	Corps/SFWMD	Water storage and flow	2010	1.5
Flow to Northwest and Central Water Conservation Area 3A	Corps/SFWMD	Water storage and flow	2018	36.3
Flows to Eastern Water Conservation Area	Corps/SFWMD	Water storage and flow	2017	8.0
Henderson Creek / Belle Meade Restoration	Corps/FDEP	Water quality	2011	5.8
Hillsboro Aquifer Storage and Recovery - Phase 2	Corps/SFWMD	Water storage and flow	2020	[b]
L-31N (L-30) Seepage Management Pilot	Corps/SFWMD	Water storage and flow (pilot)	2010	11.3
Lake Belt In-Ground Reservoir Technology Pilot	Corps/SFWMD	Water storage and flow (pilot)	2026	26.5
Lake Okeechobee Aquifer Storage and Recovery	Corps/SFWMD	Water storage and flow	2027	1,223.4
Lake Okeechobee Regulation Schedule	Corps/SFWMD	Water storage and flow	2007	1.1
Lake Okeechobee Watershed	Corps/SFWMD	Water storage and flow	2014	575.5
Lakes Park Restoration	Corps/Lee County	Habitat acquisition and improvement	2009	6.0
Lower East Coast Utility Water Conservation	Corps/SFWMD	Water supply	To be decided	[c]
Loxahatchee National Wildlife Refuge Internal Canal Structures	Corps/SFWMD	Water storage and flow	2015	9.1
Melaleuca Eradication and Other Exotic Plants	Corps/SFWMD	Invasive species control	2025	6.6
Miccosukee Water Management Plan	Corps/Miccosukee	Water quality	2016	29.0
Modify Holey Land Wildlife Management Area Operation Plan	Corps/SFWMD	Water storage and flow	2011	[c]
Modify Rotenberger Wildlife Management Area Operation Plan	Corps/SFWMD	Water storage and flow	2009	[c]
North Lake Belt Storage Area	Corps/SFWMD	Water storage and flow	2035	308.2
North Palm Beach County - Part 2	Corps/SFWMD	Water storage and flow	2019	203.9
Operational Modification to Southern Portion of L-31N and C-111	Corps/SFWMD	Water storage and flow	To be decided	[c]
Palm Beach County Agriculture Reserve Reservoir - Part 1	Corps/SFWMD	Water storage and flow	2016	154.4
Palm Beach County Agriculture Reserve Aquifer Storage and Recovery - Part 2	Corps/SFWMD	Water storage and flow	2018	[b]
Restoration of Pineland and Hardwood Hammocks in C-111 Basin	Corps/Miami-Dade County	Habitat acquisition and improvement	2021	0.7
Seminole Tribe Big Cypress Reservation Water Conservation Plan	Corps/Seminole	Water quality	2021	89.5
Site 1 Impoundment	Corps/SFWMD	Water storage and flow	2009[a,d]	153.7

Dollars in millions

Project name	Sponsor(s)	Primary purpose	Completion date	Cost
South Miami-Dade Reuse	Corps/Miami-Dade County	Water supply	2022	430.6
Southwest Florida Feasibility Study	Corps/SFWMD	Study	2009	12.0
Strazzulla Wetlands	Corps/SFWMD	Habitat acquisition and improvement	2010	70.4
Wastewater Reuse Technology Pilot	Corps/SFWMD	Water supply (pilot)	2021	35.4
Water Conservation Area 2B Flows to Everglades National Park	Corps/SFWMD	Water storage and flow	2021	539.4
Water Conservation Area 3 Decompartmentalization and Sheetflow Enhancement (Decomp)	Corps/SFWMD	Water storage and flow	2020	253.4
Water Preserve Area Conveyance	Corps/SFWMD	Water storage and flow	2016	331.7
West Miami-Dade Reuse	Corps/Miami-Dade County	Water supply	2022	518.1
Winsberg Farm Wetlands Restoration	Corps/Palm Beach County	Habitat acquisition and improvement	2008	17.1
3 CERP-related projects				
East Water Conservation Area 3A Hydropattern Restoration	SFWMD	Water storage and flow	2012	5.3
Water Conservation Area 2A Hydropattern Restoration	SFWMD	Water storage and flow	2012	4.9
West Water Conservation Area 3A Hydropattern Restoration	SFWMD	Water storage and flow	2012	7.4
16 Non-CERP projects				
Babcock Ranch	FDEP	Habitat acquisition and improvement	To be decided	[c]
Big Cypress National Preserve Mineral Rights	NPS	Habitat acquisition and improvement	To be decided	[c]
Complete an Invasive Exotics Plant Prevention, Early Detection, and Eradication Plan by 2005	NEWTT/FDEP/NPS	Invasive species control	To be decided	5.2
Devil's Garden	FDEP	Habitat acquisition and improvement	To be decided	[c]
Half Circle L Ranch	SFWMD	Habitat acquisition and improvement	To be decided	[c]
Hen Scratch Ranch	SFWMD	Habitat acquisition and improvement	To be decided	[c]
Kissimmee-St. Johns Connector	FDEP	Habitat acquisition and improvement	To be decided	[c]
Lake Hatchineha Watershed / Parker-Poinciana	SFWMD	Habitat acquisition and improvement	To be decided	[c]
Lake Okeechobee Fast-Track Projects	SFWMD	Water quality	2009	200.0

Dollars in millions

Project name	Sponsor(s)	Primary purpose	Completion date	Cost
Miccosukee Water Resources Management	Miccosukee	Water quality	To be decided	26.0
North Savannas	SFWMD	Habitat acquisition and improvement	To be decided	[c]
Pine Island Slough Ecosystem	FDEP	Habitat acquisition and improvement	To be decided	[c]
Seminole Tribe Comprehensive Surface Water Management System for the Brighton Reservation	Seminole	Water storage and flow	2010	16.3
Soil Survey Update for the Everglades Agricultural Area	USDA (NRCS)	Other	2012	1.5
Soil Survey Update for the Everglades National Park, Big Cypress National Preserve, and Water Conservation Areas	USDA (NRCS)	Other	2013	5.8
Water Conservation Area 2A Regulation Schedule Review	Corps	Study	To be decided	[c]

Source: GAO analysis of documents provided by Task Force and participating agencies.

[a]SFWMD is expediting the design and construction of this project with its own funds in advance of congressional authorization, which may result in earlier project completion.

[b]The estimated cost of this aquifer storage and recovery (ASR) project is included in the cost estimate for the project's initial part or phase. Specifically, the estimated cost of the C-43 Basin ASR is included in the cost estimate for the C-43 Basin Storage Reservoir; the estimated cost of the Hillsboro ASR is included in the cost estimate for the Site 1 Impoundment; and the estimated cost of the Palm Beach County Agriculture Reserve ASR is included in the cost estimate for the Palm Beach County Agriculture Reserve Reservoir.

[c]We did not receive estimated cost information for this project.

[d]This project is currently being reviewed by the Assistant Secretary of the Army before its project implementation report is submitted to the Congress for authorization.

Appendix III: Funding Allocations by Federal and State Agencies for the South Florida Ecosystem Restoration Initiative, FY 1999-2006

Dollars in millions

	Fiscal years								
Agency	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**Total**
Federal agencies									
Department of Agriculture[a]									
Agricultural Research Service	$4.8	$4.8	$4.8	$5.4	$5.7	$5.7	$6.3	$4.9	**$42.4**
Natural Resources Conservation Service	6.0	7.5	6.0	42.1	23.3	25.0	64.4	61.5	**235.9**
Department of Commerce[b]									
National Oceanic and Atmospheric Administration	19.3	21.4	4.8	4.5	4.4	4.6	4.5	3.0	**66.7**
Department of Defense[a,d]									
U.S. Army Corps of Engineers	42.7	116.6	137.2	157.1	145.4	146.0	122.6	137.0	**1,004.6**
Department of the Interior[a,e]									
National Park Service	150.8	140.1	64.0	97.7	73.1	47.0	46.5	44.7	**663.8**
U.S. Fish and Wildlife Service	9.5	15.4	21.1	21.0	18.1	17.3	12.4	10.7	**125.6**
Bureau of Indian Affairs	0.5	0.5	0.4	0.4	0.4	0.6	0.6	0.4	**3.8**
U.S. Geological Survey	10.2	9.9	9.7	9.5	13.2	8.3	8.0	7.8	**76.7**
Environmental Protection Agency[a]	7.3	5.5	5.2	5.2	3.7	3.3	3.0	3.4	**36.6**
Total federal	**$251.2**	**$321.7**	**$253.2**	**$343.0**	**$287.4**	**$258.0**	**$268.2**	**$273.4**	**$2,256.1**
Florida agencies									
Florida Department of Agriculture and Consumer Services[b]	$6.1	$7.2	$28.0	$8.5	$16.9	$17.2	$8.8	$5.1	**$97.9**
Florida Department of Community Affairs[b]	44.1	31.6	36.1	10.9	10.9	48.6	39.0	37.0	**258.3**
Florida Department of Environmental Protection[c]	81.3	179.6	255.2	181.7	283.4	210.1	238.1	305.1	**1,734.5**
Florida Department of Transportation[b]	51.7	4.0	18.3	5.5	11.5	2.1	8.1	5.4	**106.5**
Florida Fish and Wildlife Conservation Commission[b]	11.2	11.4	19.9	22.4	23.7	27.7	28.6	27.9	**173.0**
South Florida Water Management District[a,f]	208.1	126.8	120.2	362.7	306.8	352.0	409.3	563.1	**2,449.0**
Total state	**$402.5**	**$360.6**	**$477.7**	**$591.7**	**$653.2**	**$657.7**	**$732.1**	**$943.6**	**$4,819.0**
Total restoration	**$653.7**	**$682.3**	**$730.9**	**$934.7**	**$940.6**	**$915.7**	**$1,000.2**	**$1,217.0**	**$7,075.1**

Source: Federal and state agencies restoration funding data.

[a]Funding data provided in response to a GAO funding data request.

[b]Funding data used were as reported in the Task Force's annual cross-cut budgets.

[c]Funding data used as reported in the Task Force's annual cross-cut budgets, except for data on certain land acquisitions, which were provided in response to a GAO funding data request.

[d]The funding data provided by the Corps differed from that reported in the cross-cut budgets because the amounts in the cross-cut budgets represent the amounts in the President's budget and the amounts provided to GAO represent the amounts contained in the conference report according to the Corps.

[e]The funding data provided by Interior differed from that reported in the cross-cut budgets because of the timing differences in agency budget execution and cross-cut budget data submission timeframes; moving funding among departmental budget lines; and/or the application of across-the-board reductions, supplementals, and rescissions, according to an Interior official.

[f]The funding data provided by the South Florida Water Management District differed from that reported in the cross-cut budgets because of variations in the financial systems used to derive the funding information according to a SFWMD official.

Appendix IV: Summary of the Primary Models

	Model name	Entity responsible for development	Model study area	Model type	Does the model have an interface?	Model description
1	ATLSS—Across Trophic Level System Simulation	DOI and University of Tennessee	Regional, project	Ecological	Yes	A suite of individual ecological models that compare the impact of changes in hydrology on the biotic components of the ecosystem, from zooplankton, to different species of fish, to the Florida panther.
2	CH3D—Curvilinear-grid Hydrodynamic Three Dimensional Model	Corps, Iowa Institute of Hydraulic Research, and Y. Peter Sheng of Titon Corporation	Sub-regional	Hydrological (hydrodynamic)[a]	No	A three-dimensional model that simulates the major physical processes affecting circulation and mixing of a large water body, taking into account the hydrology, salinity, and temperature.
3	DMSTA—Dynamic Model for Stormwater Treatment Areas	W. Walker and R. Kadlec for DOI and Corps	Project	Water quality, hydrological	No	Used in evaluating hydrological and water quality impacts of stormwater treatment areas in South Florida.
4	ECO Lab	Danish Hydraulic Institute	Regional, project	Ecological	Yes	Simulates chemical, biological, ecological, and physical interactions that occur as a result of a number of variables that influence hydrodynamic processes. Also simulates water quality.
5	EFDC—Environmental Fluids Dynamics Code	John Hamrick of Tetra Tech, Inc.	Project	Hydrological (hydrodynamic),[a] water quality	Yes	A hydrodynamic model that simulates aquatic systems in one, two, and three dimensions, and rainy and arid cycles, taking into account the salinity, temperature, and contaminants.
6	ELM—Everglades Landscape Model	SFWMD	Regional, project	Ecological	Yes	Predicts the landscape response to different water management scenarios in South Florida. In simulating changes to habitat, the model dynamically integrates hydrology, water quality, soils, algae, and vegetation in the Everglades region.

	Model name	Entity responsible for development	Model study area	Model type	Does the model have an interface?	Model description
7	E-MCM—Everglades Mercury Cycling Model	EPA, SFWMD, and FDEP	Project	Water quality	Yes	Predicts the movement and deposit of the major forms of mercury in marsh areas and considers physical, biological, and chemical factors affecting fish mercury concentration.
8	HEC-RAS—Hydrologic Engineering Center's River Analysis System	Corps	Regional, project	Hydrological	Yes	Simulates steady and unsteady water flows and stages, and the movement of sediment. Also used to simulate canal network for flood analysis.
9	LOEM—Lake Okeechobee Environmental Model	SFWMD	Sub-regional	Hydrological, water quality	No	Simulates how water transports sediment in Lake Okeechobee. Also provides long term information on water circulation patterns, and the location of sediment under different hydrological and management scenarios.
10	LOWQM—Lake Okeechobee Water Quality Model	EPA	Regional, sub-regional, project	Water quality	Yes	Simulates impacts of sediment management on water quality, specifically phosphorus levels, in Lake Okeechobee.
11	Mike 11	Danish Hydraulic Institute	Regional, project	Hydrological, water quality	Yes	Simulates water flow, level, and quality, and sediment transport in rivers, irrigation canals, reservoirs, and other inland water bodies.
12	Mike She	Danish Hydraulic Institute	Regional, project	Hydrological	Yes	An integrated hydrological model that covers the entire land phase of the hydrological cycle. Also simulates groundwater flow, the movement of substances found in water, and agricultural practices.
13	MODHMS	HydroGeologics, Inc.	Regional, project	Hydrological, water quality	Yes	Simulates interactions between overland flow, channel flow, and groundwater under different water supply management scenarios. Also simulates flood control, river flow, and wetland restoration.

	Model name	Entity responsible for development	Model study area	Model type	Does the model have an interface?	Model description
14	MODBRANCH—MODFLOW/BRANCH Coupled Flow Model	DOI	Regional, project	Hydrological	Yes	Simulates hydrology, including groundwater and canal flow, in three dimensions under different water management scenarios.
15	MODFLOW—Modular Three-Dimensional Groundwater Flow Model	DOI	Regional, project	Hydrological	Yes	The recognized standard model for simulating the movement of groundwater under a variety of hydrological conditions.
16	RAS-MODFLOW—HEC-RAS/MODFLOW Coupled Model	Corps and DOI	Regional, project	Hydrological	Yes	Simulates projects where there are large stormwater-groundwater exchanges and where groundwater pumping affects the water flow in streams. Models the effects of floodplain water lost to groundwater on downstream water flows and stream flow on adjacent wetlands.
17	RMA 2—Resource Management Associates 2	Norton, King and Orlob of Water Resources Engineers for the Corps	Project	Hydrological	Yes	Calculates water levels and distribution of water flow for islands, bridges, hydropower plants, river junctions, and pumping plant channels. Also simulates the circulation and transport in bodies of water with wetlands, and general water levels and flow patterns in rivers, reservoirs, and estuaries.
18	RMA 4—Resource Management Associates 4	Corps and Research Management Associates	Project	Water quality	Yes	Simulates water levels, flow distribution, circulation, flow patterns, and water quality in rivers, reservoirs, and estuaries. Used to study the hydrodynamics and salinity-flow relationships in the St. Lucie estuary and the southern reach of Indian River Lagoon, as well as to assess the circulation patterns in a water conservation area.

	Model name	Entity responsible for development	Model study area	Model type	Does the model have an interface?	Model description
19	SFWMM—South Florida Water Management Model	SFWMD	Regional	Hydrological	Yes	Simulates the major components of the hydrological cycle in South Florida, including rainfall, overland and groundwater flow and pumping, and the management of the water resources system for a 7,600 square mile area, from Lake Okeechobee to Florida Bay.
20	SICS—Southern Inland and Coastal Systems Model	DOI	Sub-regional, project	Hydrological	Yes	Simulates flows, stages, and salinities in the southern Everglades and Florida Bay. Can be linked to the South Florida Water Management Model and be used to quantify the effects of restoration alternatives on flows, stages, and salinities in the SICS area.
21	SWMM—Storm Water Management Model	SFWMD	Regional, project	Water quality	No	Evaluates changes in water restrictions and hydrological performance of new storage areas in the Lower East Coast and Lake Okeechobee Service Areas under different management scenarios.
22	TABS-MDS (RMA 10)	Corps	Project	Hydrological	Yes	Simulates water movement, salinity, and sediment transport in three dimensions.
23	TIME—Tides and Inflows in the Mangroves of the Everglades	DOI	Regional, sub-regional, project	Hydrological	Yes	Examines the interaction between wetland sheet flows and the dynamic forces in the zone between the southern Everglades and the coast. Will be used to evaluate the combined response of cyclical water periods in wetlands and salinities in the mangrove zone to changes in water flows.

	Model name	Entity responsible for development	Model study area	Model type	Does the model have an interface?	Model description
24	WAMView—Watershed Assessment Model	Soil and Water Engineering Technology, Inc. and Mock, Roos and Associates	Regional, project	Water quality, hydrological	No	Assesses the water quality of both surface water and groundwater based on land use, soils, climate, and other factors and simulates the primary physical processes important for watershed hydrological and pollutant transport.
25	WASH123D—WAterSHed Systems of 1-D Stream-River Network, 2-D Overland Regime, and 3-D Subsurface Media	Dr. George Yeh, University of Central Florida	Regional, project	Hydrological, water quality	No	Simulates flow movement from one CERP project component to another and can be adapted to simulate on both a sub-regional and project-specific level.
26	WASH—WAterSHed Water Quality Model	URS Greiner, Inc., with some funding by SFWMD	Regional, project	Hydrological, water quality	Yes	Simulates hydrology in watersheds with high groundwater tables and dense drainage canal networks.
27	WASP—Water Quality Analysis Simulation Program	EPA	Project	Water quality	Yes	Used to interpret and predict water quality responses to natural phenomena and manmade pollution for various pollution management decisions. Can dynamically simulate different aquatic systems.

Source: GAO's analysis of agency documents, model Web sites, and agency interviews.

[a]Hydrodynamic models include the mathematical study of the forces, energy, and pressure of liquids in motion, and represent the various flow and transport processes in rivers, lakes, and oceans.

Appendix V: Comments from the Department of Defense

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
CIVIL WORKS
108 ARMY PENTAGON
WASHINGTON DC 20310-0108

MAY 1 0 2007

Ms. Anu Mittal
Director
Natural Resource and Environment
U.S Government Accountability Office
441 G Street, N.W.
Washington D.C. 20548-1000

Dear Ms. Mittal:

This is the Department of Defense (DoD) response to the proposed GAO Report, GAO-07-520 (GAO Code 360662), "South Florida Ecosystem: Restoration is Moving Forward, But it **(Is)** Facing Significant Delays, Implementation Challenges, and Rising Costs", dated April 20, 2007.

We generally concur with the recommendation that the Corps obtain the key data necessary for making sequencing decisions and to continually re-evaluate the implementation sequence. We also concur that the Secretary of the Army make it a high priority to reach agreement with the Governor of Florida on the interim goals for the CERP project effort, so that this information can be used to guide the sequencing of decisions as was required by Congress. (p. 42/GAO Draft Report). In that regard, on April 27, 2007, the Interim Goals Agreement were signed by representatives from the Departments of the Army and Interior, and the State of Florida.

We do not concur with the recommendation that as chair of the Task Force, the Secretary of the Interior take the lead on helping participating agencies better coordinate their efforts to develop models and their interface. The Interagency Modeling Center (IMC) is the modeling services single point of responsibility for CERP being co-lead by the SFWMD and Corps. The Center provides, coordinates and oversees the modeling needs and efforts of each Project Development Team (PDT) and RECOVER as well as coordinating their efforts in the development of various models and their interface. The IMC has the primary organizational and production responsibilities for regional and sub-regional CERP modeling and will be a clearinghouse for, oversee, and coordinate all other project-specific CERP modeling.

Detailed responses to the GAO recommendations are enclosed. Please do not hesitate to contact me if you have any questions.

Very truly yours,

John Paul Woodley, Jr.

John Paul Woodley, Jr.
Assistant Secretary of the Army
(Civil Works)

Enclosures

GAO DRAFT REPORT DATED APRIL 20, 2007
GAO-07-520 (GAO CODES 360662)

"SOUTH FLORIDA ECOSYSTEM: RESTORATION IS MOVING FORWARD, BUT IS FACING SIGNIFICANT DELAYS, IMPLEMENTATION CHALLENGES, AND RISING COSTS"

DEPARTMENT OF DEFENSE COMMENTS
TO THE GAO RECOMMENDATION

RECOMMENDATION 1: The GAO recommended that the Secretary of the Army direct the Corps of Engineers (Corps) to obtain the key data that are needed to ensure that all required sequencing factors are appropriately considered when deciding which projects to implement. Once this information is available, the Corps should comprehensively reassess its sequencing decisions to ensure that Comprehensive Everglades Restoration Plan (CERP) projects have been appropriately sequenced to maximize the achievement of restoration goals. (p. 42/GAO Draft Report)

DOD RESPONSE: Concur. The Master Implementation Sequencing Plan (MISP) Version 1.0 was completed in July 2001 based on the best available information and resulted in a first-cut framework for restoration of the south Florida ecosystem. The MISP sequenced and scheduled projects to maximize efforts for achieving the goals and objectives of CERP. The MISP was developed in phases, with Phase 1 consisting of a qualitative review, including reviewing task durations, component packaging, project interdependencies, cash flow and the potential impacts of the savings clause and elimination or transfer requirements of the Programmatic Regulations. It was envisioned that Phase 2 of the MISP development would include model simulations at five-year increments and an analysis of the performance of the system during each increment. Phase 2 development was constrained to include presenting the out put of Phase 1 into Bands. This information was presented to the public and stakeholders for review and comment. In addition, factors that could affect scheduling such as the State's Acceler8 Initiative and also streamlining of the implementation process were taken into consideration. Originally Phase 2 was envisioned to include model runs that would assist in the optimization of sequencing of the projects. However, during the time that Phase 2 was underway, these model runs were not available. The MISP Team recognized that this first run would be improved by later runs as additional information became available.

Since 2001, additional data has become available that could be used for a new MISP run. Although an MISP 2.0 has not yet been developed, efforts are underway to develop an integrated schedule showing the relationship of projects, construction completion dates, and key linkages between projects. This new

integrated schedule includes all of the Everglades restoration efforts underway by the Corps and State. It updates and reassesses the original sequencing of projects from the MISP 1.0, and makes necessary adjustments. As part of this effort it will be necessary to model the integrated schedule to determine when we can expect benefits from each project and determine if there are projects that should be shifted within the bands to achieve certain benefits sooner or if there are projects that should be shifted further out in implementation due to their relationship with other projects. This approach will greatly enhance our ability to achieve restoration goals by the earliest date. This implementation schedule is undergoing review by ASA(CW), USACE HQ, USACE SAD, DOI, EPA, FL DEP and SFWMD. Likewise, modeling of the integrated schedule will be accomplished through the interagency modeling center and will be reviewed by the agencies listed above.

RECOMMENDATION 2: The GAO recommended that the Secretary of the Army make it a high priority to reach agreement with the Governor of Florida on the interim goals for the CERP project effort, so that this information can be used to guide the sequencing of decisions as was required by Congress. (p. 42/GAO Draft Report)

DOD RESPONSE: Concur. On 27 April 2007 the Interim Goals and Interim Targets Agreement was signed by the Secretary of the Army and the Secretary for the Department of Environmental Protection.

In addition to the Interim Goals agreement, the Interim targets agreement between the Department of the Army and the State of Florida was also signed on April 27, 2007. This agreement provides a means for evaluating progress toward meeting other water related needs of the region provided by the Plan. Interim targets will be used to analyze progress at specific intervals of time by agency managers, the State, and Congress throughout the overall planning and implementation process for the Plan. The interim targets will also facilitate adaptive management of the Plan to allow the Corps of Engineers and its non-Federal sponsors opportunities to make adjustments to projects in the Plan, including recommending changes to the Plan, if actual project performance toward meeting other water related needs of region provided by the Plan is less than anticipated.

RECOMMENDATION 3: Given the importance of modeling and interfaces to managing the restoration effort, GAO does recommend that, as chair of the Task Force, the Secretary of the Interior take the lead on helping participating agencies better coordinate their efforts to develop models and their interface.

DOD RESPONSE: Non-concur. The Interagency Modeling Center (IMC) is the modeling services single point of responsibility for CERP being co-lead by the SFWMD and Corps. The Center provides, coordinates and oversees the modeling needs and efforts of each Project Development Team (PDT) and

RECOVER as well as coordinating their efforts in the development of various models and their interface. The IMC has the primary organizational and production responsibilities for regional and sub-regional CERP modeling and will be a clearinghouse for, oversee, and coordinate all other project-specific CERP modeling.

The IMC is an equal partnership between the USACE Jacksonville District and the South Florida Water Management District. These two agencies are the sponsoring agencies of the IMC. Participation by other federal and state agencies is welcomed and encouraged. The IMC is responsible to its Board of Directors (IMC Board) and receives resources, management, and technical oversight from the Corps Hydrology and Hydraulics Branch and the SFWMD's Office of Modeling. The IMC is located in West Palm Beach, Florida.

The team in West Palm Beach is made up of both Corps (One Team Leader/Manager and 12 modelers and 6 support staff) and SFWMD (One Team Leader/Manager and 12 modelers and 6 support staff) staff. Other Agencies are expected to co-locate up to 10 staff members (collectively) at the IMC.

The IMC has established a peer review and other technical review processes to meet the review requirements of and maintain a high quality CERP modeling program. This will include the assistance of funded visiting academicians' positions with awardees selected from a competitive process. Academicians serving at the IMC through a competitive award will assist directly in providing reviews and will also provide opportunities for informal educational enhancement and renewal of the IMC staff and its tools and methods. This process maintains an unbiased look at the modeling needs for CERP and also the evaluation of potential models to be used in project evaluations.

In addition, to meet the CERP responsibilities and insure the quality of the entire model development and application process, the IMC will implement some standard procedures for working with the PDTs and RECOVER. The IMC has identified among all the models that might be used, which are the most appropriate to address each of these separate groups of model applications. The IMC has established a model toolbox, borrowing from its sponsoring agencies, and adding additional models as necessary to meet the specific requirements of CERP. The IMC has also established and documented procedures for evaluation and for peer review of any model proposed for use on CERP projects.

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Appendix VI: Comments from the Department of the Interior

THE ASSOCIATE DEPUTY SECRETARY OF THE INTERIOR
WASHINGTON

MAY 21 2007

Anu K. Mittal
Director, Natural Resources and Environment
United States Government Accountability Office
Washington, D.C.

Dear Ms. Mittal:

The Department of the Interior appreciates the opportunity to provide comments on the Government Accountability Office's review and recommendations for the intergovernmental South Florida Ecosystem Restoration Program. As land manager for half of the remaining natural Everglades, including 4 national parks and 16 national wildlife refuges, restoring the Everglades and the South Florida Ecosystem remains a high priority for the Department. As the GAO report noted, the restoration is "vast and complex." We therefore appreciate your recommendations, as well as the recommendations that we receive from others, including the National Academy of Sciences, on how we can improve our work to ensure that restoration goals are achieved.

We are pleased that your report recognizes the significant Federal and State financial contributions that support programs to restore the Everglades. Since this initiative began in 1993, the Department has provided over $1.2 billion for Everglades restoration activities, including funding to assist in the acquisition of over 100,000 acres of lands for water storage, water quality improvement, and restored habitat. Additionally, we increased efforts to remove invasive exotics, recover species, and invest in scientific research supporting our land management responsibilities. We are pleased that your report recognizes that some restoration projects are complete and others are moving from concepts and plans to on-the-ground accomplishments. This is particularly noteworthy with respect to the State of Florida's *Acceler8* initiative, which will complete key components of several important restoration projects within the next five years.

As the report notes, since the enactment of the Comprehensive Everglades Restoration Plan in December 2000, we have worked diligently with the Army Corps of Engineers, the State of Florida, and our partners to establish the legal assurances for CERP, including a binding and enforceable agreement between the President and the Governor of Florida, as well as programmatic regulations, to ensure that restoration goals will be achieved. Although we have made significant progress in the last decade in both developing and implementing plans for restoration, we realize, as the GAO noted, that work remains and that the restoration effort will continue for several decades. This has always been anticipated and acknowledged. Although we may be behind the original schedule that was submitted to the Congress in the summer of 1999, we are pleased with

the collaboration and partnership that has developed and the strong foundation we have laid for future restoration efforts.

With respect to your recommendations, we will address the two recommendations that directly impact the Department and the South Florida Ecosystem Restoration Task Force, which is chaired by the Department and provides for coordination among the Federal, State, tribal, and local units of government that carry out the restoration effort.

First, with respect to your recommendation that the interim goals agreement be completed, we are pleased to report that the interim goals agreement was signed in April and May 2007 by representatives of the Secretary of the Interior, the Secretary of the Army, and the Governor of Florida. (A copy of the agreement is enclosed). Although completion of the agreement took longer than anticipated, we are pleased that the agreement embraces all of the technical recommendations of the Restoration, Coordination and Verification technical team to establish interim goals and indicators for areas affected by the implementation of CERP. Because RECOVER was unable to provide quantifiable indicators for all of the interim goals, the agreement directs RECOVER to continue to refine its recommendations into measurable and quantifiable indicators that will be used to measure the restoration success of CERP at specific intervals.

Second, the report recommends that the Secretary of the Interior, as Chair of the Task Force, "take the lead on helping participating agencies better coordinate their efforts to develop models and their interface." We agree that models are an important predictive tool to assist in the evaluation of how projects will affect various attributes of the South Florida landscape (groundwater and surface water flow, salinity, endangered species, etc.) so that agencies can develop projects with restoration objectives to replicate as much as possible the predrainage conditions that characterized the South Florida ecosystem. We also agree that coordination in the modeling area will be beneficial, and it is for these reasons that we supported the establishment several years ago of the Interagency Modeling Center, which is comprised of technical representatives of key agencies.

However, we note that models are only one predictive tool to develop restoration project plans. A 2006 report from the National Academy of Sciences, while noting that much of the science, including modeling, that has been done to date is valuable, urges the agencies to avoid delaying action until all scientific uncertainty is removed and implement instead an "incremental adaptive restoration" strategy that is based upon monitoring and assessing the performance of restoration projects that are in place and as they are being implemented. Utilizing physical evidence observed from monitoring the performance of current restoration projects, in lieu of modeling, is another important tool to assist agencies in carrying out projects to achieve restoration goals.

As Chair of the Task Force, we will encourage the agencies to improve technical coordination among the models being used so that appropriate investments may be made in the models being used to allow them to work together productively. Because this matter is highly technical, we believe that it may be beneficial for the Task Force's

Science Coordination Group and the Interagency Modeling Center to assist in this effort, and we will make that recommendation to the Task Force.

Once again, we appreciate the GAO review of the Everglades restoration program and the opportunity to provide comments. We look forward to receiving a copy of the final report.

Sincerely,

James E Cason

James E. Cason

Enclosure

Appendix VII: Comments from the State of Florida

Florida Department of Environmental Protection
Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

South Florida Water Management District
3301 Gun Club Road
West Palm Beach, Florida 33406

May 14, 2007

Ms. Anu Mittal, Director
Natural Resources and Environment
U.S. Government Accountability Office
441 G Street, NW, Room 2T23A
Washington, D.C. 20548

Dear Ms. Mittal:

Thank you for the opportunity to review and comment on the Government Accountability Office's (GAO) draft report to the House of Representatives' Committee on Transportation and Infrastructure regarding the restoration of the South Florida ecosystem.

The State of Florida commends the GAO for its considerable undertaking to analyze a full spectrum of restoration activities, compile varied and intricate information and offer recommendations for improvement. While the State agrees with the major areas studied, the report fails to adequately acknowledge and address the pressing need for the federal authorizations and appropriations required to fulfill the 50-50 State-federal partnership to restore the Everglades.

As the GAO noted, restoring the 18,000-square mile South Florida ecosystem encompasses hundreds of projects and is an enormous and complex responsibility whose very success relies on the coordination and cooperation of government at every level.

Restoring the South Florida ecosystem is this State's highest environmental priority. As the report identifies, Florida has invested more than $4.8 billion since 1999 toward restoration and has demonstrated a continued commitment to move aggressively forward with land acquisition, project construction and water quality improvement.

Since 1999, Florida has:

- Invested more than $2 billion to improve the quality, timing and distribution of water in this unique ecosystem;
- Acquired 97 percent of the real estate needed to complete the first ten restoration projects authorized by the Congress in the 2000 Water Resources Development Act;

- Completed acquiring all of the land needed to fully restore the Kissimmee River – a foundation project to restore the upper limits of the ecosystem;
- Under its own initiative, assumed the burden of funding and constructing eight restoration projects identified by the Congress as priorities;
- Used Certificates of Participation -- a funding technique never before utilized for environmental restoration -- to generate a half billion dollars to begin building the fast-tracked *Acceler8* projects;
- Added 5,120 acres of treatment area to the State's 36,000-acre system of constructed wetlands to enhance treatment capacity by more than 40 percent;
- Started constructing three massive above-ground reservoirs, including one of the world's most expansive;
- Launched restoration of Picayune Strand, a project wholly devoted to the restoration of the natural system;
- Started building the Acme Basin B Discharge Project to add a new source of clean, fresh water to directly benefit the Arthur R. Marshall Loxahatchee National Wildlife Refuge; and
- Most recently, expanded Florida's Lake Okeechobee Protection Act to focus restoration efforts in the northern extent of the ecosystem and improve the environmental health of Lake Okeechobee and the coastal estuaries, and extended the Save Our Everglades Trust Fund through 2020 to dedicate another $2.3 billion in State funding toward restoration of the South Florida ecosystem.

While these achievements are indeed laudable, the GAO's attention to specific areas of the restoration effort – project status, sequencing, cost and modeling -- highlight the complicated challenges facing scientists, resource managers and agency leadership. The State's complete technical review is enclosed and the following briefly summarizes Florida's comments on the report's recommendations:

Determining Project Sequencing
The report concludes that the process used by agencies to determine project sequencing has been based more on funding availability, technical dependencies and constraints among projects rather than the full range of criteria developed by the Army Corps of Engineers as directed by Congress in 2000.

Contrary to the report, the sequencing of Comprehensive Everglades Restoration Plan projects is driven less by funding and more appropriately by the March 2005 Master Implementation Sequencing Plan. The plan was developed in partnership according to the 2000 Water Resources Development Act, the Programmatic Regulations, environmental benefits as well as technical and resource constraints, as outlined and required in the Central and Southern Florida Project and Comprehensive Everglades Restoration Plan.

Any deviations from the Master Implementation Sequencing Plan are due largely to the lengthy federal planning and approval process, uncertainty with the timing of future Congressional authorization, delays in federal funding and a desire to begin achieving environmental results sooner. The current Master Implementation Sequencing Plan was also driven by a delay in completing the federal Modified Water Deliveries project, a foundation project that was authorized 18 years ago and is essential to the successful restoration of the Everglades. Because of delays in funding, estimated costs have now quadrupled and this core project to restore the natural sheetflow of water to Everglades National Park is nearly two decades behind schedule.

The GAO's recommendation that the Secretary of the Army direct the Corps of Engineers to obtain more data for project sequencing determinations may simply serve to delay restoration and increase costs. While the State acknowledges that uncertainties remain and additional information is needed to help determine project sequencing and benefits, we also recognize the importance of advancing restoration. Florida fully supports science-based restoration using the best available data, consistent with the approach recently recommended by the National Research Council's: *Progress Toward Restoring the Everglades: The First Biennial Review, 2006*. The Council recommends Incremental Adaptive Restoration, which supports applied restoration to provide immediate environmental benefits at today's costs, while at the same time addressing critical scientific uncertainties and promoting learning to guide future project design. This approach has already proved effective during the early start on the restoration of Picayune Strand, a project that is already witnessing the return of habitat and wildlife including the Florida panther.

Beyond the Comprehensive Everglades Restoration Plan, it is also important to note that the timing and sequencing of land acquisition for conservation and project construction by the Florida Department of Environmental Protection is determined by land availability, resource quality and connectivity as well as available funding.

Executing the Interim Goals Agreement
The GAO report identifies reaching agreement on the Interim Goals for the Comprehensive Everglades Restoration Plan, as required by the Programmatic Regulations, as a priority for guiding project sequencing.

The good news is that the Interim Goals Agreement to evaluate success of ecosystem restoration and ensure protection of the natural system was finalized and signed by the State of Florida, U.S. Army Corps of Engineers and U.S. Department of Interior on April 27, 2007. The agreement was the result of years of assessment, deliberation and consultation with a wide range of interests. As predictive capabilities improve and ecosystem relationships are better understood, these interim goals will be fine-tuned to more accurately reflect restoration expectations.

Ms. Anu Mittal
May 14, 2007
Page 4 of 4

Restoration Guided by Modeling
The GAO report states that the limited number of interfaces between and among the mathematical models impedes the participating agencies from obtaining the comprehensive information needed to implement projects. The agencies realized early the value of coordinated and integrated modeling in the implementation and success of the Comprehensive Everglades Restoration Plan. So far, while considering interfaces, the partner agencies have focused on developing the appropriate application tools to adequately and effectively guide Everglades restoration.

Development of interfaces is an important objective that is being addressed through the Interagency Modeling Center, which co-locates technical modeling resources from each agency. With the participation of the U.S. Department of Interior and the Interagency Modeling Center functioning as a true multi-agency institution, the need for the Secretary of Interior to coordinate modeling efforts may not be warranted. While the State supports the GAO's recommendation that the South Florida Ecosystem Restoration Task Force provide direction, we believe it important that the Board of the Interagency Modeling Center continue to provide policy guidance on modeling and interfacing consistent with the Task Force's objectives.

Thank you, again, for the opportunity to comment on the GAO's report. Florida is serious about its commitment to improving the ecological health of the South Florida ecosystem. There remains, however, the need for focused federal involvement beyond process and procedure. Until projects are authorized and appropriated through the Congress, the full potential of the restoration program and the environmental benefits derived will remain limited. We believe, however, that with the federal government's full and equal partnership we can indeed succeed in fulfilling the promise of the largest environmental restoration in the nation's history.

Sincerely,

Michael W. Sole
Secretary
Department of Environmental Protection

Carol Ann Wehle
Executive Director
South Florida Water Management District

MWS/jo
Enclosure

Appendix VIII: GAO Contact and Staff Acknowledgments

GAO Contact

Anu K. Mittal (202) 512-3841 or mittala@gao.gov

Staff Acknowledgments

In addition to the individual named above, Sherry McDonald, Assistant Director; David Brown; Maureen Driscoll; Les Mahagan; Leigh Ann Nally; and Carol Herrnstadt Shulman made key contributions to this report. Also contributing to this report were Kevin Bray, Katherine Raheb, and Greg Wilmoth.

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