Everglades Restoration: Federal Funding and Implementation Progress

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Summary

The Everglades is a unique network of subtropical wetlands in South Florida that is approximately half of its historical size, due in part to degradation from federal water projects built by the U.S. Army Corps of Engineers (the Corps). In 2000, Congress authorized a plan, termed the Comprehensive Everglades Restoration Plan (CERP), as a comprehensive framework for the restoration of the Everglades ecosystem in southern Florida. When originally authorized, it was estimated that CERP would cost a total of $8.2 billion and take approximately 30 years to complete. More recent estimates indicate that the plan will cost $16.4 billion and will take approximately 50 years to implement. At issue for Congress is oversight and implementation of this commitment.

Under CERP, the federal government (through the Corps and various bureaus within the Department of the Interior) is required to fund half of the costs for restoration, with an array of state, tribal, and local agencies paying the other half. In addition to activities under CERP, a number of ongoing federal and state efforts that predate CERP (known collectively as "non-CERP" or "Foundation" activities) also factor into Everglades restoration. Although non-CERP efforts technically are not part of CERP, the two sets of activities are widely viewed as complementary.

Since passage of CERP in 2000, the federal investment in Everglades restoration has increased. As of the end of FY2016, the federal government had provided in excess of $1.2 billion in funding for CERP, with the state providing matching funds for CERP projects, as well as advanced funding for land acquisition and construction for expected future CERP projects. Federal funding for non-CERP activities has also continued over this period. Together with CERP, all federal Everglades restoration efforts are estimated to have totaled in excess of $5 billion from FY1993 to FY2016. While estimates of nonfederal (i.e., state) funding contributions to CERP vary depending on what methodology and assumptions are used, observers agree that to date, the state of Florida has spent more on Everglades restoration than has the federal government.

Although overall progress has fallen short of initial timelines, progress has been made on a number of Everglades restoration projects. The majority of the land necessary for restoration projects under CERP has been acquired, and significant progress has been made on non-CERP activities (including improved water deliveries to Everglades National Park). Of the nine CERP projects that had been authorized by the end of 2016 (not including pilot projects), construction was ongoing or complete at eight projects and studies were completed or under way for a number of other projects. Despite this progress, some projects have seen setbacks in the form of schedule delays and cost escalations. Assuming that most of the 50 projects included in the original CERP plan will be required to complete the effort, many new authorizations and significant additional funding would be necessary. Reviewers of the restoration program have pointed out that at current rates of project authorization and funding, additional delays would be likely.

Reductions to state funding and the enactment of new CERP project authorizations in 2014 and 2016 legislation have renewed attention on Everglades restoration. Restoration of the Everglades is one of the largest and most mature efforts of its kind; thus, debate and resolution of Everglades restoration issues has implications not only for South Florida but also for large-scale restoration initiatives elsewhere. This report provides an overview of the federal role in Everglades restoration. It discusses background, funding history, and major accomplishments and challenges to date in federal efforts to restore the Everglades.

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Introduction

The Florida Everglades is a unique network of subtropical wetlands that is currently half its historical size. The federal government has a long history of involvement in the Everglades, beginning in the 1940s with the U.S. Army Corps of Engineers (the Corps) constructing flood control projects that shunted water flowing south into the Everglades to make way for agricultural and urban development. Other factors, including major nonfederal development efforts, also have contributed to shrinking and altering the Everglades ecosystem.

In recognition of the unique nature of the Everglades, federal and state agencies began ecosystem restoration activities in the Everglades in the early 1990s, and many of these activities are ongoing. However, it was not until 2000 that federal and state restoration activities were coordinated under an integrated plan. In the Water Resources Development Act of 2000 (WRDA 2000; P.L. 106-541), Congress approved the Comprehensive Everglades Restoration Plan (CERP) as a framework for Everglades restoration. In addition to the CERP framework and related processes, the WRDA 2000 authorized an initial round of projects with federal participation by the Corps and the Department of the Interior (DOI). The plan envisioned 50 major projects to restore the quantity, quality, and timing of water deliveries in south Florida to historical conditions. According to the process established under CERP, Everglades restoration projects are to be studied and presented to Congress for authorization as their planning is completed (presumably in water resources development acts, typically referred to as WRDAs). Since passage of CERP, nine non-pilot CERP projects have been authorized. Other projects are ongoing in the study phase (including projects that have completed the study phase and are awaiting congressional authorization).

Most observers agree that, although progress has been made on Everglades restoration, much more time and funding would be required to achieve restoration as currently contemplated. Previously, some have highlighted what they consider to be the "slow" pace of restoration as an argument for increased and expedited financial support. Conversely, others have argued that restoration activities in the Everglades receive too much funding relative to other priorities, and that the level of support provided for these activities is not appropriate given larger fiscal concerns and the uncertainty of results.

At issue for Congress is oversight and implementation of efforts to restore of the Everglades, including the ongoing federal funding commitment and the priority of Everglades restoration relative to other federal commitments. Stakeholders involved with planning other large-scale restoration initiatives look to the Everglades as a model and a test case. The achievements realized and challenges faced in Everglades restoration efforts may provide additional information on the possibilities and limitations inherent to all large-scale ecosystem restoration efforts.

This report provides information on Everglades restoration, with a focus on the federal role in funding this restoration and related issues for Congress. The report discusses background, trends, and major accomplishments and challenges to date in federal efforts to restore the Everglades.

Everglades Restoration Background: CERP and Non-CERP Projects

Federal efforts to restore the Everglades are often divided into two broad categories: CERP and non-CERP (or "Foundational"). CERP efforts refer to projects and programs authorized in the Comprehensive Everglades Restoration Plan, enacted in WRDA 2000. Non-CERP refers to the subset of federal Everglades restoration activities that were not enacted in CERP (in fact, many of these efforts predate CERP). CERP considered and assumed implementation of a number of non-CERP projects; thus, both efforts are considered to be complementary.

Federal CERP funding was first authorized in WRDA 2000, with a focus on increasing storage and treatment of excess water in the rainy season to provide more water during the dry season for the Everglades ecosystem and for urban and agricultural users. In the original documents presented to Congress in 1999, CERP was expected to consist of 50 projects and was estimated to cost $8.19 billion (in 1999 dollars) to complete. Over time, the reported funding requirement to complete has increased, although some of this increase has been due to inflation (see **Table 1**, below). As of 2014, the Corps estimated that completing construction of CERP projects would take more than 50 years and would cost $16.4 billion.[1] Of the approximately $8.2 billion (rounded) in cost increases from 1999 to 2014, approximately $4.7 billion has been due to inflationary increases and$3.8 billion has been attributed to other factors.

Table 1. Comparison of Estimated Comprehensive Everglades Restoration Plan (CERP) Completion Costs, 1999-2014

(in billions of dollars)

	Total Reported Cost (Estimate)	Increase over Previous Estimate Attributed to Inflation	Increase over Previous Estimate Attributed to Noninflationary Changes
Original (1999) Estimate	$8.2	—	—
2004 Update	10.9	1.6	1.1
2009 Update	13.5	2.0	0.6
2014 Update	16.4	1.0	2.2
Cumulative Change (as of 2014)	*8.2*	*4.7*	*3.8*

Source: CRS estimates based on 2005, 2010, and 2015 CERP Reports to Congress.

Notes: Amounts may not sum due to rounding. CERP reports to Congress typically update the estimated total costs for Everglades restoration in current-year dollars based on information available at the time of the report. This table shows how much of the cost increase over time has been due to inflationary factors compared to other factors (project scope, etc).

[1] This figure represents the estimated cost to the federal government in October 2014 dollars according to the Corps. See U.S. Army Corps of Engineers, *Comprehensive Everglades Restoration Plan, 2015 Report to Congress*, at http://evergladesrestoration.gov/content/cerpreports/cerp_2015_rpt_to_congress.pdf. Hereinafter *2015 CERP Report to Congress.*

Pursuant to CERP, project construction costs are shared 50/50: the federal government is required to pay half of project costs, and an array of state, tribal, and local agencies (i.e., nonfederal sponsors) must pay the other half.[2] The same cost share applies to all project operation and maintenance costs.

WRDA 2000 included initial projects (including pilots), established the aforementioned cost-sharing ratios and created a process for additional projects to be authorized as part of the CERP framework. Subsequent legislation has built on this: WRDA 2007 authorized three additional CERP projects; four other projects completed the study phase between 2007 and 2014 and were thus authorized for construction in the Water Resources Reform and Development Act of 2014 (WRRDA 2014; P.L. 113-121); and two other CERP projects were authorized in the Water Infrastructure Improvements for the Nation Act (WIIN Act; P.L. 114-322), enacted on December 16, 2016. The status of these projects is discussed later in this report.

Federal Everglades restoration activities not authorized under CERP are often referred to as "non-CERP" or "Foundation" activities. Most (but not all) of the authorities for this funding predate the enactment of CERP in 2000. For example, this category includes funding for the Modified Water Deliveries Project that originally was authorized under the Everglades National Park Protection and Expansion Act of 1989 (P.L. 101-229).[3] Depending on how broadly the non-CERP category is defined, it can encompass a wide variety of Everglades restoration activities undertaken by multiple agencies. However, similar to CERP funding, non-CERP activities of the Department of the Interior and the Corps typically receive the most attention and are often the focal point of congressional consideration. Unlike CERP, there is no statutorily required cost-share split for non-CERP projects.

Funding for Everglades Restoration

As noted above, federal funding for Everglades restoration is largely provided through DOI and the Corps and is concentrated in two annual appropriations bills—the Interior and Environment appropriations bill (which provides funds for much of DOI) and the Energy and Water Development appropriations bill (which funds the Corps). Additional funding in other appropriations bills is sometimes noted as contributing to Everglades restoration, but is not formally tracked under the Administration's non-CERP totals.[4]

Although the Administration's budget request identified restoration funding totals for CERP and non-CERP for both DOI and the Corps, appropriations laws and conference reports typically do not tabulate and specify their recommended appropriations levels for Everglades restoration activities (including CERP and non-CERP totals). Rather, these totals are embedded within

[2] Section 101 of WRDA 1986 (P.L. 99-662) requires that local sponsors pay the costs for land, easements, relocation, and rights-of-way for its projects. After a project cost-share agreement is certified by the Corps, these costs may be credited toward the overall nonfederal share of project costs.

[3] This project is expected to augment flows to Everglades National Park. For more information, see National Park Service, "Modified Water Deliveries (MWD)," at http://www.nps.gov/ever/learn/nature/modwater.htm.

[4] In addition to the Corps and DOI, the South Florida Ecosystem Restoration Task Force also tracks funding provided to other federal agencies, including the National Oceanic and Atmospheric Administration, the U.S. Environmental Protection Agency, and the U.S. Department of Agriculture, among others. However, in its annual budget request, the Administration typically only cites funding for the Corps and DOI under the designation of "non-CERP" Everglades restoration funding. For additional information, see Everglades crosscut budget documents available at http://www.sfrestore.org/documents/index.html.

project and account-level totals of the Corps and DOI. A summary of funding for DOI and Corps CERP and non-CERP activities in recent years is shown in **Table 2**.

Table 2. Corps and DOI Funding for Everglades Restoration, FY2010-FY2017

(in thousands of dollars)

	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017 Proposed
DOI	**79,424**	**70,600**	**99,884**	**66,355**	**70,452**	**62,272**	**64,429**	**63,000**
CERP	*8,449*	*8,401*	*8,347*	*7,883*	*8,376*	*8,408*	*7,934*	*8,000*
Non-CERP	*70,975*	*62,199*	*91,537*	*58,472*	*62,076*	*53,864*	*56,495*	*55,000*
Corps	**167,364**	**131,066**	**142,486**	**96,008**	**47,616**	**68,551**	**94,045**	**106,000**
CERP	*119,966*	*79,860*	*57,886*	*76,212*	*38,499*	*61,001*	*69,970*	*75,000*
Non-CERP	*47,398*	*41,108*	*84,600*	*19,796*	*9,117*	*7,550*	*24,075*	*31,000*
Total	**246,788**	**201,666**	**242,370**	**158,683**	**118,068**	**130,823**	**188,000**	**169,000**

Source: Congressional Budget Justifications for the U.S. Department of the Interior and the U.S. Army Corps of Engineers, South Florida Ecosystem Restoration Crosscut Budget Report for FY2015.

Note: Unless otherwise indicated, funding levels are actual amounts.

DOI Funding

Everglades restoration funding within the Department of the Interior, Environment, and Related Agencies Appropriations bill is generally allotted to four agencies within DOI:

- the National Park Service (NPS),
- the Fish and Wildlife Service (FWS),
- the U.S. Geological Survey (USGS), and
- the Bureau of Indian Affairs (BIA).

Within these agencies, two types of Everglades funding are often highlighted in appropriations debates: funding for CERP and funding for the Modified Water Deliveries Project for Everglades National Park (also known as the *Mod Waters* project). Mod Waters is a non-CERP project that has received significant attention from Congress. It aims to improve water deliveries to Everglades National Park by removing barriers in and around the Tamiami Trail.[5] Although Mod Waters is technically a non-CERP project, it is widely considered to be a keystone project for Everglades restoration, with an important nexus to CERP.

DOI's CERP funding largely goes to NPS and FWS to carry out CERP project activities related to NPS and FWS projects (e.g., national parks, wildlife refuges) and authorities that fall under CERP. Non-CERP DOI Everglades restoration funding provides for a number of different activities in addition to the Mod Waters project. These activities include management of national parks and national wildlife refuges in the Everglades, research and monitoring, implementation of relevant laws in the Everglades such as the Endangered Species Act (16 U.S.C. §§1531-1544) and the Migratory Bird Treaty Act (16 U.S.C. §§703-712), and BIA funding for the Seminole and

[5] Efforts to raise portions of the Tamiami Trail (a highway running east to west across the Everglades that blocks the southward flow of water) are considered a linchpin in efforts to increase the water flowing from north to south (i.e., into Everglades National Park).

Miccosukee to carry out water- and ecosystem-related planning and studies. Non-CERP DOI funding also includes operations of the South Florida Ecosystem Restoration Task Force, which supports DOI, the Corps, and the state of Florida in carrying out Everglades restoration. The FY2017 Administration request for DOI bureaus receiving Everglades restoration funds was $63 million, including $8 million for CERP projects and $55 million for non-CERP projects.

U.S. Army Corps of Engineers Funding

Corps funding is directed toward planning and construction of projects authorized under CERP and other authorities. Within Corps totals, the amount allocated to CERP projects (i.e., CERP projects that have been authorized for construction) is widely considered a key benchmark for Everglades restoration commitment and progress. Corps non-CERP restoration projects include those projects for which authorization predates CERP. The most prominent recent example is the ongoing construction of the Kissimmee River Restoration Project,[6] as well as operations and maintenance of other non-CERP projects.

Funding for Corps Everglades restoration projects in the Energy and Water Development appropriations bill is listed under South Florida Ecosystem Restoration within the Corps Construction and Operations and Maintenance accounts. The FY2017 requested level for Corps Everglades restoration funds was $106 million, including $75 million for CERP activities and $31 million for non-CERP activities.[7] Recent funding levels below previous averages have been attributed to a number of factors, including the availability of unobligated funds from prior years and the drawdown of funding for authorized, ongoing construction projects.

Funding Trends

The federal government has provided funding for restoration of the Everglades since the early 1990s. Overall, from FY1993 to FY2016, the total federal investment in Everglades restoration (i.e., including agencies other than the Corps and DOI) is estimated to have exceeded $5 billion. From FY1993 through FY2000 (i.e., prior to the enactment of CERP), federal appropriations for Everglades restoration activities totaled more than $1.2 billion. More recently, since the enactment of CERP in WRDA 2000 through FY2015, total federal funding from all agencies has exceeded $4 billion, with Corps and DOI accounting for approximately 75% of that total, or approximately $3 billion.[8] CERP projects accounted for approximately $1.1 billion of this funding.

As previously noted, Everglades funding for the Corps and DOI typically receives the most attention from Congress. **Table 2**, below, shows the split of CERP and non-CERP totals between the two agencies since 2010. Although overall funding for Everglades restoration by the Corps and DOI has remained somewhat constant since the enactment of CERP, the distribution between CERP and non-CERP funding has changed over time. CERP projects gradually increased from FY2001 to FY2010, including significant increases under P.L. 111-5 (the American Recovery and Reinvestment Act). Over the same period, funding for non-CERP projects (such as Mod Waters)

[6] In the past, the Corps has also received funding to implement the Mod Waters project, although in recent years this money has been provided to DOI.

[7] The FY2017 request for the Corps included funding to continue construction on two ongoing CERP projects (Picayune Strand and Indian River Lagoon-South) authorized in WRDA 2007, as well as funding for pre-construction work on the four CERP projects authorized in WRRDA 2014.[7]

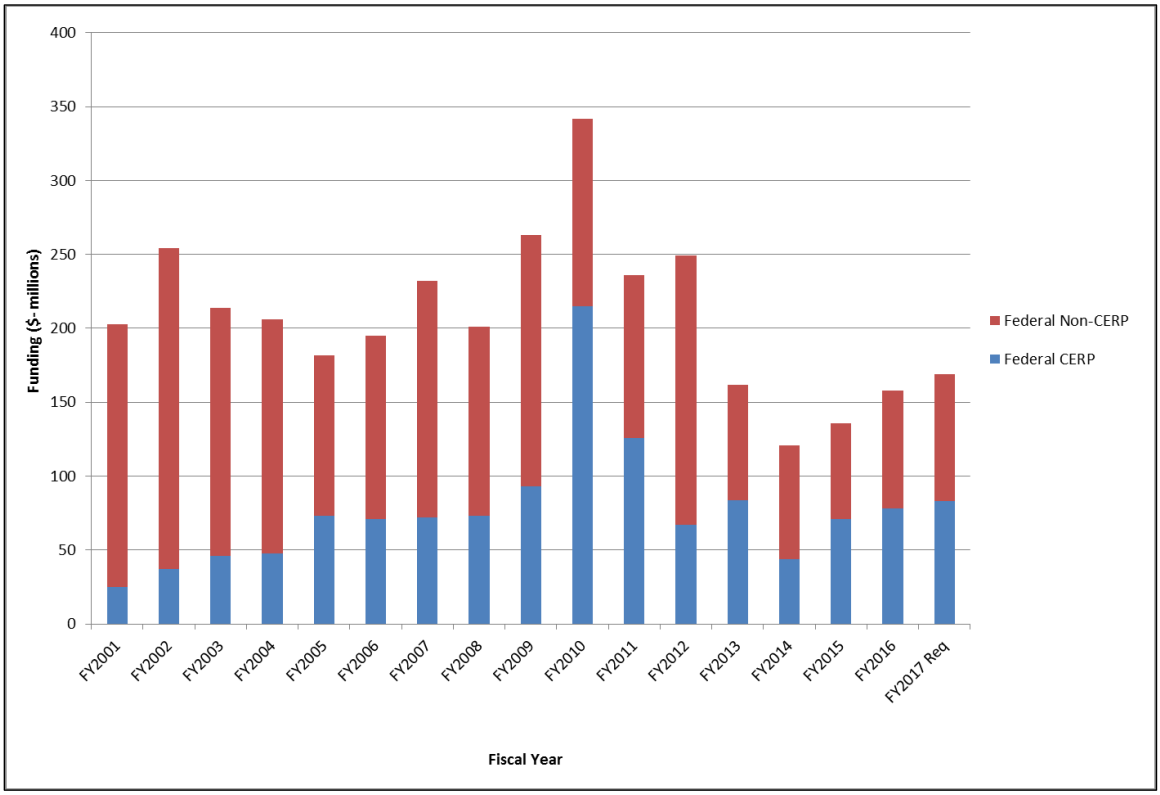
[8] CRS analysis of departmental data for FY1993-FY2014.

decreased from earlier levels. In recent years, overall appropriations in both categories have decreased.

In most enacted appropriations bills since passage of CERP, Congress has agreed to the Administration's funding request for the Everglades. The fluctuations in funding levels over time can be attributed to a number of factors. For instance, after authorization in FY2007, federal funding for "Generation 1" CERP projects (i.e., projects authorized in WRDA 2007) increased as project construction commenced after years of study and pilot projects; these funding levels began to decline in FY2012 as Generation 1 project construction activities wound down and "Generation 2" projects (i.e., projects with completed project-implementation reports that were proposed and eventually authorized in WRRDA 2014) were awaiting construction authorization. For non-CERP funding trends, more recent decreases in funding can be attributed in part to the completion of the initial phases of construction on the Mod Waters project.

Figure 1. Corps/DOI Appropriations for Everglades Restoration

(CERP and non-CERP funding split)



Source: CRS estimates based on Corps and Department of the Interior (DOI) budget data.

Notes: Does not include agency funding for activities outside of the Corps and DOI. Appropriated funding may differ from actual spending (due to transfers, etc.). FY2010 includes additional funding under P.L. 111-5 (the American Recovery and Reinvestment Account).

Comparing Federal and State CERP Funding

Many Everglades restoration supporters view the status and amount of federal CERP funding relative to nonfederal funding for restoration activities under CERP as an important indicator of the federal government's commitment to Everglades restoration. While there is widespread agreement that the state has invested more funding in CERP than has the federal government,

comparisons between federal and state funding levels for Everglades restoration are complicated for a number of reasons.

CERP project costs must be shared equally between the federal government and project sponsors. Further, pursuant to general Corps policies under Section 101 of WRDA 1986 (P.L. 99-662), all local project sponsors must fund the costs for project lands, easements, relocations, right-of-way, and disposal sites. As a result, a considerable amount of nonfederal funding for Everglades restoration has been expended by the state of Florida for land acquisition related to the expected "footprint" of future CERP projects. Although nonfederal CERP funding is widely acknowledged to be considerable (and by most accounts exceeds federal funding), it has in some cases anticipated details of future projects that have yet to be federally approved and designed in detail by the Corps.[9]

Although some estimates reference large nonfederal contributions toward CERP, estimates of expenditures that have been formally credited toward CERP's nonfederal share are typically smaller. For instance, in 2015 the state of Florida estimated that it had spent $2 billion toward implementing CERP.[10] At the same time, actual credited nonfederal expenditures through 2014 were reported to be $1.05 billion in the 2015 CERP Report to Congress.[11] Although some amount of nonfederal expenditures that have yet to be credited to CERP are expected to be counted eventually, it is possible that not all of these funds may be credited toward CERP cost shares.

In recent years, the state of Florida's funding of CERP has decreased due to a number of factors, including a decline in state tax revenues and a focus on other aspects of Everglades restoration. For instance, the state has increased its funding for projects under its Restoration Strategies Regional Water Quality Plan, which is intended to address EPA narrative and numeric nutrient criteria in the Everglades imposed under the Clean Water Act (33 U.S.C. §§1251 et seq.).[12] It is unclear whether state funding for CERP will return to previous levels at some point in the future. Previous estimates indicated that approximately $584 million in previous state expenditures would become "available" for crediting when "Generation 2" projects were authorized by Congress (as occurred in June 2014). Assuming no major influx of new funding by the state of Florida in the near future, the status of federal authorizing legislation for subsequent Everglades restoration projects (in particular those subject to prior spending by the state) may receive added attention.

Implementation Progress/Challenges

Reporting

Congress has mandated multiple reports to regularly evaluate Everglades restoration. Independent review of Everglades restoration was required in WRDA 2000. As a result,

[9] Funding is not formally "credited" by the Corps toward CERP project cost shares until a number of requirements have been met. These requirements include completion of a project implementation report (PIR) and authorization for construction of the project by Congress, as well as signing of a project partnership agreement.

[10] South Florida Water Management District, "Quick Facts on Everglades Restoration Progress," January 2016, at https://www.sfwmd.gov/sites/default/files/documents/spl_everglades_progress.pdf. Hereinafter, "SFWMD Everglades Restoration Fact Sheet." Over this time period, the federal government estimates that it spent $1.2 billion on CERP.

[11] *2015 CERP Report to Congress*, p. 38.

[12] These efforts, which began in 2012, are being undertaken in response to a court-ordered Amended Determination by the EPA. For more information on the Clean Water Act, see CRS Report R42752, Clean Water Act and Pollutant Total Maximum Daily Loads (TMDLs), by (name redacted) .

the National Academies of Sciences, Engineering, and Medicine's Committee on Independent Scientific Review of Everglades Restoration Progress (CISRERP) was formed in 2004. Since this time, the committee has published biennial reviews of Everglades restoration (including both CERP and non-CERP projects). The most recent report was released in 2016.[13] Separately, WRDA 2000 also required a report, authored jointly by the Corps and DOI, which focuses specifically on CERP implementation and is published every five years. The most recent of these reports was completed in 2015.[14] Both reports outline accomplishments and challenges related to CERP and non-CERP projects. Finally, a report by the South Florida Ecosystem Restoration Task Force (a joint state/federal/tribal governance entity established in WRDA 1996) publishes a biennial strategy and report on restoration accomplishments.[15]

Status and Accomplishments

Progress has been made on Everglades restoration for both CERP and non-CERP projects. For CERP activities, significant accomplishments have included the construction of a number of pilot projects, the completion of studies, and the initiation of multiple construction projects. **Table 3**, below, shows the status of recent major CERP projects. Additionally, some non-CERP projects are complete or nearing completion, whereas others are ongoing. Finally, in addition to progress on the construction of projects, baseline information and processes also have been established and the scientific understanding of many of the issues associated with Everglades restoration has improved significantly since initial enactment of CERP.[16]

Table 3. Status of Recent CERP Projects

Project Name	Construction Authorization (Public Law)	Project Status
Melaleuca Eradication	WRDA 2000 (P.L. 106-541)	Complete
Site 1 Impoundment	WRDA 2007 (P.L. 110-114)	Under Construction
Picayune Strand	WRDA 2007 (P.L. 110-114)	Under Construction
Indian River Lagoon-South	WRDA 2007 (P.L. 110-114)	Under Construction
C-43 West Storage Basin	WRRDA 2014 (P.L. 113-121)	Under Construction
C-111 Spreader Canal	WRRDA 2014 (P.L. 113-121)	Under Construction
Broward County Water Preserve Areas	WRRDA 2014 (P.L. 113-121)	Under Construction
Biscayne Bay Coastal Wetlands	WRRDA 2014 (P.L. 113-121)	Under Construction
Central Everglades Planning Project	WIIN Act (P.L. 114-322)	Study Complete, Awaiting Construction Funding

[13] Committee on Independent Scientific Review of Everglades Restoration, National Research Council, *Progress Toward Restoring the Everglades: The Sixth Biennial Review*, Washington, DC, 2016. Hereinafter referred to as the Sixth Biennial Review.

[14] *2015 CERP Report to Congress.*

[15] These reports are available at http://www.evergladesrestoration.gov/content/Strategic_Plan_Biennial_Report.html.

[16] For example, since enactment of CERP, research on aquifer storage projects has revealed that the potential for these projects to provide storage is less than was initially assumed. For more information, see "Challenges" section below.

Project Name	Construction Authorization (Public Law)	Project Status
Big Cypress/L-28 Interceptor	NA	Study in Progress
Loxahatchee River Watershed Project	NA	Study in Progress
Lake Okeechobee Watershed Project	NA	Study in Progress

Source: CRS based on U.S. Army Corps of Engineers data.

Notes: Does not reflect pilot projects. WRDA 2007 = Water Resources Development Act of 2007; (WRRDA 2014 = Water Resources Reform and Development Act of 2014; WIIN Act = Water Infrastructure Improvements for the Nation Act; NA = not available.

For the most part, significant ecosystem benefits as a result of Everglades restoration construction projects have yet to be achieved. However, some preliminary effects have been noted. According to recent reporting, documented ecosystem benefits of projects have included increased water levels and vegetation response, a reduction in seepage loss (i.e., increased water remaining in the natural system), and improved water quality in some areas.[17] Observers expect that most benefits will lag several years behind project construction and restoration of hydrologic conditions. Furthermore, maximizing these benefits is expected to require extensive monitoring and adaptive management, which would further confirm and refine approaches to restoration.

Selected CERP and non-CERP accomplishments as of the end of 2016 are discussed below.

CERP Land Acquisition and Pilot Efforts, Non-CERP Projects

As noted above, Everglades restoration had achieved several milestones. Major achievements included accomplishment of several of the early steps that will be critical to the eventual completion of larger restoration projects. This includes the purchase by nonfederal project sponsors of most of the land expected to be required for CERP projects (a necessary first step in project construction).[18] As discussed previously, many of these projects are expected to be credited toward the nonfederal cost share for individual projects.

Early pilot projects that will influence the eventual prioritization and construction of larger CERP projects also have been completed. Specifically, design and installation of six pilot projects authorized in the Water Resources Development Act of 1999 (P.L. 106-53) as well as under CERP in WRDA 2000 have taken place in recent years. For example, a pilot groundwater seepage barrier to the southeast of the Mod Waters project was completed and has been found to be successful in blocking subsurface migration of groundwater.

Many non-CERP projects predate CERP and are therefore largely more established and in some cases closer to completion than CERP projects. Some non-CERP accomplishments include the completion of the Florida Keys Water Quality Improvement Project, as well as the National Park Service (NPS)-constructed 1-mile bridge component of the Modified Water Deliveries project, which may be expanded in the future.[19] Another major restoration project that predated CERP, the Kissimmee River Project (authorized in 1992 and initiated in 1999), is nearing completion. Some

[17] Sixth Biennial Review.

[18] The state estimated that as of 2015, it had acquired nearly 64% of lands needed for CERP. See SFWMD Everglades Restoration Fact Sheet.

[19] Another planning project, known as the Next Steps project, is being directed by the National Park Service and may eventually lead to the bridging of up to an additional 5.5 miles of the roadway.

outside observers have noted that this project has already resulted in significant ecosystem benefits that demonstrate the potential for planned CERP projects.[20]

Generation 1 CERP Projects

Among the Generation 1 CERP projects authorized in WRDA 2000 and WRDA 2007 (Picayune Strand Restoration, Site 1 Impoundment, Indian River Lagoon-South or IRL-South, and the programmatic authority for Melaleuca Eradication that was authorized by Congress in WRDA 2000), only one project, Melaleuca Eradication, is considered complete.[21] As of early 2017, the three remaining projects were all under construction, with some phases completed and others yet to begin. The 2016 NRC Biennial Review has noted preliminary ecosystem benefits associated with several of these projects.[22]

Generation 2 CERP Projects

As previously noted, WRRDA 2014 (P.L. 113-121) authorized four Generation 2 CERP projects, with total estimated costs of $1.9 billion: the C-111 Spreader Canal, Biscayne Bay Coastal Wetlands, C-43 West Basin Storage Reservoir, and Broward County Water Preserve Areas (WPAs). Two of these (C-43 Reservoir and Broward County WPAs) were new projects, whereas the two others (the C-111 Spreader Canal and Biscayne Bay Coastal Wetlands) were previously initiated by the state but required congressional authorization for federal participation. As of early FY2017, construction had been initiated or planned for initiation for all four projects.

Generation 3 CERP Projects

One Generation 3 CERP project, the Central Everglades Planning Project (CEPP), was authorized for federal construction in the WIIN Act. CEPP, which is made up of a suite of individual projects from the original CERP, is widely considered to be a high-priority project for Everglades restoration, and its status has received considerable attention. CEPP was initiated due to a perceived need to prioritize restoration projects in the central portion of the Everglades ecosystem and to enhance the prospects for Everglades restoration overall. Before CEPP, most restoration projects in the Everglades had focused on the periphery of the Everglades, rather than flows to Lake Okeechobee and the Central Everglades, as CEPP does. The preliminary estimated cost of CEPP is $1.9 billion.

Ongoing Planning

Three CERP projects (Loxahatchee River Watershed, Lake Okeechobee Watershed, and Western Everglades) were beginning or entering the planning phase as of publication of the NRC review in late 2016. Numerous other original CERP projects had yet to initiate planning. An internal Corps effort to reduce the time and cost of Corps studies was enacted on a permanent basis in

[20] Committee on Independent Scientific Review of Everglades Restoration, National Research Council, *Progress Toward Restoring the Everglades, the Fifth Biennial Review*, Washington, DC, 2014, p 102. Hereinafter referred to as the Fifth Biennial Review.

[21] The project consists of a facility that enables the use of biological controls to aid existing efforts to control invasive exotic plants in south Florida.

[22] Sixth Biennial Review, pp 36-37.

WRRDA 2014. This program aims to limit the time and review of future Corps studies, including those for Everglades restoration projects.[23]

Challenges

Despite the achievement of some milestones, outside reviewers have noted the relatively slow overall pace of Everglades restoration compared to the ambitious timetables laid out in the original document (as well as in more recent plans). These observers have pointed out that while there has been some progress toward restoring the Everglades, project implementation has been considerably slower than expected due to a number of factors, such as appropriations levels and delayed project authorization.[24] As previously noted, increasing project costs are another challenge, as the total estimated cost of restoring the Everglades has gone up significantly over time. Finally, as the understanding of the ecosystem and local geology and hydrology has improved, other challenges have become apparent (for example, see box below, "Harmful Algal Blooms in Florida"). If the full benefits of restoration are to be realized, these challenges will need to be addressed.

Harmful Algal Blooms in Florida: The Connection to Everglades Restoration

In 2015 and 2016, high precipitation events in the Central Everglades (i.e., the area around Lake Okeechobee) combined with decreased water storage available at Lake Okeechobee led to significant releases of nutrient-laden water from the lake into the Caloosahatchee and St. Lucie Rivers (the rivers on the lake's western and eastern sides, respectively). These releases were made by the U.S. Army Corps of Engineers (Corps), in coordination with the South Florida Water Management District and pursuant to the lake's operational rules to avoid flooding. However, they resulted in harmful algal blooms (sometimes referred to as HABs) in the Caloosahatchee and St. Lucie Rivers and estuaries. These HABs were detrimental to fish and plant species and were widely covered by the media and conservation advocates.

A number of solutions have been raised to combat future occurrence of similar HABs. Major repairs by the Corps to Herbert Hoover Dike (a federal flood-control project that is not typically counted in Everglades funding totals) have been ongoing since the 1990s. These repairs (and related concerns related to the dike's structural integrity) are the primary reason that Lake Okeechobee cannot currently hold as much water as it was designed to store and why high volume water releases into the lake's two primary outlets (i.e., the rivers) are sometimes necessary. Many have noted the need for expedited completion of the Corps' dike repair project (which has estimated costs in the hundreds of millions of dollars) to allow for additional lake storage and revised operational schedules, which would reduce the potential for future HABs resulting from lake releases.

Some also point to the role of potential Everglades restoration projects (in particular water storage projects) near Lake Okeechobee in addressing the HAB issue. They note that new water storage projects have the potential to both hold and treat high nutrient water that might otherwise be released into the rivers and could add to the storage in Lake Okeechobee that is expected to be available once dike repair is complete. Many advocates of Everglades restoration in the central and coastal areas of the state believe that, given recent events, these projects need to be prioritized (and perhaps potentially expanded).

One widely noted challenge is the overall slow pace of Everglades restoration to date. Taken both individually and as a group, CERP projects have been implemented more slowly than initially anticipated. Although some projects are nearing completion, the project schedules envisioned in

[23] The aim of this effort is to complete feasibility studies in less time than is traditional for Corps investigations. Among other goals, studies initiated under these requirements are expected to adhere to a "3x3x3" rule, which means that they will be completed with no more than $3 million in federal costs, in three years or less, and with the involvement of the three levels of Corps review (districts, divisions, and headquarters).

[24] The lack of project authorizations in a WRDA appears to have occurred mostly during the 2012-2014 time period, since PIRs for three projects were completed and awaiting congressional authorization beginning in 2012.

earlier program documents have for the most part not been maintained, and only a fraction of the project implementation reports originally envisioned under CERP have been finalized. [25]

Funding for projects is a related challenge for Everglades restoration, and one that could continue or even grow in coming years. Recently authorized Generation 2 and Generation 3 CERP projects may in some cases compete with ongoing Generation 1 and non-CERP projects for funding, and all of these projects must compete with other water resource projects and appropriations priorities. Even if funding were to be maintained at current levels, project implementation could slow if funding were spread out among multiple projects as they are authorized. In light of decreased funding by the state of Florida and its shift toward other restoration priorities in recent years, attaining new state funding where required for project cost shares also may be challenging.

Changing information also poses issues for Everglades restoration. Recent studies have shown that the Everglades ecosystem was historically wetter than previously assumed; thus, more water than initially thought may be required to restore the system. At the same time, more than 1 million acre-feet in planned CERP water storage (much of this in the form of aquifer storage projects) has been shown to be infeasible by additional study. Finally, increasing potential for saltwater encroachment under various scenarios of sea-level rise adds further uncertainty to previous plans. The significance of potential new water needs for ecosystem health and for South Florida's people and industry, the effects of lost storage, and the resulting need (and feasibility) for revisions to old projects and/or construction of new projects has yet to be fully explored.

Other challenges to Everglades restoration that may be of interest to Congress have been widely noted. These challenges include ongoing issues associated with water quality in central and southern Florida and the adequacy (and feasibility) of some restoration efforts in recreating historical hydrologic conditions; and ongoing degradation of species and ecosystems in south Florida due to invasive species and other factors (which in some cases appears to have accelerated in recent years). The interaction of these factors has the potential to impact the status and effectiveness of other Everglades restoration projects.

Completion of project construction represents only one hurdle for Everglades restoration, with operations and monitoring of performance representing challenges in their own right. While preliminary benefits in the early stages of project operations are possible, many observers note that it will take time for projects to individually and collectively refine their operations and demonstrate significant long-term positive effects on Everglades-dependent species and the environment.

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[25] As of the end of 2016, none of the original estimated completion dates for projects in the CERP conceptual plan (also referred to as the "yellow book") have been met.