



EVERGLADES NATIONAL PARK

STATE PARTY REPORT  
ON THE STATE OF CONSERVATION OF  
EVERGLADES NATIONAL PARK

December 2016

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## World Heritage Committee Decision 39 COM 7A.17

### Thirty-ninth Session (Bonn, 2015)

#### Everglades National Park (United States of America) (N76)

#### Decision: 39 COM 7A.17

The World Heritage Committee,

1. Having examined Document WHC-15/39.COM/7 A. Add,
2. Recalling Decisions **38 COM 7 A.30** and **37 COM 7 A.15**, adopted at its 38th (Doha, 2014) and 37<sup>th</sup> (Phnom Penh, 2013) sessions respectively,
3. Welcomes the continued and substantial effort of the State Party to provide detailed and clear measurements of the trends and conditions for the indicators developed for the Desired state of conservation for removal of the property from the List of World Heritage in Danger (DSOCR) and to connect them to the corrective measures, allowing a comprehensive report on progress;
4. Notes with appreciation the progress made by the State Party on the implementation of the corrective measures, and requests the State Party to continue its effort towards the completion of those restoration projects that are most crucial to increasing waterflow into the property and meeting the water quality targets, and that can lead to an improvement of the ecological indicators for the integrity of the property over time;
5. Notes with concern that the finalization of the General Management Plan, initially mentioned in Decision **35 COM 7 A.14**, is further delayed, and urges the State Party to ensure implementation of the plan commences in 2016;
6. Also notes with concern the increased abundance of invasive species in the property, including top marine predators such as Lionfish and strongly encourages the State Party to ensure that the necessary resources are provided to contain their spreading and to research how and to what degree these species are affecting the property's Outstanding Universal Value;
7. Also requests the State Party to submit to the World Heritage Centre, by **1 December 2016**, an updated report, including a 1-page executive summary, on the state of conservation of the property and the implementation of the above, for examination by the World Heritage Committee at its 41st session in 2017;
8. **Decides to retain the Everglades National Park (United States of America) on the List of World Heritage in Danger.**

## **Everglades National Park United States of America (N76)**

### **Executive Summary**

In 1993, Everglades National Park was entered into the list of World Heritage Sites in Danger. Since that time, the United States National Park Service has worked continuously to address the threats originally identified for the Property: alterations of the hydrologic regime, adjacent urban and agricultural growth, increased nutrient pollution and impacts to the protection and management of Florida Bay. An additional threat identified more recently by the Committee is the proliferation of exotic invasive plant and animal species. The Committee has also requested information on the potential impact of climate change on the Outstanding Universal Values (OUV) of the property.

In 2006, a suite of corrective measures associated with changes to water management (hydrology and water quality) was developed and presented to the Committee, to help assess progress toward restoration of the OUV of the Property. In 2011, a joint reactive monitoring mission of the World Heritage Committee and IUCN visited Everglades National Park. This mission and the United States agreed that the 2006 corrective measures would need to be augmented to secure the long-term restoration and preservation of the property. The augmented suite of corrective measures, along with indicators of ecological integrity, was described and the status documented in the 2012, 2013 and 2015 reports of the State Party to the World Heritage Committee.

This 2017 State of Conservation Report is being submitted for the 41<sup>st</sup> Session of the World Heritage Committee, and gives an overview of overall progress made since the establishment of the corrective measures in 2006, with descriptions of recent progress and difficulties experienced since the last report in 2015.

All private lands inside the property have been acquired by the National Park Service. Additional bridging of the Tamiami Trail is under construction, adding 2.3 miles of bridging to the already implemented 1-mile bridge. A second phase of this project, to raise the remaining portions of the Tamiami Trail roadway, is in the planning phase, and funds for construction will be actively pursued.

Seepage management projects along the eastern boundary of the park are nearly complete. Recent developments include the construction of 5 miles of underground seepage barrier, and progress on the last remaining detention basin, scheduled for completion in 2018. Unusually wet weather conditions provided an unplanned “test” of this seepage management infrastructure in 2016: that “test” indicates that additional work may be needed to increase water levels within the park while retaining flood protection in adjacent agricultural and suburban areas.

Much work remains to be done on an interim water control plan (COP) that uses the completed restoration infrastructure to provide consistent hydrologic patterns that reach targets for the Desired State of Conservation for hydrology, and therefore provide the conditions for plants and wildlife to flourish. The limited changes to water management operations associated with the Modified Water Deliveries and C-111 South Dade projects are likely to move restoration forward slowly and in small increments. Implementation of the recently-authorized Central Everglades Planning Project (CEPP) is needed to reach the hydrologic restoration conditions envisioned in the original corrective measures of

2006. Likewise, completion of the water quality treatment features included in the Restoration Strategies project is needed to reach our 2006 water quality improvement goals. Both CEPP and Restoration Strategies will reach key milestones around 2025-2026.

The Final General Management Plan for Everglades National Park was approved in October 2015. Work is moving forward to manage the use of boats in Florida Bay. In addition, work is proceeding to improve management of private and commercial airboats in the freshwater marsh in Northeast Shark River Slough.

Invasive plant and animal species continue to be a significant and increasing concern for Everglades National Park, in both marine and terrestrial habitats. While lionfish have invaded reef habitats outside the park, this species does not appear to have adapted to the habitat conditions inside the property. In freshwater habitats, Old World climbing fern and Brazilian pepper continue to spread in the park's habitats, and Burmese pythons and Argentine tegu continue to be of enormous impact and concern.

Steps have been taken to address invasive species, including additional staff at the park, the creation of a regional Invasive Exotic Species Action Framework, and the signing of a recent Presidential Executive Order with intent to strengthen coordinated, cost-effective federal actions at the national level to combat invasive species. These are positive developments; however, at the level of Everglades National Park, significant additional financial resources and long-term steady attention is needed to turn the tide on invasive exotic species within the property.

The timeframe for implementation of the corrective measures is approximately a decade from now, though much depends on the outcome of the intermediate water control plan (COP) for restoration. We expect to see small improvements over the next 4 to 6 years, and more significant improvements with the implementation of portions the CEPP, Tamiami Trail Next Steps, and Restoration Strategies projects, scheduled for 10-15 years from now.

The most recent reporting period (late 2014 through 2016) coincided with the 2015 El Niño event that brought weather conditions (unseasonal local drought conditions followed by a prolonged, heavy rainy season) that stressed the ecosystem and tested the recently implemented restoration infrastructure. Targets for the Desired State of Conservation for hydrology were not met for this period, and were too low even during the period of unusually high rainfall. This situation emphasizes the importance of the future water control plans that use the infrastructure to bring natural patterns of hydrology to the park.

The severe dry period of 2015 had negative effects on salinity levels and seagrasses in Florida Bay. A large-scale die-off of seagrass has affected about 40,000 acres of seagrass meadows in the bay, and has been followed by an algal bloom. This situation is similar to the seagrass die-off and algal bloom that began in 1987, which affected Florida Bay for more than a decade. These events, the result of a severe but short-term weather pattern, demonstrate that the property is still in a fragile state, and that the ecosystem lacks resilience. Consistent, more natural hydrologic patterns that reach established targets are required for the plants, fish, and wildlife of both terrestrial and marine areas of Everglades National Park to achieve the Desired State of Conservation.

## Introduction

Everglades National Park (ENP) was established in 1947 with a mission unique within the National Park Service (NPS). In contrast to parks in the western United States featuring dramatic landscapes, this park was to protect the abundant and diverse biological resources of a vast wetland ecosystem. Achieving this mission has proven challenging in light of human modifications to the south Florida hydrology and landscape.

ENP is located at the southernmost end of the highly modified Everglades wetland ecosystem. The flow of water in this once natural ecosystem has been controlled and managed by the canals, levees, and pumps of the Central and Southern Florida (C&SF) water control project for more than 100 years, resulting in unnatural discharges to fragile estuaries and limited flow southward through the system. Managed reservoirs, located upstream of the park, confine freshwater for flood control purposes and urban and agricultural water supply needs. These changes outside the park have had tremendous implications within ENP: the northeastern sector of the park (called Northeast Shark River Slough, or NESRS) is unnaturally dry; western Shark Slough (WSS) is too wet; and the estuaries of Florida Bay are starved for freshwater and suffer from high salinity levels.

The altered wetland function has profoundly affected both habitats and the wildlife that depend on them. In recognition, at the request of the U.S. Government, ENP was inscribed on the list of World Heritage Sites in Danger in 1993. Four major threats have negatively affected ENP for many decades, and were highlighted at the time of listing.

**Threat 1. Alterations of the hydrologic regime** have resulted in changes in the volume, distribution, and timing of water flows to the park.

**Threat 2. Adjacent urban and agricultural growth** has resulted in flood protection improvements that alter the park's wetlands and in the invasion of exotic species from urban and agricultural environments.

**Threat 3. Increased nutrient pollution** has resulted from runoff from upstream agricultural areas, causing alterations in native flora and fauna in the park's freshwater ecosystems.

**Threat 4. Impacts to the protection and management of Florida Bay** have resulted from reduced freshwater inflows and increased nutrient loadings.

ENP participates in local and regional restoration efforts to shape restoration projects that address these threats and that serve as important corrective measures to help move the park closer to the Desired State of Conservation.

This report, prepared in 2016 for examination by the World Heritage Committee at its 41<sup>st</sup> session in 2017, is the second biennial report to be submitted by NPS. This report follows the format of the World Heritage Committee, responding directly to the latest decision of the Committee, providing information on progress implementing the corrective measures, and describing recent detected changes in the status of physical and ecological indicators. The information presented is intended to assist decision-making regarding the status of ENP as a World Heritage site and to gauge the overall response of the ENP ecosystem to factors such as changes to water management, climatic change, invasive exotic species, and implementation of Everglades Restoration projects.

During this reporting period (2015-2016), unusual weather conditions associated with the 2015 El Nino occurred, ranging from high rainfall to drought conditions. Fortunately, enough restoration infrastructure was complete to allow water to be moved into the park during high water conditions in quantities and in locations that had not been seen for many decades. On the other hand, the drought events exacerbated long-term water deficit stresses on Florida Bay, leading to negative ecological consequences. Though unplanned and uncontrolled, these weather events are giving us insight into how the system may respond to actual restoration conditions.

### **Response to the Decision of the World Heritage Committee**

1. *Having examined Document WHC-15/39.COM/7 A. Add,*
2. *Recalling Decisions 38 COM 7 A.30 and 37 COM 7 A.15, adopted at its 38th (Doha, 2014) and 37<sup>th</sup> (Phnom Penh, 2013) sessions respectively,*
3. *Welcomes the continued and substantial effort of the State Party to provide detailed and clear measurements of the trends and conditions for the indicators developed for the Desired state of conservation for removal of the property from the List of World Heritage in Danger (DSOCR) and to connect them to the corrective measures, allowing a comprehensive report on progress;*

The Government of the United States, through the Department of the Interior and the National Park Service, continues to track the trends and indicators developed for the Desired State of Conservation for Everglades National Park. The status of these trends and indicators is periodically evaluated for the entire south Florida region in the Biennial Reports on Everglades Restoration ([http://evergladesrestoration.gov/content/Strategic\\_Plan\\_Biennial\\_Report.html](http://evergladesrestoration.gov/content/Strategic_Plan_Biennial_Report.html)). The National Park Service produces a technical evaluation of these indicators and trends, as input to the State of Conservation reports, every 2 to 5 years (<https://www.nps.gov/ever/learn/nature/worldheritage.htm>). The National Park Service plans to continue this reporting process in future, with the next technical evaluation of indicators to be completed for Everglades National Park in 2018 or 2019.

4. *Notes with appreciation the progress made by the State Party on the implementation of the corrective measures, and requests the State Party to continue its effort towards the completion of those restoration projects that are most crucial to increasing waterflow into the property and meeting the water quality targets, and that can lead to an improvement of the ecological indicators for the integrity of the property over time;*

Progress continues to be made regarding land acquisition and implementation of infrastructure needed to allow increased water flows into the Northeast Shark River Slough (NESRS) area of Everglades National Park (see the Corrective Measures Table for details). The National Park Service has acquired all of the privately-owned inholdings that would potentially be affected by increasing water levels in NESRS. More than 8,000 parcels have been acquired since the early 1990s. The final 3 parcels came into federal ownership in December 2016: thus, all land acquisition is complete. Work is still required to protect federally-owned, developed parcels (visitor centers/airboat access on the northern border of the park) from the expected increase in water levels associated with ecological restoration.

Bridging of the Tamiami Trail continues, creating the potential for increased water flow to the park. Projects to control the seepage loss of water along the eastern boundary of the park moved forward substantially between 2000-2016 and the last remaining originally-planned project (the Northern Detention Basin) is scheduled for completion in mid-2018. Additional seepage management features—specifically two phases of an underground seepage barrier—have been constructed and are contributing to retention of water in the northeast sector of the park.

With respect to the quality of water entering the park, the State of Florida's Restoration Strategies water quality improvement plan is proceeding on schedule. The element of this plan (a flow-equalization basin) that will most directly affect the water entering the park will be fully operational by 2018, and in full compliance by 2021. All of the proposed Restoration Strategies remedies are scheduled to be completed by 2025. These are positive developments, and we will continue to evaluate the quality of water entering the park to assess progress toward the Desired State of Conservation for this indicator.

A critical next step in restoration of NESRS is the creation of a water control plan that utilizes the built infrastructure to reliably bring improved restoration water flows to the park. At this time, several water operations planning actions are underway (ERTP 2 and the Incremental Field Test). High water conditions associated with the El Nino climate event during late 2015 and into 2016 required emergency water operations to be put into effect, leading to high water conditions in NESRS that had not been experienced for many, many years, and in effect testing the infrastructure put in place over the last decade. In addition, the unusual weather conditions sparked a State effort focused on flood protection in the agricultural areas southeast of the park. Analysis of these operations will be used to help design the water control plan (expected in 2019).

Our current assessment remains the same as that of 2015: the limited changes to water management operations associated with the Modified Water Deliveries project (MWD) and C-111 projects are likely to move restoration forward slowly and in small increments. Even when fully implemented, the MWD and the Combined Operational Plan (COP) are expected to fall short of achieving the Desired State of Conservation for hydrologic conditions in the Northeast Shark River Slough basin of ENP. Implementation of the recently-authorized Central Everglades Planning Project (CEPP), which includes additional water storage areas south of Lake Okeechobee, is needed to reach the hydrologic restoration conditions originally envisioned in the Corrective Measures of 2006.

5. *Notes with concern that the finalization of the General Management Plan, initially mentioned in Decision 35 COM 7 A.14, is further delayed, and urges the State Party to ensure implementation of the plan commences in 2016;*

The ENP General Management Plan in 2016

The corrective measures originally identified by the World Heritage Committee and NPS in 2006 are almost exclusively associated with ecosystem restoration projects implemented *outside* of park boundaries and have overarching effects on the hydrology and water quality of ENP.

During the ENP General Management Plan (GMP) development process, managers deliberately chose not to address ecosystem restoration issues in detail and instead focused primarily on management of lands and resources *inside* park boundaries. Nonetheless, these two efforts necessarily connect in several places: primarily in the statements of desired conditions in the GMP, but also in broad statements within the GMP that commit NPS to continued work with stakeholders and to strengthening of partnerships for management of ENP as a critical component of the south Florida ecosystem.

The intent of the GMP is to manage park lands, visitor services, and visitor activities in such a way that the desired conditions for ENP resources and visitor experiences are attained and maintained. The Final GMP was approved in October 2015. The GMP focused on several major planning issues and concerns that were identified early in the process, including management of the lands encompassing NESRS (called the East Everglades Addition), wilderness assessment and management, visitor use (boating, visitor facilities, and user capacity), park stewardship, and climate change.

In addition, the GMP specifies a broad range of desired conditions that the park is striving to attain. A focus on the goal of achieving these conditions connects internal park management with the elements of external threat that are described in this report and that are being addressed through the evolution of the corrective measures originally established in 2006. Several of these desired conditions goal statements follow:

*Marine, estuarine, freshwater, and terrestrial habitats are managed from an ecosystem perspective, considering both internal and external factors affecting visitor use, environmental quality, and resource stewardship.*

*... NPS managers adapt management strategies to changing ecological and social conditions and are partners in regional land planning and management....The resources and processes of the national park retain a significant degree of ecological integrity. Management decisions about natural resources are based on scholarly and scientific information and on the national park's significant resources....Human impacts on resources are monitored and harmful effects are minimized, mitigated, or eliminated.*

*Hydrologic conditions within Everglades National Park and the south Florida ecosystem are characteristic of the natural ecosystem prior to European American intervention, including water quality, quantity, distribution, and timing. Water levels and timing of water deliveries reflect quantities resulting from natural rainfall and are distributed according to pre-engineered drainage patterns. Water is free of introduced agricultural nutrients and urban-related pollutants.*

*....natural processes...enhance and maintain native plant communities. Communities [are] representative of an ecologically functioning subtropical wetland system. Natural wildlife populations and systems are understood and perpetuated.... Naturally functioning and healthy fisheries are maintained as an important component of the ecology of Florida Bay and other waters in the park.*

*...populations of invasive nonnative fish and wildlife species [are managed] wherever such species threaten park resources or public health and when control is prudent and feasible.*

Following the GMP approval, work began in 2016 on high-priority strategies and actions identified in the plan, and as of November 2016 important progress has been made on a number of these projects. Park managers expect to implement several projects in 2017 that work towards meeting a number of the desired conditions described above. These include:

- 1) instituting a boater education and permit program for motor boat operators that focuses on increased protection of many resource and ecosystem features (e.g., seagrass beds, mud flats, endangered species, fisheries, soundscapes);
- 2) establishing shallow-water protection zones in Florida Bay (over 125,000 acres or about 1/3 of Bay waters), most of which will prohibit combustion engine use (pole and troll zones); and
- 3) designating zones and routes for individual and commercial airboating in the East Everglades that reduces the areas open to airboat use, and better protects ecosystem habitats (e.g., soils, vegetation, hydrology, wildlife, natural sounds).

The process to determine pole and troll zones has already begun with the implementation of a pilot project in 2011. A 5-year analysis of the effectiveness of the Snake Bight Pole/Troll Zone will be completed in 2017. Early results show that the zone is effective as a management strategy to protect seagrass.

The establishment of the ENP Advisory Committee has been postponed while work focuses on the above priority projects. Future reports to the World Heritage Committee will provide additional progress updates on the implementation of the GMP.

6. *Also notes with concern the increased abundance of invasive species in the property, including top marine predators such as Lionfish and strongly encourages the State Party to ensure that the necessary resources are provided to contain their spreading and to research how and to what degree these species are affecting the property's Outstanding Universal Value;*

Invasive plant and animal species continue to be a significant and increasing concern for Everglades National Park, in both the marine and terrestrial habitats of the park.

At this time, three marine species are of concern regarding invasive capability for Everglades National Park: *Halophila stipulacea* (seagrass), *Pterois volitans* (lionfish), and *Cichlasoma urophthalmus* (Mayan cichlid). Currently, *Halophila stipulacea* has not been detected in the park; however, its expanding presence in Caribbean is of concern, because if this species were to invade it is considered to have a high future potential to alter the native seagrass of Florida Bay.

The number of the lionfish, *Pterois volitans* and *Pterois miles*, in the Florida Keys has exploded by the thousands since 2009, when it was first reported. However, Florida Bay and the coastal

Everglades have reported only ten sightings, of which only four lionfish were confirmed in the waters of Everglades National Park. Lionfish show a preference for natural reef or artificial structures, and the habitat of Everglades National Park marine waters may not be suitable for lionfish. While the potential impact of invasion on native fish and crustaceans can be considered extremely high, the scarcity of observations of lionfish in the Everglades marine waters during a period of rapid growth of the lionfish population in the region suggests a low level of concern for establishment in Everglades National Park.

The Mayan cichlid has an established population in Everglades National Park. It can tolerate salinities ranging from 0-40 ppt, and anoxic waters for up to two hours. In the Everglades, it has shown a preference for fresh and brackish water and manmade canals. The Mayan cichlid has a high potential for negative impact on native prey fish. At this time, invasive marine species in Everglades National Park are of concern; however, we are concentrating most of our efforts on terrestrial invasives because we have better information on the severe negative impacts of invasive terrestrial plants and animals on our native flora and fauna.

In terrestrial and freshwater wetland habitats, continuing exotic plant control efforts include on-the-ground work to remove and manage Brazilian Pepper from a 6,000 acre area of old agricultural lands (the “Hole in the Donut” program), and ongoing work to remove melaleuca (Australian paperbark) from the northeast sector of the park. These programs are implementing successful techniques for removal and long-term management of these two invasive plant species; however, additional funding is needed to assure that we continue to reduce the areas invaded by these exotic plants over time. Increasing presence of Brazilian pepper in the western sector of the park is of a high level of concern. As of this writing, removal and management techniques for this specific, flooded type of habitat are known, but would require funding in the tens of millions of dollars to address.

In addition, we continue to work on another invasive plant of concern, the Old World Climbing Fern (*Lygodium microphyllum*). Our program relies on biocontrol, prescribed fire and aerial herbicide applications to manage the largest, densest, and most inaccessible infestations of *Lygodium* located in the very remote western regions of the park. Our treatment techniques do reduce the amount of above-ground plant growth, but are not successful in controlling the spread of *Lygodium*. *Lygodium* continues to increase its cover and distribution within the park; at this time there is not a proven or effective method for control of this species.

Work on the Burmese python and the Argentine tegu lizard continues, although the outlook for control or containment of both of these species is bleak. Burmese pythons are removed by NPS staff and authorized agents when they are encountered in the park, and we continue to invest in research to understand the biology of pythons in the Everglades with the goal of developing control methods. We are also continuing our efforts to capture Argentine tegu lizards along the eastern border of the park, with the goal of delaying or possibly preventing the expansion of their populations onto park lands. Research into the ecology of tegu lizards is also ongoing. In spite of the investment of well over \$2 million in the past decade (significantly more if non-federal funds are included), no proven successful control method exists for Burmese pythons in the Everglades. Although tegu lizards do readily enter the traps along the eastern border of the park,

the extent and remoteness of suitable habitats make it difficult to say whether or not this effort will be successful in preventing tegu invasion of the park in the long run.

In the last year, Everglades National Park has committed funding to two full time positions focused on invasive exotic species management. One is a supervisory position to focus on both plants and animals, and the second is a position dedicated specifically to the problem of invasive exotic reptiles, to complement an existing position dedicated to invasive exotic plants. In addition, several agencies (U.S. National Park Service, U.S. Geological Survey, U.S. Department of Agriculture, and especially the Florida State Fish and Wildlife Conservation Commission) are providing funding for research on invasive exotic plants, reptiles, and fish present in the park: Burmese pythons, Argentine tegu lizards, Old World climbing fern, and Cichlid fishes are all currently the subject of research and control/management efforts by our agency partners.

During 2015, the South Florida Ecosystem Restoration Task Force spearheaded an interagency effort to develop an Invasive Exotic Species Action Framework (<http://evergladesrestoration.gov/content/ies/>). This framework is helping to align and prioritize the work of the various government entities (Federal, State and Local) in the fight against invasive species in the south Florida ecosystem, including Everglades National Park. In addition, the Task Force effort has brought the situation of invasive species in the south Florida ecosystem to a higher level of awareness at the national level. The U.S. National Invasive Species Council (NISC) Secretariat is producing a documentary on invasive species entitled, *Protecting What Matters*, and intends to include information on south Florida invasive species. An early 2017 release is planned.

All of these efforts are positive progress toward addressing the issue of invasive species within the World Heritage property. Nevertheless, additional resources and long-term steady attention will be needed to turn the tide on invasive exotic species within the World Heritage Site. Current data indicate that many additional exotic species are present in the urban and agricultural areas outside the boundaries of Everglades National Park, though not yet found inside the boundaries. Thus we expect to be working on this threat to the Outstanding Universal Value of Everglades National Park for many years to come.

### **Progress on the Implementation of the Corrective Measures adopted in 2006 by the World Heritage Committee**

1. *Progress achieved in implementing the corrective measures adopted by the World Heritage Committee.*

Please see attached Table 1, specifying the corrective measures and progress made. Success factors and difficulties in implementation of each of these corrective measures are described in the table, and in the text of this report.

2. *Is the timeframe for implementing the corrective measures suitable? If not, please propose an alternative timeframe and an explanation why this alternative timeframe is required.*

The timeframe for implementing the corrective measures presented in the 2015 State of Conservation Report is still in place. A major challenge in implementing these corrective measures is in making sure that objectives for restoration originating more than two decades ago are not lost in the extended planning, authorization, and funding process. The park was placed on the list of World Heritage Sites in Danger in 1993. Three water infrastructure and operations projects, the MWD, C-111 South Dade, and Everglades Construction projects, were initially authorized at about that time.

The MWD and C-111 South Dade projects included goals associated with hydrologic restoration of the natural Everglades (including Everglades National Park) and goals associated with maintaining and improving water supply and flood protection for the agricultural and urban environment of south Florida, heralding the dual nature of all Everglades Restoration projects since. The Everglades Construction Project was oriented to improve water quality to the natural system.

Elements of these three projects, as originally envisioned in the early 1990s, were the foundation of the description of corrective measures as adopted by the World Heritage Committee in 2006. Much progress has been made on all three of these projects. But due to the large scale, long timeline and complexity of the projects, some modifications were made that limited the ecological restoration benefits.

As of this writing (December 2016), infrastructure associated with the MWD and C-111 South Dade project construction components is still scheduled to be completed by about 2017. The next section of bridge along the Tamiami Trail (TTNS Phase I) is scheduled to begin construction soon, on a timeline accelerated compared to what we reported in 2013. Similarly, the Everglades Construction Project water quality improvement features were fully operational by 2012, including a substantial expansion of the treatment area footprint. Additional water quality features are under construction and on schedule (State of Florida Restoration Strategies). The completion of these structural features does not by itself guarantee the delivery of additional clean freshwater to the historical flow-way of ENP.

For example, although infrastructure has been completed, we are still working on a water control plan that utilizes this infrastructure to benefit the natural system, including Everglades National Park. The revised Water Control Plan is scheduled to be completed by 2019. In addition, the original objective of the MWD project, to restore flow through Water Conservation Area (WCA) 3B and into Northeast Shark Slough as a functioning component of the Everglades hydrologic system, was not implemented as envisioned due to funding constraints. This important flow connection through WCA 3B has been incorporated into the CEPP, a project whose full implementation is at least a decade into the future. Similarly, the flow volume targets for the MWD project were lowered as modifications to the bridging of Tamiami Trail were designed. Now, the flow volume increases needed to achieve the original corrective measures from 2006 are linked to implementation of the CEPP. This large project was authorized in amount \$1.9 Billion in December 2016 (a final WRDA bill was passed both Houses of Congress with a large margin of support.) The CEPP project still requires appropriations and significant additional detailed planning.

If restoration project components (including additional infrastructure and development of water control plans) are implemented according to the current plans, we should expect to receive small but positive changes to the distribution and quantity of water in NESRS within the next 4 to 6 years. The timeline for implementation of water quality features is proceeding as planned, with completion of an element important to ENP also occurring within the next 4 years. Incremental operational changes during this time period should help to induce measureable positive changes in the ecological indicators. The timeline for substantial water operations changes, however, is delayed, as the CEPP is still decades from completion. At the time of this writing, with our knowledge of the expected physical and water quality changes over the next 4 to 6 years, the expected changes in the coming decade will not be commensurate with the original corrective measures established in 2006. Those changes will await the construction of the CEPP, Tamiami Trail Next Steps, and Restoration Strategies projects and will likely not occur for a decade or more.

3. *Progress achieved towards the Desired state of conservation for the removal of the property from the List of World Heritage in Danger (DSOCR).*

In previous reports to the World Heritage Committee, we have provided detailed information on the status of Indicators of Integrity, which are physical and biological elements of Everglades National Park. Desired State of Conservation statements exist for each of these indicators, some of which are quantitative, and some of which are qualitative. Progress on restoration projects (water infrastructure and operations, as detailed in the 2. above and Table 1) is expected to have positive effects on the Indicators of Integrity. These effects may not be immediately perceptible, as biological responses sometimes are delayed with respect to changes to the physical environment.

By mid-2015, the restoration infrastructure required to flow a portion of needed additional water into Everglades National Park was well-advanced. (Additional infrastructure, as well as changes to water operations, is still needed to reach the DSOCR). By mid-2015, upstream water quality storage and treatment areas were available, the 1-mile bridge on Tamiami Trail was finished, originally planned seepage management features along the eastern border of the park were well-advanced, and a new pump station had been built to return escaped seepage water to the northern border of the park along the Tamiami Trail. The 2015 El Nino event brought weather conditions (unseasonal local drought conditions, followed by a prolonged, heavy rainy season) that not only stressed the ecosystem, but also tested this recently implemented restoration infrastructure.

The dry season in the Everglades usually begins around November and lasts through the subsequent April, with seasonal rains beginning sometime in May or June. In 2015, the onset of the rainy season was delayed by about three months, leading to localized drought conditions in the freshwater wetland areas of the park, and to a severe lack of freshwater reaching the estuary of Florida Bay. Once the local drought broke in the fall of 2015, the subsequent rainy season continued well into the dry season of 2016. The November 2015 through January 2016 rainfall amount was the highest ever since data began to be recorded in 1932.

Water depths in Northeast Shark River Slough (NESRS) during this period reflected the unusual rainfall conditions; going from record low depths in June 2015 to record high depths in March

and April of 2016. Water depths in NESRS were in the lower 10<sup>th</sup> percentile through August 2015 and in the upper 10<sup>th</sup> percentile from December, 2015 through July 2016. The unusual weather conditions, especially the high dry-season rainfall of 2015-2016, provoked emergency water operations across the entire south Florida water management system, including temporary increase in the maximum allowable stage in the L29 canal. The L29 canal is the large canal that runs parallel to the Tamiami Trail on the northern border of the park, and the height of water in this canal has a significant impact on water flow into the park. The emergency water operations were intended primarily to protect urban and agricultural areas from flooding, but also were intended to utilize the implemented restoration infrastructure to the fullest extent possible and to deliver water to the Northeast Shark River Slough area of the park.

The desired state of conservation for NESRS hydrology includes three indicator metrics:

1. Spatial distribution of sheet flow
2. Water depth
3. Annual flow to NESRS

The target for the spatial distribution of sheet flow is to direct 55 percent of the total flow to NESRS. During the period from October 1, 2014 through September 30, 2016 there were several weeks when this target was met, however overall the ratio of water directed to NESRS was 32 percent. The period of time when the target was met consistently corresponded to the temporary increase in the allowable maximum stage in the L29, providing some evidence that this target is achievable when the project is operated fully.

The water depth and annual flow targets vary with rainfall amounts. For this reason we present our evaluation of depth and flow based on the two unusual rainfall periods during the past two years: the first very dry and the second very wet.

The water depth target for average rainfall conditions is an annual average of 2.25 feet. For a low rainfall period the target is 1.75 feet: during the dry time period of October 1, 2014 through September 30, 2015, the average water depth in NESRS was 0.05 feet. For a wet year the target is 2.75 feet: during the wet period between October 1, 2015 and September 30, 2016 the average water depth in NESRS was 1.65 feet. These data indicate that the targets were not met during these two periods. Furthermore, the depth in NESRS during the very rainy period did not even reach the target depth for a dry year (i.e., the dry target is 1.75 feet, and we reached 1.65 feet during this recent very wet period.)

The annual flow target varies from 200 k-acre-feet for a dry year to 900 k-acre-feet in a wet year; the target for an average rainfall year is 500 k-acre-feet. During the period from October 1, 2014 through September 30, 2015 the total flow into NESRS was 58 k-acre-feet, well below the low rainfall target of 200 k-acre-feet. During the later period with higher rainfall, water deliveries to NESRS totaled 476 k-acre-feet. This volume is very close to the average rainfall target, but well below the 900 k-acre-feet target for a wet year.

In summary, even when large amounts of water were available during the most recent wet period, restoration infrastructure was available, and emergency operations for flood control were in place (allowing significant deviations from normal water operations) the park did not meet the

hydrologic targets defined in the DSOCR. This situation reflects the need for significant work on the water control plan (COP), as well as the need for implementation of CEPP.

The extended dry season of 2015 had negative effects on salinity levels and seagrasses in Florida Bay (both are Indicators of Integrity). Salinity measured in Florida Bay during this period in some instances reached 70 or more parts per thousand, twice the salinity of seawater, and the highest salinity level ever recorded in the bay. At the same time, very warm and calm weather fostered low levels of dissolved oxygen in the waters of the bay. These two physical conditions are stressful for seagrasses, particularly for turtle grass (*Thalassia*), the most abundant seagrass in the bay, and a key component of the Florida Bay ecosystem. Through a complex biochemical process, these stressors resulted in a large-scale die-off (approximately 40,000 acres) of seagrass meadows in Florida Bay. Localized fish kills occurred sporadically in the same area as the 2015 die-off, affecting several species of fish. Subsequently (summer/fall of 2016), the large quantities of dead seagrass, through decomposition released nutrients into the water column of Florida Bay, provoking an algal bloom (also an Indicator of Integrity). Algal blooms, if widespread and persistent, can further degrade ecological conditions in the bay by reducing the ability of sunlight to reach seagrass meadows on the bay bottom, and by competing with seagrasses and with marine fish for oxygen. We are currently monitoring the algal bloom to track potential increase in area as well as persistence into the future.

Freshwater input to Florida Bay has been severely reduced by the construction and operation of the south Florida water management system for a period of about 100 years, leading to the development of an ecosystem that lacks resilience and is precariously balanced. In such an ecosystem, even short-term severe weather can provoke events such as the current seagrass die-off. The events are rare, but can have lasting impact. In 1987 Florida Bay, long-starved for freshwater, experienced similar weather conditions (drought and warm weather) which led to a large-scale seagrass die-off and algal bloom event, the effects of which lasted nearly 20 years.

The effects of the unusual 2015-2016 weather conditions, the effects of the infrastructure completed to date, and any additional changes due to modified water operations (COP), will likely be reflected in changes to the ecological indicators within the next several years. In our subsequent report we will provide a detailed analysis of the status of ecological indicators of integrity, to inform progress toward the Desired State of Conservation.

### **Other current conservation issues identified by the State Party which may have an impact on the property's Outstanding Universal Value**

The Outstanding Universal Value defined for Everglades National Park includes the unique geological processes of the limestone substrate, the juxtaposition of temperate and subtropical species and habitats, the complexity and integrity of biological processes in the park, the large number of bird and reptile species, and the threatened and endangered species that reside within the ecosystem. In other parts of this report, we have described our efforts to address the Corrective Measures associated with bringing the park closer to the Desired State of Conservation, primarily the work on Everglades Restoration (natural hydrology and improved water quality), work to implement the now-final General Management

Plan, and work to improve our ability to understand the impacts of exotic invasive species and develop programs and methods to manage this threat.

The issue of climate change has been previously identified with respect to the potential impact on the Outstanding Universal Value of Everglades National Park. As stated in our 2015 report, the vulnerability of the Everglades area to sea-level rise is moderate to high, based on the U.S. Geological Survey Coastal Vulnerability Index. We continue to engage in research to identify natural resources at risk from climate change, in the formation of partnerships with other management entities to maintain regional habitat connectivity, and in the restoration of key ecosystem features to increase ecosystem resilience. Everglades National Park is adapting to this issue by incorporating the reality of climate change and sea level rise into all aspects of park management: not only is the issue now incorporated in a growing number of research and monitoring projects regarding natural resources, but the issue is becoming fully incorporated into park facility infrastructure plans and into interpretive and environmental education programs for the public.

**In conformity with Paragraph 172 of the *Operational Guidelines*. describe any potential major restorations, alterations and/or new construction(s) intended within the property, the buffer zone(s) and/or corridors or other areas, where such developments may affect the Outstanding Universal Value of the property, including authenticity and integrity.**

1. Proposal of Utility Transmission Lines by the Florida Power and Light Company

This proposed construction is related to the exchange of land described in Table 1. Corrective Measure 1A (p. 18). The Florida Power & Light (FPL) company is seeking to construct major transmission lines northward from its Turkey Point facility in south Florida. The recently completed land exchange (November 18, 2016) means that FPL now owns a utility corridor on the eastern border of Everglades National Park, rather than a utility corridor surrounded by park lands. This utility corridor on the border of the park is termed the “West Preferred Corridor” in FPL planning documentation.

The path for the FPL transmission lines has not yet been finalized, and the planning process has been taken to the courts. On April 20, 2016, Florida's 3<sup>rd</sup> District Court of Appeals issued a decision reversing the Florida Siting Board's (Governor and Cabinet) May 2014 Final Order which had approved the West Preferred Corridor (NPS lands proposed for exchange) as the location for FPL's transmission lines. The court determined the West Preferred Corridor was not properly certified and remanded the Final Order back to the Siting Board for further consideration. The court determined that the Siting Board erred by not properly considering the Area of Critical Environmental Concern ordinance as "environmental regulations" instead of "zoning ordinances." On June 6, 2016 FPL filed a motion for a rehearing before the Third District Court of Appeals.

On November 22, 2016, the Third District Court of Appeals denied rehearing in the FPL transmission line case. The Court's April 20, 2016 decision in Miami-Dade County's favor - reversing certification of the West Preferred Corridor - is now final. FPL could still seek review from the Florida Supreme Court.

## 2. Potential for Hydraulic Fracturing projects in South Florida

Hydraulic fracturing (also known as fracking) is a well stimulation technique in which rock is fractured by high-pressure injection of a liquid (primarily water but also including various proprietary components) into a wellbore to create cracks in deep-rock formations through which natural gas and petroleum will flow more freely. Environmental opponents to this technique argue that benefits of this approach are outweighed by potential environmental impacts, which include risks of ground and surface water contamination, and air and noise pollution.

There is currently no fracking or other form of oil and gas development in Everglades National Park. However, in 2013 the Texas-based Dan A. Hughes company used an "acidization process" while drilling in Collier County at the edge of the Florida Panther National Wildlife Refuge (Big Cypress National Preserve is in Collier County and a small section of Everglades National Park is in Collier County as well). They injected 700,000 gallons of acidic water into the ground before they were stopped and fined by the Florida Department of Environmental Protection. High-pressure injection of chemicals has not traditionally been used in Collier County for oil and gas production and existing laws and regulations do not fully address these techniques.

Two bills were introduced in 2015 to the Florida Legislature (House Bill 0191 and Senate Bill 0318), which were intended to prevent counties, cities, and local communities from creating regulations that ban or otherwise regulate fracking near their communities. The bills would have also overturned or negated any current regulations or bans that communities had in place on fracking. These bills died in the legislature in the spring of 2016. While individual counties, including Miami-Dade and Monroe, have passed bans on fracking, Collier County has not and there is no state-wide ban on the activity to date.

There is still interest within the oil and gas industry, and from members of the Florida legislature, to carry out this type of petroleum development. The limestone geologic formations underlying south Florida are potentially vulnerable to unintended fractures which could result in contamination of surface water and groundwater aquifers. The hydrocarbon-bearing basins of interest to the industry underlie all of south Florida, including Big Cypress National Preserve, and Everglades and Biscayne National Parks.

**Public access to the state of conservation report**

We approve public access to the entirety of this report on the World Heritage Centre's State of Conservation Information System.

**(Signature of the Authority)**

A handwritten signature in black ink, consisting of several overlapping loops and a long horizontal stroke at the end, positioned above a thin horizontal line.

Pedro M. Ramos  
Superintendent  
Everglades and Dry Tortugas National Parks

**Table 1. Everglades National Park – History and Status of Corrective Measures December 2016.**

Corrective Measure (Established 2006)	Status of Corrective Measure 2013	Status of Corrective Measure 2016
<b>Threats 1 and 2: Alterations to the Natural Hydrologic Regime, and Adjacent Urban and Agricultural Growth.</b>		
<b>Park Need:</b> Public ownership of lands in the East Everglades is a prerequisite to re-establishing water flows in Northeast Shark River Slough.		
<p>1A: Complete East Everglades Expansion Area land acquisition (approximately 44,000 hectares (ha)).</p> <p>Note in 2016: Acquisition of private parcels and protection of developed sites from flooding are both required in order for this corrective measure to result in the ability to increase flows significantly to NESRS.</p>	<p>1A: Land acquisition is 99% complete though six of the largest parcels remain in private ownership, totaling 300 ha. Funds for acquisition remain in the NPS budget. An NPS decision on the pathway for acquisition of five of the six parcels is expected in 2013. NPS is preparing an Environmental Impact Statement for acquisition of the sixth and largest parcel (a utility corridor of approximately 134 ha). Estimated completion date is spring 2014.</p>	<p>1A: Land acquisition is complete. The exchange of land with Florida Power and Light Company (the utility corridor) is complete, including transfer of title. The three final small parcels (commercial airboat operations along Tamiami Trail) were brought into federal ownership in December 2016.</p> <p>Limited water flow improvements in Northeast Shark River Slough began in April 2015. Although all properties in the area are in federal ownership, we continue to work with the private businesses that function on these properties, working on flood protection cures to enable continued business services as restoration moves forward. Completion of design &amp; construction of these flood protection cures is expected to extend into 2019, earlier than we had previously estimated, and may require additional appropriations.</p>

**Park Need:** The inhabited area adjacent to the park, called the 8.5 Square Mile Area, must be protected from flooding in order to allow water flows into NESRS.

1B: Complete flood mitigation features in the 8.5 Square Mile Area.

1B: Construction of the flood mitigation features for the 8.5 Square Mile Area was completed in 2009. Monitoring data indicated that additional work was needed to achieve flood protection goals. A "connector canal" modification was designed in 2012 and construction will be completed in 2013. Completion of this project will remove one of the main barriers to increasing water levels in the L-29 canal.

1B: The construction of the "connector canal" modification has been completed, and monitoring to determine the year-round benefits of this project to Everglades National Park is underway. Operation of this system is linked to the completion of the Combined Water Operations Plan.

Note that this project is also linked to Corrective Measure 4A: Full implementation of the 8.5 Square Mile Area flood mitigation system depends on completion of the C-111 North Detention Area, which receives stormwater runoff from the 8.5 SMA system. Completion of the North Detention area is expected in mid-2017.

Note that this project is also linked to Corrective Measure 2C: protection of the 8.5 Square Mile Area not only provides flood mitigation to residents, but also provides one of the numerous elements of seepage control along the eastern border of the park.

Corrective Measure (Established 2006)	Status of Corrective Measure 2013	Status of Corrective Measure 2016
<p><b>Park Need:</b> A water control plan defining water operations that will improve rainfall-based water deliveries and promote increased sheetflow to ENP, while maintaining flood control and water supply requirements, is necessary.</p>		
<p>1B: Complete the Water Control Plan (CSOP) for the Modified Water Deliveries (MWD) and C-111 South Dade Projects.</p> <p>This Corrective Measure is the same as Corrective Measure 2B.</p>	<p>1B: Everglades Restoration Transition Plan (ERTP) operations have been implemented. A water operations field test is being designed and agreed upon between the U.S. Government and the State of Florida that should address water quality concerns associated with increases in flow to NESRS. This field test is expected in early 2013 and will last for 2 years.</p> <p>The CSOP and the COP plans have been eliminated from the MWD project, and future water control plans will be developed at the conclusion of the field test. Changes to water operations are likely to move forward very slowly and in small increments. Substantial change will occur only when raising and bridging the Tamiami Trail is complete as envisioned in the Central Everglades Planning Project (CEPP—a new element of the CERP) and the Tamiami Trail Next Steps (TTNS) project. Timeline for completion of these projects is &gt;10 years from now.</p>	<p>1B: During the current reporting period (2015-2016), we began incremental testing of water operations (fall 2015). The intent is to have the final MWD and C111 South Dade water control plan (COP) build on these temporary, incremental changes and further modify the water management regime in Water Conservation Area 3A, ENP, and the South Dade Conveyance System.</p> <p>Incremental field testing was affected by unusual weather conditions associated with a 2015-2016 El Nino. We experienced high water conditions, leading to an emergency deviation of water operations. These weather conditions required emergency modifications to water operations, in effect testing the infrastructure that has been put in place over the last decade. One result is that the flood protection system linked to seepage management may not be as effective as originally expected (see CM 2C below): unless this issue is addressed, restoration project benefits may be reduced. In addition, the unusual weather conditions have sparked a State effort focused on flood protection in the agricultural areas southeast of the park. Analysis of these operations is underway, and we will use the information to inform design of the COP.</p> <p>The COP is expected to be complete in late 2019. Our assessment remains the same as in 2015: the limited changes to water management operations associated with the MWD and C-111 projects are likely to move restoration forward slowly and in small increments.</p> <p>Even when fully implemented, the Modified Water Deliveries project and the COP are expected to fall short of achieving the 550Kaf/year average annual water volume target for the Northeast Shark River Slough basin of ENP. This is due in part to the fact that the unbridged portions Tamiami Trail must be raised in order to allow additional significant water flow under the trail (see CM 1C). The shortfall in achieving the water volume and flow distribution targets would be most limiting in wetter years.</p> <p>The substantial flow improvements required to fully achieve the desired state of conservation will occur only when the CEPP and TTNS projects are complete in about a decade. The CEPP project was authorized in 2016, but still requires additional detailed planning and appropriations. Therefore, our strategy is to push for maximizing ENP benefits via the MWD and C-111 projects and their association water control plan (COP), while remaining fully engaged in the longer-term restoration initiatives.</p>

Corrective Measure (Established 2006)	Status of Corrective Measure 2013	Status of Corrective Measure 2016
<p><b>Park Need:</b> Removal of barriers to water flow within Water Conservation Area 3 (WCA 3) upstream of the park is needed to enhance sheetflow and marsh connectivity into NESRS.</p>		
<p>1C: Construct water conveyance structures on the L-67A, L-67C, and L-29 canals and levees.</p> <p>In 2006, both the MWD project, and the CERP WCA 3 Decompartamentalization and Sheetflow Enhancement Project (Decomp) included projects to degrade levees and fill canals within WCA 3, north of the park.</p>	<p>1C: The Decomp physical model along the L-67 levees and canals is under construction. Construction components are expected to be complete in early 2013, and data will be collected during 2013 and 2014. The test is scheduled to conclude in 2014.</p> <p>Phase 1 of the Decomp project is incorporated into the CEPP, which is also examining changes to the L-67 levees and canals. The scope of alternatives ranges from small to large modifications to the L-67 structures. Schedule for completion of conceptual planning for CEPP is the end of 2013. The CEPP project then moves forward to Congress for authorization and funding. Timeline for completion of this project is &gt;10 years from now.</p> <p>The CEPP plan to move water from WCA 3 to NESRS is needed in the same timeframe as required by the TTNS project.</p>	<p>1C: The Decomp physical model construction features along the L-67 A and C levees and canals have been completed. Field testing continues, and the findings will inform us on the best approaches to removing the upstream sheetflow impediments.</p> <p>The Final EIS and Record of Decision for the CEPP was completed in late 2014, and the CEPP Project was authorized by Congress in 2016. CEPP still requires detailed planning and appropriations. The CEPP project includes removal of portions of the L-67C and L-29 levees, and additional water conveyance structures in the L-67A levee, which are expected to be complete by 2030.</p>
<p><b>Park Need:</b> Removal of barriers to water flow along the Tamiami Trail is needed to enhance sheetflow and marsh connectivity into NESRS. Both bridges and modifications to the roadway are needed in order to raise water levels in the park while avoiding water damage to the road itself.</p>		
<p>1C: Tamiami Trail bridging and roadway modifications.</p>	<p>1C: The 2008 Tamiami Trail 1-mile bridge and limited road-raising project will provide modest flow increases into NESRS and is now scheduled for completion in spring of 2014.</p> <p>An NPS project to design and construct 2.6 miles of additional bridging is underway as of October 2012. Planning and final design should be complete by June 2014 and, depending on the availability of funding, a design and build contract should be awarded by the end of 2014, with construction completed by 2018.</p> <p>Raising the remainder of the Tamiami Trail roadway is still required in order to restore more-natural water levels to NESRS without compromising the roadway. The funding and timing of this work is unknown at this time.</p>	<p>1C: The 2008 Tamiami Trail 1-mile bridge and limited road-raising project is complete and providing modest flow improvements in NESRS. The capacity for additional flow of water into NESRS via the bridge was tested during the unusually wet 2015-2016 year, and the northeast corner of the park received more water than it has in many years, although hydrologic targets associated with the DSOCR were not met.</p> <p>The TTNS phase 1 project with approx. 2.3 miles of additional bridging is underway and is jointly funded by the Department of the Interior and the Florida Department of Transportation. A contract for this work was awarded in June 2016, work began in November 2016, and construction is expected to be complete in 2019.</p> <p>The combination of the CEPP and TTNS phase 2 projects would remove a 2+ mile section of the L-29 Levee and the adjacent Tamiami Trail roadway, reconnecting the marshes in WCA-3B and NESRS. The timeline for CEPP removal of the L-29 Levee as well as construction of the upstream conveyance features is 2030.</p> <p>Raising the remainder of the Tamiami Trail roadway and adding additional conveyance (TTNS phase 2) is required to fully implement the CEPP, and restore more natural water levels to NESRS without compromising the roadway. We are beginning the planning and design phase for TTNS phase 2, and are actively seeking construction funding for this project.</p>

Corrective Measure (Established 2006)	Status of Corrective Measure 2013	Status of Corrective Measure 2016
<p><b>Park Need:</b> Water in NESRS and Taylor Slough needs to be retained inside the park via seepage management features. This water should flow down the historic sloughs, increasing water depths and hydroperiods in the park. Currently, lowered water levels in urban and agricultural areas east of the park draw large amounts of water out of the park via seepage.</p>		
<p>2A: Complete C-111 land exchange between the South Florida Water Management District (SFWMD) and NPS. This is required to construct the C-111 detention areas.</p>	<p>2A: The land exchange is complete and no additional real estate is required for completion of the C-111 detention area projects.</p>	<p>2A: The land exchange is complete and no additional real estate is required for completion of the C-111 detention area projects.</p>
<p>2B: See 1B.</p>		
<p>2C: Complete the construction of C-111 detention-area features from the 8.5 Square Mile Area south to the area known as the Frog Pond. These features include northern and southern components. The detention areas reduce seepage losses along the portions of the eastern ENP boundary.</p> <p>An existing pump station (S-356), constructed by the MWD project, is available for use to help retain water in NESRS.</p> <p>CERP included an ENP Seepage Management project that would add additional S-356 pump stations as well as a subsurface seepage barrier by 2015.</p>	<p>2C: Operation of the C-111 southern detention-area components and their effects on park ecology are being assessed.</p> <p>Construction of the C-111 northern detention area is still delayed, scheduled for completion in 2017.</p> <p>The water operations field test described in 1B should address water quality concerns associated with increases in flow to NESRS. This test is expected in early 2013 and will last for 2 years.</p> <p>Construction of the rock-mining shallow seepage barrier pilot (2 miles) was completed in spring of 2012. The feature is being monitored for effectiveness, and depending on results, may lead to an additional 3-5 miles of shallow seepage barrier in the near future.</p> <p>Additional seepage management to restore water levels in NESRS while maintaining flood protection is envisioned in the CEPP and would follow the schedule of design and implementation for that project.</p>	<p>2C: An assessment of the operation of the C-111 south detention-area components and their effects on park hydrology and ecology was published in a dedicated volume in the journal <i>Wetlands</i> in July 2013. The operation of the S-332B/C/D pump stations and their associated detention areas has demonstrated that they can reduce the over-drainage of the adjacent ENP marshes, and begin to restore more natural wetland habitats and aquatic communities in these areas. The S-356 pump station began returning seepage in October 2015, as part of the first incremental field test. An expansion of the S-356 pump station that would double its pumping capacity is included in the CEPP, and the construction is scheduled to be complete in 2026.</p> <p>Three additional miles have been added to the 2-mile shallow seepage barrier installed by the rock mining industry. Recent analysis of the function of this barrier indicates that it can be an effective component for seepage management in combination with other features such as the detention areas. Seepage retention for the park must be managed to allow deeper groundwater flows to the east to maintain public water supply and beneficial flows to Biscayne Bay.</p> <p>Construction of the C-111 northern detention area (Contract 8) is expected to be complete in mid-2017. This detention area will receive runoff from the 8.5 SMA features to the north, and create a nearly continuous seepage management system connecting NESRS and Taylor Slough.</p> <p>The unusually rainy weather conditions experienced in 2015-2016 required emergency modifications to water operations, in effect testing the seepage management infrastructure that has been put in place over the last decade. One result is that the flood protection system linked to seepage management may not be as effective as originally expected: unless this issue is addressed, restoration project benefits may be reduced.</p>

**Threat 3: Increased Nutrient Pollution from Upstream Agricultural Areas.**

Corrective Measure (Established 2006)	Status of Corrective Measure 2013	Status of Corrective Measure 2016
<p><b>Park Need:</b> Water entering the park must be low in nutrients, with concentrations of phosphorus in surface water &lt;10 parts per billion (ppb), as established by the State of Florida. Total phosphorus (TP) concentrations above this level lead to imbalances in flora and fauna. Water needs to be cleaned upstream of the park, via improvement of agricultural practices and treatment by stormwater treatment areas (STAs). Reduction of nutrient concentrations and redistribution of phosphorus loading by sheet flow discharges will contribute to healthier freshwater Everglades wetlands, as well as a healthier estuary in Florida Bay.</p>		
<p>3A: Implement upstream water quality source controls or Best Management Practices (BMPs) and construct engineered wetlands or STAs to achieve the long-term TP limits for water flowing into Shark River Slough and the Taylor Slough/Coastal Basins.</p> <p>In 2008, a Federal Court found that delay in achieving the State of Florida Phosphorus Threshold Rule (&lt;0.01 mg per liter for the Everglades) was a violation of the Clean Water Act. The US District Court (2010) directed the U.S. Environmental Protection Agency (EPA) to develop a plan for compliance for runoff from the Everglades Agricultural Area (EAA). The EPA (2010) issued an Amended Determination identifying a protective discharge limit for phosphorus from the STAs and a comprehensive set of actions to meet this limit.</p>	<p>In June 2012, the State of Florida and the EPA reached a consensus on additional remedies needed for improving water quality in America’s Everglades—Restoration Strategies (RS). Included in the RS are a Water-Quality-Based Effluent Limit for STA discharges, to be enforced by permits that, if achieved, will ensure that park waters meet the 10 parts per billion (ppb) target; the construction of six projects by the South Florida Water Management District (SFWMD) that will create more than 6,500 acres of new STAs and 116,000 acre-ft of additional water storage in Flow Equalization Basins (FEBs); and development of science plan to ensure continued research and monitoring of water quality treatment technologies. The FEBs are upstream water storage features intended to provide a more steady flow of water to the STAs downstream, helping to maintain desired water levels and flows needed to achieve optimal water quality treatment performance. It is possible that the FEBs also will have some TP removal ability within their footprints.</p> <p>In order for CEPP to be implemented, an additional FEB (A-2) upstream of the park is needed to ensure that additional future inflows to the park meet the water quality targets.</p>	<p>Construction of the State’s Restoration Strategies projects was scheduled to be completed by 2025; however, several of the projects may be completed ahead of schedule. The component of these remedies that affects park water quality most directly—a 60,000 acre-ft FEB (A-1)—was constructed in 2015. In addition, the L-8 FEB (45,000 acres), the L-8 Divide Structure and S-5AS Modifications are expected to be complete by 2016; the S-375 Expansion is expected to be complete by 2017, and the STA-1 West expansion (6,500 acres) by 2018.</p> <p>In order for CEPP to redirect water flows from Lake Okeechobee back to the Everglades, an additional 14,000-acre FEB (A-2) is needed. The new storage reservoir is located within the Everglades Agricultural Area (EAA), upstream of ENP. This new reservoir will retain wet season inflows, then release this water to the adjacent STAs, to ensure that the additional flows from Lake Okeechobee (new source) and EAA runoff meet the water quality targets before these flows are discharged into the Everglades, including the park. Construction is expected to be complete by 2030.</p>

**Threat 4: Impacts to the Protection and Management of Florida Bay (Reduced Freshwater Inflows and Increased Nutrient Loadings).**

Corrective Measure (Established 2006)	Status of Corrective Measure 2013	Status of Corrective Measure 2016
<p><b>Park Need:</b> Increasing natural freshwater flows from NESRS and Taylor Slough into the downstream estuaries will contribute to healthier and more diverse seagrass communities and increase fish and invertebrate productivity in Florida Bay.</p>		
<p>4A: Complete construction of the C-111 Detention Area features from the 8.5 Square Mile Area to the Frog Pond and implement CSOP operations.</p> <p>Implementing rainfall-driven pumping operations based on marsh water levels as envisioned in CSOP will reduce the likelihood of pumping nutrient enriched groundwater into ENP marshes.</p>	<p>4A: The C-111 North Detention area is still not complete; it is scheduled for completion in 2017.</p> <p>The CSOP and the COP plans have been eliminated from the MWD project, and future water control plans will be developed at the conclusion of the water operations field test described in 1B. Changes to water operations are likely to move forward very slowly and in small increments, with substantial change occurring only when raising and bridging the Tamiami Trail is complete as envisioned in the CEPP and TTNS projects (more than a decade).</p> <p>Rainfall-based pumping operations will be encouraged in the water control plan for ENP.</p>	<p>4A: The C-111 North Detention area is planned for completion in mid- 2017.</p> <p>Water deliveries to NESRS and TS will be improved via the incremental field tests and implementation of the water control plan (Combined Operational Plan- COP) for the MWD and C-111 South Dade projects, associated with Corrective Measure 1B. The COP modeling and environmental assessments will inform us as to the potential benefits these projects will have on freshwater flows to Florida Bay. The seepage management issues identified above will need to be addressed.</p> <p>During this reporting period, Florida Bay experienced a large-scale die-off of seagrass, and a significant algal bloom, both of which move the bay away from the Desired State of Conservation. The unusual weather conditions that we experienced, combined with lack of sufficient freshwater flow, are linked to these ecological events.</p> <p>The State effort focused on flood protection in the agricultural areas southeast of the park directly affects the water flow into Taylor Slough, and to Northeast Florida Bay. We are monitoring these operations closely to determine their effects and incorporate the information into the upcoming water control plan (COP).</p> <p>Substantial improvements in freshwater flows to Florida Bay required to fully achieve the desired state of conservation will occur only when the CEPP and TTNS projects are complete (10-15 years from now.) Therefore, our strategy is to push for maximizing ENP benefits via the MWD and C-111 projects, while remaining fully engaged in the longer-term restoration initiatives.</p>
<p>4B: Complete the C-111 Spreader Canal and revised water management operations to include rainfall-driven operations.</p>	<p>4B: Phase 1 Western Project of the C-111 Spreader Canal project was completed in spring of 2012 and began operating in June 2012. The effects of this project on adjacent park wetlands and on Florida Bay are being monitored and will be evaluated after 3 years of monitoring (2015). Initial signals are positive. Rainfall-driven operational controls have not yet been implemented but will be incorporated into future water control plans.</p> <p>The remaining phases of the C-111 Spreader Canal project are not currently scheduled.</p>	<p>4B: The SFWMD has not released a report evaluating the first three years of operation of the C-111SC Western Project Phase I. Release date is currently unknown.</p> <p>The remaining phases of the C-111 Spreader Canal project are not currently scheduled.</p>

