National Park Service
U.S. Department of the Interior

Big Cypress National Preserve
Florida

HYDROLOGIC RESTORATION MANAGEMENT PLAN ENVIRONMENTAL ASSESSMENT (EA)

October 2021

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Purpose and Need for Action

CHAPTER 1: PURPOSE AND NEED FOR ACTION

This chapter describes the purpose and need for hydrologic restoration at the Big Cypress National Preserve (Preserve), as well as background information on the Preserve and a summary of the Environmental Assessment (EA) process.

1.1 INTRODUCTION

This EA evaluates the potential environmental impacts of the Hydrologic Restoration Management Plan (Plan) at the Preserve under the jurisdiction of the National Park Service (NPS), U.S. Department of the Interior. This EA has been prepared in accordance with the National Environmental Policy Act (42 U.S. Code § 4321) (NEPA) and implementing regulations (40 Code of Federal Regulations [CFR] 1500-1508), and U.S. Department of the Interior regulations.

The Preserve comprises 729,000 acres in south Florida in Collier, Miami-Dade, and Monroe Counties (**Figure 1-1**). Drainage works within and adjacent to the swamp ecosystems have severely impacted hydrologic conditions within the Preserve. Hydrologic impacts to the Preserve include alteration of upstream inflows from the north; alteration of downstream deliveries to the Everglades, Fakahatchee Strand, and coastal estuaries; alteration to the swamp's characteristic sheet flow surface-water flooding regime, including impoundment and blockage of water during high-water events; reductions in surface water duration and soil moisture during the winter dry season; and a general depletion of surface and shallow groundwaters throughout the entire year.

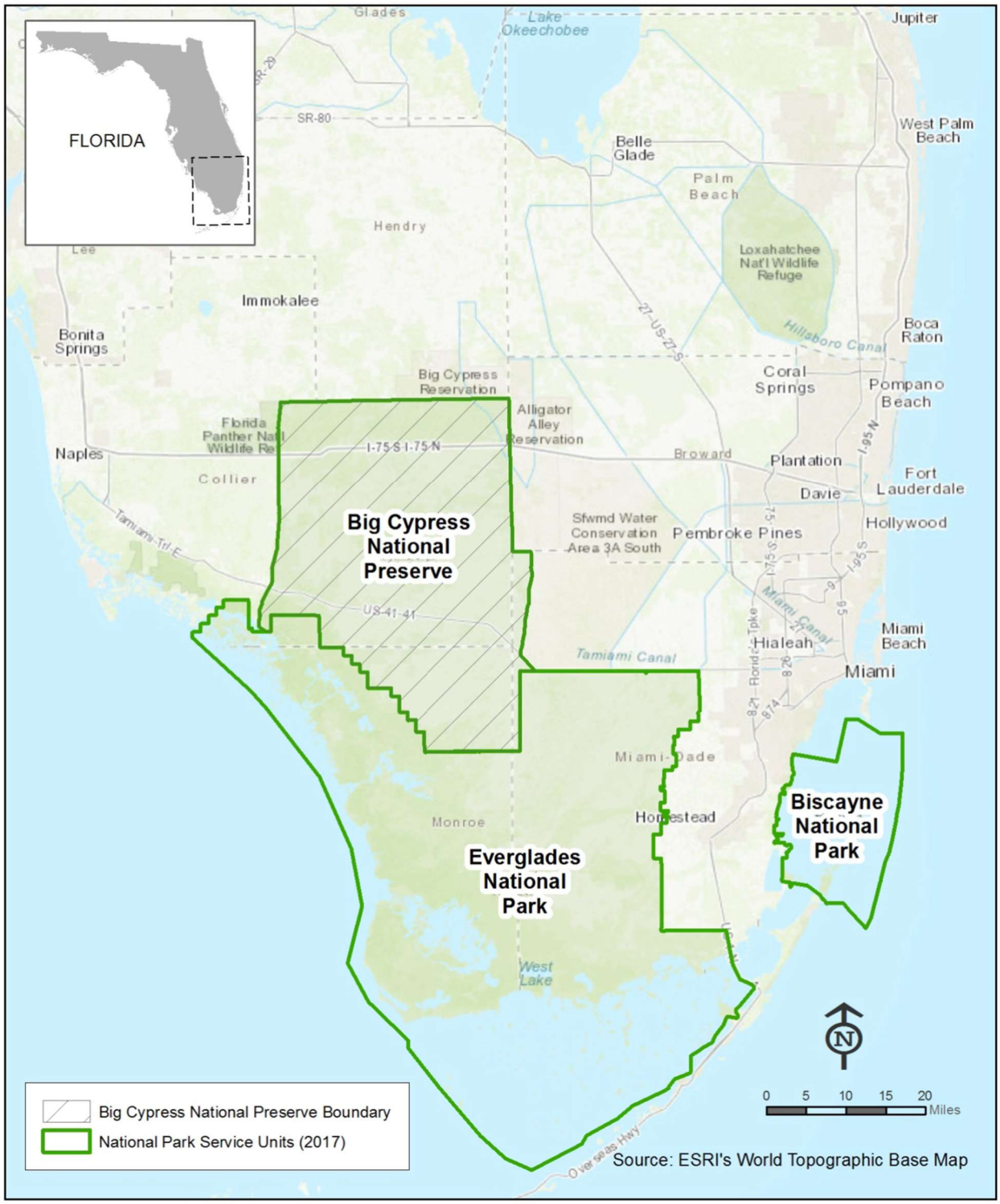


Figure 1-1: Location Map

1.2 PURPOSE AND NEED

The purpose of the Plan is to provide an overall framework for making drainage infrastructure in the Preserve "sheet flow neutral," allowing the natural topography – not canals or levees – to dictate natural water flow. Replumbing existing infrastructure to become sheet flow neutral would help to revitalize the natural hydrologic processes within the swamp preserve and downstream delivery points, while also enhancing visitor experience. Specific purpose statements include:

- Identify, repair, and modify the aged water management infrastructure system to facilitate hydrologic restoration.
- Restore the distribution, duration, and timing of surface water in the Preserve.
- Maintain the hydrologic integrity of natural firebreaks such as domes, strands, and marshes, especially during the spring when the swamp ecosystem is most vulnerable to large wildfires.
- Improve vital freshwater delivery downstream to wetlands and estuaries in the Everglades ecosystem.
- Reduce the severity and duration of ecosystem-damaging drought, flooding, and fire.
- Decrease the Preserve's vulnerability to saltwater intrusion.
- Provide additional educational and outreach opportunities regarding the role of water in the Preserve.
- Improve the Preserve's ability to work with stakeholders on hydrologic restoration projects, including Everglades Restoration initiatives.

Water is vital to the ecological function and public enjoyment of the Preserve. Its natural hydrologic regime has been negatively impacted by drainage infrastructure inside and adjacent to the Preserve. The Plan is needed to provide a framework for managers to use to update an outdated and aging water management infrastructure that negatively impacts the hydrology of the swamp ecosystem.

1.3 SCOPE AND CONTENTS OF THE EA

The EA conceptually evaluates the potential impacts from implementing the no action and action alternatives. The scope of this EA (i.e., the range of topics considered in the impact analysis) was determined based on previously prepared documents related to the Preserve (see Section 1.4) and currently available information regarding environmental conditions within and near the Preserve.

Impacts on the following resources were evaluated: water resources (i.e., hydrology and water quantity, and groundwater), wildlife and protected species, soils, vegetation and invasive species, visitor use and experience, and ethnographic resources and cultural landscapes. **Appendix B** outlines impact topics dismissed from detailed analysis.

1.4 RELATED RESTORATION PLANS AND REPORTS

The following completed and ongoing studies are relevant to the purpose of the Plan:

- *The Pre-Drainage Big Cypress, A Proposed Hypothesis and Paradigm Shift (Draft)* (NPS 2019a): At the time of its formation in 1974, the Preserve was understood to form a self-contained and separate watershed (Klein et al. 1970; U.S. Senate 1973/1974). In recent years, this view has given way to a growing appreciation that the Preserve is hydrologically interconnected to

adjacent watersheds, that inputs across these watersheds have changed over time, and that canals and levees internal to the Preserve continue to alter its natural hydrologic regime. Relevance to our plan: Hydrologic restoration is a vital component of maintaining and improving the ecological health of the Preserve.

- *Western Everglades Restoration Plan (WERP)* (USACE 2020): WERP began in 2016 as a component of the 1999 Comprehensive Everglades Restoration Plan, most closely resembling the L-28 Modification Project, but expanded in size to include the L-28 (i.e., L-28 Tieback and L-28 South) that ties into the Tamiami Trail to the south and the C-139 and C-139 Annex Basins with tie-ins to the Caloosahatchee and Lake Okeechobee to the north. WERP geographically covers the eastern half of the Preserve's area and will be considering a broad range of hydrologic restoration actions in that area. Relevance to our plan: A goal of WERP is to reestablish sheet flow into the Preserve and other natural areas within the WERP footprint.
- *Ochopee Sheet Flow Restoration Pilot Project* (NPS 2015a; 2019b): From 2015 to 2021, a series of relatively simple hydrologic fixes were implemented along Birdon, Upper Wagonwheel, and Turner River Road to reduce the blockage and over-drainage of water caused by the road and canal network. Relevance to our plan: The project helped inform and provided a demonstration area for concepts and project types in the plan.
- *Prelude to a Water Plan: Laying the Foundation for Moving Ahead (Draft)* (NPS 2019c): This report provides a brief history and overview of water management in the Preserve. Relevance to our plan: The report provides background information that was used in the planning process.

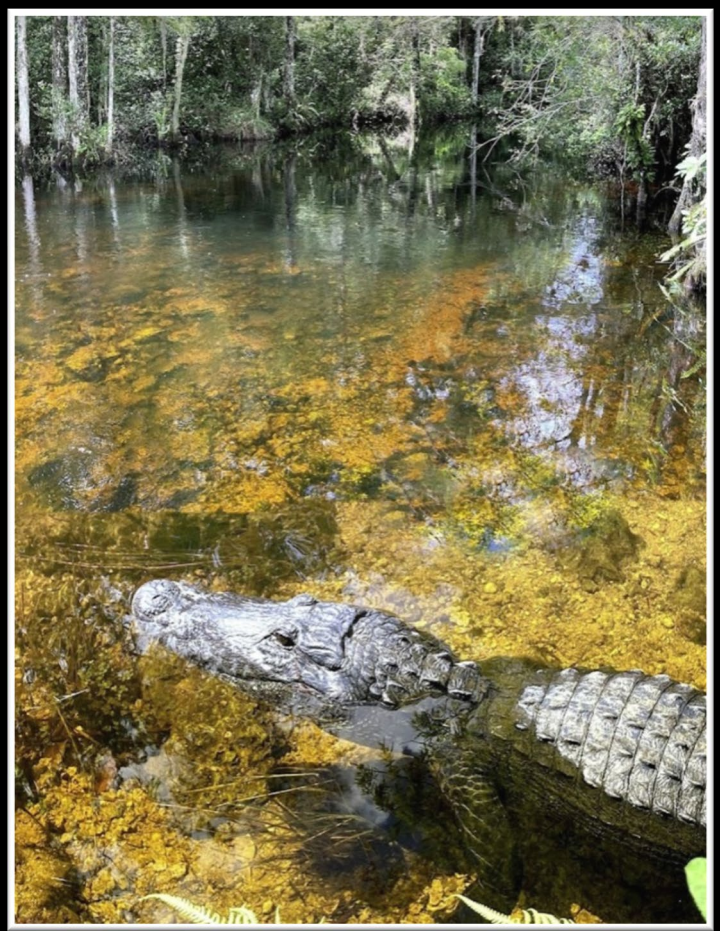
1.5 ORGANIZATION OF THE DRAFT EA

This EA consists of the following sections:

- Executive Summary
- Chapter 1 (Purpose and Need) presents information on the purpose and need for the Plan, as well as background information on the Preserve and a summary of the EA process.
- Chapter 2 (Alternatives) provides a description of the alternatives analyzed in the EA. Alternatives consist of a no action alternative and two action alternatives, including a preferred alternative.
- Chapter 3 (Affected Environment) describes the characteristics of the various environmental resources that could be affected as a result of implementation of the alternatives.
- Chapter 4 (Environmental Consequences) describes both short-term and long-term environmental impacts of the alternatives on baseline conditions that are both beneficial and adverse.
- Chapter 5 (Consultation and Coordination) summarizes the consultations undertaken in the preparation and review of the EA, including the scoping process; public involvement; and agency, local government, and tribal coordination.

Chapter 2

Alternatives



CHAPTER 2: ALTERNATIVES

This chapter describes the alternatives, consisting of a no action alternative and two action alternatives, including a preferred alternative. The no action alternative is required by NEPA and serves as a baseline for comparison. The preferred alternative is the NPS management preference for implementation.

2.1 HOW THE ALTERNATIVES WERE DEVELOPED

In accordance with NEPA, the NPS is required to examine a range of alternatives when preparing an EA. Reasonable alternatives developed for analysis are those alternatives that are technically and economically feasible and meet the purpose and need for action as required by 40 CFR 1501.5(c)(2) and 1508.1(z).

Hydrologic restoration projects at the Preserve were evaluated by complexity and feasibility using a three-tiered ranking system, in which Tier 1 projects would be the simplest and most feasible; Tier 2 projects would be more complex, but still within the Preserve's jurisdiction; and Tier 3 projects would be the most complex, falling outside the Preserve's jurisdiction and boundary. Action alternatives were developed to modify hydrologic disruptions through implementation of Tier 1 and Tier 2 projects, whereas Tier 3 projects were determined to fall outside the scope of this plan.

Tier 1 projects focus primarily on land-development-centric disruptions associated with historical logging, farming, and residential and commercial developments. These projects are contained entirely within and managed by the Preserve, without assistance from outside state or Federal agencies. **Table 2-1** includes examples of Tier 1 projects. These are straightforward projects that are likely to be implemented, with funding mechanisms that are feasible, and infrastructure that the Preserve can address without assistance from outside agencies.

Tier 2 projects focus primarily on transportation-centric disruptions, such as the more than 100 miles of paved and gravel (limestone) roads located within and adjacent to the Preserve. These roads were elevated above natural grade using a cut and fill construction technique, which formed elevated driving surfaces and adjacent canals. The elevated roadbeds form barriers and the canals create diversionary channels to the swamp's shallow surface water and groundwater regime. The projects would include waterways that may involve an additional jurisdiction, such as a county or state road easement, but are not tied to regional and multi-use water management infrastructure and schemes that extend outside the Preserve. **Table 2-2** includes examples of Tier 2 projects.

Tier 3 includes projects that fall outside of the jurisdiction of the Preserve and have a multi-water use function beyond the Preserve's mission. While these projects may provide the biggest benefit and rank highest in terms of priority for the Preserve, because they lie outside the Preserve's jurisdiction and involve many stakeholders and serve multi-use water management goals, these projects would need to be considered separately and independent of this plan. Many of these projects would be planned, evaluated, and implemented external to the Preserve's control and would range in cost from tens to hundreds of millions of dollars. The projects include upstream flood control, water quality treatment, and active water management components (i.e., pumps, regulation schedules, gates) that fall outside the scope of this plan.

The action alternatives include a programmatic toolbox for Tier 1 and Tier 2 type sheet flow restoration projects, including a listing of sample projects in each Tier. Programmatic refers to similar projects that are not yet specifically identified, but for which similar restoration methods would be applied to achieve restoration goals. Other similar projects that fit the Tier 1 and Tier 2

descriptions above could also be addressed under this programmatic approach. These projects, including bridging, would receive additional site-specific review and consultation as needed in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended; Section 7 of the Endangered Species Act; Section 404 of the Clean Water Act and Florida's Water Resources Act; and other environmental laws and required consultations, prior to land disturbance.

2.2 ALTERNATIVES CONSIDERED BUT DISMISSED FROM DETAILED ANALYSIS

The following sections briefly describe the alternatives that were considered but have been eliminated from detailed analysis. The reasons for their elimination from further analysis are also summarized.

2.2.1 TIER 3

Tier 3 projects were dismissed from consideration. These are complex projects that typically occur at the boundary and extend upstream of the Preserve; serve multiple jurisdictions and multidisciplinary water uses; and involve greater complexity of design, including active water management components, introduction of new water from outside the Preserve, or a need to improve water quality; and therefore fall outside the scope of this plan. Projects involving active water management tools were also dismissed from consideration, because such tools are not needed to meet the purpose and need of the plan and are typically used in complex water-engineering projects that involve multiple jurisdictions and agencies. Active water management projects include construction of stormwater treatment area pumps, above-ground reservoirs, adjustable water release gates, and combinations thereof that require operational control after they are installed. Additional active management tools include herbicidal applications to control vegetation, dredging of existing canals and ditches, injection and recovery of surface water into the ground for future use, and injection of low-permeability substances at road areas to decrease permeability and groundwater leakage (referred to as a slurry wall). Relevant projects that use these tools are already ongoing or are planned and are addressed in the affected environment section of this EA.

2.2.2 REMOVAL OF ALL BARRIERS

The design concept of maximizing removal of roads, canals, levees (i.e., remove the barriers for maximum restoration; elevate roads and level everything else) was dismissed from consideration. This alternative would not meet the purpose and need of the plan, as it would negatively impact regional transportation, private property access, and visitation in the Preserve. While bridging in limited areas to maximize hydrologic benefit is possible, bridging throughout the Preserve would be infeasible. Those projects that address bridging in larger areas are outside NPS's jurisdiction and the scope of this plan.

2.3 ALTERNATIVE A: NO ACTION

Under the no action alternative, the Preserve would continue to manage water by maintaining existing infrastructure and modifying it on an ad hoc basis with opportunistic planning and management as funding permits. Projects would be adopted without the benefit of a holistic planning process focused on Preserve-wide restoration needs. Historically, this has resulted in one to two small-scale restoration projects per decade, with a slight uptick in the last five years as the Preserve undertook the Ochopee Sheet Flow Restoration pilot project. Under the no action alternative, the Preserve would continue to rely heavily on external county, state, and Federal

agencies to perform hydrologic restoration on levees, canals, and bridges within and adjacent to the Preserve, and the number of projects would be limited.

2.4 ALTERNATIVE B – PROPOSED ACTION

Alternative B, the proposed action, includes two tiers of projects, Tier 1 and Tier 2, as described above. It proposes to modify the existing canal and levee system using passive water management techniques. Passive water management involves simple actions that, once installed, do not require additional inputs or operational control, and with the exception of routine maintenance, they can operate by themselves. A typical passive water management action for an elevated roadbed would be to add culverts to enhance sheet flow. A typical passive water management action for a canal would be to fill it in, or portions of it, back to wetland grade.

The goal of the passive water management approach is to lessen the effect that elevated and excavated features have on the swamp's natural hydrologic regime. During the summer wet season, the goal is to make the elevated and excavated features become more "sheet flow neutral." Sheet flow neutral is a state whereby an elevated or excavated feature is as invisible as possible to the regional and natural movement of surface water across the swamp. During the winter dry half of the year, the goal is to stop the slow leakage of water out of the swamp. The passive water management features would help against both unnaturally high stands of water and unnaturally low drops in the water table. In sum, these actions would help the natural landscape, as opposed to the artificial elevated and excavated features, dictate the flow of the water.

Given the large size of the Preserve and the fact that work is generally limited to a relatively short dry-season window, projects would be prioritized to address specific geographic regions, divided into watersheds and subdivided into catchments and drainages. Focusing on specific geographic areas also allows for better evaluation and demonstration of effects.

Within the Central Pinelands watershed, sub-areas of focus would include Halfway Creek/Headquarters, Turner River Headwaters, Deep Lake Strand, Monroe Strand, and the Tamiami Trail drainages; within Okaloacoochee Slough watershed, focus sub-areas include hydrologic impediments within the East Hinson Marsh (Perocci Grade) and Little Marsh (Bundschu Grade) drainages; within Mullet Slough watershed, focus sub-areas include hydrologic impediments within the Kissimmee Billy Strand, Cowbell Strand, and California Slough drainages; and within the Everglades portion of the Preserve, focus areas include hydrologic impediments within the Lostman's Slough and Dayhoff Strand drainage. Figure 3-3a depicts the locations of discussed water features.

Restoration in lower priority areas may occur prior to those in higher priority areas due to availability of funds or sequencing with other NPS projects and priorities. Restoration in higher priority areas may occur later than expected due to complexity of design, funding, or other factors. Implementation may be performed in stages in an area. Installation of a single canal plug or culvert in one area may be followed up in subsequent years with additional culverting or plugging based on some combination of monitoring, availability of funding, or other opportunities.

Restoration efforts would not apply to some hydrologic disruptions that are currently active in the Preserve and addressed under separate permitting authorities, such as oil and gas operations and private property rights. If restoration efforts were needed in these areas, they would be located, where possible, to avoid adverse effects to private property, roadways, historic and archeological resources, sensitive resource areas, and other improved areas.

Factors that would influence sequencing include:

- Expediting the list of highest priority projects and areas where and when possible
  - Maximizing attention to projects with highest ecosystem benefits
  - Opportunistically implementing projects in areas where other work is being performed (e.g., trail maintenance, exotic plant removal, cyclic culvert or plug maintenance, infrastructure projects, visitor use sites)
  - Targeting projects that rank highly with external funding sources (e.g., coastal wetland grants, saltwater intrusion grants)
  - Opportunistically recommending hydrologic restoration features in situations where right of way entities or other jurisdictional authorities perform an infrastructure project in the Preserve (e.g., bridge replacement, road repaving, road regrading)
  - Potentially avoiding areas we know will be included in other external large projects

2.4.1 TOOLS (TIER 1 AND TIER 2 PROJECTS)

Tier 1 and Tier 2 projects are primarily addressed using passive water management tools. Except for routine maintenance, passive water management tools do not require additional inputs or operational control; they can operate by themselves. These include:

- Plugging Canals and Ditches – plug can comprise various materials, including concrete, earthen, and/or sheet piling of various dimensions.
- Filling in Canals and Ditches – returning a previously excavated channel to natural grade. Materials would consist of fill. Preferentially, the fill is taken from nearby sources when feasible.
- Culverting Roadbeds – installation of conveyance points under a roadbed using a variety of culvert types (e.g., box, round, elliptical).
- Breaching Impounding Structures such as Roads, Levees, Trams, and Berms – removal of fill to create conveyance points.
- Fill Removal – removal of elevated fill pads to match adjacent grades.
- Vegetation Management – manipulating vegetation to restore managed flows.
- Maintenance activities to maintain plugs, culverts, and breaches.
- In some areas, restoration work could include minor bridging or elevated boardwalks to maintain sheet flow and prevent erosion, as well as provide visitor access and educational opportunities.

<u>Disruptions caused by land development (Tier 1 and Programmatic)</u>

For hydrologic disruptions caused by land development, the primary approaches for addressing impacts would range from complete removal, to modification, to not touching the feature. Each of these developed features is contained on NPS-owned land; however, the prescription would change depending on each situation.

Where features are determined to affect the hydrology, the goal would be to return them to wetland grade of the surrounding landscape. Some features have historic or continued NPS uses and values, for example logging trams that offer historic and hiking values that could be culverted versus removed.

Many of the areas that were farmed have returned to native vegetation – and therefore require no action; however, in some instances they have not, and abandoned farm fields with furrows, dikes, ditches, and swales remain. These areas may benefit by upstream hydrologic restoration efforts in instances where water flow is being blocked or diverted away (e.g., surrounding Ochopee Post Office).

Proposed tools address elevated and excavated disruptions. Levees, berms, and fill pads are examples of elevated disruptions. Canals, ditches, and borrow pits are examples of excavated disruptions. Tool specifics include:

- In every case, the goal is to return the impediment or a portion of the impediment to wetland grade to minimize or eliminate the impact on the natural hydrologic regime.
- For elevated disruptions, this would require adding conveyance (i.e., culvert installation), partial removal of material (breeching) to allow conveyance, or full removal to wetland grade.
    - The elevated feature would first have vegetation removed, usually with an excavator, hydro-ax, or articulated mower.
    - Fill would be removed to re-establish natural wetland grade using an excavator.
    - Fill would be returned to an adjacent canal or ditch, or where an adjacent canal or ditch is not present, would be taken off-site to a staging area for future use in a restoration project.
    - In instances where there is an elevated feature that provides important upland habitat, the entire feature or a portion of the feature may be retained.
- For excavated disruptions, this would require filling in the impediment to bring it to wetland grade.
    - The excavated feature would be raised to natural grade using earthen fill or concrete plugs. However, the envisioned primary methodology would use a bulldozer and earthen fill. In certain situations, sheet-piling and concrete weirs or other methods to obstruct channelized flow may also be employed.
    - The excavated feature may be completely or partially filled in depending on a variety of factors. In instances where there is an excavated feature that does not convey flow, such as a borrow pit, this excavation feature may be retained to serve as a low-water refugia pool where deemed appropriate, and may be modified in a way to maximize its environmental function, such as partially filling it in to establish a littoral shelf for fish habitat. However, another reason for not filling in a borrow pit is that unlike a canal or ditch, it does not tend to divert water away. Thus, it is better to retain recovered fill for use in canals and ditches.
- Elevated and excavated disruptions are commonly found together. In these cases, it might create an opportunity to return the elevated feature and excavated feature to wetland grade in unison. In some instances, it may prove beneficial to retain portions of either the excavated or elevated feature. For example, borrow pits provide valuable low-water refugia for alligators and other creatures during drought, ditches may provide a useful feature for directing culvert flow into the wetland interior, and elevated features may prevent over-drainage into a canal or provide habitat.

Transportation-centric disruptions (Tier 2 and Programmatic)

The primary tool (i.e., design concept) for the transportation-centric hydrologic disruptions is the culvert/plug pair. In the same way the roadbed and adjacent canal function together to alter flows, strategic installation of culverts and plugs near one another can improve the performance of both the culvert and the plug, and together deliver the best hydrologic outcome at the lowest cost.

Culverts and plugs work best in tandem. A plug by itself (without an upstream culvert) is unable to deliver water to the other side of the road and is prone to erosion over time, and a culvert by itself tends to flow under capacity because of the greater drainage capacity of the canal absent a plug.

There is no perfect place to add a culvert/plug pair to completely fix the hydrologic changes caused by a road and canal corridor. In general, culvert/plug pairs work better where culverts are located in lower lying habitats such as cypress or marsh and the plugs are located just down-gradient from the culvert in areas where the canal cuts through a higher elevation landscape feature such as pinelands or prairie (**Figure 2-1**).

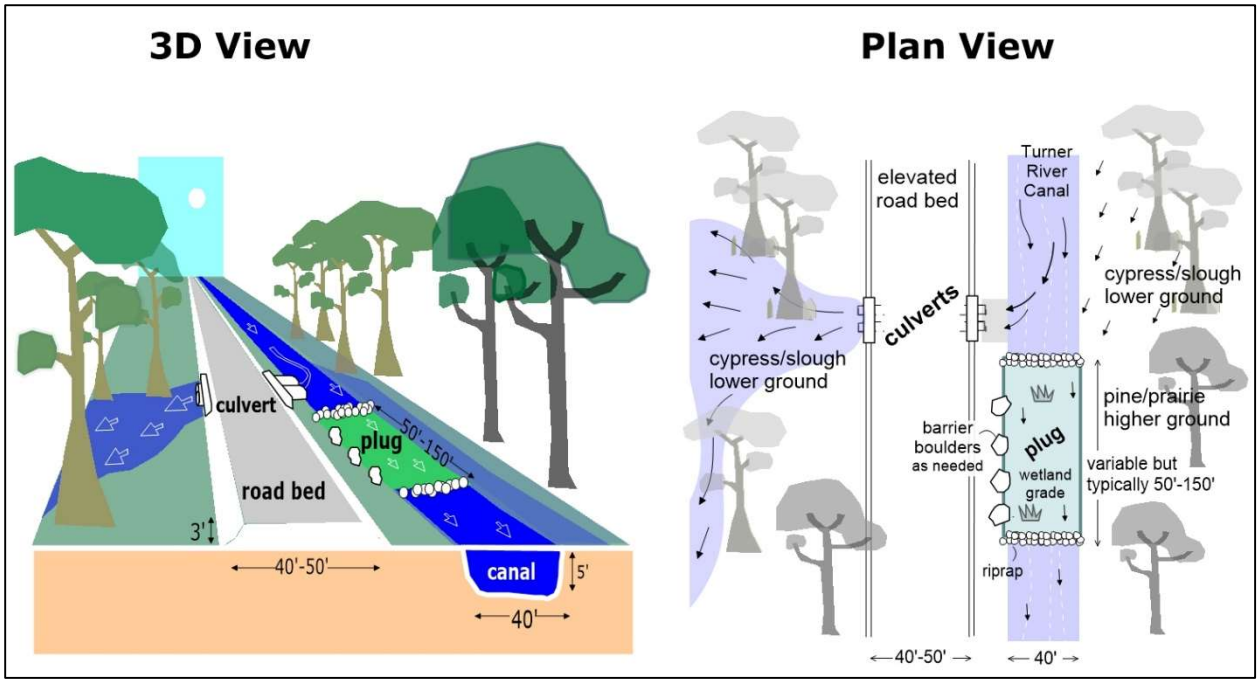


Figure 2-1: 3D and Plan Views of a Typical Culvert/Plug Pair

Priority areas for culvert/plug pairs include pre-existing plugs where there is not an upstream culvert, pre-existing culverts or bridges where there is no downstream plug, long stretches of road and canal where neither plugs nor culverts exist, natural flow-ways (such as marshes or cypress) where culverts are not present or are under capacity, and natural catchment boundaries (such as a pineland or hammock) that are severed by a canal and where canal plugs do not exist.

2.4.2 POTENTIAL PROJECT EXAMPLES

Tier 1 examples of proposed projects

Examples of Tier 1 projects are identified in **Table 2-1**. Potential Tier 1 project areas are depicted on **Figure 2-2**.

Table 2-1: Examples of Tier 1 Proposed Projects

Project Name	Major Corridor	Existing Issue	Proposed Solution	Benefits		
				Saltwater Intrusion	Wet Season Sheetflow	Dry Season Water Table
Deep Lake Ditch	State Road (SR) 29	An open channel connects Deep Lake to the SR 29 Canal	Completely fill or plug ditch	---	---	Yes
Diagonal Canal Infilling	Birdon Road	The canal accelerates drainage of water out of the Preserve to tide	Completely fill in or plug the canal	Yes	Yes	Yes
Loop Canal Plugs	Loop Road	The 24-mile canal is almost entirely unplugged along its entire length	Add more/better plugs in canal	---	---	Yes
Halfway Creek Canal Replumb	Halfway Creek Canal	The canal accelerates drainage of water out of the Preserve to tide and exacerbates saltwater intrusion	Plug the canal at one or multiple locations	Yes	Yes	Yes
Crooked Culvert Canal Replumb	Loop Road	Crooked Culvert Canal accelerates drainage of water south	Add a series of plugs or completely infill the canal	---	Yes	Yes
Littoral Shelf Enhancement	Preserve	Vertical walls of borrow ponds usually lack banks	Modification of perimeter of borrow pit to create a seasonally flooded wetland			
Disturbed Lands Removal	Preserve	There is a variety of disturbed lands (e.g., fill pads, agricultural fields, ditches, berms) in the Preserve	Wetland reclamation of disturbed sites	---	Yes	---
Elevated Trail Removal/Modification	Preserve	There are several elevated trails that alter water flow in the Preserve	Removal or periodic breaching of trams	---	Yes	---

Tier 2 examples of proposed projects

Examples of Tier 2 projects (**Table 2-2**) include waterways that may involve an additional jurisdiction, such as a county or state road easement, but are not tied to a multi-water use goal (e.g., upstream drainage). Potential Tier 2 project areas are depicted on **Figure 2-2**.

Table 2-2: Examples of Tier 2 Proposed Projects

Project Name	Major Corridor	Existing Issue	Proposed Solution	Benefits		
				Saltwater Intrusion	Wet Season Sheetflow	Dry Season Water Table
Lower Wagonwheel Replumb	Lower Wagonwheel Road	The canal drains directly into SR 29 canal, thus causing a loss of water out of the Preserve	Add more/ better plugs in canal	---	Yes	Yes
Birdon Replumb	Birdon Road	The canal accelerates drainage of water out of the Preserve to tide	Increase conveyance under road and add more/ better plugs in canal	Yes	Yes	Yes
Monroe Prairie Plugs	Loop Road	Loop Canal accelerates drainage of surface water and groundwater out of Monroe Prairie	Add a series of plugs in prairie (adjacent reach of canal)	---	---	Yes
Turner River Headwaters Replumb	Turner River Road	The canal and roadbed divert and restrict water flow to the headwaters of the Turner River	Increase conveyance under road and add more/ better plugs in canal	---	Yes	Yes
Deep Lake Strand Headwaters	Turner River Road	The canal and roadbed restrict entry of surface water into Deep Lake Strand	Increase conveyance under road and add more/ better plugs in canal	---	Yes	Yes
Upper Wagonwheel Replumb	Upper Wagonwheel Road	The road is under-culverted, causing pooling to the north and restriction of flow to the south	Increase conveyance under road and add more/ better plugs in canal	---	Yes	Yes
11 Mile Road Culverts	11 Mile Road	Inadequate culverting along the southern end of the road causes water to pool to the east	Increase conveyance under road	---	Yes	---
Tamiami Canal Plugs	US41	The canal is unplugged for most of its 35-mile length	Add plugs in canal to minimize east-to-west movement of water	---	Yes	Yes
Deep Lake Prairie Replumb	Turner River Road	Border canals on east and west drain groundwater and surface water from prairie	Add a series of plugs and culverts	---	---	Yes

Project Name	Major Corridor	Existing Issue	Proposed Solution	Benefits		
				Saltwater Intrusion	Wet Season Sheetflow	Dry Season Water Table
Tamiami Trail Culverts Project	US41	Tamiami Trail is a barrier to sheet flow	Installation of 33, 3-foot diameter culverts and 11 earthen canal plugs as designed by the USACE report	---	Yes	Yes
Alligator Alley Plugs (add or improve current plug network; not adding bridges, etc.)	I-75	Alligator Alley Canal is directly connected to SR 29 and Turner River Road Canals in a way that negatively impacts Preserve waters	Add/improve plugs network	---	Yes	Yes

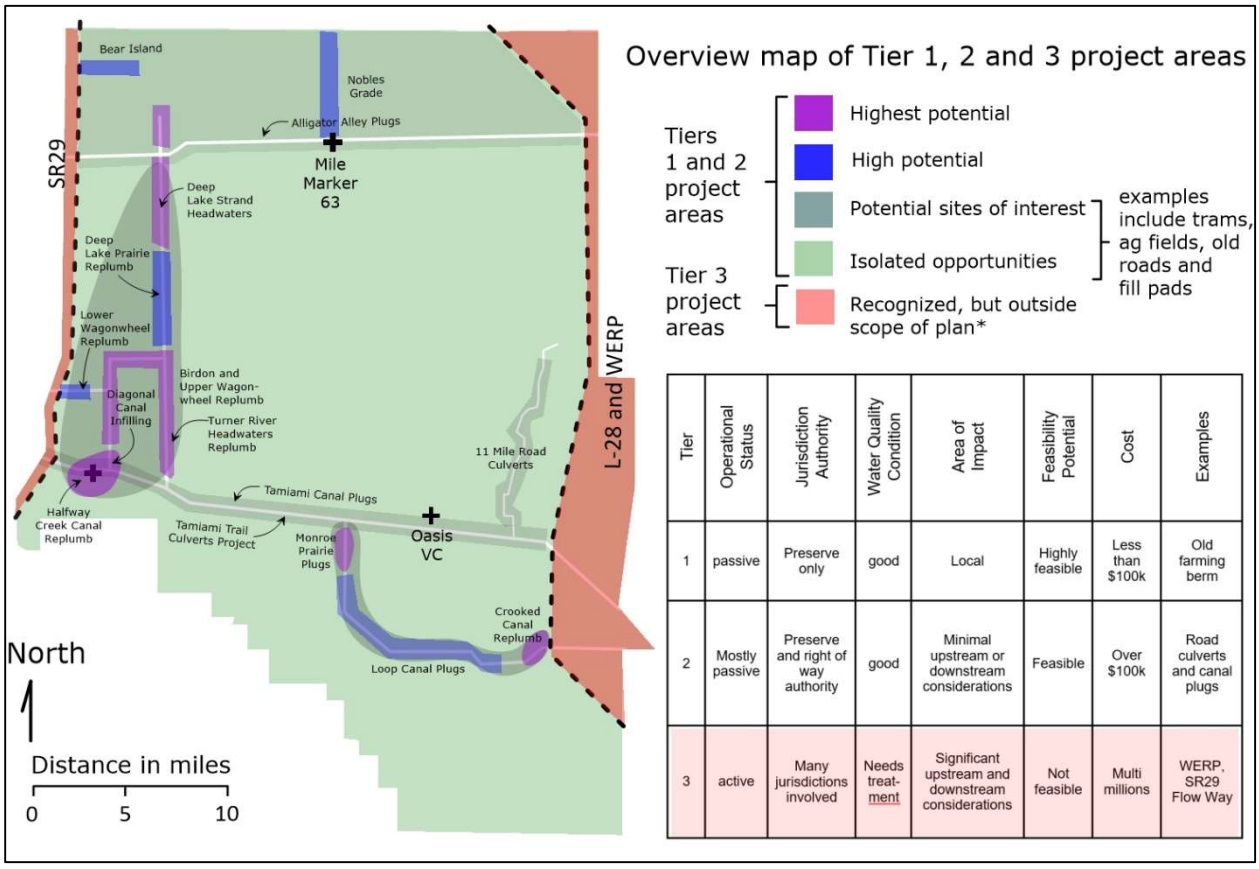


Figure 2-2: Overview Map of Tier 1, Tier 2, and Tier 3 Project Areas

2.5 ALTERNATIVE C - PREFERRED ALTERNATIVE

Alternative C, the NPS preferred alternative, includes the elements of Alternative B, plus additional Tier 2 Site-specific projects including limited strategic road removal and bridge addition at major flow-ways that are intersected by limerock roads.

2.5.1 TOOLS

Alternative C employs the primary tools for land development-centric hydrologic disruptions and transportation-centric hydrologic disruptions as previously described under Alternative B (**see** Section 2.3.2). However, under Alternative C, bridging is also proposed as an additional tool for addressing transportation-centric hydrologic disruptions. Bridging is essentially an enlarged version of the plug/culvert pair, but it is structurally different from plugs and culverts due to the larger and longer spans. They also have different load-bearing requirements. Bridging is a larger structural construction operation; whereas a culvert/plug pair can be completed in approximately one month, bridges require a greater degree of engineering. A bridge's function in this instance is to convey sheet flow, not span a water body, so the bridge would be low to the ground but longer than a plug/culvert pair (100 to 1,000s of feet long), and generally wide enough to accommodate vehicle traffic. Bridging is generally more expensive than the plug/culvert pair, although it may be more effective at hydrologic restoration and may provide enhanced wildlife and scenic vista benefits. Along high-speed corridors, where possible, addition of new bridges or replacement of existing bridges may include features that enhance their functionality as wildlife under-crossings, including ledging on the underside endmembers of the bridge, co-location of earthen fill plugs in the adjacent canal, and other features as appropriate.

2.5.2 POTENTIAL PROJECT EXAMPLES

In addition to the projects addressed above in Alternative B, Alternative C includes installation of elevated structures over regularly flooded areas and/or waterbodies to maintain conveyance (i.e., bridging).

Bridging projects are proposed at the following locations:

- Turner River Road at Deep Lake Strand
- Turner River Road at Turner River Strand
- Turner River Bridge Concept at US41
- US41 at Turner River and HP Williams Wayside
- Wagonwheel Road at Deep Lake Strand
- Upper Wagonwheel Road at its approximate center point
- Birdon Road at the headwaters of Copeland Prairie
- Loop Road at Gator Hook Strand, Robert Lake Strand, Sweetwater Strand, and Dayoff Strand
- Perocchi Grade at East Hinson Marsh

2.6 MONITORING AND MITIGATION MEASURES

Measuring success would be achieved with a combination of photo points, observations, and direct measurements focused on the hydrologic connectivity principle.

- Success is achieved where ponding behind elevated features and channelized flow in excavated features is eliminated or reduced.
- Wherever water is flowing in a canal or water is backing up behind a levee, additional water conveyance or canal plugging should be considered.
- Opportunities may emerge to cluster monitoring schemes to look at success at a larger-than-local scale. This may include a range of monitoring and analysis approaches.

The following monitoring and mitigation measures and best management practices would be applied to avoid or minimize potential impacts from implementation of the action alternatives in this Plan.

2.6.1 GENERAL

Hydrologic restoration project areas would be properly maintained to avoid adverse impacts on aquatic environments or public safety. Although most of the restoration measures are passive in nature (e.g., adding culverts, adding earthen plugs to canals), routine inspection would be performed to confirm restoration measures are working as planned based on monitoring.

The NPS currently monitors hydrologic conditions using monitoring stations located throughout the Preserve. NPS is working to expand its hydrologic monitoring network and upgrade existing sites, which would provide great ability to comprehensively monitor hydrologic conditions. However, the size of the Preserve, the complexity of its hydro-ecological functions (i.e., the natural attributes and processes that water influences), natural variation of the water cycle, and the incremental sequencing of proposed fixes limit the applicability of large spatial models to measure success. Prior to site-specific project implementation, site-specific baseline data will be collected to measure restoration success, with the goal of reducing and/or eliminating ponding behind elevated features and channelized flow in excavated features.

2.6.2 WATER RESOURCES

Best management practices for water resources would be followed to make sure that effects from hydrologic restoration measures prevent short-term impacts during construction on water quality and wetland function. Work would generally be conducted during the dry season and may involve turbidity control barriers where needed for proper sediment stabilization so that it does not move off-site.

In each case, restoration measures identified in this plan are aimed at: (1) directly increasing wetland acreage through removal of elevated fill or infilling of artificial channels or (2) improving wetland function by improving the natural water regime (i.e., new culvert and canal plugs). Restoration measures may result in minor loss of wetland in some circumstances that would be quantified, but also shown to be offset by the environmental benefits of the project. For example, a new culvert may result in minor excavation of pools on the upstream and downstream side of a culvert to optimize its flow capacity and prevent it from getting clogged up over time. Wetland impacts would be compensated with mitigation to provide no net loss of wetland function.

2.6.3 WILDLIFE AND PROTECTED SPECIES

Water control structures and other hydrologic restoration activities would be sited to avoid sensitive wildlife habitats. Alternative B and the associated activities required to restore hydrology

and complete maintenance would be timed to avoid sensitive periods, such as nesting or breeding seasons.

Where possible it may be preferable to retain low-water spots when canals or other excavation features are filled in. This measure would provide low-water spring refugia habitat for alligators, fish, and other animals during spring droughts.

Where appropriate, some upland features may be retained to provide high-water refugia or other upland wildlife benefits. These upland habitats provide important refuge for marsh wildlife, allow upland wildlife to access the marsh for food and other resources, and further contribute to biological diversity and landscape complexity.

In consultation with the United States Fish and Wildlife Service (USFWS) and Florida Fish and Wildlife Conservation Commission (FWC), and in accordance with their guidelines, recommendations, and issued project permit conditions, appropriate mitigation measures would be taken to protect special status species whether identified through surveys or presumed to occur in areas that contain suitable habitat characteristics. Consultation would be initiated during project design and permitting for individual projects.

2.6.4 SOILS

Heavy equipment would be used in almost every hydrologic restoration project. Whether it is adding culverts under a road, removing elevated fill to restore an area to natural wetland grade, or filling in a section of canal to help prevent over-drainage of adjacent wetlands –restoration actions require the use of heavy equipment such as brush mowers, bulldozers, front-end loaders, excavators, and dump trucks. Heavy equipment would be used in such a way as to avoid or minimize impact to adjacent wetlands (see Section 2.6.2). In each instance, impacts caused by heavy equipment would be minimized through preventative measures, and the area restored to natural wetland grade. Severity and areal extent of disturbed (compacted, churned, rutted, or displaced) soil by heavy equipment would be minimized by the following actions: identifying risks, planning and scheduling operations, selecting appropriate equipment, controlling on-site activities to accommodate identified risks, and training and feedback during construction to increase operator awareness. Mitigation measures for a given area would be determined during project planning and design based on a site-specific evaluation.

Where possible, surplus fill material generated from removing a fill feature should be saved for future hydrologic restoration work, and in particular canal plugs. The reason for this is that fill is expensive to haul long distances and can be an invasive and/or exotic seed source, which are often limiting factors for restoration projects.

Best management practices for erosion and sediment control would be maintained during construction, and stabilization of restoration areas would occur naturally as a result of plant recolonization from the adjacent area, which has been successful in previous restoration efforts. Where needed, supplemental efforts may be required to eliminate exotics and promote natural floral composition.

2.6.5 VEGETATION AND INVASIVE SPECIES

Under normal circumstances, revegetation of wetland reclaimed areas would rely upon natural recruitment from the surrounding seed bank and seed sources. Where needed, invasive exotic (e.g., Brazilian pepper) or undesirable vegetation would be removed. Where appropriate, cypress trees or habitat-appropriate vegetation may be planted. The decision to remove vegetation and/or implement an active restoration approach (i.e., planting) for a given project area would be

determined based on a site-specific evaluation, in accordance with the South Florida and Caribbean Parks Exotic Plant Management Plan (NPS 2006a and 2010a).

Special attention would be devoted to preventing the spread of exotic and invasive species, especially on disturbed sites. For exotic invasive plants, standard measures could include identifying and treating areas of nonnative plants before hydrological restoration activities are initiated, treatment as part of the nonnative plant control program, and revegetation with native species as appropriate. The approach for a given treatment area would be determined based on a site-specific evaluation and implemented following the South Florida and Caribbean Parks Exotic Plant Management Plan (NPS 2006a and 2010a).

2.6.6 VISITOR USE AND EXPERIENCE

Restoration measures may result in local changes to recreational opportunities. For example, new culverts create visitor scenic viewing opportunities. New plugs may create visitor access points into the swamp that were previously blocked by the canal. Restoration measures may also attract wildlife, including alligators or wading birds, and could also result in unexpected human/wildlife issues. As a result, restoration measures may require the use of signage, walkways, barriers, and other techniques to enhance resource protection and visitor access goals.

2.6.7 CULTURAL RESOURCES: ETHNOGRAPHIC RESOURCES AND CULTURAL LANDSCAPES

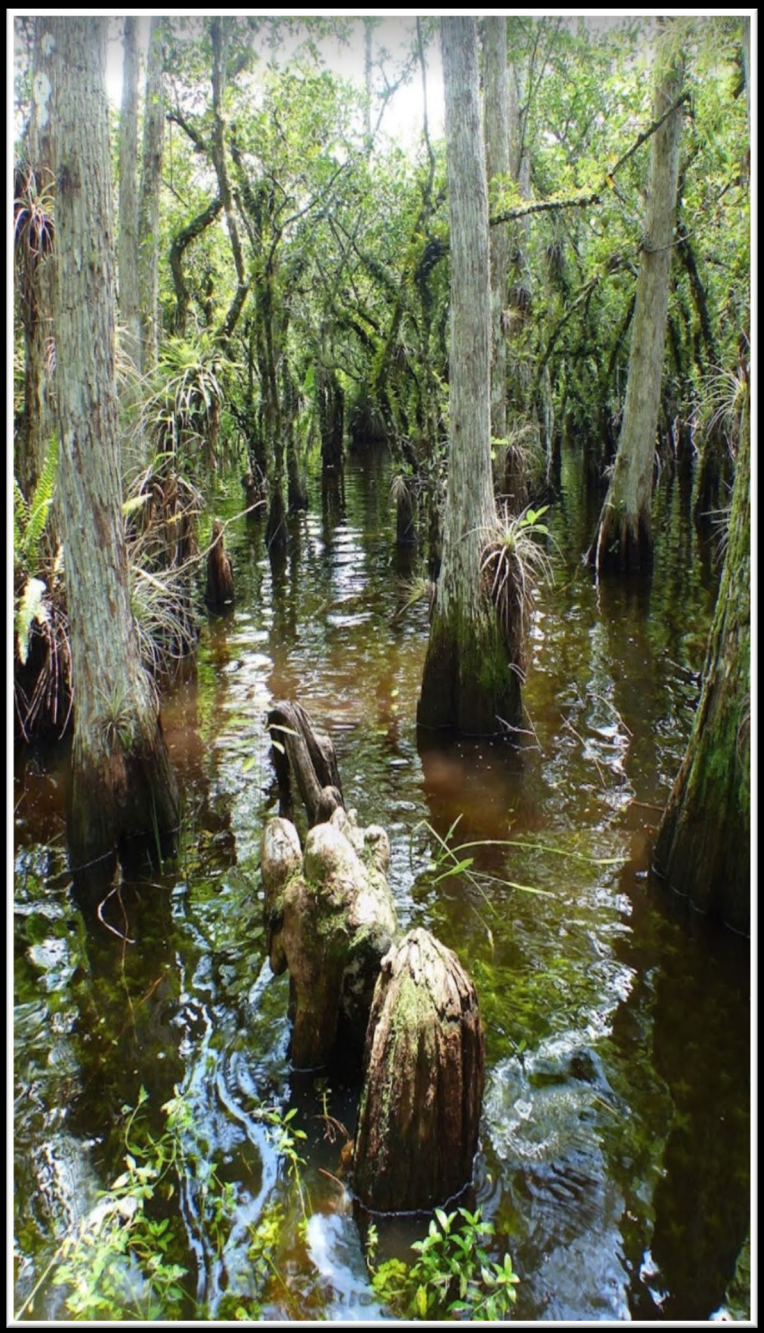
In compliance with Section 106 of the National Historic Preservation Act, the NPS would take practical measures take to avoid, minimize, or mitigate adverse effects in consultation with the State Historic Preservation Officer (SHPO) and, as needed, the Advisory Council on Historic Preservation, Native American tribes, and other concerned parties. In addition to adhering to the legal and policy requirements for cultural resources protection and preservation, the NPS would also undertake the measures listed below to further protect the Preserve's resources:

- Areas proposed for hydrologic restoration measures would be surveyed so that previously unidentified cultural resources (i.e., archeological, historic, ethnographic) in the area of potential effects are adequately identified and protected by avoidance or, if needed, mitigation.
- If during ground-disturbing activities, previously unidentified archeological resources are discovered, work in the immediate vicinity of the discovery would be halted until the resources could be identified and documented. If the resources could not be preserved in situ, an appropriate mitigation strategy would be developed in consultation with the SHPO and, if needed, Federally recognized Indian tribes and associated groups. Archeological documentation would be done in accordance with the Secretary of the Interior's Standards for Archeology and Historic Preservation (1983, as amended).

  In the unlikely event that human remains believed to be Native American are discovered during ground-disturbing activities, compliance with the Native American Graves Protection and Repatriation Act of 1990 would apply. Prompt notification and consultation with the Federally recognized tribes would occur in accordance with the Act. If such human remains are believed to be non-Indian, standard reporting procedures to the proper authorities would be followed, as would applicable Federal, state, and local laws.
- Visitors would continue to be educated on the importance of protecting the Preserve's cultural resources and leaving these undisturbed for the enjoyment of future visitors.

Chapter 3

Affected Environment



CHAPTER 3: AFFECTED ENVIRONMENT

This chapter describes the characteristics of the various environmental resources that could be affected as a result of implementation of the alternatives. The topics presented in this chapter are those related to the key issues described in chapter 1 (Introduction) that inform the National Park Service (NPS) decision. The descriptions of the resources serve to provide the baseline conditions against which the potential effects of the alternatives considered are compared. The effects on these baseline conditions are described in chapter 4 (Environmental Consequences). Descriptions of the following resources are included in this chapter: water resources (i.e., hydrology and water quantity, groundwater, water quality), wildlife and protected species, soils, vegetation and invasive species, visitor use and experience, and ethnographic resources and cultural landscapes.

Information for this chapter was gathered from several sources, including but not limited to the following documents:

- General Management Plan (GMP) for the original BICY Preserve (NPS 1992);
- BICY Addition GMP (NPS 2010a);
- Improvement of Access and Hydrology Monitoring Stations in Big Cypress National Preserve (NPS 2001a);
- BICY and Florida Panther National Wildlife Refuge Fire Management Plans Environmental Assessment (NPS and USFWS 2016);
- BICY Backcountry Access Plan (BAP) Draft Environmental Impact Statement (NPS 2020);
- BICY Environmental Assessment for Off-Road Vehicle (ORV) Trail Heads and Turn Lanes (NPS 2012); and
- BICY Copeland Prairie Restoration Plan Environmental Assessment (NPS 2014).

3.1 WATER RESOURCES

This resource topic describes the conditions associated with water resources, including the watershed, hydrology and water quantity, groundwater, and water quality.

The Preserve lies predominantly within the *Big Cypress Swamp* physiographic region of southwestern Florida. The southeastern corner is within the *Everglades* region and the southwest corner of the Preserve is within the *Southern Coast and Ten Thousand Islands and Florida Keys* region (**Figure 3-1**).

The Big Cypress Swamp region is a source of recharge for the shallow aquifers of south Florida and is important to the integrity of the water resources in the western part of Everglades National Park. Congress recognized the hydrologic values of the region through the establishment of the Preserve and the Addition.

Water plays a vital and perhaps unrivaled role in supporting the ecological health and public enjoyment of the Preserve. The Preserve is inseparable from its hydrologic regime: every aspect of the swamp ecosystem's natural and cultural history is tied to its water. Waters of the Preserve also support adjacent watersheds and water bodies. The Preserve recharges water in the shallow aquifer that underlies it, discharges water to Fakahatchee Strand to the west, the Everglades River of Grass to the east, and downstream coastal areas in Everglades National Park and 10,000 Islands to the south.

The Preserve is probably best known for its cypress trees, as indicated by its name, although "Big Cypress" is generally agreed to refer to the size of the area and its number of trees, not the size of the trees (Duever et al. 1979). The parabolic shape of the Preserve's many cypress domes and strands gives the appearance of rolling hills, with the caveat that the "hill tops" occur at the deepest spots where water pools longest. However, like the rest of south Florida, the terrain of the Preserve is exceptionally flat.

Land elevations in the Preserve range from sea level near the coast to 19 feet above sea level (asl) at its northern boundary, which equates to a gradient of only 5 to 10 inches per mile (Duever et al. 1979).

Small variations in elevation and resultant hydrology result in large differences in vegetation: a vertical range of just 2.5 feet differentiates the Preserve's major vegetation communities (Lodge 2010). More than the Everglades which is mostly buried under peat, differences in elevation, hydrology and plant communities in the Big Cypress are related to undulations in the underlying bedrock (Lodge 2010). The underlying bedrock is irregular, and both exposed at the surface and buried by as much as 10 feet of soil and organic matter (Schneider, Weeks, and Sharrow 1996). Hammocks and pinelands are typically found where bedrock is at or near the surface. Cypress strands form where bedrock undulations are deepest and in marshy sloughs where bedrock undulations are shallower (Schneider, Weeks, and Sharrow 1996).

Rainfall averages 53 inches per year but has ranged from 35 to 80 inches, with nearly 80% of that annual total falling during the 6-month wet season from May to October (Miller et al. 2004). Median monthly rainfall in the Preserve is presented on **Figure 3-2**. On an annual cycle, the Preserve fluctuates between flood and drought stages. Flood stage typically peaks in early fall and results in over 90% of the Preserve becoming flooded with a shallow expanse of slow-flowing water called sheet flow. Drought stage typically occurs in late spring and results in over 90% of the Preserve going dry. The magnitude and duration of the Preserve's annual flood and drought cycle varies each year in response to rainfall.

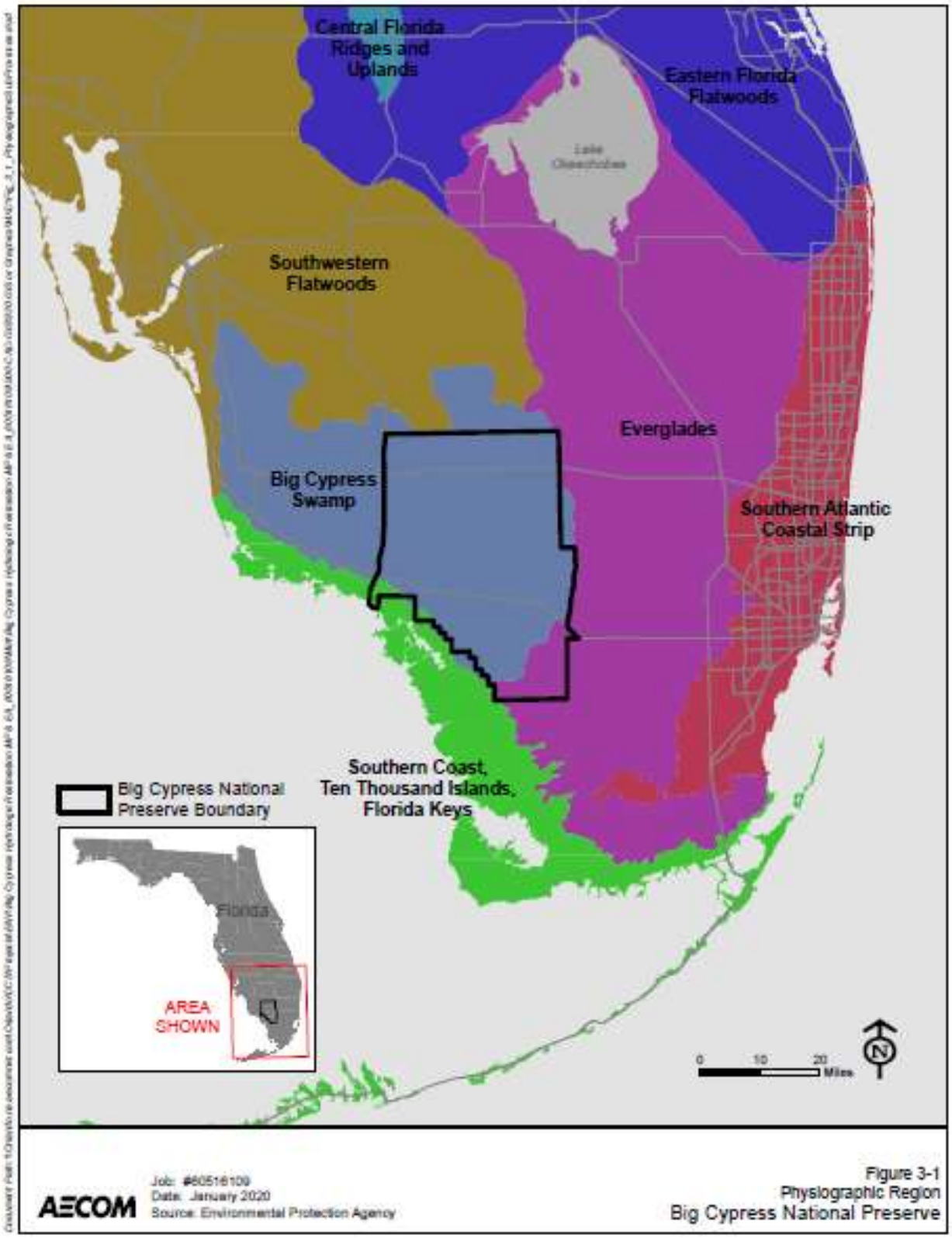


Figure 3-1: Physiographic Region

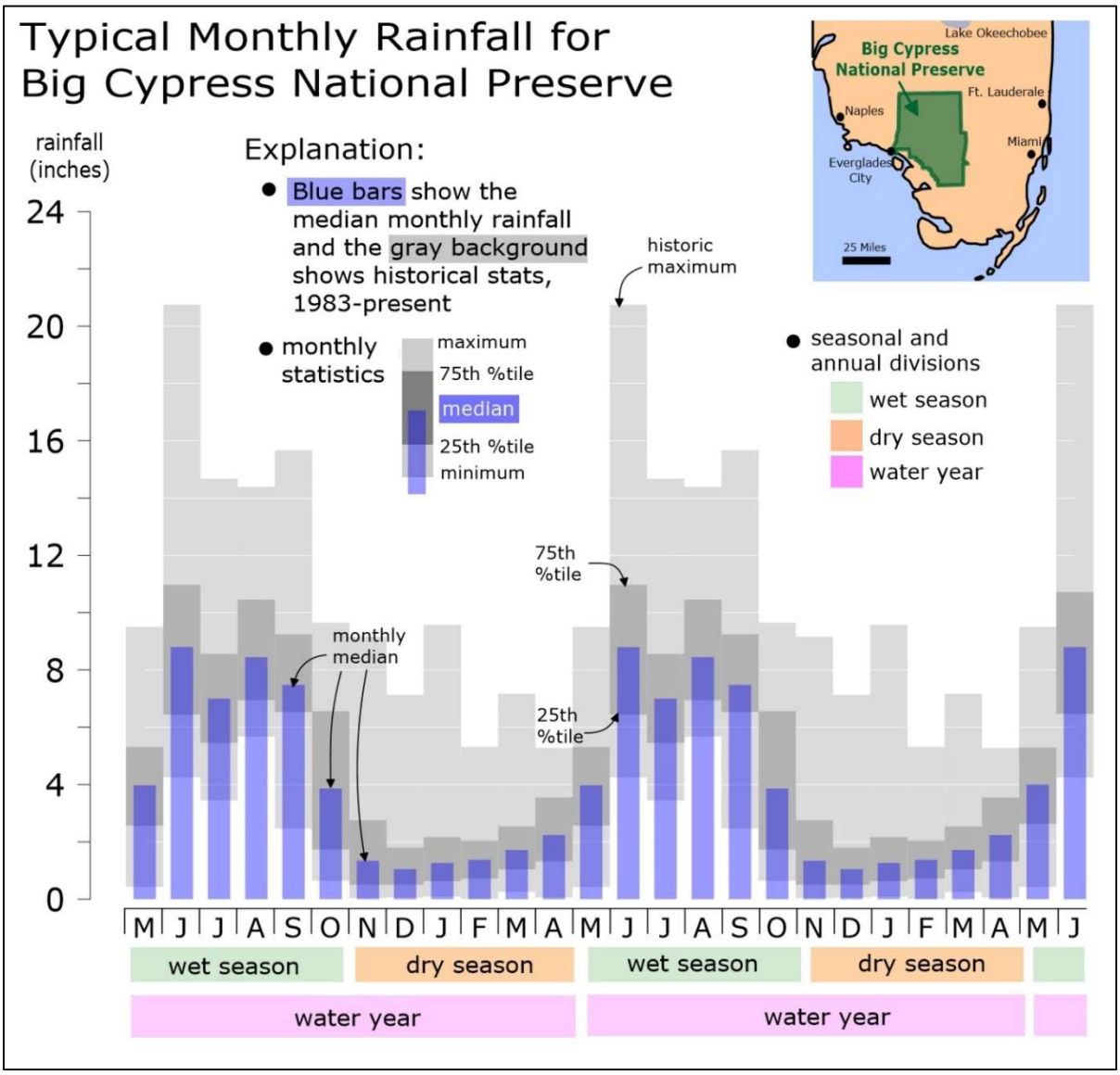


Figure 3-2: Typical Monthly Rainfall for the Preserve

Watershed, Catchment and Drainage Profiles

A watershed is formally defined as "an area of land where all water drains to a central point like a lake, river, or stream. The boundary of a watershed is drawn by the natural landscape, such as hills or mountain ridges." Watersheds are often organized into a hierarchy with smaller "drainages" fitting within larger "catchment basins," which form a larger "watershed." This definition allows for large and small scale organization and understanding of the water resources.

Natural topography often provides the best guide not only for development of watershed boundary but also for understanding and restoring the natural flow of water across the land. This topographic approach and watershed hierarchy has helped to define the restoration actions identified in the Plan (NPS 2019c). Descriptions of the geospatial hierarchy (from largest to smallest) are described below:

Watershed (Largest): Watersheds are the largest subareas and are defined by the uniqueness of their endpoint. There are four watersheds in the Preserve: (1) Central Preserve/ Central Pinelands and Deep Lake (off-white), (2) Okaloacoochee Slough (red), (3) Mullet Slough (green), and (4) Everglades Watersheds (blue) (**Figure 3-3a**) (NPS 2019c).

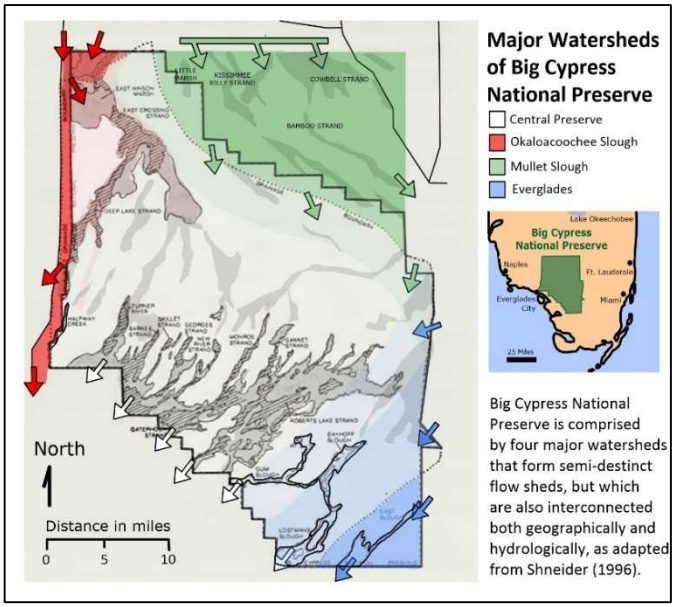


Figure 3-3a: Major Watersheds of the Preserve

Catchments (Middle): Catchments are major flow systems within those watersheds. For example, the central Preserve watershed contains several major strand and slough systems such as Barnes Strand, New River Strand, Roberts Lakes Strand, and others that would be catchments within the larger watershed (**Figure 3-3b**).

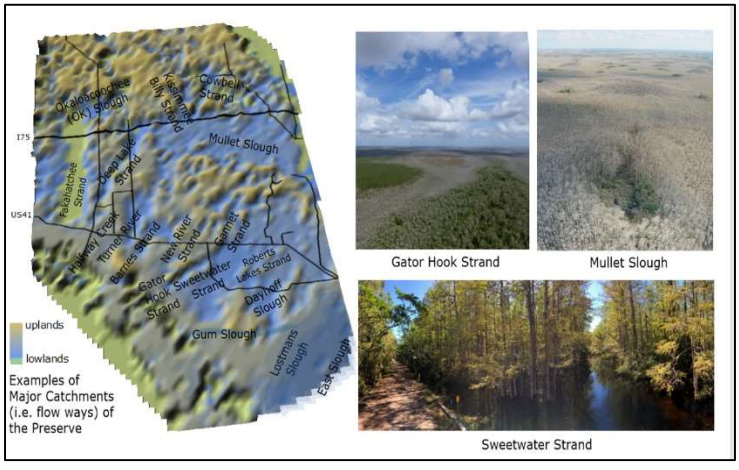


Figure 3-3b: Examples of Major Catchments (i.e., flow-ways) of the Preserve

Drainages (Smallest): Drainages are localized flow paths that occur throughout the Preserve as dictated by the ecosystem's intricate, yet miniscule, mosaic of valleys and swales (**Figure 3-3c**). Land elevation differences as small as a few inches can serve to exclude, collect, or route water, depending on the seasonal height of the water table. Examples include the presence of a marl prairie between two hammocks or a series of marshes that forms a path of least resistance through a slash pine forest.

Figure 3-3c: Examples of Drainages (i.e., smaller flow-ways) of the Preserve

The Preserve's Watershed Paradigm

While the importance of water and its restoration was recognized at the inception of the Preserve, as reflected in the Preserve's enabling legislation, the swamp ecosystem was largely understood to form a self-contained and separate watershed. This meant that unlike the complex network of water management infrastructure and operational rules used to control water in the Everglades to the east, the Preserve would be an area where water could flow freely without human-created physical or operational controls. This status was thought to both guarantee water to the Preserve and the downstream estuaries in Everglades National Park. The large size, remoteness, and watershed-derived shape of the original Preserve fostered a belief that its hydrologic system was largely intact, requiring just minor modifications in a few places.

More recently, the status of the Preserve as a separate and unaffected watershed has given way to a more nuanced view:

- Expansion of the Preserve to include the Addition Lands – a 1-mile strip that abuts State Road (SR) 29 to the west and a northeast corner commonly called Mullet Slough – connects it with overland inflows and outflows with adjacent lands, including the Florida Panther National Wildlife Refuge and Fakahatchee Strand Preserve State Park to the west, agricultural lands and the Big Cypress Seminole Indian Reservation to the north, and the Miccosukee Indian Reservation and Water Conservation Area 3A to the east.
- The Preserve is surrounded on three sides and crisscrossed throughout by a network of legacy canals and levees that block and divert water flows. While these drainage features were built prior to establishment of the Preserve and generally do not feature operational controls, they are not inert when it comes to regional water flows.
- The methodology used to delineate the Big Cypress Watershed and its subbasins (including the Preserve) was conducted after, not before, the regional network of major waterworks had already been installed throughout south Florida. These waterworks altered the delivery of water into the modern-day footprint of the Preserve.

The more nuanced view means that the hydrologic regime within the Preserve is interdependent with adjacent watersheds, making it vital for the Preserve to collaborate with relevant stakeholders within those watersheds and also taking steps internally, where possible, to make the Preserve the very best watershed it can be.

A hydrologic disruption is defined as a manmade landscape feature that alters water flow in the Preserve. In almost every case, hydrologic disruptions were built prior to the formation of the Preserve with some combination of transportation, water management, or land development

purpose in mind, and with the chief design imperative almost always being how to deal with the region's expansive seasonal flooding regime. Roads, homes, farming, airstrips, and businesses required dry land. That meant either raising the earth or draining the water, or a combination of both.

These disruptions include an assortment of elevated and excavated features that act passively on the landscape to alter the wetland landscape's natural hydrologic regime.

- Elevated disruptions include levees, berms, trams, and fill pads. These features may range from 0.5 foot to over 10 feet above land surface, but are usually 1 to 5 feet above land surface.
- Excavated disruptions include canals, ditches, and borrow pits. These features may range in depth from 1 foot to 10 feet below natural grade, but are usually in the range of 2 to 6 feet below natural grade.
- Elevated and excavated disruptions may be located separately, or in close proximity to one another. Disruptions were usually achieved with local excavation of material. In other cases, fill was brought into the Preserve externally, or excavated material was removed off-site.

The introduction of hydrologic disruptions to the Preserve started with completion of the Tamiami Trail in 1930 and reached a crescendo in the latter half of the 1960s with the completion of the L-28 levee system and the Miami-Dade Everglades Big Cypress Jetport. The timeline of water management infrastructure in the Preserve is depicted on **Figure 3-4**.

Over the decades, the NPS has succeeded in a number of efforts to remove or modify these disruptions to lessen the effect of some of these hydrologic disruptions. Major successes include:

- Removal of elevated fill throughout the Preserve to restore natural wetland grade and function, ranging in scale from single parcels to larger features such as Paces Dike (1980s) and the Copeland Prairie farm roads (2010s)
- Installation of increased water conveyance capacity under Alligator Alley when it was expanded to Interstate 75 in the 1980s
- Infilling of the southern terminus of the Turner River Canal, thereby making the river navigable for the first time in decades in the 1990s
- Installation of new culverts under Loop Road and Bear Island Grade in the 2000s
- Installation of a series of roadbed culverts and earthen canal plugs in the Turner River Road complex in the 1990s and 2010s.

Despite these efforts, many hydrologic disruptions remain in the Preserve.

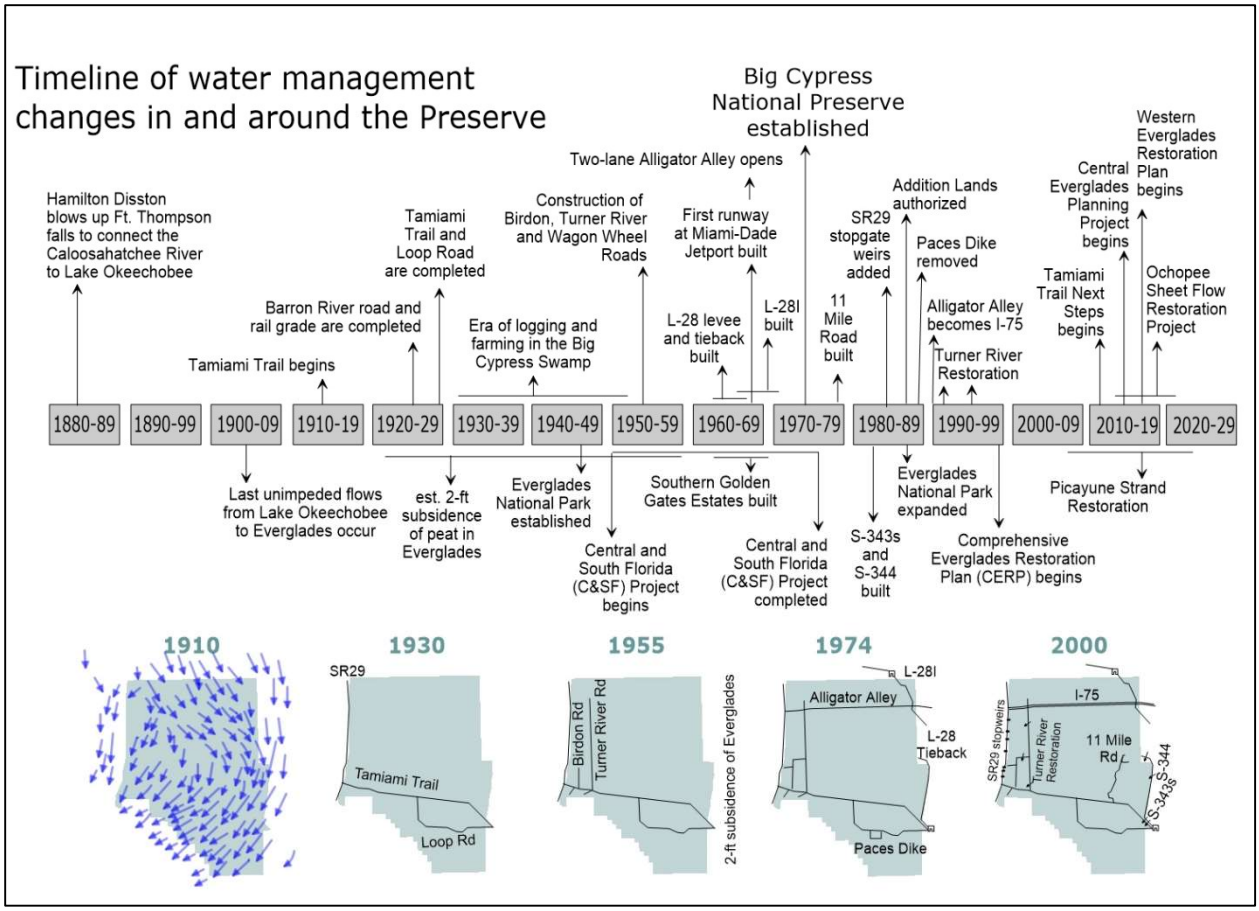


Figure 3-4: Timeline of Water Management Changes in and around the Preserve

Hydrology and Water Quantity

The quality, quantity, seasonality, and distribution of water plays a primary role in the ecological processes and biological communities in the Preserve and downstream delivery points, including Fakahatchee Strand, the Everglades, and coastal estuaries.

The Preserve receives the majority of its water from direct rainfall, but also receives surface water inflows from the north via the SR 29 Canal, Okaloacoochee Slough, Private Lands, and the Big Cypress Seminole Indian Reservation; and from the east via the Miccosukee Indian Reservation, Water Conservation Area (WCA) 3A, and Everglades National Park (NPS 2019c).

The hydrology of the Preserve is best described by its two meteorological seasons – a summer wet season and a winter dry season – which cause the swamp ecosystem to naturally fluctuate between a flooded and drought condition on an annual basis.

The summer wet season is a hot, humid, and stormy 5- to 6-month period that lasts from mid-May to October and accounts for upwards of 80 percent (42 inches from May through October) of the annual rain total. The nearly daily occurrence of afternoon thunderstorms and periodic tropical storms causes the regional water table underlying the Preserve to gradually (and sometimes rapidly) rise up and flood across the swamp ecosystem. Low-lying cypress strands, sloughs, marsh, and cypress domes fill with water first and deepest, with higher elevation pinelands and hammocks inundating for shorter durations and at shallower depths. During its high-water peak, over 90% of

the Preserve is covered with a shallow, expansive, and sluggishly flowing body of water commonly referred to as sheet flow. **Figure 3-5** depicts the major freshwater habitats of the Preserve and their typical land elevation relative to the center of a cypress dome.

The winter dry season is mild with long stretches of no rain, lasting from November to May. Despite the cessation of regular rains, the flatness of the Preserve prevents water from draining away fast. This results in a slow-motion months-long drying process that lasts from late fall into spring. High ground such as hammocks and pinelands dry out first, usually by late fall, followed by marl prairies in the winter, tall cypress and marshes by winter's end, and dry season refugia pools last, usually in spring – although some years they hold water year round. The spongy nature of the Preserve's marl and peat substrates helps retain soil moisture even when the water table has dropped below ground. Some years the drying process can be delayed or even reversed by a frontal rain event. Absent timely spring rains (usually from fronts that are aperiodic and hard to predict), by March, April, and May the swamp can turn into a waterless tinderbox where even the deepest spots are dry. Wildfires during this period can often spread quickly and indiscriminately across the landscape and into areas and biological communities usually protected by water.

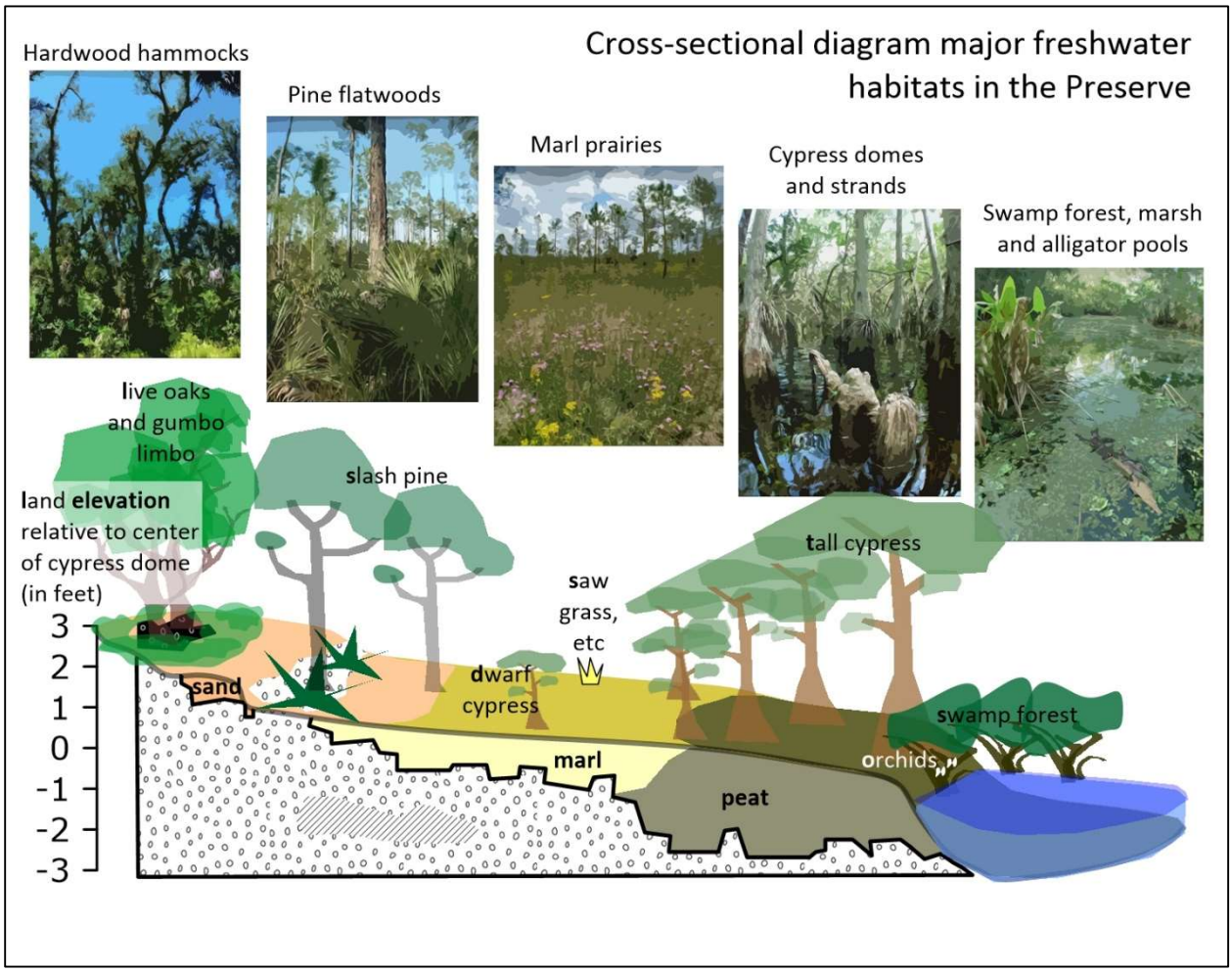


Figure 3-5: Cross-sectional Diagram of Major Freshwater Habitats in the Preserve

Natural variation in the duration and amplitude of seasonal flood and drought is easily disturbed by human-dug canals and levees. Despite appearing to be only hairline thin on a map of the Preserve, their impact on the regional water regime can be quite profound. Whereas the natural topography of the Preserve varies as little as 3 to 4 feet between its low and high land, the depth of canals and height of levees typically exceed the water table's annual fall and rise. As a result, canals funnel water and levees stay dry year round. Furthermore, in contrast to the patchy nature of the Preserve's natural landscape undulations (i.e., as reflected in the mosaic of cypress, marsh, pineland, and hammocks), canals and levees are interconnected with one another (forming a network) and run uninterrupted for miles. This network alters the natural hydrology of the Preserve through a combination of blocking, diverting, and draining surface and shallow groundwater.

The over-riding effect of canals and levees is reduction of water in the Preserve (Duever et al. 1979). During the dry season, canal-induced drainage causes the water table to drop deeper below the ground, thereby increasing the severity and duration of spring drought. During the wet season, canal-induced drainage stunts the sheet flow season by delaying its summer onset (i.e., due to deeper spring droughts) and hastening its winter demise. Although primarily designed to drain water around or out of the swamp, the network of canals and levees can become overwhelmed during large storm events, causing water to unnaturally pool upstream.

The unnatural drainage and blockage of water disrupts the ecology of the Preserve. The Preserve's swamp ecosystem exhibits both similarities and differences to the pre-drainage era prior to 1880. While the ecosystem continues to respond to natural swings between seasonal flood and drought, its floral and faunal composition is also a reflection of anthropogenic changes that predate the Preserve. Notable ecological changes include an inland invasion of mangroves from the coast and an increase of cabbage palm in marl prairies.

Anthropogenic changes since the Preserve was established have tended to focus on reducing the impact of canals and levees on the natural hydrologic regime. Examples include modifications to the L-28 South and Tieback levees in the mid-1980s, removal of Paces Dike in the late 1980s, an increase in water conveyance capacity under Alligator Alley (I-75) in the early 1990s, the Turner River Restoration Project in the 1990s, and the Ochopee Sheet Flow Restoration Project from 2015-2021.

Review of historical water-level information by NPS staff shows a general increase in the depth and duration of water levels in the Preserve since its establishment, as measured at its longest running monitoring station along the Tamiami Trail near the Oasis Visitor Center. However, canals and levees continue to alter the natural hydrologic regime of the Preserve. The magnitude and nature of the alteration varies by region and season. For example, Loop Road and Upper Wagonwheel Road tend to pool water during the wet season. Farther to the north, areas of the Preserve that lie adjacent to major canals are prone to dry season drops of the water table that exceed the ecosystem's natural range. **Figure 3-6** depicts the change in average summer, fall, winter, and spring water levels for the longest running monitoring station in the Preserve, expressed as a 5-year running average.

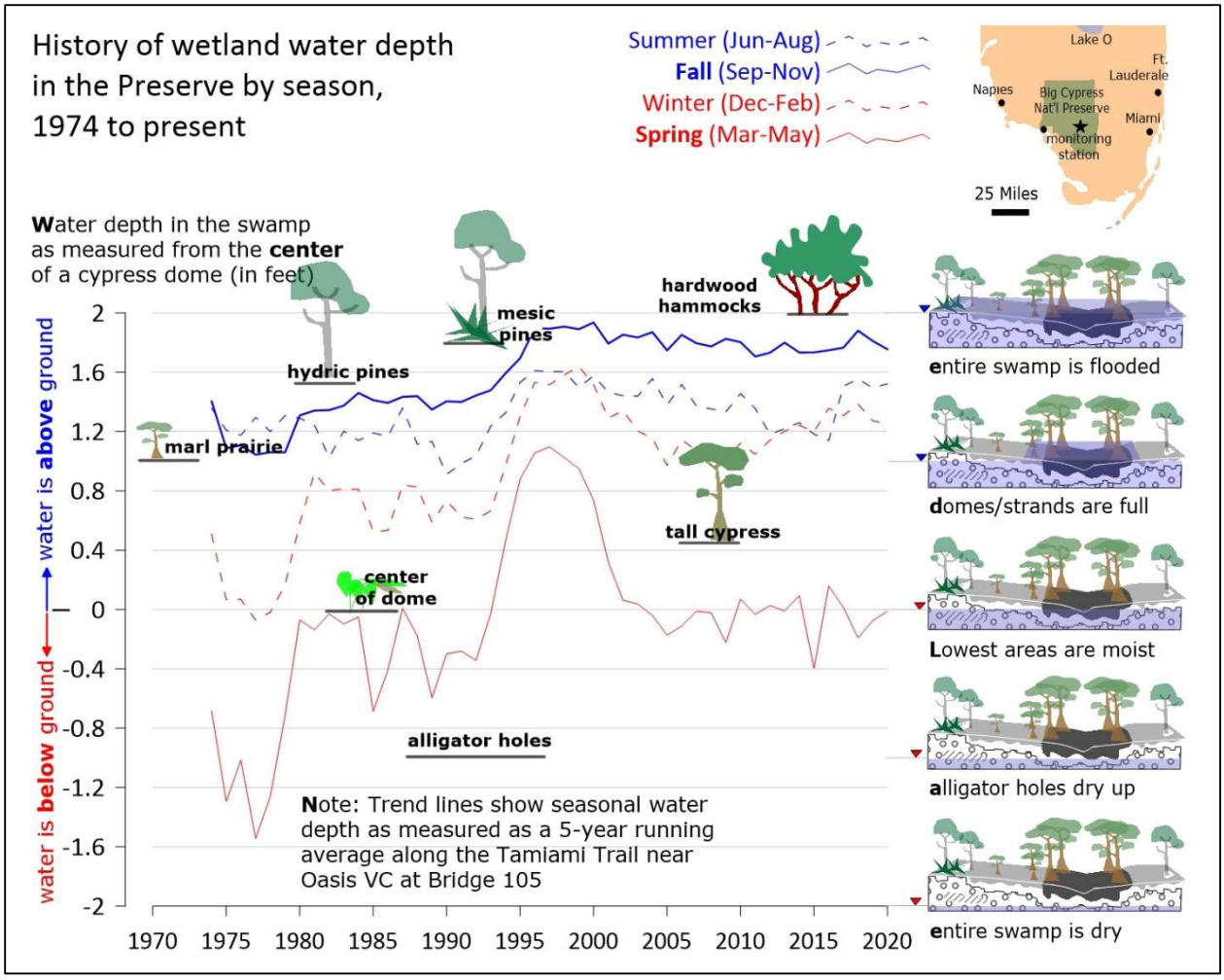


Figure 3-6: History of Wetland Water Depth in the Preserve by Season

Groundwater

A marine limestone called the Tamiami Formation underlies the Preserve to a depth of 150 feet (Hoffmeister 1974). At its top surface, the rock formation forms a hard 1- to 2-foot-thick crust called cap rock that functions as the bedrock for the Preserve ecosystem. The cap rock is irregular, pocked with solution holes, and less permeable to water flow than the underlying rock formation (Duever et al. 1979). Although it can be exposed as a craggy pinnacle rock at the surface, cap rock is more typically covered with a thin layer of sand, marl, or peat soils. Cap rock and overlying soils form a semi-permeable seal that inhibits, but does not eliminate, groundwater and surface water exchange. This semi-permeable seal augmented sheet flow and the formation of groundwater fed springs in the pre-drainage Everglades (McCally 1999). Disruption of the caprock seal has occurred as a result of excavation of canals and borrow ponds.

The Tamiami Formation also forms the gray limestone aquifer. The aquifer generally lies within 10 feet of the surface of the Preserve, ranges in thickness from 30 to 100 feet, and becomes progressively thinner to the east, where it eventually disappears near the eastern boundary of Collier County (Reese and Cunningham 2000). It is non-artesian and contains lenses of confining layers, which prevent circulation of water in the aquifer. The upper part of the rock formation is typically of lower permeability than below, restricting the ability of shallow canals to drain water

from the aquifer. The aquifer is recharged by rainfall during the wet season, and overland flow occurs when the aquifer is saturated (Schneider, Weeks, and Sharrow 1996).

Where limestone or other porous aquifers are near the coast, seawater can begin to move inward and infiltrate freshwater aquifers. The problem can be exacerbated by depletion of interior freshwater supplies through groundwater pumping or canal-induced drainage. Rapid development in south Florida has resulted in saline marine groundwater moving inward more than 15 miles in some places (USGS 2001).

Trends and Planned Actions

Water resources in the project area have been, and will continue to be, influenced by human activity. Past, present, and reasonably foreseeable future effects to the Preserve's water resources may result from modifications to water management infrastructure, conversion of land use, oil and gas exploration and production operations, wildland fire activity, and a changing climate.

Land, water, and transportation management actions external to this plan and upstream and adjacent to the Preserve have the potential to impact the hydrologic regime within the Preserve. Note, a project that requires water quality cleanup (i.e., Stormwater Treatment Areas) is outside the scope of the Hydrologic Restoration Management Plan. Everglades Restoration projects such as the U.S. Army Corps of Engineers (USACE)/South Florida Water Management District (SFWMD)-led Western Everglades Restoration Plan (WERP) and the SR 29 Barron River Flowway plan, if implemented, are expected to benefit the Preserve and also amplify the beneficial effects of Tier 1 and Tier 2 projects. WERP would improve the Preserve's hydrologic connectivity with the Everglades to the east, whereas the SR 29 Barron River Flowway project would improve the Preserve's hydrologic connectivity with Okaloacoochee Slough and Fakahatchee Strand to the west (USACE 2021; Sobczak 2020). The Preserve's hydrology will continue to be negatively impacted if Everglades Restoration projects are not implemented or if external land, water, and transportation management activities are pursued without adequate protections to the downstream and/or adjacent Preserve.

A phased conversion of an existing citrus grove from agricultural production to mitigation bank (Cherrylake Wilderness Preserve Mitigation Bank) is being planned for a parcel abutting the Preserve to the north, which would include hydrologic restoration activities to achieve topography conducive to sheet flow from north to south and return the water table to natural levels (SFWMD 2020). Oil and gas exploration and production operations (e.g., Nobles Grade Prospect) within the Preserve could potentially result in localized, temporary water quality degradation from construction of fill pads and equipment and crew movement, and associated erosion and sedimentation (BOCI 2016). Implementation of the Preserve's Fire Management Plans, which includes fire suppression, prescribed burning, and the use of mechanical treatments, may temporarily impact water quality and hydrology if broader vegetated areas and prairies are burned, thereby reducing resistance to sheet flow and increasing water movement to adjacent areas (NPS and USFWS 2016). However, over the past two decades there has been an undesirable increase in ecologically damaging and costly large wildfires during spring drought periods. A changing climate may alter the antecedent cycling of water in the Preserve, including seasonal patterns of rainfall and drought, frequency and intensity of hurricanes and other large storm systems, saltwater intrusion, and concomitant ecological succession (NPS 2021).

3.2 WILDLIFE AND PROTECTED SPECIES

The Preserve is known for its diversity and abundance of wildlife, many of which are protected by the Florida Fish and Wildlife Conservation Commission (FWC), the U.S. Fish and Wildlife Service

(USFWS), and/or the Convention on International Trade in Endangered Species. About 200 bird species, 68 fish species, 66 species of reptiles and amphibians, and 35 mammal species have been documented in the Preserve (NPS 2019c). The distribution, abundance, and diversity of species within the Preserve vary by season and variety of habitats present.

Protected species are species listed as threatened, endangered, proposed threatened, or proposed endangered under the Federal Endangered Species Act of 1973 (16 USC § 1531 et seq.); species protected under Florida Endangered and Threatened Species Act of 1977 (Section 379.2291, FS); and species considered sensitive by the Preserve that are protected to prevent further population decline.

For the purposes of this evaluation, a list of Federally and state listed species was obtained from the following sources: 1) Federally listed species that may occur in or near the Preserve were obtained from the USFWS Information for Planning and Consulting (IPaC) website (http://ecos.fws.gov/ipac/) on January 17, 2020 (Official Species List; Consultation Code 04EF2000-2020-SLI-0299 (USFWS 2020); 2) Preserve official species list from NPSpecies website (https://irma.nps.gov/NPSpecies/; NPS 2019d); and 3) state listed species that may occur in Miami-Dade, Broward, or Collier Counties (FWC 2018, FDACS 2018).

The USFWS IPaC Official Species List identified Federally listed protected wildlife species that could occur in the Preserve. An evaluation of the species range, general habitat requirements, and potential for the Federally listed wildlife species to occur was conducted (**Appendix C, Table 1**). Many of the protected species were eliminated from further consideration in this Environmental Assessment (EA) when best available scientific information indicated that the species are considered to be extirpated or are not believed to occur within the Preserve, or when suitable habitat for the species does not occur within the Preserve. Other protected species were identified as low potential to occur in the Preserve and are not discussed in detail in this EA. Species were identified as having low potential to occur when species occurrence is limited (geographically, seasonally) within the Preserve and would not be impacted by hydrological restoration, such as estuarine areas, mangroves, and upland areas. The protected species with potential to occur in the Preserve that are likely to be impacted by the alternatives are described in more detail below.

With the exception of the manatee, designated critical habitat for Federally protected species does not occur within the Preserve. The Preserve is currently excluded from the critical habitat designation for Cape Sable Seaside Sparrow. In 2007, the USFWS revised the designated critical habitat for Cape Sable Seaside Sparrow to more specifically identify those habitats that sparrows use. It also eliminated several large areas of unsuitable habitat from the designation. The areas supporting sparrows within the boundaries of the Preserve continue to receive significant protections even without the critical habitat designation.

The following protected animal species were retained for evaluation in this EA.

Florida panther: The Florida panther (*Puma (=felis) concolor coryi*) require large, contiguous areas of suitable habitat; their habitat selection is most closely related to prey availability. The preferred vegetation communities include native upland forests and communities with a dense saw palmetto (*Serenoa repens*) understory for denning and resting. Their diet mainly consists of white-tailed deer (*Odocoileus virginianus*), and wild hogs (*Sus scrofa*), but smaller mammals such as raccoons (*Procyon lotor*), armadillos (*Dasypus novemcinctus*), and rabbits (*Sylvilagus palustris*) are also an important part of their diet (USFWS 2016a). Dees, Clark, and Van Manen (2001) found that panther use of pinelands in prescribed fire areas the first year post-burn was the greatest, with use declining in subsequent years. Prey species could be attracted to burned areas due to increased presence of white-tailed deer and other prey species in response to vegetation and structural changes. Excluding fire for longer periods to allow the growth of mature, dense saw palmetto

patches may increase the use by panthers but would also increase the likelihood of intense future wildland fires in these areas, which may increase the likelihood of kitten mortality and changes in suitability of habitat.

Historically, this species ranged throughout most of the southeastern United States. Now, the only known self-sustaining population occurs in south Florida, generally in Lee, Collier, Hendry, Miami-Dade, and Monroe Counties (USFWS 2016a), which is less than 5% of its historical range. Panther mortality resulting from vehicle collisions threatens the potential for population expansion (USFWS 2016a). Panther deaths caused by vehicle collisions have been sharply reduced in areas where crossings and fencing are in place (FWC 2019).

West Indian manatee: The West Indian manatee (*Trichechus manatus*) moves between freshwater, brackish, and saltwater environments. They prefer large, slow-moving rivers, river mouths, and shallow coastal areas, but may be found in canals during winter months as they search for warmer waters. Within the Preserve, manatees are known to occur along SR 29, the US 41 canal up to Wootens, and Halfway Creek. Designated critical habitat exists within the Preserve boundary in the southwest portion of Stairsteps Zone 1.

Everglade snail kite (snail kite): The Everglade snail kite (*Rostrhamus sociabilis plumbeus*) is found primarily in lowland freshwater marshes and the shallow littoral zone of lakes inhabited by apple snails (*Pomacea paludosa*) in tropical and subtropical America. Because of a highly specific diet composed almost entirely of apple snails, survival of the snail kite depends directly on the hydrology and water quality of these watersheds, each of which has experienced pervasive degradation as a result of urban development and agricultural activities (USFWS 1999). Kites prefer foraging habitat that consists of short-stature, sparse, graminoid marsh vegetation and water clarity that allows a clear view for hunting and capturing apple snails (Kitchens, Bennetts, and DeAngelis 2002). Low-density emergent vegetation is also important for apple snail reproduction. The Everglade snail kite is uncommon but can be found throughout the year and is known to breed in the Preserve (NPS 2015b). In the Big Cypress basin, snail kites use the Lostman's and Okaloacoochee sloughs, Hinson Marsh, and the East Loop and Corn Dance units of the Preserve (USFWS 1999).

Critical habitat for the snail kite does not occur within the Preserve; however, the eastern boundary of the Preserve directly abuts the western boundary of a large critical habitat unit. The Preserve contains abundant suitable habitat and forage area within its vast prairies and marshes for this species.

Florida bonneted bat: The Florida bonneted bat is a year-round resident but may have seasonal shifts in roosting sites. This species has two breeding seasons: in the summer and during January and February (Timm and Genoways 2004).

Florida bonneted bats are known to forage in tropical hardwood, pineland, and mangrove habitats, as well as developed areas. It roosts in cliff crevices, tree cavities, and buildings. It is present in rural areas, as well as residential and urban areas (NPS 2017). In the Preserve, bonneted bats have been found in various habitats, but primarily in cypress swamps and wetlands; however, to date only one roost site has been identified and efforts are underway to confirm roosting at a potential second site. Because of its extremely limited range and low numbers, the Florida bonneted bat is vulnerable to a wide array of natural and human-related threats (NPS 2017).

American alligator: The American alligator is listed as threatened in south Florida due to similarity of appearance to the crocodile, as an additional protection measure for the crocodile. While alligator hunting is permitted in the state of Florida, it is currently prohibited in the Preserve. This species inhabits freshwater ecosystems including lakes, canals, and cypress swamps.

Alligators, a keystone species, "wallow" in water, scooping mud and removing vegetation to create deeper water areas that provide dry season habitat for a variety of other wildlife species. During severe dry periods alligator populations are substantially impacted.

Red-cockaded woodpecker: The red-cockaded woodpecker (*Picoides borealis*) makes its home in mature pine forests that have little understory growth, primarily due to fires and seasonal flooding. Longleaf pines (*Pinus palustris*) are most commonly preferred, but other species of southern pine are also acceptable (USFWS 2015). The red-cockaded woodpecker is well established in mature slash pines (*Pinus elliottii*) in the Preserve. There are approximately 100 active clusters in the Preserve (Deborah Jansen, personal communication, May 11, 2020). Typically, prescribed fires are conducted outside of the species breeding season at intervals that reduce understory growth. The lack of fire, or infrequent fire, within mature pine forest reduces habitat quality, and can result in catastrophic fire that destroys nesting habitat for the woodpecker (NPS 2010b).

Protected Wading Birds: Several protected wading birds are known to breed in the Preserve: wood stork (*Mycteria americana*), little blue heron (*Egretta caerulea*), and tricolored heron (*Egretta tricolor*) (NPS 2015b). Other than the wood stork (Federally listed threatened), they are not Federally listed under the Federal Endangered Species Act; however, they are afforded protection under the Federal Migratory Bird Treaty Act. The population of wading bird species declined in the early 1900s due to egg and plume hunting, and currently habitat degradation and loss, reduced prey availability, and disturbance at breeding and foraging sites contribute to ongoing population decline. These species range throughout Florida. In general, they forage in shallow water on a variety of fish, crustaceans, insects, and small reptiles, and they are colonial breeders.

Wood stork - nests in freshwater and brackish wetlands, primarily in cypress or mangrove swamps and forages in shallow water in freshwater marshes, swamps, lagoons, ponds, tidal creeks, flooded pastures, and ditches. Preservation and/or restoration of natural hydrologic processes are critical to the survival of the wood stork, as it depends on open water to support its nesting, roosting, and foraging sites. It has been noted that the presence of alligators might be beneficial to the species, as they help prevent nest predation by raccoons and other small mammals (USFWS 2016b). The water level depths and duration in 1994-1995 resulted in a healthy enough prey base for storks to nest extensively and successfully in 1996. Since 1996 wood stork nests in the Preserve have been sporadic (Deborah Jansen, personal communication, May 11, 2020).

Little blue heron - nesting colonies are typically in coastal areas, usually in cypress, willow, maple, black mangrove, and cabbage palms. Foraging generally occurs in freshwater lakes, marshes, swamps, and streams; this habitat is abundant in the Preserve (FNAI 2001).

Tricolored heron - nests primarily in colonies of mixed species on mangrove islands or willow thickets in freshwater habitat and coastal environments. It forages in permanent and seasonal wetlands, including mangrove swamp, tidal creeks, ditches, and the edge of ponds and lakes. Habitats for colony nesting and foraging are abundant in the Preserve.

Trends and Planned Actions

Wildlife in the project area have been, and will continue to be, influenced by human activity. Past, present, and reasonably foreseeable future effects to the Preserve's wildlife and protected species may result from modifications to water management infrastructure, conversion of land use, oil and gas exploration and production operations, wildland fire activity, and backcountry visitor access.

Land, water, and transportation management actions external to this plan and upstream and adjacent to the Preserve have the potential to impact wildlife primarily from efforts to restore historical distribution of sheet flow by removal of roads and berms and plugging of canals.

Everglades Restoration projects such as the USACE/SFWMD-led WERP and the SR 29 Barron River Flowway project would re-establish ecological connectivity and ecological resilience, restore water levels to reduce wildfires associated with altered hydrology, and restore aquatic low nutrient (oligotrophic) conditions to reestablish and sustain wildlife and protected species (USACE 2021; NPS 2020). The Preserve's hydro-ecological function would continue to be negatively impacted if Everglades Restoration projects are not implemented or if external land, water, and transportation management activities are pursued without adequate protections to the downstream and/or adjacent Preserve.

Other adjacent projects involving enhancement and preservation of wetlands, such as Cherryland Wilderness Preserve Mitigation Bank, would provide quality habitat for fox squirrel, panther, bear, wading birds such as wood storks, and other wetland dependent listed species (SFWMD 2020). Oil and gas exploration and production operations within the Preserve could result in localized, short-term adverse wildlife impacts due to habitat removal, degradation, and disturbance that may interfere with breeding, foraging, and dispersal/migration associated with heavy equipment and the construction of roads and pads. However, the required mitigation measures reduce the impact of activities to these resources, and habitats for wildlife and protected species are expected to recover after operations cease (BOCI 2016). Implementation of the Preserve's Fire Management Plans may result in temporary loss of habitat and displacement of mobile wildlife species, while mortality may occur for smaller and less mobile animals. Following fire, some wildlife species respond favorably and could increase in numbers, while other wildlife species respond negatively and could decrease in numbers (NPS and USFWS 2016). Over the past two decades, there has been an undesirable increase in ecologically damaging and costly large wildfires during spring drought periods. The continuation of the current Backcountry Access Plan may have a small adverse impact on wildlife and protected species from construction activity and the associated habitat and visual/noise disturbance, which may result in disruption of breeding, foraging, or dispersal behaviors and may affect species' home range or displace individuals (NPS 2020).

3.3 SOILS

The Preserve spans three Florida counties: Collier, Miami-Dade, and Monroe. Several different sources were consulted to understand the soils within the Preserve. Most of the soils in the Preserve are simple geological and biological products that have not had enough time or environmental conditions for evolution into true soils. Marl, sand, organic matter, and rock are the four substrate types in the Preserve.

Formation and stabilization of soils in the Preserve are dependent on the natural hydrologic regime. Peat soils is a product of long hydroperiods where dead plant matter accumulates over time in the presence of water; and marl is a product of shorter hydroperiod wetlands where periphyton dries in the absence of water to form a yellowish to brown mud. A type of peat called humus is also present on high-ground hammocks in the Preserve.

On developed sites, fill material has either been transported to the sites, or has been locally generated through excavation from a nearby borrow pit or rock pit. Within the Preserve, these areas are generally located near existing infrastructure within the Preserve, such as Loop Road, Tamiami Trail, or Turner River Road. Fill material in the region is often sourced from sand deposits. Within the Preserve these deposits are thin, infrequent, and likely derived from old shoreline deposits. Hydrological restoration activities could utilize internal fill from disturbed lands or could be sources from off-site. In either instance, fill would be evaluated and sourced from locations near the project area. Canal and levee construction often has occurred through excavation of an adjacent canal and deposition of the material to form the adjacent levee. These activities are typically

indiscriminate of the type of soil found in the area, and may include use of marl, sand, organic matter, and rock.

In many instances the use of fill material for development and levee and canal construction has resulted in the loss of aquatic ecosystem functions and services and/or changes in water quality, water quantity, and hydrology. Removal of fill material from wetlands could also result in wetland mitigation credit through ecological lift and restoration of wetland functions and services. As described in Section 3.4, nuisance and invasive species are often found on developed and disturbed sites. Soil material on disturbed and/or developed sites may contain nuisance and invasive species. Removal of the fill material associated with hydrologic restoration would result in restoration of the wetlands and enhancements in water quality, quantity, and hydrology.

Trends and Planned Actions

Soils in the project area have been, and will continue to be, influenced by human activity. Past, present, and reasonably foreseeable future effects to the Preserve's soils may result from modifications to water management infrastructure, conversion of land use, oil and gas exploration and production operations, wildland fire activity, and backcountry visitor access.

Land, water, and transportation management actions external to this plan and upstream and adjacent to the Preserve have the potential to impact soils from both the excavation and the addition of fill soils with the removal of roads and berms and plugging of canals. Everglades Restoration projects (e.g., WERP and the SR 29 Barron River Flowway project) could result in localized adverse soil impacts during construction, such as erosion and deposition (USACE 2021; Sobczak 2020; SFWMD 2020). After construction, the return to more natural hydrologic conditions would benefit the formation and stabilization of soils. The Preserve's natural soils would continue to be negatively impacted if Everglades Restoration projects are not implemented or if external land, water, and transportation management activities are pursued without adequate protections to the downstream and/or adjacent Preserve.

Other adjacent projects involving enhancement and preservation of wetlands, such as Cherryland Wilderness Preserve Mitigation Bank, would also lead to organic soil accretion and nutrient accumulation (SFWMD 2020). Oil and gas exploration and production operations within the Preserve could result in localized, short-term adverse soil impacts due to soil rutting and compaction associated with heavy equipment operation and the construction of roads and pads. Localized soil disturbance is short-term and remediated on-site (BOCI 2016). Implementation of the Preserve's Fire Management Plans burn off most vegetation and soil organic matter (duff/litter), altering soil resources (e.g., soil sterilization, killing rhizomes and mycorrhizae, causing hydrophobic layers) (NPS and USFWS 2016). Over the past two decades, there has been an undesirable increase in ecologically damaging and costly large wildfires during spring drought periods. The continuation of the current Backcountry Access Plan may have a small adverse impact on soils from motorized and non-motorized trail use that would lead to erosion, degradation, displacement, trail braiding, and rutting of soils over a limited area compared to the overall size of the Preserve. These impacts would continue as long as visitor use continued (NPS 2020).

3.4 VEGETATION AND INVASIVE SPECIES

This section describes the existing native vegetation communities, protected plant species, and the invasive and nuisance species that are known to occur in the Preserve.

Native Vegetation Communities

The Preserve hosts a variety of plant communities, including pinelands, prairies, marshes, mangroves, hammocks, cypress savannahs, and mixed swamp forests. Variability within the Preserve results from differences in elevation, water, fire, and soil conditions. Given the limited range of elevation in the Preserve, minor changes in elevation (i.e., just a few inches) bring about vastly different plant communities. Marshes, mangroves, cypress strands, and cypress savannahs are found at the lowest elevations. Prairies typically are found in the middle elevations, while the higher elevations are characterized by pinelands and hammocks (Ewel 1990, Kushlan 1990).

Seven major vegetation communities can be found in the Preserve: (1) cypress strands, domes, and sloughs; (2) hardwood swamps; (3) prairies; (4) pinelands; (5) hammocks; (6) marshes; and (7) mangroves (NPS 2010a, 2010c). Disturbed areas can also be found throughout the Preserve and are intermixed within these vegetation communities. Numerous protected plant species can be found within the vegetation communities, as well as species that serve as habitat for the protected animal species that use the Preserve. **Table 3-1** summarizes the major vegetation communities/landcover types, the typical dominant vegetation species in each vegetation community, and the overall percentage of cover of each vegetation community/landcover type within the Preserve.

Both temperate and tropical plants are present in the Preserve. Prairies and cypress strands and domes are the most prevalent vegetation types and are dominated by temperate species. Tropical species primarily occur in hammocks, but are also found in pinelands, mixed-hardwood swamps, and cypress strands. Endemic plants, native only to peninsular Florida, comprise 9% of the vegetation found in south Florida (Long 1974). NPS staff members are active in the NPS Inventory and Monitoring Program and have completed a thorough inventory of the Preserve's vascular plants, which include some that are afforded special protection (NPS 2010a).

Table 3-1: Vegetation Communities and Landcover within the Preserve

Vegetation Community/ Landcover	Typical Vegetation/Community/Landcover Type	Percentage of Cover within the Preserve
Cypress	Cypress Savannah, Dwarf Cypress Forest	45
Prairie	Cordgrass, Graminoid Prairie, Sawgrass, Muhly Grass, Broom and White-top Sedge	25
Pinelands	Savannah, Slash Pine	16
Hammocks	Slash Pine, Cabbage Palm, Hardwood Scrub, Saw Palmetto Scrub	5
Marsh	Broadleaf Emergent Marsh, Sawgrass, Cattail Marsh	3
Mixed Hardwood Swamp	Cypress, Red Bay, Sabal Palm, Pond Apple, Laurel Oak	3
Disturbed	Brazilian Pepper, Exotics, Melaleuca, Java Plum, Spoil Area, Roadway	1
Mangrove	Mangroves	1
Water	Water	1
TOTAL		**100**

Source: NPS 2010c

The Preserve comprises a mosaic of vegetation communities and habitats. The vegetation composition within these communities have been adversely affected by the decrease in distribution, depth, and duration of water on the landscape caused by the network of canals and levees within and adjacent to the Preserve. The proposed alternatives include hydrological

restoration of aquatic and wetland vegetation communities (i.e., open water areas, marsh, prairie, mangrove, mixed hardwood swamp, and cypress) and other adjacent communities (e.g., hammocks) in the Preserve. The wetlands vegetation communities comprise approximately 78% of the Preserve (NPS 2010c). Uplands communities, such as pinelands and particularly disturbed areas, may also be impacted by hydrologic restoration alternatives.

The vegetation communities are well-described in the General Management Plan for the Original Preserve (NPS 1992) and General Management Plan/Wilderness Study/Off-Road Vehicle Management Plan for the Addition (NPS 2010a), and the descriptions provided below are compatible with these two plans. Recently, the Everglades National Park and Big Cypress National Preserve Vegetation Mapping Project has published results of their efforts for a portion of the Preserve; the 2019 report (Ruiz et al.) includes a comprehensive description and mapping of the vegetation resources within the eastern portion of the Preserve. Since vegetation composition is a visible expression of the hydrological conditions, the vegetation mapping may be useful in identification of major and minor drainages and sloughs, and development and monitoring of Hydrologic Restoration Management Plan objectives and priority areas. By reference, the vegetation community descriptions and mapping are further incorporated in this EA.

Cypress: Two cypress species are the dominant trees throughout the Preserve – bald cypress (*Taxodium distichum*) and pond cypress (*T. ascendens*). Cypress are deciduous trees that can grow to 130 feet tall and reach diameters of 7 to 10 feet. Despite the name of the Preserve, most of the larger cypress trees have been removed by logging, and only a few large cypress trees remain. Cypress trees are highly resistant to fire and thrive in saturated soils. Cypress systems in the Preserve primarily occur as domes, strands, and prairies and are determined by the underlying soils and hydrology. Cypress systems are the most dominant vegetation communities. Hydrologic restoration has the potential to increase quantity and duration of water within the Preserve. Therefore, hydrologic restoration alternatives may benefit the cypress systems.

Cypress Domes - Cypress domes are characterized by a cypress overstory, which grows tallest in the center of a depression and tapers off toward the fringes, forming a dome-like feature. This depression in the limestone bedrock fills with organic soils, and eventually peat forms due to constant saturation and slow decomposition. The largest cypress trees are found in these wetter, deeper peat deposits. Trees toward the dome edge are thought to be smaller because of soils that are more marginal, lower water levels, and more frequent susceptibility to fires (Duever et al. 1986). Flooding for the majority of the year is essential for maintaining cypress domes; average maximum water levels reach about 2 feet (Duever et al. 1986). Periodic fires play an important role because they limit hardwood invasion, remove peat, and generally leave the cypress unharmed. Ponds often form in the center of cypress domes and are important habitat for alligators and aquatic wildlife.

Cypress Strands - Cypress strands are distinct from cypress domes because they form along major drainages and generally retain a north-south orientation. Tall cypress trees dominate the overstory. Unlike cypress domes, understory vegetation is diverse and includes shade-tolerant hardwoods, ferns, and epiphytes. Cypress strands are also associated with relatively deep water and are flooded for the majority of the year (Duever et al. 1986). The interiors of cypress domes and strands serve as important refuges for water-dependent wildlife during the dry season.

Cypress Prairie - Cypress prairies are communities that transition between shortgrass prairies and cypress-dominated swamp communities. Cypress prairies are typically dominated by grass-like ground cover common in prairies, such as muhly grass (*Muhlenbergia capillaris*) or sawgrass. Bald cypress trees are common but typically smaller partly because the limestone cap rock can inhibit

the trees' growth. These trees are called dwarf or hatrack cypress. These areas are inundated (usually less than 1 foot of water depth) through much of the wet season.

Prairie: Prairies are treeless areas dominated by an herbaceous understory and groundcover. Prairies occur extensively throughout the Preserve, particularly in the western and southern portions. Wet prairies in the Preserve are characterized by muhly grass, love grass (*Eragrostis* sp.), and sand cordgrass (*Spartina bakeri*); tend to have sandier soils than the wetter marsh systems; and are inundated up to approximately 8 inches during the wet season. Prairie communities are often found on frequently flooded fine sands or calcium carbonate marls. Limestone is commonly found near the soil surface. These areas are inundated for part of the year, and they receive considerable sunlight. Prairies burn during periods of drought – fires maintain the prairie by eliminating trees and shrubs. Hydrologic restoration has the potential to increase quantity and duration of water within the Preserve. Therefore, hydrologic restoration alternatives may benefit prairie communities.

Pinelands: Pinelands in the Preserve are dominated almost exclusively by south Florida slash pine (*Pinus elliottii* var. *densa*) in the canopy. Sub-canopy vegetation varies depending upon soils and hydrology. Pinelands are scattered across wide areas of the Preserve, particularly north of US 41. Pinelands occur in areas that are higher than most wetlands, so their substrates are inundated less frequently. For this reason, the quantity, seasonality, and distribution of surface water associated with hydrologic restoration may result in minor beneficial effects to pineland communities.

Several distinct types of pinelands occur within the Preserve: Slash pine forest, pine rocklands, and pine palmetto. These communities are most prevalent in the Preserve within the western portion of Zone 4 of the Stairsteps Unit; across a central band of the Deep Lake, Turner River, and Corn Dance units; and scattered across the Bear Island Unit and Northeast Addition.

Slash pine forests are woodland communities with scattered pine trees that form an infrequent canopy. Depending on substrate, some of these woodlands contain pine and palmetto communities, where scattered pine trees form an open canopy with a dense understory mostly consisting of saw palmetto. The palmetto shrub layer is usually dense so that groundcover does not become well established.

Pine rocklands are slash pine-dominated communities that occur on limestone outcrops. These areas also develop a saw palmetto shrub layer; however, this shrub layer is usually less dense than that same layer in the pine and palmetto communities. This allows the establishment of other types of groundcover and shrub species. Because of this, pine rocklands are often more diverse than pine and palmetto communities living on sandy substrates. Pineland communities often contain plants that are associated with the Atlantic coastal ridge communities.

The pine and palmetto and pine rockland communities are typically mesic communities, but frequently include extensive ecotonal areas that are adjacent to wetlands. These ecotonal communities have brief or infrequent hydroperiods and contain elements of the adjacent wetlands. Saw palmetto does not typically survive in hydric conditions and is not common in areas that are saturated or inundated often. Slash pines have the ability to tolerate hydric conditions, so that in areas with short hydroperiods, slash pines commonly live without the saw palmetto understory. In these areas, the open pine canopy allows sunlight to penetrate, and grass-like cover is commonly found.

Pine needles, grasses, and other combustible materials accumulate relatively quickly in pinelands, which burn at frequent intervals. Pinelands are fire-dependent, and prescribed fires by NPS staff maintain the habitat viability by preventing hardwood succession. If fires are suppressed, pinelands eventually succeed to hardwood-dominated stands.

Hammocks: Hammocks are dense and diverse forests of hardwood trees mixed with sabal palms, shrubs with saw palmettos, ferns, and epiphytes that are relatively small in area (2.5 acres or less). These communities are typically found on slightly elevated bedrock areas overlain with sandy peat soils that are slightly drier than those in the surrounding swamps (wetlands dominated by trees) and herbaceous wetlands. Hammocks are scattered throughout the Preserve and often appear as tree islands, which function as refuges for wildlife during periods of high water. Many hammocks are located on slightly elevated shell mounds that were left by the Calusa Indians. These shell mounds support tropical hardwoods including gumbo limbo (*Bursera simaruba*), mastic (*Mastichodendron foetidissimum*), and poison wood (*Metopium toxiferum*).

Hammocks that occur inland are usually surrounded by freshwater wetlands. Inland hammocks are usually dominated by live oak (*Quercus virginiana*) or laurel oak (*Q. laurifolia*) trees with understories made up of cocoplum (*Chrysobalanus icaco*), snowberry (*Chiococca alba*), and beauty berry (*Callicarpa americana*). Ground cover is sparse, usually consisting of tufted grasses such as bluestem (*Andropogon virginicus*). Epiphytes are common, especially on the branches of oak trees, where resurrection fern (*Polypodium polypodioides*), many bromeliads, and several uncommon orchids grow. Many epiphytes also occur on the trunks of sabal palms; vines such as poison ivy (*Toxicodendron radicans*), grapes (*Vitis* spp.), and pepper vine (*Ampelopsis arborea*) are common.

Trees that dominate these hammock communities are often large, such as oaks, sabal palms, or wild tamarind (*Lysiloma latisiliquum*). Hammocks are susceptible to invasion by unwanted exotic species, especially Brazilian pepper, when their soils and tree canopies are disturbed. The quantity, seasonality, and distribution of surface water associated with hydrologic restoration may result in beneficial effects to the wetland ecotone of hammock communities.

Marsh: Since preparation of the 1992 General Management Plan (NPS 1992), the classification of marshes in the Preserve has been changed to be consistent with vegetation classification throughout south Florida. Under the classification of Welch, Remillard, and Doren (1999), marshes now include many of the areas previously identified as prairies.

Marshes are open communities with few trees or shrubs; ground cover is dominated by emergent herbs. Inundation is year-round or nearly year-round. The Preserve supports both freshwater and saline marshes. Freshwater marshes are wetland communities that are typically inundated nearly year-round and have substrates with a thick organic surface layer. Freshwater marshes are commonly dominated by broad-leafed plants, such as pickerel weed (*Pontederia cordata*), cattail (*Typha domingensis* or *T. latifolia*), and duck potato (*Sagittaria* spp.). These wetlands have comparatively deep water during the wet season, which provides refuge for fish and other aquatic animals during the dry season. Wading birds, such as wood storks and American egrets (*Casmerodius albus*), depend on these concentrated prey populations to find sufficient food. Hydrologic restoration has the potential to increase quantity and duration of water within the Preserve. Therefore, hydrologic restoration alternatives may benefit marsh communities.

Mixed Hardwood Swamp: Mixed hardwood swamps contain hardwood trees such as red bay (*Persea borbonia*), sabal palm, pond apple, or laurel oak that co-dominate the tree canopy with bald cypress trees. Greater tree diversities lead to greater epiphyte diversities. Several bromeliads (*Tillandsia* spp., *Guzmania monostachia*) and orchids, such as epidendrums (*Epidendrum* spp.) and ghost orchids (*Polyrrhiza lindenii*), are found on the trunks and branches of these trees. Epiphytic ferns, such as shoestring fern (*Vittaria lineata*) and golden serpent fern (*Phlebodium aureum*), are common on the trunks of sabal palms. Vines, including poison ivy, several grapes, and rattan vine (*Berchemia scandens*), are also common components of the tree canopy. Similar to the cypress strand communities, the interiors of mixed hardwood swamps serve as refuges for water-dependent wildlife during the dry season. Hydrologic restoration has the potential to increase

quantity and duration of water within the Preserve. Therefore, hydrologic restoration alternatives may benefit mixed hardwood swamps.

Disturbed: Disturbed areas, found throughout the Preserve, are intermixed within native vegetation communities. These areas have been affected by nature (fire, freeze, storms, extreme tides, etc.) or by human activities such as logging, canal and road construction, farming and grazing, oil extraction, ORV use, fire, introducing exotic species, earth moving, altering drainage, altering the chemistry of water or soils, or facility construction. Community succession has been altered in disturbed areas. Soils in disturbed areas differ with locations and original substrates. The result is a change in the ecosystem that usually allows colonization and recruitment of ruderal (weedy) species. These weeds are often exotic plants that outcompete native plants and quickly dominate the disturbed area.

Mangrove: Mangrove forests (a.k.a. mangrove swamps) are intertidal wetlands dominated by hardwood trees that are tolerant of coastal, saline conditions. Three trees commonly occupy these areas – red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), and white mangrove (*Laguncularia racemosa*) – and are closely associated with buttonwood (*Conocarpus erectus*) in south Florida mangrove communities along much of the coastline. Florida law prohibits destruction of mangrove trees. The mangrove communities in the Preserve are found primarily in the Stairsteps Unit Zone 1 and along the southern edge of Zone 2. Hydrologic restoration has the potential to increase quantity and duration of water within the Preserve. Therefore, hydrologic restoration alternatives may benefit mangrove communities.

Protected Plant Species

Protected plant species include those species that are listed under the Federal Endangered Species Act of 1973, as amended (16 USC §1531-1544), and those species identified by the State of Florida as endangered, threatened, or commercially exploited. Based on existing USFWS IPaC online resources, the Preserve potentially supports 21 Federally listed plant species. The list of State of Florida listed plant species, maintained by the Florida Department of Agriculture and Consumer Services (FDACS), identified many state-listed plants that potentially occur in Collier, Miami-Dade, and Monroe Counties under rule 5B-40.0055. An evaluation of potential Federally listed plant species to occur in the Preserve, based on the known range of the species and the presence of suitable habitat, is provided in **Appendix C, Table 1**. To date, the Preserve resource staff have identified a total of 104 protected plant species within the Preserve (**Appendix C, Table 2**). However, only three Federally listed species have been observed within the Preserve:

- Everglades bully (*Sideroxylon reclinatum* ssp. *austrofloridense*) - Threatened
- Florida pineland crabgrass (*Digitaria pauciflora)* - Threatened
- Florida prairie-clover (*Dalea carthagenensis* var. *floridana*) – Endangered (82 FR 46691)

The remaining 101 species are state listed as endangered, threatened, or commercially exploited. The listing status and general habitat description for each of the protected plant species known to occur in the Preserve are provided in **Appendix C, Table 2**. Typically, these state-listed plant species warrant attention because they have had long-term population declines and are vulnerable to exploitation or environmental changes. The evaluation of the potential impacts on protected plant species is provided based on anticipated changes to the habitats in which these species occur, as identified in **Appendix C, Table 2**. Many are members of fire-dependent plant communities or associated with wetland and aquatic vegetation communities that may be affected by hydrological restoration activities. Descriptions of the three Federally protected plant species are provided below.

Everglades bully. Everglades bully is found in pinelands and prairies, and in the ecotone between them. This species also grows on the sunny edges of hammock habitat (82 FR 46691). These plants can tolerate inundation of freshwater for a portion of the year, but do not tolerate saline water. Hydrology within pine rocklands is largely dependent on the porosity of the limestone substrates; however, most sites are only wet following heavy events. In contrast, prairie is typically inundated for less than 6 months of the year (USFWS 1999).

In the Preserve, surveys conducted in 2013 in Gum Slough within the Lostman's Pines area (south of Loop Road) on the mainland portion of Monroe County identified 17 plants in pine rocklands associated with sawgrass and hammock (USFWS 2013a). The plant currently has limited distribution within the Preserve; however, additional taxonomic research on the species and closely related subspecies may indicate that the species is more widespread than thought (82 FR 46691).

Florida prairie-clover. Florida prairie-clover is typically found in pine rocklands, edges of rockland hammocks, coastal uplands, prairie, and ecotones between these habitats. This species may also occur along roadsides, where there is regular mowing, other native herbs and grasses are present, and exotic lawn grasses have not been planted (Gann et al. 2006; 82 FR 46691). Fire is probably an important component to the livelihood of this plant and the habitats in which it resides. Historical declines have been partially attributed to fire suppression or an inadequate fire regimen.

Florida prairie-clover is restricted to south and southwest Florida, with small, scattered populations found within the Preserve (in Monroe and Collier Counties), three Miami-Dade County conservation areas, and three unprotected lands within the Cutler Bay region of Miami-Dade County (82 FR 46691). Three populations were known to exist in the Preserve (i.e., north of Oasis Visitor Center, 11-Mile Road, and Pinecrest); however, the 11-Mile Road population appears to have been extirpated in 2014. The population north of the Oasis Visitor Center is one of the largest known populations, consisting of 236 plants of various age groups.

Florida pineland crabgrass. Florida pineland crabgrass most commonly occurs along the ecotone between pine rockland and prairie, with some overlap into the two ecosystems. These habitats occasionally flood during the wet season, especially within the prairie habitat. These preferred habitats indicate that this species is associated with low-elevation pinelands and pineland/prairie ecotones that flood for several months each year during the wet season. These habitats are maintained by periodic fires, which are important for maintaining healthy populations of Florida pineland crabgrass by both the removal of overstory hardwoods and the removal of accumulated litter.

Florida pineland crabgrass was historically found in central and southern Miami-Dade County, along the Miami Rock Ridge, from south Miami to the Long Pine Key region of the Everglades National Park (82 FR 46691). The current range includes Everglades National Park, where it is much wider ranging than previously known, and the Preserve, where it was discovered in 2002 in Zones 3 and 4 of the Stairsteps Unit, which are the first known occurrences outside of Miami-Dade County. Subsequent survey efforts have identified up to nine separate occurrences within the Preserve, with a total population estimated in 2007 of greater than 10,000 individuals (82 FR 46691).

Nuisance and Invasive Species

The NPS defines an invasive species as a nonnative species that causes harm to the environment; economy; or human, animal, or plant health (Executive Order 13751). Thousands of nonnative plant species have been introduced to south Florida for ornamental plantings, agriculture, and other human uses. Due to the relatively young age of the south Florida landmass and the semi-

tropical climate, it is theorized that the region is particularly susceptible to invasion by nonnative invasive plant species (Duever et al. 1986). Nuisance species, such as sabal palm and cattails (*Typha* sp.), are native species, and are known to invade natural communities and under certain circumstances (physical disturbance, lack of periodic fire, or decreased hydroperiod) out-compete and choke out desirable native vegetation.

Many of these nonnative plants are reported in the Preserve, but most are restricted to early successional stages on disturbed sites, and only a few pose a long-term threat to native communities. Five invasive species are common within the Preserve:

- Melaleuca (*Melaleuca quinquenervia*): occurs on disturbed and natural habitats, including pinelands, and seasonally flooded, shallow wetlands.
- Brazilian pepper (*Schinus terebinthifolius*): almost always confined to areas with substrate disturbance (roadsides, canal banks, abandoned homesites, or camps) and invades adjacent natural vegetation communities.
- Water hyacinth (*Eichhornia crassipes*): occurs in open water areas of ditches, canals, lakes, and excavated ponds. Does not invade dry wetlands.
- Hydrilla (*Hydrilla verticillata*): occurs in ditches, canals, lakes, and excavated ponds. Does not invade dry wetlands.
- Old World climbing fern (*Lygodium microphyllum*): occurs in disturbed sites and invades cypress stands, but also infests pinelands, wet prairies, sawgrass marshes, mangrove communities, and tree islands.

Control efforts have been concentrated on melaleuca, Brazilian pepper, and Old World climbing fern, as these species are capable of displacing native plant communities. In addition to the common invasive species, common air-potato (*Dioscorea bulbifera*) is known to be present within the Preserve, occurring on disturbed sites and invading pinelands and hammocks. Also, water-lettuce (*Pistia stratiotes*), an aquatic invasive species, occurs in ditches, canals, lakes, and ponds Crested floating heart (*Nymphoides cristata*), a relatively new nonnative for south Florida, was discovered in the Preserve in August 2006. Infestations are restricted to about 4 miles of canal along Tamiami Trail and two strand swamps south of the trail (NPS 2006a). Invasion of the adjacent swamps likely occurred from water flowing through culverts in the area.

Many of the invasive tree species thrive in drier environments that contain shorter hydroperiods and are associated with sites that have been disturbed or have experienced degradation of natural conditions (such as changes in hydrology, fire management, or other manipulations). Because hydrologic restoration activities would occur in areas that are disturbed or have been developed and impact habitats that are potentially occupied by aquatic invasive species, there is high potential for invasive species to occur. Information regarding the invasive species and the Preserve's plan to manage these species can be found in the South Florida and Caribbean Parks Exotic Plant Management Plan (NPS 2006a and 2010a).

The nonnative plant control program is carried out by NPS contractors and maintenance and resource management staff. When invasives are discovered, actions are prioritized to control or remove threat populations. On well-established invasive sites, fire is sometimes used to burn stands of invasives, then treatment by herbicide, mechanical, and additional fire can lead to successful control and re-establishment of natives. NPS staff members are active participants in the Florida Exotic Pest Plant Council, an interagency task force organized to share technical information on the control of nonnatives, monitor the distribution of nonnatives in south Florida, and collaborate on comprehensive control strategies. NPS staff members are also involved in the Everglades

Cooperative Invasive Species Management Area, an interagency partnership that manages, researches, and educates about invasive species across south Florida.

Trends and Planned Actions

Past, present, and reasonably foreseeable future effects to the Preserve's vegetation and invasive species may result from modifications to water management infrastructure, conversion of land use, oil and gas exploration and production operations, wildland fire activity, and backcountry visitor access.

Land, water, and transportation management actions external to this plan and upstream and adjacent to the Preserve have the potential to impact vegetation primarily from efforts to restore historical distribution of sheet flow by removal of roads and berms and plugging of canals. Everglades Restoration projects such as WERP and the SR 29 Barron River Flowway plans would re-establish ecological connectivity and ecological resilience, restore water levels to reduce wildfires associated with altered hydrology, and restore aquatic low nutrient conditions to reestablish and sustain native plants (USACE 2021; Sobczak 2020). The Preserve's hydro-ecological function would continue to be negatively impacted if Everglades Restoration projects are not implemented or if external land, water, and transportation management activities are pursued without adequate protections to the downstream and/or adjacent Preserve.

Other adjacent projects involving enhancement and preservation of wetlands, such as Cherryland Wilderness Preserve Mitigation Bank, would convert agricultural lands (e.g., citrus) into habitat types that historically occurred within the area and remove nuisance and exotic species (SFWMD 2020). Oil and gas exploration and production operations within the Preserve could result in localized, short-term adverse vegetation impacts due to clearing and matting down of plants associated with heavy equipment operation and the construction of roads and pads. There would be some potential for the spread of nonnative invasive plant species through the operation of vehicles, albeit low probability (BOCI 2016). The Preserve's Fire Management Plans emulate a natural fire regime using prescribed fires to maintain the species diversity and composition and community structure of native fire-dependent vegetation communities (NPS and USFWS 2016). However, over the past two decades there has been an undesirable increase in ecologically damaging and costly large wildfires during spring drought periods. The continuation of the current Backcountry Access Plan may have a small adverse impact on native vegetation, such as trampling and edge effects from ORV use and trail maintenance. If visitor use ceased, these areas would recover naturally (NPS 2020).

3.5 VISITOR USE AND EXPERIENCE

The Preserve is a destination for both local residents and nonlocal visitors (NPS 2010a). In the 1970s and 1980s, the primary visitors to the Preserve were hunters, ORV users, and owners of improved properties (NPS 2010a). Since the 1990s, there has been an increase in other recreational activities such as hiking, canoeing, wildlife viewing, birdwatching, photography, bicycling, camping, picnicking, and sightseeing. This increase has happened concurrently with an increase in overall visitors to the Preserve since the 1970s (NPS 2010a). Owners of private in-holdings within the Preserve benefit from Preserve amenities because they use existing roads to access their private residence or camp. Other improved properties, such as private camps, may also benefit from visitor use and experiences provided within the Preserve.

Peak visitation occurs during the drier winter months from December to March (NPS 2015c). According to a 2007 visitor study, common visitor activities include viewing wildlife, taking a scenic drive, driving through to another destination, and birdwatching (Papadogiannaki, Le, and

Hollenhorst 2007). Eight percent reported staying for one day, 46% reported staying for 2–3 days, and 30% of visitors reported staying 7 days or more (Papadogiannaki, Le, and Hollenhorst 2007). Existing visitor amenities and opportunities provided at the Preserve include visitor centers, campgrounds, scenic drives, picnic facilities, trailheads, and trails. There are 22 permitted commercial operators authorized to provide visitor services in the Preserve. The Preserve provides backcountry users with opportunities to experience peace and quiet in a natural environment. These activities include swamp buggy tours, canoe and kayak rentals and tours, pole boat tours, camping and hiking tours, wilderness education, and bike rental and tours.

The key recreation activities within the Preserve that may be affected include the following:

Camping - The Preserve provides several campgrounds and allows backcountry camping in most of the Preserve. The campgrounds, some of which are closed seasonally, provide tent and recreational vehicle (RV) sites, restroom facilities, electrical hookups, and drinking water. Some campgrounds are accessible only by permitted ORVs, biking, or hiking. Backcountry camping provides visitors a chance to experience the Preserve's interior. Backcountry users must carry everything they need to survive on their back or in an ORV. Backcountry camping is prohibited within close proximity to developed areas or county or state roads.

Hiking - Hiking in the Preserve can be along designated trails, including ORV trails, or orienteering through unmarked territory. There are miles of dedicated hiking trails in the Preserve, including trails that are part of the Florida National Scenic Trail (FNST). The FNST is a 1,400-mile nonmotorized, recreational trail that stretches across Florida; it received Federal designation as a National Scenic Trail in 1983. The FNST provides backcountry hiking experiences to visitors; its southern terminus is the Oasis Welcome Center.

Hunting, fishing, and frogging - The Preserve has been designated by the state as a wildlife management area, and the NPS permits hunting by the public in accordance with state laws and regulations. Hunting seasons in the Preserve include archery, muzzle-loading gun, general gun (rifles or shotguns), small game, spring turkey, and migratory bird. Hunters typically access stands and camps via ORVs. Hunters may take antlered deer (September through December), wild hogs (September through December), and turkeys (spring turkey season only). Hunters may also take gray squirrels, quail, rabbits, raccoons, and coyotes, as well as migratory game birds in season. Deer populations may decline over time due to high-water events and floods that may cause lower productivity, reduced recruitment, and higher mortality (Garrison et al. 2011). However, long-term research on causes of mortality and survival rates of fawns and adults may be needed to clarify the role of hydrology on deer populations in the area.

Fishing and frogging are allowed year round. Fishing requires a license and anglers are required to adhere to Florida's Freshwater Fishing Regulations published by the FWC. Recreational frogging for personal use is allowed and does not require a license. Hydrologic restoration activities have the potential to result in beneficial effects on fishing and frogging uses within the Preserve.

Motor boat use - Use of motorboats throughout the Preserve is generally restricted to the deeper water estuarine environments south of US 41 outside of Everglades City and the L-28 Interceptor Canal in the Northeast Addition. The Stairsteps Unit (south of US 41) is the wettest area of the Preserve and is often referred to as "airboat country." Zone 4 of the Stairsteps Unit is restricted to airboats.

In accordance with the principles of adaptive management, the Preserve has established water levels for airboat use only in Stairsteps Unit Zone 4. Different low-water levels have been established for the summer-fall (June through December) and winter-spring (January through May) seasons. As described in the 2000 ORV Plan, airboat use in Zone 4 is allowed as follows:

- During the summer-fall season only when water levels at the P34 gauging station are above 2.2 feet asl and below 4.0 feet asl.
- During the winter-spring season only when water levels at the P34 gauging station are above 3.0 asl and below 4.0 feet asl.

Off-road vehicle use - Remote backcountry areas of the Preserve are challenging to reach by foot. ORVs are a practical way to access the Preserve's interior, and thus, ORV use is a traditional, popular recreational activity. Several types of ORVs are used to access the backcountry, including street-legal four-wheel-drive vehicles (4 x 4s), lightweight all-terrain vehicles, utility task vehicles, swamp buggies, and airboats. ORV use is heaviest during the fall, winter, and spring hunting seasons. The greatest use is on opening weekends of hunting seasons and holidays.

Paddling - There are several opportunities for visitors to enjoy designated paddling (nonmotorized) trails in the Preserve, most of which are south of US 41. Visitors have several options that offer easy to moderate trails, including the Turner River Paddling Trail, the Halfway Creek and Halfway Creek Loop Paddling Trails, and the Lefthand Turner River Paddling Trail. Other areas are open to other types of boats. In the Addition, the lakes and streams adjacent to Everglades City and Plantation Island are open to paddlers and provide a coastal marsh and mangrove experience (NPS 2010a).

Wildlife viewing (birdwatching) - There are various opportunities for visitors to view wildlife along the extensive network of paved and unpaved roads throughout the Preserve, such as Burns Road, Bear Island Grade, Levee Road, the Jetport access road, Bass Road, and others. Popular scenic drives in the Preserve include Loop Road and the Turner River/ Wagonwheel/Birdon Roads loop. Visitors can view birds, alligators, and other wildlife. There is also a nature center and an interpretive trail along Loop Road. In the original Preserve, several formal wildlife observation platforms are available to users; within the Addition, wildlife viewing and birdwatching opportunities are relatively primitive in nature and self-directed because no infrastructure is available (NPS 2010a). Visitors also use non-conventional observation areas, such as plugs and culvert areas to access scenic wildlife and scenic views. At these non-conventional areas, there are occasionally unexpected and adverse human/wildlife encounters and behaviors. The Preserve is part of The Great Florida Birding and Wildlife Trail, a collection of 445 sites throughout Florida selected for their excellent birdwatching or bird education opportunities. Nearly 200 species of birds may be seen throughout the year, including limpkins, purple gallinules, roseate spoonbills, snail kites, swallow-tailed kites, and wood storks.

Trends and Planned Actions

Past, present, and reasonably foreseeable future effects to the Preserve's visitor use and experience may result from modifications to water management infrastructure, conversion of land use, oil and gas exploration and production operations, wildland fire activity, and backcountry visitor access.

Land, water, and transportation management actions external to this plan and upstream and adjacent to the Preserve have the potential to impact recreation activities primarily from efforts to restore historical distribution of sheet flow by removal of roads and berms and plugging of canals. Everglades Restoration projects such as WERP and the SR 29 Barron River Flowway plans would correct hydrologic diversions and introduce new water into the Preserve (USACE 2021; Sobczak 2020; SFWMD 2020). The Preserve's hydrology would continue to be negatively impacted if Everglades Restoration projects are not implemented or if external land, water, and transportation management activities are pursued without adequate protections to the downstream and/or adjacent Preserve.

Other adjacent projects involving enhancement and preservation of wetlands, such as Cherryland Wilderness Preserve Mitigation Bank, would convert agricultural lands (e.g., citrus) into habitat types that historically occurred within the area and remove nuisance and exotic species (SFWMD 2020). Oil and gas exploration and production operations within the Preserve could result in localized, short-term adverse visitor impacts due to anticipated impacts to visual quality from disturbance to vegetation and/or soils, and temporary disruption to recreational uses by hikers, ORV users, hunters, and birdwatchers as a result of temporary trail/area closures and noise disturbance (BOCI 2016). Implementation of the Preserve's Fire Management Plans may result in temporary visitor use restrictions in specific section of the Preserve. Impacts to visitor use and experience would be short-term adverse and localized due to public use closures and smoke impacts (NPS and USFWS 2016). Over the past two decades, there has been an undesirable increase in ecologically damaging and costly large wildfires during spring drought periods. The continuation of the current Backcountry Access Plan may have a small adverse impact on visitor use and experience from construction activity and the associated visual/noise disturbance, which may result in temporary disruption to recreational activities and visitor perception (NPS 2020).

3.6 CULTURAL RESOURCES: ETHNOGRAPHIC RESOURCES AND CULTURAL LANDSCAPES

Ethnographic Resources

Ethnographic resources are the cultural and natural features of the Preserve that are of cultural significance to the peoples traditionally associated with them (NPS 2006b), including traditional sites, structures, objects, landscapes, natural resources, and other material features. In other words, the resource is "closely linked with the people's own sense of purpose, existence as a community, and development as ethnically and occupationally distinctive peoples" (NPS 2006b). Traditionally associated peoples are defined as contemporary neighbors or ethnic or occupational groups that have been associated with a unit for two or more generations (40 years) and whose interests in the unit began prior to the unit's establishment. The Miccosukee Tribe of Indians of Florida and the Seminole Tribe of Florida are both recognized in the enabling legislation as peoples traditionally associated with the Preserve. The Seminole Nation of Oklahoma is a Federally recognized tribe that is historically related to the Seminole Tribe of Florida. Its members are descendants of the Seminoles who were removed from Florida to Indian Territory (now Oklahoma). These peoples are the contemporary Preserve neighbors and ethnic or occupational communities that have been associated with the Preserve for two or more generations (40 years) and whose interests in the Preserve's resources began before the Preserve's establishment. An ethnographic resource is a resource under NPS stewardship that is of cultural significance to peoples traditionally associated with it. In other words, the resource is "closely linked with [the peoples'] own sense of purpose, existence as a community, and development as ethnically [and occupationally] distinctive peoples." (NPS 2006b).

Both the Miccosukee and Seminole trace their ancestry to the ancient people of Florida (Calusa, Tequesta, Apalachee, and others) and descendants of the Creek Nation, an association of clan villages that lived in Georgia and Alabama. These tribes have histories that pre-date Columbus and Spain's "discovery" of Florida in the early 16th century. Due to conflicts between the Creek people and European settlers, many Creek families fled to Florida's remote Glades region to seek refuge. Here, the Miccosukee and Seminole tribes developed distinct cultures. As the Miccosukee and Seminole moved south, they adapted to the plants found in their new environment. The Miccosukee and Seminole continue to access natural resources as their ancestors did. They use timber for construction of traditional shelters known as chickees, harvest plants and animals for personal use,

and have ceremonial sites within the Preserve. Because of the tribes' concern for maintaining confidentiality, some ethnographic resources are unknown by Preserve staff. Information relating to these ethnographic resources would be obtained through collaborative research between the NPS and designated tribal representatives. However, the tribes regard archeological sites that may retain tribal/cultural associations (e.g., middens, burial locations) as having cultural and/or sacred importance, and they believe these sites should be protected and not disturbed. The NPS consults regularly with the tribes and plans to continue such collaboration efforts. The NPS has a goal of avoiding and minimizing impacts to ethnographic resources; if tribes identify ethnographic resources that need to be protected or enhanced (such as by hydrologic restoration), the NPS would try to enhance the condition of those resources.

The NPS, in accordance with the American Indian Religious Freedom Act of 1978, is working with the various Miccosukee and Seminole groups to protect the privacy and sanctity of their ceremonial and burial sites. The Miccosukee have a repatriation plan that outlines the protocols for the repatriation of human remains and associated funerary objects, sacred objects, and objects of cultural patrimony found in Florida. Both the Miccosukee and Seminole also claim cultural affiliation with the ancestral Calusa Indians, and others, who formerly inhabited the Preserve; therefore, the tribes retain repatriation interests for cultural materials determined to be of Calusa origin.

Cultural Landscapes

According to the NPS Cultural Resource Management Guideline (Director's Order 28), a cultural landscape is "...a reflection of human adaptation and use of natural resources and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. The character of a cultural landscape is defined both by physical materials, such as roads, buildings, walls, and vegetation, and by use reflecting cultural values and traditions." Descriptions of cultural landscapes typically identify the character-defining features that reflect the historic character and existing condition of the landscape. These features may include spatial organization, circulation, vegetation, views, small-scale features, building clusters, and constructed water features, among others. Detailed descriptions of these features are available in the Designated ORV Trail Heads and Turn Lanes Environmental Assessment (NPS 2012). Due to the potential significance of Loop Road and Tamiami Trail and associated Tamiami Canal, these resources are described as cultural landscapes for purposes of this EA.

The focus of the description in the ORV Trail Heads and Turn Lanes Environmental Assessment is on the roads and their settings. At this time, no formal documentation or recognition of cultural landscapes has occurred in the Preserve, although Loop Road and Tamiami Trail may be designated as such in the future. It is also possible that within the Big Cypress area, there may be cultural landscapes related to past use of the Preserve by Native American groups; guidance is already in place to avoid impacts to identified sacred sites.

Trends and Planned Actions

Past, present, and reasonably foreseeable future effects to the Preserve's cultural resources may result from modifications to water management infrastructure, conversion of land use, oil and gas exploration and production operations, wildland fire activity, and backcountry visitor access.

Land, water, and transportation management actions external to this plan and upstream and adjacent to the Preserve have the potential to impact cultural resources through introduction of new water and sheet flow.

Other adjacent projects involving enhancement and preservation of wetlands, such as Cherryland Wilderness Preserve Mitigation Bank, would convert agricultural lands (e.g., citrus) into habitat types that historically occurred within the area and thereby restore the historic character of the landscape (SFWMD 2020). Oil and gas exploration and production operations within the Preserve could have inadvertent adverse impacts on archeological resources although approval of oil and gas proposals requires an approved operations plan, which includes mitigation measures to eliminate or reduce impacts on archeological resources (BOCI 2016). The Preserve's Fire Management Plans include resource protection measures that protect archeological resources by helping to reduce hazard fuel loads, control non-native plant species, and maintain defensible space (NPS and USFWS 2016). However, over the past two decades there has been an undesirable increase in ecologically damaging and costly large wildfires during spring drought periods. The continuation of the current Backcountry Access Plan could result in an adverse impact to cultural resources, primarily from the potential for impacts to archeological sites from illegal activity such as collecting and ORV damage. These impacts would continue as long as visitor use continued (NPS 2020).

Chapter 4

Environmental Consequences

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

This chapter discusses the likely environmental consequences resulting from a no action alternative and two action alternatives. The analysis is the basis for comparing the beneficial and adverse effects of implementing the alternatives. By examining the environmental consequences of the alternatives on an equivalent basis, decision makers can evaluate which approach would create the most desirable combination of benefits with the fewest adverse effects.

4.1 ANALYSIS METHODS AND ASSUMPTIONS

The analysis of impacts follows Council on Environmental Quality NEPA regulations at 40 CFR Part 1500 *et. seq.*, Director's Order 12 procedures, the National Park Service (NPS) *NEPA Handbook* (NPS 2015d), and NPS *NEPA Handbook Supplemental Guidance: Writing Impact Analysis Section of EA and EISs* (NPS 2015e).

The planning team based the impact analysis and the conclusions in this chapter on the review of existing literature and field studies, information provided by experts in the Preserve and in other agencies, and professional judgment. The team's method of analyzing impacts is further explained below. Impacts were assessed with the assumption that the implementation of mitigation measures would minimize, reduce, and/or avoid impacts to resources. If mitigation measures described in chapter 2 "Alternatives," including the two action alternatives, were not implemented, the potential for resource impacts and the degree of those impacts would increase. However, implementation of monitoring and mitigation measures and best management practices are routinely applied to avoid or minimize potential impacts in the Preserve. Projects would be designed and constructed in accordance with regulatory guidelines, recommendations, and issued project permit conditions.

The environmental consequences for each resource were identified and characterized based on the potentially affected environment and degree of the effects of the action, in accordance with 40 CR 1501.3(b):

Potentially affected environment refers to the geographic setting within which an impact may occur (i.e., the affected region or locality) and its resources, such as listed species and designated critical habitat under the Endangered Species Act. In this document most impacts are either site-specific or are expected to occur throughout the Preserve.

Degree refers to both short-term and long-term effects, both beneficial and adverse effects, effects on public health and safety, and effects that would violate Federal, State, Tribal, or local law protecting the environment. For many of the resources evaluated, the duration an impact would last (e.g., short-term and long-term) is estimated based on whether restoration to pre-disturbance conditions would require mechanical manipulation or human intervention or would occur under natural ecological processes within a given period. Beneficial effects refer to a favorable change in the condition or appearance of the resource, or a change that moves the resource toward a desired condition; and adverse effects would be a change that declines, degrades, and/or moves the resource away from a desired condition or detracts from its appearance or condition.

Impacts on a resource area may result from a variety of direct or indirect effects. Direct effects are caused by an action and are effects that occur at the same time and place as the action. Indirect effects are caused by the action and occur later or farther away, but are still reasonably foreseeable. This document discloses and analyzes both direct and indirect effects, but does not differentiate between them in the discussions.

The impacts of the alternatives describe the impacts that would occur as a result of implementing the no action alternative and implementing the action alternatives. The "Affected Environment" section (chapter 3) serves as the baseline for assessing impacts. To understand the full scope of the impacts of implementing the action alternatives, the reader should also consider the impacts that would occur in the no action alternative.

The impact analysis for natural resource impact topics (water resources, wildlife and protected species, soils, and vegetation and invasive species) was based on research; the NPS and other expert knowledge of the area's resources; and the best professional judgment of planners, resource specialists, and biologists who have experience with similar types of projects.

4.2 WATER RESOURCES

This section discusses the potential impacts related to water resources and the function of water resources in the Preserve. As discussed in chapter 3 "Affected Environment," water resources in the Preserve include the watershed, hydrology and water quantity, groundwater, and water quality. The quality, quantity, seasonality, and distribution of water throughout the Preserve's watershed affect the biological communities in the Preserve and downstream delivery points. Importantly, projects that require water quality treatment (i.e., stormwater treatment areas) largely occur at or upstream of the Preserve's boundary and outside of its exclusive jurisdiction control. These projects and actions are considered to fall outside the scope of the Hydrologic Restoration Management Plan, and the two action alternatives would not affect water quality. Therefore, water quality is not retained for evaluation in this EA.

Methodology

The methodology used for assessing water resource impacts included using available GIS data and literature to identify the water resources present and identifying the potential effects to water resources by the alternatives. Potential impacts for the alternatives were based on professional judgment and experience with similar actions.

Duration of impacts is defined as follows:

Short-term: Water resources would recover in one year or less.

Long-term: Water resources would recover in more than one year.

Impacts of Alternative A – No Action Alternative

The Preserve would continue to manage water as status quo by maintaining existing infrastructure and modifying it on an ad hoc basis with opportunistic planning and management as funding permits. This results in projects being adopted only as funding permits, and without the benefit of a holistic planning process focused on Preserve-wide restoration needs. Historically, this has resulted in one to two small-scale restoration projects per decade, with a slight uptick in the last five years as the Preserve undertook the Ochopee Sheet flow Restoration pilot project. Under the no action alternative, the Preserve would continue to rely heavily on external county, state, and Federal agencies to perform hydrologic restoration on levees, canals, and bridges within and adjacent to the Preserve, and the number of projects would be limited.

Hydrology and Water Quantity – Under the no action condition, existing hydrologic disruptions that hamper natural sheet flow within the Preserve would remain. The relationship between vegetation communities and the hydrological cycle (wet and dry periods) would continue to be negatively influenced.

Groundwater – Under the no action alternative, canals would continue conveying water off the swamp during the dry season and exacerbate the seasonal drop in the groundwater table. The slow leakage of water out of the swamp would persist and the Preserve's swamp ecosystem would continue to be stressed by periods of prolonged drought and heightened wildfire severity.

Under the no action alternative, the Preserve would also continue to be impacted by saltwater intrusion.

Conclusion. Under Alternative A, an overarching hydrologic restoration plan would not be initiated. Therefore, the Preserve's hydrology would not be restored, and under current conditions, the Preserve's hydro-ecological functions would continue to deteriorate and the overall goals of the NPS to improve the hydrology in the region would not be met. The environmental consequences of the no action alternative on hydrology, water quantity, and groundwater would be long-term adverse.

When considering the planned actions described in chapter 3, such as modifications to regional water management infrastructure, conversion of adjacent land use, oil and gas exploration and production operations, and wildland fire management, and the existing condition of the environment, the environmental consequences would continue to be long-term adverse.

Impacts of Alternative B

Alternative B would modify the existing canal and levee system using passive water management techniques. As discussed in chapter 2, these techniques include: plugging or filling canals and ditches; culverting roadbeds; breaching impounding structures; removing fill; managing vegetation; maintaining plugs, culverts, and breaches; and in some areas, restoration work could include minor bridging or elevated boardwalks. The goal is to strategically modify excavated (e.g., canal) and elevated (e.g., levee) features to minimize or eliminate their impact on the natural hydrologic regime.

Under Alternative B, the depth, duration, and distribution of water on the landscape would be improved and as a result, it would improve the Preserve's hydro-ecological functions. The passive water management features would help the landscape dictate the flow of the water. During implementation, elevated disruptions would require strategic modification (including removal of material or addition of culverts) for the purpose of eliminating or reducing unnatural water blockage. Excavated disruptions would require strategic infilling to wetland grade for the purpose of eliminating or reducing unnatural drainage. (see chapter 2.3.1).

Hydrology and Water Quantity – Under Alternative B, planned projects would restore freshwater flow paths, flow volumes and timing, seasonal hydroperiods, and historical distribution of sheet flow to re-establish ecological connectivity and ecological resilience of the wetland/upland mosaic. Alternative B would also restore water levels to reduce wildfires associated with altered hydrology, which damage the geomorphic and associated ecological conditions of the Preserve.

For restoration of excavated features, construction activities would include raising to natural grade using earthen fill, or to a more limited extent, concrete plugs. For restoration of elevated features, construction activities would include removal of vegetation, removal of fill, and placement of fill to an adjacent canal or ditch or alternatively taken off-site to a staging area for future use in a restoration project. Hydrology and water quantity impacts from construction sites would be minimized by performing the work during the dry season and using best management practices such as hay bales, silt fences, and turbidity barriers where needed.

Groundwater – Under Alternative B, planned projects would reduce draining of groundwater from the shallow aquifer underlying the swamp ecosystem during the dry season, thereby making the region less susceptible to drought and wildfire. Alternative B could also help reduce saltwater

intrusion by increasing subsurface recharge of water, especially in areas currently negatively impacted by saltwater intrusion. No direct impact on groundwater is anticipated during construction, as excavation would be limited to the artificially elevated landscape.

Conclusion. Alternative B would result in short-term, adverse, localized impacts to hydrology and water quantity during construction because of potential temporary impediments to natural flow and stormwater runoff. Alternative B would result in long-term beneficial effects to hydrology, water quantity, and groundwater at both a local and regional scale. Mitigation measures and best management practices would be applied in accordance with regulatory guidelines, recommendations, and issued project permit conditions to avoid or minimize potential impacts from implementation (see chapter 2.5).

When considering the planned actions described in chapter 3, such as modifications to water management infrastructure, conversion of land use, oil and gas exploration and production operations, and wildland fire management, and the existing condition of the environment, Alternative B would continue to have long-term, beneficial effects.

Impacts of Alternative C

Alternative C includes the elements of Alternative B, plus additional Tier 2 Site-specific projects including limited strategic road removal and the addition of bridging at major flow-ways. As discussed in chapter 2, bridging is essentially an enlarged version of the plug/culvert pair.

Bridging may be more effective at hydrologic restoration; however, it is generally more expensive than the plug/culvert pair. Bridging is a larger structural construction operation with larger and longer spans. The greater degree of required engineering and larger footprint would lead to increase in the footprint and duration of construction.

Hydrology and Water Quantity – Under Alternative C, impacts to hydrology and water quantity would be generally similar to those described under Alternative B. However, bridging in limited areas would maximize long-term hydrologic benefits. Construction activities for bridging would take longer to complete and the total project area would be larger.

Groundwater – Under Alternative C, impacts to groundwater would be generally similar to those described under Alternative B. However, construction of bridge foundations such as pilings, piers, and other support elements may require groundwater dewatering during construction. Groundwater impacts from construction sites would be minimized by performing the work during the dry season and using best management practices to prevent potential pollution by controlling it at the source. The work would be performed in accordance with the National Pollutant Discharge Elimination System Stormwater (NPDES) Program, which regulates point source discharges.

Conclusion. Alternative C would result in short-term, adverse, localized impacts to hydrology, water quantity, and groundwater during construction because of potential temporary impediments to natural sheet flow/groundwater flow and stormwater runoff. Alternative C would result in long-term beneficial effects to hydrology, water quantity, and groundwater at both a local and regional scale.

When considering the planned actions described in chapter 3, such as modifications to regional water management infrastructure, conversion of adjacent land use, oil and gas exploration and production operations, and wildland fire management, and the existing condition of the environment, Alternative C would continue to have long-term, beneficial effects.

4.3 WILDLIFE AND PROTECTED SPECIES

This section discusses the potential impacts related to wildlife and protected species in the Preserve. As discussed in chapter 3 "Affected Environment," the following protected animal species were retained for evaluation in this EA: Florida panther (Federally designated endangered), West Indian manatee (Federally designated threatened), Everglades snail kite (Federally designated endangered), Florida bonneted bat (Federally designated endangered), American alligator (Federally designated threatened due to similarity of appearance), red-cockaded woodpecker (Federally designated endangered), and protected wading birds. Management goals for wildlife include maintaining components and processes of naturally evolving Preserve ecosystems, including natural abundance, diversity, and the ecological integrity of plants and animals.

Methodology

The methodology used for assessing wildlife impacts included using Preserve knowledge and available literature to identify the wildlife species and habitat communities present and identifying the potential effects to wildlife populations (e.g., composition, diversity, abundance) by the alternatives.

Duration of impacts is defined as follows:

> Short-term: Individual species or habitat would recover in less than one year or within one breeding season.
>
> Long-term: Individual species or habitat would recover in more than one year or more than one breeding season.

Impacts of Alternative A – No Action Alternative

Under the no action alternative, the Preserve would continue to manage water as status quo by maintaining existing infrastructure and modifying it on an ad hoc basis with opportunistic planning and management as funding permits. The Preserve would continue to rely heavily on external county, state, and Federal agencies to perform hydrologic restoration on levees, canals, and bridges within and adjacent to the Preserve, and the number of projects would be limited. Under the no action alternative, projects to improve the hydrology of the swamp ecosystem would not be designed and implemented as part of an overarching hydrologic restoration management plan.

Florida panther – Under the no action alternative, the Florida panther would continue to use habitat within the Preserve. The Florida panther uses a wide variety of habitats, with over 95% of the overall Preserve falling within the U.S. Fish and Wildlife Service (USFWS) primary zone of this species. Although no habitat would be removed, hydrology in the Preserve would not be restored and therefore prey would not have improved foraging opportunities. There would be no direct impact on Florida panthers in the project area; however, the continued ecological degradation and lack of sheet flow would affect Florida panther habitat over the long-term.

West Indian manatee – Under the no action alternative, the West Indian manatees would continue using the area in the same manner. Manatees benefit from coastal-connected canals that provide access to warm-water refugia during winter cold snaps, including the SR 29 canal, US 41 canal up to Wootens, and the Halfway Creek Canal.

Everglades snail kite – Under the no action alternative, snail kites would continue to forage in the area. Although no snail kite foraging habitat would be removed, the habitat for prey (e.g., apple snail) would continue to be impacted by an altered hydrologic regime, including shallower water depths and shorter hydroperiods. While there would be no direct impact on snail kite in the project area, hydrologic impacts to its habitat would occur in the long-term.

Florida bonneted bat – Under the no action alternative, the Florida bonneted bat would continue to forage in the area. Although no bat foraging habitat would be removed, sheet flow in the Preserve would not be restored and therefore habitat for prey (e.g., insects) would not have improved water levels. As such, there would be no direct impact on Florida bonneted bat in the project area. However, the continued ecological degradation and lack of sheet flow would affect bat habitat over the long-term.

American alligator – Under the no action alternative, American alligators would continue using the area in the same manner. Alligators commonly use canals, particularly during the dry season when water is scarce, and occasionally use road berms for basking or crossing to the other side of the road. Many alligators have become habituated to humans and human activities (e.g., fishing, illegal feeding) where canals are present at high public visitation areas, including HP Williams Roadside Park, Sweetwater Strand, and Oasis Visitor Center. Wildlife adjacent to roads and drainage structures during maintenance activities may be disturbed and move away from the location during those activities. The continued degradation of wetlands and sheet flow would affect alligator habitat over the long-term.

Red-cockaded woodpecker – Under the no action alternative, the red-cockaded woodpecker would continue using the area in the same manner. Although no nesting and foraging habitat would be removed, hydrology in the Preserve would not be restored and therefore hydric pine habitat would not have improved water levels. The mature pine forests which the red cockaded woodpecker occupies have limited understory growth, primarily due to fires and seasonal flooding.

There would be no direct impact on red-cockaded woodpeckers in the project area; however, the continued ecological degradation and reduced hydroperiod would affect red-cockaded woodpecker habitat over the long-term. Hydrologic changes have already caused a major loss of pines in the Lostman's Pines area of the Preserve (USFWS 1999). The altered hydrology has drastically favored cabbage palms (*Sabal palmetto*) over the typically grassy understory of pinelands (USFWS 2017a).

Protected wading birds – Under the no action alternative, protected wading birds would continue to forage in the area. Although no wading bird foraging habitat would be removed, sheet flow in the Preserve would not be restored and therefore habitat for wading birds would not have improved water levels. As such, there would be no direct impact on protected wading birds in the project area. However, the continued alteration of the natural water regime would affect wading bird habitat over the long-term.

Conclusion. An overarching hydrologic restoration plan would not be initiated. Therefore, the Preserve's hydrology would not be restored, and under current conditions, the Preserve's hydro-ecological functions would continue to deteriorate, and the overall goals of the NPS to improve the hydrology in the region would not be met. Therefore, continuation of current management under the no action alternative would result in long-term adverse impacts to wildlife and protected species due to the large area of habitat being affected.

When considering the planned actions described in chapter 3, such as modifications to regional water management infrastructure, conversion of adjacent land use, oil and gas exploration and production operations, and wildland fire management, and the existing condition of the environment, the environmental consequences would continue to be long-term adverse.

Impacts of Alternative B

Alternative B would modify the existing canal and levee system using passive water management techniques. As discussed in chapter 2, these techniques include plugging or filling canals and ditches; culverting roadbeds; breaching impounding structures; removing fill; managing vegetation; maintaining plugs, culverts, and breaches; and in some areas, restoration work could include minor

bridging or elevated boardwalks. The goal is to allow the natural lay of the land, not canals and levees, to control the Preserve's hydrologic regime. The goal would be achieved by strategically modifying excavated and elevated features to minimize or eliminate their impact on the natural hydrologic regime. Alternative B does not introduce new water to the landscape; rather it helps lessen the blockage, diversion, and drainage of water already in the Preserve in a way that enhances the natural distribution and persistence of water on the landscape.

The restoration projects could adversely impact wildlife and protected species in the short-term during construction but provide beneficial impacts over the long-term after construction is complete. Restoration efforts would be sited and/or timed to avoid sensitive wildlife habitats and periods. Site-specific monitoring and mitigation measures and best management practices would be applied following consultation with the USFWS and FWC, and in accordance with their guidelines, recommendations, and issued project permit conditions.

For restoration of excavated features, construction activities would include strategically adding earthen fill to reestablish natural wetland grade. Earthen fill may be supplemented by rip rap, concrete, or sheet piling to a more limited extent. For restoration of elevated features, construction activities would include strategically adding culverts or removing fill to re-establish natural grade. Wildlife and protected species impacts from construction sites would be minimized by following guidelines and recommendations provided during consultation with the USFWS and FWC.

Under Alternative B, the depth, duration, and distribution of water on the landscape would be improved and as a result, increase the swamp ecosystem's floral and faunal health. The base of the swamp's food chain would benefit (e.g., invertebrate and fish communities), thereby supporting the rest of the swamp ecosystem, such as alligators and wading birds, that are dependent on the aquatic food base. Where possible, projects would favor design elements that provide additional environmental or visitor enjoyment benefits. Alternative B would provide general beneficial impacts to each wildlife species by allowing the natural lay of the land – not canals and levees – to control the distribution and persistence of water on the landscape.

Florida panther – Under Alternative B, improving the hydrology of the swamp ecosystem would offer an overall improvement offer to habitat and foraging opportunities for the white-tailed deer, which is the Florida panther's primary prey, and thereby indirectly benefit the Florida panther. New plugs would provide new canal crossings for panthers, deer, and other terrestrial wildlife. Individuals present during construction are anticipated to temporarily move away from the location during those activities.

West Indian manatee – Under Alternative B, infilling of coastal canals such as Halfway Creek Canal could impede manatee access to warm-water refugia during winter cold snaps.

The importance of freshwater to manatees has been evidenced by studies of manatee physiology (Ortiz, Worthy, and Byers 1999) and manatee movement patterns (USGS 2004a). Because restoration activities are expected to change the timing and quantity of freshwater inflow to rivers and canals within the Preserve, manatee movement patterns are anticipated to adjust in response to the changing availability of freshwater. The abundance and distribution of manatees would likely track the increased availability of freshwater associated with restoration (USGS 2004a). Individuals present during construction are anticipated to move away from the location during those activities.

Snail kite – Under Alternative B, improving the hydrology of the swamp ecosystem would also improve sparsely vegetated wetlands that are habitat for the snail kite's primary prey, the apple snail. Water management actions are the most important human-controlled factors in survival and recovery of the snail kite. A balanced approach to water level management is needed to maintain favorable habitat conditions for the snail kite. Nearly continuous flooding of wetlands for more than

one-year duration is required to sustain apple snail populations (USFWS 1999). Therefore, hydrologic restoration alternatives may benefit the snail kite.

Florida bonneted bat – Under Alternative B, improving the hydrology of the swamp ecosystem would also improve natural habitats conducive to insect diversity where the Florida bonneted bat may forage for insects. This species uses a wide variety of habitat types, including forested areas, wetlands, and open water in the Preserve. Therefore, the Florida bonneted bat would indirectly benefit from increased foraging opportunities.

Currently, there is one documented Florida bonneted bat roost site in the Preserve, with a potential for a second roost site to be identified. This species is unlikely to be impacted, but if the species were to occur in an area where there is a proposed project, the project would be postponed, or further consultation with USFWS would take place. To determine if the species were present, surveys would be conducted on each project site prior to implementation.

This species forages at night when construction would not be active. Therefore, no impacts to foraging individuals or their insect prey are anticipated as a result of construction activity.

American alligator – The American alligator, a keystone species, is and will continue to be negatively impacted by prolonged drought. The same canal system that drains and diverts water out of the swamp preserve also serves as a vital life support for alligators during spring droughts. Under Alternative B, partial plugging of canals helps reduce their diversionary drainage capacity while retaining deep water habitat during droughts. Plugs also provide basking areas for alligators away from roads. This is expected to improve the suitability and population of alligators in its natural habitat. Doing so would improve the broad range of ecological services that alligators provide, such as wallowing out local depressions in domes and marshes, which are also used by other species due to the created benefits in fish habitat, wading bird foraging, and nesting potential. Individuals present during construction are anticipated to move away from the location during those activities.

Red-cockaded woodpecker – Under Alternative B, improving the hydrology of the swamp ecosystem would also improve the mesic and hydric pinelands habitat. South Florida is the only place where red-cockaded woodpeckers inhabit this community type throughout their range. The red-cockaded woodpecker would indirectly benefit from an increase in hydroperiod and sheet flow sustaining a healthy pineland habitat.

Protected wading birds – Under Alternative B, foraging opportunities for wading birds would be anticipated to increase. Several specific predictions were made as associated with the Comprehensive Everglades Restoration Program (Frederick et al. 2008), which are equally appropriate for this Hydrologic Restoration Management Plan:

- Foraging distribution of wading birds would shift in response to changes in prey community characteristics.
- Wading bird nesting colonies would be reestablished, and numbers of nesting pairs and colony sizes would increase in the southern Everglades in response to changes in prey community characteristics.
- Nesting success and annual survival rate of wading birds would increase in response to changes in prey community characteristics.
- Wading bird prey availability is directly related to the time since reflooding and the length of time the marsh is dry.
- Concentration of wading bird prey is controlled by the rate of water-level recession and habitat heterogeneity.

Following the Turner River flow enhancements project, an increased attraction of wading birds was observed. Wading bird use of the constructed plug areas for foraging were not isolated events but rather frequently reported, especially when water was flowing over the plugs. Similar wading bird activity was not observed on the previously designed plugs that were replaced (NPS 2019b).

The water level depths and duration in 1994-1995 resulted in a healthy enough prey base for wood storks to nest extensively and successfully in 1996. Hydrologic restoration would probably have a substantial beneficial impact on the prey base, enabling the Preserve to serve as a more consistent wood stork nesting area (Deborah Jansen, personal communication, May 11, 2020).

Conclusion. Alternative B would result in short-term, adverse, localized impacts to Florida panther, West Indian manatee, snail kite, Florida bonneted bat, American alligator, red-cockaded woodpecker, and protected wading birds during construction because of noise, vegetation clearing, and soil disturbance. Wildlife species present during construction are anticipated to move away from the location during those activities. After construction is complete, Alternative B is anticipated to result in long-term beneficial effects to the Preserve's hydro-ecological functions, thereby benefitting wildlife and protected species at both a local and regional scale. Mitigation measures and best management practices would be applied in accordance with regulatory guidelines, recommendations, and issued project permit conditions to avoid or minimize potential impacts from implementation (see chapter 2.5).

When considering the planned actions described in chapter 3, such as modifications to water management infrastructure, conversion of land use, oil and gas exploration and production operations, and wildland fire management, and the existing condition of the environment, Alternative B would continue to have long-term, beneficial effects.

Impacts of Alternative C

Impacts on wildlife and protected species under Alternative C would be generally similar to those described under Alternative B for the Florida panther, West Indian manatee, snail kite, Florida bonneted bat, American alligator, red-cockaded woodpecker, and protected wading birds. Alternative C includes the elements of Alternative B, plus additional Tier 2 Site-specific projects including limited strategic road removal and bridge addition at major flow-ways that are intersected by limerock roads. As discussed in chapter 2, bridging is essentially an enlarged version of the plug/culvert pair.

Bridging is a larger structural construction operation with larger and longer spans. Projects involving bridging would have larger construction footprints and increased construction timeframe and therefore temporary disturbance/displacement of wildlife would be increased. Bridging may be more effective at hydrologic restoration and may provide enhanced wildlife benefits; however, it is generally more expensive than the plug/culvert pair. Bridging in limited areas would maximize hydrologic benefits by allowing for greater openness than culverts. The increased openness of a bridge span and designed bridge features may also maintain safe wildlife movement across the highway (e.g., ledging on the underside endmembers of the bridge).

Conclusion. During construction, the effects of Alternative C would be short-term, adverse, localized impacts because of the construction-related noise, vegetation clearing, and soil disturbance. After construction is complete, this alternative is anticipated to result in long-term beneficial impacts to wildlife, including protected species, at a local and regional scale due to restored hydro-ecological functions and created wildlife crossings (i.e., bridge span).

When considering the planned actions described in chapter 3, such as modifications to water management infrastructure, conversion of land use, oil and gas exploration and production

operations, and wildland fire management, and the existing condition of the environment, Alternative C would continue to have long-term, beneficial effects.

4.4 SOILS

This section addresses the potential consequences of the no action and action alternatives on soils.

Methodology

The methodology used for assessing soil impacts included using Preserve knowledge and available literature to identify the soils present and identifying the potential effects to soils by the alternatives.

Duration of impacts is defined as follows:

> Short-term: Disturbed soils would be revegetated in less than one year or within one growing season.
>
> Long-term: Disturbed soils would be revegetated in more than one year or more than one growing season.

Impacts of Alternative A – No Action Alternative

Under the no action alternative, the Preserve would continue to manage water as status quo by maintaining existing infrastructure and modifying it on an ad hoc basis with opportunistic planning and management as funding permits. The Preserve would continue to rely heavily on external county, state, and Federal agencies to perform hydrologic restoration on levees, canals, and bridges within and adjacent to the Preserve, and the number of projects would be limited. Under the no action alternative, projects to improve the hydrology of the swamp ecosystem would not be designed and implemented as part of an overarching hydrologic restoration management plan.

Formation and stabilization of soils in the Preserve is dependent on the natural hydrologic regime. Under the no action condition, soil formation and stability would continue to be impacted by hydrologic alterations caused by canals and levees. The natural accumulation of peat and marl soils can be impeded by lack of water. Peat subsidence can occur over time as a result of repeated or prolonged exposure to air or rapidly when peat soils are burned (NPS 2015f). While hammocks typically exclude fire, they can be completely eliminated by fire if their soil burns (Lodge 2010).

The current trend of low seasonal water table levels increases potential for organic matter decomposition to exceed production and for intense fires that could sterilize the soil. Fire may alter soil composition and characteristics. Organic soils are essential habitat for crayfish, crabs, and other burrowing invertebrates. Disturbed soils are likely associated with altered plant species composition and possible reduced ecological function (NPS 2015f).

Conclusion. Under the no action alternative, projects would not be designed and implemented, as part of an overarching hydrologic restoration management plan, to re-engineer the existing water management infrastructure to improve the hydrology of the swamp ecosystem. Soil resources in the Preserve would continue to be impacted as they are now by the altered hydrologic regime. The environmental consequences of the no action alternative on organic soils, and associated wildlife and vegetation, would be long-term adverse because of soil subsidence and altered soil composition and characteristics.

When considering the planned actions described in chapter 3, such as modifications to regional water management infrastructure, conversion of adjacent land use, oil and gas exploration and production operations, and wildland fire management, and the existing condition of the environment, the environmental consequences would continue to be long-term adverse.

Impacts of Alternative B

Alternative B would modify the existing canal and levee system using passive water management techniques. As discussed in chapter 2, these techniques include plugging or filling canals and ditches; culverting roadbeds; breaching impounding structures; removing fill; managing vegetation; maintaining plugs, culverts, and breaches; and in some areas, restoration work could include minor bridging or elevated boardwalks. The goal is to return all or a portion of the excavated and elevated disruptions to wetland grade to minimize or eliminate their impact on the natural hydrologic regime.

For restoration of excavated features, construction activities would include strategically adding earthen fill to reestablish natural wetland grade. Earthen fill may be supplemented by rip rap, concrete, or sheet piling to a more limited extent. For restoration of elevated features, construction activities would include strategically adding culverts or removing fill to re-establish natural grade. Impacts caused by heavy equipment would be minimized through preventative action. Severity and areal extent of disturbed (e.g., compacted, churned, rutted, or displaced) soil by heavy equipment would be minimized by the following actions: identifying risks, planning and scheduling operations, selecting appropriate equipment, controlling on-site activities to accommodate identified risks, and training and feedback during construction to increase operator awareness. Soil stabilization of restoration areas would occur naturally as a result of plant recolonization from the adjacent area.

During project implementation, erosion and sedimentation impacts from construction sites would be minimized by performing the work during the dry season when soils stability is greatest and using best management practices such as deployment of hay bales, silt fences, and turbidity barriers where needed. Restoration efforts would generally rely on earthen fill recovered from disturbed lands within the Preserve, and as close as possible to the project sites. This would lessen but could still introduce non-native species. Removal of interior soils would receive mitigation credit as well, if it contributes to restoration. If fill external to the Preserve were used, the fill would require evaluation for non-native species. Preference would always be for internal fill.

Under Alternative B, planned projects would restore water levels to reduce hot, high intensity wildfires associated with altered hydrology, which consume organic soils. Planned projects would also reduce draining of groundwater from the shallow aquifer underlying the swamp ecosystem during the dry season, making the region less susceptible to drought and wildfire. The oxidation rate of organic matter would be minimized by managing water table levels to reduce aeration. Healthy soils would be anticipated to interact with healthy plant communities to deliver high biomass food webs.

Conclusion. Alternative B would result in short-term, adverse, localized impacts to soils during construction because of soil disturbance from heavy equipment. Alternative B would result in long-term beneficial effects to soil resources at both a local and regional scale. The beneficial effects would be due to a return to more natural hydrologic conditions, organic soil accretion, and nutrient accumulation. Mitigation measures and best management practices would be applied in accordance with regulatory guidelines, recommendations, and issued project permit conditions to avoid or minimize potential impacts from implementation (see chapter 2.5).

When considering the planned actions described in chapter 3, such as modifications to regional water management infrastructure, conversion of adjacent land use, oil and gas exploration and production operations, and wildland fire management, and the existing condition of the environment, Alternative B would continue to have long-term, beneficial effects.

Impacts of Alternative C

Impacts on soil under Alternative C would generally be similar to those described under Alternative B. Alternative C includes the elements of Alternative B, plus additional Tier 2 Site-specific projects including limited strategic road removal and bridge addition at major flow-ways that are intersected by limerock roads. As discussed in chapter 2, bridging is essentially an enlarged version of the plug/culvert pair.

Bridging may be more effective at hydrologic restoration; however, it is generally more expensive than the plug/culvert pair. Bridging is a larger structural construction operation with larger and longer spans. The greater degree of required engineering and larger footprint would lead to an increase in construction duration and disturbed area.

Conclusion. Alternative C would result in short-term, adverse, localized impacts to soil resources during construction because of soil disturbance from heavy equipment. Alternative C would result in long-term beneficial effects to organic soils and associated wildlife and vegetation at both a local and regional scale due to a return to more natural hydrologic conditions, organic soil accretion, and nutrient accumulation.

When considering the planned actions described in chapter 3, such as modifications to water management infrastructure, conversion of land use, oil and gas exploration and production operations, and wildland fire management, and the existing condition of the environment, Alternative C would continue to have long-term, beneficial effects.

4.5 VEGETATION AND INVASIVE SPECIES

This section discusses the potential impacts on native, protected, nuisance, and invasive vegetation communities and habitat for species in the Preserve that have the potential to be impacted. As discussed in chapter 3 "Affected Environment," most nonnative plants reported in the Preserve are restricted to early successional stages on disturbed sites, and five species (melaleuca, Brazilian pepper, water hyacinth, hydrilla, and Old World climbing fern) pose a long-term threat to native communities. Of these, two species (melaleuca and Brazilian pepper) have the potential to displace native plant communities in pineland and prairie habitats.

Ways in which the NPS would avoid or minimize distribution of nonnative plants is discussed in chapter 2 "Alternatives."

Methodology

Available information on vegetation and invasive plant species in the project area was compiled and scientific literature was reviewed. Potential impacts for the alternatives were based on expected disturbance to vegetative communities and professional judgment and experience with previous projects.

Duration of impacts is defined as follows:

> Short-term: Individual species or habitat would recover in less than one year or within one growing season.
>
> Long-term: Individual species or habitat would recover in more than one year or more than one growing season.

Impacts of Alternative A – No Action Alternative

Under the no action alternative, the Preserve would continue to manage water as status quo by maintaining existing infrastructure and modifying it on an ad hoc basis with opportunistic planning

and management as funding permits. The Preserve would continue to rely heavily on external county, state, and Federal agencies to perform hydrologic restoration on levees, canals, and bridges within and adjacent to the Preserve, and the number of projects would be limited. Under the no action alternative, projects would not be designed and implemented, as part of an overarching hydrologic restoration management plan, to re-engineer the existing water management infrastructure to improve the hydrology of the swamp ecosystem.

Under the no action condition, existing hydrologic disruptions that hamper natural sheet flow within the Preserve would remain and the hydrological cycle would continue to be negatively influenced. Canals would also continue conveying water off the swamp during the dry season and exacerbate the seasonal drop in the groundwater table. The trending hydrologic conditions of the Preserve increase the susceptibility of desired floral communities to fire, increase the swamp's susceptibility to nuisance natives such as sabal palm, increase the inland encroachment of saltwater and brackish tolerant species, and increase the ecosystem's susceptibility to invasive non-native species.

Native Vegetation Communities – Under the no action condition, the decrease in the distribution, depth, and duration of water on the landscape caused by the network of canals and levees that crisscross and surround the Preserve would continue to have negative consequences on the floral composition of the Preserve.

Past exclusion of fire and changes in hydrology have altered forest stand composition to a mostly high-density, second-growth pine overstory with a competing cabbage palm understory. Although cabbage palm is native, not invasive, it is a nuisance species opportunistically expanding its range as a result of reduced hydroperiods. In the Preserve's existing condition, cabbage palms occur in far greater numbers than would be likely if the natural hydrologic system were functioning. Where the density of cabbage palms is high, the desirable herbaceous plants are prevented from growing on the forest floor. This affects species diversity and the ecosystem functions that depend on a diverse plant community (USFWS 2017a).

Changes in the local complement of plants can influence the frequency and intensity of fires as the associated flammability and rates of fuel production change (USGS 2004b). Expansion of invasive species into natural plant communities increases the susceptibility to fire. For example, cabbage palms are fire tolerant and promote high-intensity fires that may burn higher into the forest canopy. As a result, slash pine that dominate pineland communities, are killed more frequently than would normally occur during ecologically desirable low-intensity fire events within the Preserve (USFWS 2017a). Old World climbing fern is an invasive species that grows up and over native trees and shrubs, reducing plant diversity and degrading habitats. The fern creates a fire ladder that may increase fire intensity and canopy fires in vegetation where it would not normally occur, thereby increasing native tree and shrub mortality (NPS and USFWS 2016).

Alteration of freshwater flow has increased the inland encroachment of saltwater and brackish tolerant species. For example, mangroves have migrated upstream into traditionally salt and brackish marshes within the Preserve. Although sea level rise and fewer deep freezes have played a role in the changing mangrove coverage, the construction of canals and waterways facilitates the dispersal of mangrove propagules into new areas by extending tidal reach, exacerbating encroachment (Krauss et al. 2011). As mangroves expand, they displace salt marsh. Although mangroves support a variety of wildlife, many species of waterbirds rely specifically on marshes as foraging habitat. Furthermore, repeated inundation of saltwater on freshwater marsh can cause pocking and subsidence of the peat (Andres et al. 2019).

The existing hydrologic and ecological conditions promote the spread of exotic species. Many of the invasive species are associated with sites that have been disturbed or have experienced

degradation of natural conditions (such as changes in hydrology, fire management, or other manipulations). Impacts to vegetation communities from uncharacteristically severe wildfires, associated with altered hydrology, create bare and burned soil areas susceptible to increased opportunities for invasive and non-native plant species to become established.

Protected Plant Species – Three Federally listed species have been observed within the Preserve: Everglades bully (*Sideroxylon reclinatum* ssp. *austrofloridense*) – threatened, Florida pineland crabgrass (*Digitaria pauciflora)* – threatened, and Florida prairie-clover (*Dalea carthagenensis* var. *floridana*) – endangered (82 FR 46691). Threats to these protected species consist primarily of habitat loss and degradation, fire exclusion, proliferation of invasive plants, stochastic events (hurricanes, storm surge, wildfires), and sea level rise (USFWS 2017b).

Under the no action alternative, protected plant species habitat would continue being degraded by off-site development and regional water control efforts. Although current management practices within the Preserve minimize impacts from fire exclusion and exotic plant infestations through a combination of prescribed fire and physical control of invasive species, hydrology in the Preserve would not be restored. As such, potential for high-intensity, ecologically devastating wildfires and the germination and sprouting of invasive plants would persist. The continued ecological degradation and altered hydroperiod would affect protected plant species over the long-term.

Nuisance and Invasive Species – Under the no action alternative, the abundance and spread of nonnative and invasive plants would continue to be minimized by Preserve management efforts. Ongoing land management would strive to reduce competition from nonnative and invasive plants and improve the integrity of native habitats. The continuation of monitoring efforts would also help to detect new nonnative and invasive species. However, the continued ecological degradation, including diversion of natural water-flow and altered hydroperiod, would affect the vegetative composition of natural communities over the long-term.

Conclusion. Under the no action alternative, projects would not be designed and implemented, as part of an overarching hydrologic restoration management plan, to re-engineer the existing water management infrastructure to improve the hydrology of the swamp ecosystem. Species composition of natural communities within the Preserve would continue to be impacted as they are now by the altered hydrologic regime. The environmental consequences of the no action alternative on vegetation and protected plant species would be long-term adverse due to the large area of habitat being affected.

When considering the planned actions described in chapter 3, such as modifications to water management infrastructure, conversion of land use, oil and gas exploration and production operations, and wildland fire management, and the existing condition of the environment, the environmental consequences of Alternative A would continue to be long-term adverse.

Impacts of Alternative B

Alternative B would modify the existing canal and levee system using passive water management techniques. As discussed in chapter 2, these techniques include plugging or filling canals and ditches; culverting roadbeds; breaching impounding structures; removing fill; managing vegetation; maintaining plugs, culverts, and breaches; and in some areas, restoration work could include minor bridging or elevated boardwalks. The goal is to return all or a portion of the excavated and elevated disruptions to wetland grade to minimize or eliminate their impact on the natural hydrologic regime. Restoration efforts would be sited to avoid protected plant species.

The restoration projects could adversely impact protected and native vegetation in the short-term during construction but provide beneficial impacts over the long-term after construction is complete. For restoration of excavated features, construction activities would include raising to

natural grade using earthen fill, or to a more limited extent, concrete plugs. For restoration of elevated features, construction activities would include removal of vegetation, removal of fill, and placement of fill to an adjacent canal or ditch or alternatively taken off-site to a staging area for future use in a restoration project. Impacts caused by heavy equipment would be minimized and revegetation of denuded areas would occur as a result of natural recruitment from the surrounding seed bank and seed sources. Loope and Dunevitz (1981) described successional sequences of vegetation at former agricultural land in Everglades National Park, known as the Hole-in-the-Donut. They observed that soon after vegetation removal from an area, an assortment of colonizing species occupies the site.

During project implementation, special attention would be devoted to preventing the spread of exotic and invasive species, especially on disturbed sites. Standard measures could include identifying and treating areas of nonnative plants before hydrological restoration activities are initiated, treatment as part of the nonnative plant control program, and revegetation with native species as appropriate.

Under Alternative B, the depth, duration, and distribution of water on the landscape would be improved and as a result, increase the swamp ecosystem's suitability for desirable native vegetation. Alternative B would provide general beneficial impacts to natural vegetative communities by restoring the historical hydroperiod and thereby lessening high-intensity wildfire occurrences and increasing the potential for beneficial, low-intensity fires.

Native Vegetation Communities – Restoration projects would affect both the spatial distribution of plants through time and the fire regime (USGS 2004b). The Preserve's altered hydrology has favored cabbage palms over the typically grassy understory of the natural pinelands. The restored water levels would prohibit the germination and sprouting of seedling cabbage palm (USFWS 2017a). Hydrologic restoration may contribute to restoration of more natural fire patterns by altering the local risk of high-intensity wildfire in different areas. Replumbing the canal system would limit inland dispersal of mangrove propagules, as well as seed from other saltwater and brackish tolerant species, and thereby limit habitat conversion of existing salt marsh.

Restoration efforts would rely on internal fill from disturbed lands within the Preserve, and as close as possible to the project sites. This would lessen but could still introduce non-native species. However, if placed in water the non-native seeds are drowned. Removal of interior soils would receive mitigation credit as well, if it contributes to restoration. If fill external to the Preserve were used, the fill would require evaluation for non-native species. Preference would always be for internal fill.

Protected Plant Species – The effects of changes in regional hydrology through restoration projects may impact the Everglades bully, Florida prairie-clover, Florida pineland crabgrass, and the habitats they occupy. Hydrologic restoration could restore groundwater levels, surface flow to marl prairies, and growing conditions in pine rocklands could improve (USFWS 2013a, 2013b, 2013c). Alternatively, increased hydroperiods in habitats where these species occur (i.e., pine rockland and marl prairie) may lead to a reduction in the amount of suitable habitat, a potential reduction in the area occupied, and a reduction in the number of individuals found (USFWS 2017b). Many of the identified populations of these plants are relatively small and isolated from one another. Therefore, specific restoration projects would need to be further assessed for resultant threats of adverse effects on the three protected plants and their habitats. Restoration efforts would be sited to avoid protected plant populations. To determine if protected plant species were present, surveys would be conducted on each project site prior to implementation.

Nuisance and Invasive Species – Under Alternative B, planned projects would restore water levels to reduce high-intensity, ecologically devastating fires that consume most of the plants. Planned

projects would also reduce draining of groundwater from the shallow aquifer underlying the swamp ecosystem during the dry season, making the region less susceptible to drought. Disturbance and stress to natural communities would be minimized and therefore opportunity for establishment of invasive species would be reduced.

Conclusion. Alternative B would result in short-term, adverse, localized impacts to native vegetation communities during construction because of vegetation clearing and soil disturbance. The potential for construction-related impacts to protected plant species exists but would be minimized, as the restoration projects would be sited to avoid protected plant populations. After construction is complete, this alternative is generally anticipated to result in long-term beneficial impacts to the Preserve's hydro-ecological functions, thereby benefitting natural vegetative communities and protected plant species at a local and regional scale. Mitigation measures and best management practices would be applied in accordance with regulatory guidelines, recommendations, and issued project permit conditions to avoid or minimize potential impacts from implementation (see chapter 2.5).

When considering the planned actions described in chapter 3, such as modifications to water management infrastructure, conversion of land use, oil and gas exploration and production operations, and wildland fire management, and the existing condition of the environment, Alternative B would continue to have long-term, beneficial effects.

Impacts of Alternative C

Impacts on native vegetation and invasive species under Alternative C would be generally similar to those described under Alternative B. Alternative C includes the elements of Alternative B, plus additional Tier 2 Site-specific projects including limited strategic road removal and bridge addition at major flow-ways that are intersected by limerock roads. As discussed in chapter 2, bridging is essentially an enlarged version of the plug/culvert pair.

Bridging may be more effective at hydrologic restoration and may provide enhanced wildlife benefits; however, it is generally more expensive than the plug/culvert pair. Bridging is a larger structural construction operation with larger and longer spans. The greater degree of required engineering and larger footprint would lead to increase in construction duration and disturbed area.

Conclusion. During construction, the effects of Alternative C would be short-term, adverse, localized impacts because of the construction-related vegetation clearing and soil disturbance. After construction is complete, this alternative is anticipated to result in long-term beneficial impacts to natural vegetative communities, including protected plant species, at a local and regional scale due to restored hydro-ecological functions.

When considering the planned actions described in chapter 3, such as modifications to water management infrastructure, conversion of land use, oil and gas exploration and production operations, and wildland fire management, and the existing condition of the environment, Alternative C would continue to have long-term, beneficial effects.

4.6 VISITOR USE AND EXPERIENCE

This section analyzes the potential effects of the no action and action alternatives on visitor use and experience in the Preserve. Visitor activities that may be affected have been identified for this analysis: camping; hiking; hunting, fishing, and frogging; motorboat use; off-road vehicle (ORV) use; paddling; and wildlife viewing.

Methodology

The methodology used for assessing visitor use and experience impacts included identifying the potential effects to visitor use by the alternatives.

Duration of impacts is defined as follows:

> Short-term: Impacts would generally last less than one year and would affect only one season's use by visitors.
>
> Long-term: Impacts would generally last more than one year and would be more permanent in nature.

Impacts of Alternative A – No Action Alternative

The no action alternative would maintain the current management of the Preserve. While roadbed levees provide visitor access into the Preserve and canals serve as common viewing spots (e.g., HP Williams Roadside Park, Oasis Visitor Center, and Sweetwater Strand), canals and levees provide a distorted view of the Preserve's ecosystem. Unlike the Preserve's natural habitats, canals tend to hold water year round, and are often colonized by exotic fish and block access. Levees block water flows and are often lined with vegetation that is unrepresentative of adjacent natural habitats. Under the no action condition, existing hydrologic disruptions that hamper natural sheet flow within the Preserve would remain and the hydrological cycle would continue to be negatively influenced. Canals would also continue conveying water off the swamp during the dry season and exacerbate the seasonal drop in the groundwater table.

Camping – The no action alternative would not change the current camping management strategies of the Preserve. Under the no action alternative, visitors would continue camping in the same manner. An average of 1,799 backcountry camping permits were issued annually between 2010 and 2016. Over the Preserve's entire 721,000 acres, this averages more than 405 acres available per camper, providing many opportunities for solitude in the backcountry.

Hiking – Under the no action alternative, visitors would continue to have access to several non-motorized trails and could also hike off-trail. Both long- and short-distance hiking opportunities would continue to be available in the Preserve, including 37 miles of the FNST, the 6.5-mile Loop Trail, and five short front-country trails (Bass Lake, Deep Lake, Fire Prairie, Gator Hook, and Tree Snail Hammock). These trails are designated hiking trails and do not overlap with designated ORV trails.

Hunting, fishing, and frogging – The no action alternative would not change the current hunting, fishing, and frogging management strategies of the Preserve. Under the no action alternative, visitors would continue hunting, fishing, and frogging in the same manner.

White-tailed deer, wild turkey, and feral hogs are the most important game species in the Preserve and serve as prey resources for the Florida panther (NPS 2010a). Although no habitat would be removed, hydrology in the Preserve would not be restored and therefore foraging opportunities would not be improved. The current trend of low seasonal water table levels, and resultant altered fire regimes, increases potential for an outbreak of high-intensity, ecologically devastating fires that consume most of the plants (even large trees) and can sterilize soils, killing seedbanks (NPS 2015f). Although there would be no direct impact on hunting in the project area, the continued ecological degradation and altered hydroperiod would negatively affect foraging and refugia habitat of important game species over the long-term.

Fishing is allowed year-round within the Preserve, with a Florida freshwater fishing license. Sloughs, ponds, rivers, lakes, and canals are popular fishing destinations that retain water year-round. Rivers and lakes, particularly those with hydrologic connections to the canal system, are

home to large marine fishes that tolerate a wide range of salinities and freshwater species. An example is the population of tarpon (*Megalops atlanticus*) and Florida gar (*Lepisosteus platyrhincus*) inhabiting Deep Lake, a flooded sinkhole adjacent to the Barron Collier Canal (USGS 2004c). Under the no action alternative, there would be no direct impact on fishing; fishing would continue within the Preserve's year-round waters in the same manner.

Recreational frogging for personal use is permissible within the Preserve and does not require a license. Under the no action alternative, frogs would continue to use habitat within the Preserve. There would be no direct impact on frogging within the Preserve; however, the continued ecological degradation and altered hydroperiod would negatively affect frog habitat over the long-term.

Motorboat use – Under the no action alternative, there would be no direct impact on motorboat use; visitors would continue to access designated airboat trails. Airboat users would continue to enjoy access to areas such as the Stairsteps Unit.

ORV use – Under the no action alternative, visitors would continue to have access to the current ORV trail network. ORV operation on designated trails is associated with camping, hunting, fishing, frogging, wildlife viewing, transportation to private property, and other traditional nature-based activities within the Preserve. There would be no direct impact on ORV use within the Preserve; however, the continued ecological degradation and altered hydroperiod would affect the nature-based experience over the long-term.

Paddling – Under the no action alternative, there would be no direct impact on paddling. Visitors would continue to access designated canoe trails, including Turner River, Halfway Creek, Halfway Creek Loop, and Lefthand Turner River. Together, these canoe trails contribute to a positive visitor experience.

Wildlife viewing – Under the no action alternative, visitors would continue to view wildlife in the same manner. Section 4.3 discusses the potential impacts related to wildlife and protected species in the Preserve.

Many visitors to the Preserve come to see alligators. Currently, there is a concentrated use at Turner River and other surface waters adjacent to roads. The continued degradation of wetlands and the altered hydroperiod (i.e., prolonged drought) would affect alligator habitat over the long-term, although the alligator population appears to be opportunistically using the canals during severe dry downs. Therefore, areas such as Turner River would continue to be popular with visitors for viewing opportunities, but these areas would also have an increased potential for alligator/ human conflicts.

Bird watching is another popular activity for visitors. Under the no action alternative, bird species would continue to use the Preserve for nesting, foraging, and loafing. Although no bird habitat would be removed, sheet flow in the Preserve would not be restored and therefore habitat for birds would not have improved water levels. As such, there would be no direct impact on birds in the project area. However, the continued ecological degradation, including diversion of natural water-flow and altered hydroperiod, would affect the habitat of various bird species and bird watching opportunities, over the long-term.

Conclusion. Under the no action alternative, projects would not be designed and implemented, as part of an overarching hydrologic restoration management plan, to re-engineer the existing water management infrastructure to improve the hydrology of the swamp ecosystem. Visitor use in the Preserve would continue to be managed as it is now. The no action alternative would result in no direct long-term impacts to camping, hiking, motorboat use, and paddling; whereas continuation of current management under the no action alternative would result in long-term adverse impacts to

hunting, fishing and frogging, ORV use, and wildlife viewing due to the large area of habitat being affected.

When considering the planned actions described in chapter 3, such as modifications to regional water management infrastructure, conversion of adjacent land use, oil and gas exploration and production operations, and wildland fire management, and the existing condition of the environment, the environmental consequences of Alternative A would continue to be long-term adverse.

Impacts of Alternative B

Alternative B would modify the existing canal and levee system using passive water management techniques. As discussed in chapter 2, these techniques include plugging or filling canals and ditches; culverting roadbeds; breaching impounding structures; removing fill; managing vegetation; maintaining plugs, culverts, and breaches; and in some areas, restoration work could include minor bridging or elevated boardwalks. The goal is to return all or a portion of the excavated and elevated disruptions to wetland grade to minimize or eliminate their impact on the natural hydrologic regime.

Alternative B is expected to enhance the long-term visitor use and experience by decreasing the effect of canals and levees on the Preserve's natural hydrologic regime. Furthermore, the proposed restoration features are expected to enhance public enjoyment and environmental outreach opportunities by creating new scenic areas to view and access the Preserve. Potential short-term impacts to visitor use and experience could result from construction activities in limited areas through the disruption of road/trail/waterway access and wildlife avoidance.

Camping – Under Alternative B, improving the hydrology of the Preserve would also improve the fire regime. Fire is an essential part of a healthy ecosystem. Frequent, low-intensity fires are desired, but human-caused fires during the dry season are a challenge to resource management. Fires can create safety concerns and can have human health impacts, and the lack of controlled fires can produce severe risks to the well-being of visitors, such as campers, when plant biomass accumulates, and uncontrolled fires occur. With more frequent non-destructive fire there would be a reduced chance for backcountry camping restrictions due to safety concerns.

Hiking – Under Alternative B, improving the hydrology of the Preserve would also improve the fire regime. Frequent, low-intensity fires are desired, but arson-caused fires during the dry season are a challenge to resource management. Fires can be safety concerns and can have human health impacts, and the absence of fire can produce severe risks to the well-being of visitors, such as hikers, when plant biomass accumulates, and uncontrolled fires occur. With more frequent non-destructive fire there would be a reduced chance for trail closures for management and safety concerns.

Hunting, fishing, and frogging – Under Alternative B, improving the hydrology of the Preserve's ecosystem would also improve the habitats of game species, fish, and frogs as discussed below.

Projects to restore the hydrology of the Preserve would improve the foraging habitat for game species, such as white-tailed deer, wild turkey, and feral hogs. Specific project design elements, such as use of box culverts over round culverts and longer plugs at wetland grade over short plugs, have been noted to provide wildlife benefits in terms of foraging and road/canal crossing opportunities. Plug installation would also increase access across canals for hunters. Improving the hydrology of the Preserve would also improve the fire regime. An increased frequency of non-destructive fire would benefit wildlife populations and therefore, more deer and turkeys would be available to hunt.

Fish populations have the potential to be positively affected by directing water to low-lying areas and decreasing the duration and intensity of spring drought. Overall, impacts are expected to be slight as the plan does not introduce new water. Installation of culverts and plugs could provide additional fishing opportunities. Plug installation also increases access across canals for fishing. Restoration projects are expected to have limited impacts on fishing within the Preserve's year-round waters.

Frog populations have the potential to be positively affected by projects that restore the depth, duration, and distribution of water on the landscape. An increase in the Preserve's suitability for sustaining healthy frog populations would benefit frogging. Specific project design elements, such as plug installation, would also increase visitor access across canals for frogging.

Motorboat use – Under Alternative B (plugging or altering current water management systems), airboat access up the canals would be limited and this could affect visitor experience. Visitor use and experience could also be affected as a result of an introduction or increase of invasive species (e.g., hydrilla). However, some previously restored sites within the Preserve, such as at the Turner River headwaters, have demonstrated a substantial reduction in hydrilla (*Hydrilla verticillata*) and therefore improved navigability. During construction, access within waterways may be temporarily occluded.

ORV use – Under Alternative B, planned projects would restore freshwater flow paths, flow volumes and timing, seasonal hydroperiods, and historical distribution of sheet flow. ORV permit numbers have declined over recent years, going from a high of 2,000 in 2010 to 1,087 in 2016. Fluctuations in the number of ORV permits issued each year also reflect water levels in the Preserve, with fewer registered vehicles in the wetter years (e.g., 1995) when portions of the Preserve are closed to hunting (NPS 2010a). The restoration projects would improve the depth, duration, and distribution of water on the landscape and help the landscape dictate the flow of the water, thereby reducing the current trend toward intense swings of hydrologic conditions. Alternative B would correct current negative conditions that include pooling of water behind roads and larger flooded areas during storm events. As a result, ORV users would indirectly benefit from increased access. Preserve staff would continue to implement management actions in accordance with the ORV Management Plan (NPS 2000a), as needed.

Paddling – Under Alternative B, there would be potential for increased flow and duration of water in the Turner River, which would beneficially affect navigability. As a result, an increase in the number of paddlers is anticipated.

Wildlife viewing – Under Alternative B, the depth, duration, and distribution of water on the landscape would be improved and as a result, would increase the swamp ecosystem's suitability for wildlife. This would provide general beneficial impacts to wildlife species by lessening unnatural wildfire occurrences and by increasing the potential for wildfires to be beneficial when they do occur. The base of the swamp's food chain would benefit, thereby supporting the rest of the swamp ecosystem, such as alligators and wading birds, that are dependent on the aquatic food base. Projects would contain design elements such as box culverts over round culverts and longer plugs at wetland grade over short plugs, which have been noted to provide wildlife benefits in terms of foraging and road/canal crossing opportunities. Overall, culverts and plugs provide more opportunities for visitors to view wildlife. Plug installation also increases access across canals for recreational users. Increased access can also result in unexpected human/wildlife interactions, but these would be addressed with signage and other educational techniques, similar to those used at Turner River Road.

There is a growing consensus that the alligator population may be dependent on the life-support of the canals during prolonged drought. Replumbing the canal system could make the landscape (not

artificial waterways) into aquatically sustainable habitat for a robust and healthy alligator population. Currently, Turner River is a popular visitor area that also has a concentrated use by alligators. Restoration projects could decrease the potential for gator/human conflicts, as some alligators may remain within the landscape and wallow out domes and marshes. Increase in alligator viewing opportunities and tourism is anticipated as a result from the installation of culverts, based on previous tourism increases from culvert installations. Alligators present during construction are anticipated to move away from the location during those activities.

Restoration projects are anticipated to increase foraging, loafing, and nesting opportunities for birds. Therefore, bird watchers would indirectly benefit from implementation of restoration projects.

Conclusion. During construction, the effects of Alternative B would be short-term, adverse, localized impacts to camping; hiking; hunting, fishing, and frogging; motorboat use; ORV use; paddling; and wildlife viewing due to temporary access limitations. After construction is complete, Alternative B is anticipated to result in long-term beneficial impacts to the Preserve's hydro-ecological functions, hereby benefitting visitor use and experience at a local and regional scale. Mitigation measures and best management practices would be applied in accordance with regulatory guidelines, recommendations, and issued project permit conditions to avoid or minimize potential impacts from implementation (see chapter 2.5).

When considering the planned actions described in chapter 3, such as modifications to water management infrastructure, conversion of land use, oil and gas exploration and production operations, and wildland fire management, and the existing condition of the environment, Alternative B would continue to have long-term, beneficial effects.

Impacts of Alternative C

Impacts on visitor use and experience under Alternative C would be generally similar to those described under Alternative B for camping; hiking; hunting, fishing, and frogging; motorboat use; ORV use; paddling; and wildlife viewing. Alternative C includes the elements of Alternative B, plus additional Tier 2 Site-specific projects including limited strategic road removal and bridge addition at major flow-ways that are intersected by limerock roads. As discussed in chapter 2, bridging is essentially an enlarged version of the plug/culvert pair.

Bridging is a larger structural construction operation with larger and longer spans. The greater degree of required engineering and larger footprint would lead to increase in construction duration and disturbed area. Bridging may be more effective at hydrologic restoration and may provide enhanced scenic vista benefits; however, extended road closures may restrict visitor access to areas of the Preserve. Sights and sounds associated with increased construction activity may also diminish visitor experience.

Conclusion. During construction, the effects of Alternative C would be short-term, adverse, localized impacts due to construction-related access limitations. After construction is complete, this alternative is anticipated to result in long-term beneficial impacts to visitor use and experience at a local and regional scale due to restored hydro-ecological functions and improved visitor use and experience.

When considering the planned actions described in chapter 3, such as modifications to water management infrastructure, conversion of land use, oil and gas exploration and production operations, and wildland fire management, and the existing condition of the environment, Alternative C would continue to have long-term, beneficial effects.

4.7 CULTURAL RESOURCES: ETHNOGRAPHIC RESOURCES AND CULTURAL LANDSCAPES

This section addresses the potential impacts on cultural resources consisting of ethnographic resources, including archeological sites and Native American ceremonial sites, and cultural landscapes from actions proposed in each alternative.

Methodology

The methodology used for assessing ethnographic resources and cultural landscapes impacts included using available literature to identify the ethnographic resources and cultural landscapes present and identifying the potential effects to these resources by the alternatives, as well as consulting with Native American tribes traditionally associated with the Preserve. At this time, no formal documentation or recognition of cultural landscapes has occurred in the Preserve.

A disturbance to ethnographic resources and/or cultural landscapes would be permanent and would thus be considered long-term.

Impacts of Alternative A - No Action Alternative

The no action alternative would maintain the current management of the Preserve.

Under the no action alternative, projects would not be designed and implemented, as part of an overarching hydrologic restoration management plan, to re-engineer the existing water management infrastructure to improve the hydrology of the swamp ecosystem. The degradation of the Preserve ecosystem due to the ongoing effects of altered hydroperiod and erosion would reduce the potential value of ethnographic resources, including archeological sites and Native American ceremonial sites, and cultural landscapes.

Generally, the decrease in the distribution, depth, and duration of water on the landscape caused by the network of canals and levees that crisscross and surround the Preserve have had negative consequences on the Preserve, including increased susceptibility of desired floral communities to fire, increased ecosystem's susceptibility to exotic (non-native) species, and increased the swamp's susceptibility to nuisance natives such as sabal palm.

As noted in the Resource Management Plan (NPS 2001b), a perceptible threat to the integrity of many archeological sites in the Preserve is the stratification of subsurface resources due to rooting of exotic vegetation, including Brazilian pepper and Australian pine (*Casuarina equisetifolia*). Change in native plant communities could result in change in cultural use of those plants. Change in species composition could eliminate use of plant species by tribes for ceremonial events and medicinal purposes. Exotic and nuisance plant species are currently being managed by the Preserve's exotic species management program, which is expected to last in perpetuity.

Since most cultural resources are nonrenewable, impacts to cultural resources would persist. Only natural elements of cultural landscapes, such as vegetation, are renewable and would be expected to recover to pre-disturbance conditions naturally due to south Florida's year-round growing season.

Conclusion. Under the no action alternative, ethnographic resources and cultural landscapes in the Preserve would continue to be impacted as they are now due to continuation of current management. The environmental consequences of the no action alternative on ethnographic resources, including archeological sites and Native American ceremonial sites, and cultural landscapes would be long-term adverse due to the ongoing effects of altered hydroperiod and erosion and resultant reduction in the potential value of ethnographic resources.

When considering the planned actions described in chapter 3, such as modifications to water management infrastructure, conversion of land use, oil and gas exploration and production operations, and wildland fire management, and the existing condition of the environment, the environmental consequences of Alternative A would continue to be long-term adverse.

Impacts of Alternative B

Alternative B would modify the existing canal and levee system using passive water management techniques. As discussed in chapter 2, these techniques include plugging or filling canals and ditches; culverting roadbeds; breaching impounding structures; removing fill; managing vegetation; maintaining plugs, culverts, and breaches; and in some areas, restoration work could include minor bridging or elevated boardwalks. The goal is to return all or a portion of the excavated and elevated disruptions to wetland grade to minimize or eliminate their impact on the natural hydrologic regime. Restoration efforts would be located, where possible, to avoid adverse effects to sensitive resource areas.

Under Alternative B, water levels would be restored to reduce wildfires and nuisance/invasive vegetative species associated with altered hydrology, which damage the integrity of many archeological sites of the Preserve. Restoration projects would help preserve cultural use of plants in the Preserve by promoting a healthy ecosystem.

Although known archeological and Native American ceremonial sites would be avoided during design of restoration projects, it remains possible that unidentified sites could be encountered and subsequently impacted unintentionally. An archeological survey would be conducted prior to ground disturbance by heavy equipment and work would be adjusted to avoid or mitigate impacts to identified sensitive resources. If post-survey construction work were to reveal previously unidentified archeological resources, work would be stopped immediately, and state and tribal authorities would be contacted to develop a coordinated response. After construction is complete, beneficial impacts would be provided over the long-term.

Conclusion. Under Alternative B, the potential for construction-related adverse impacts on ethnographic resources exists but would be minimized, as the restoration projects would be sited to avoid known archeological sites and Native American ceremonial sites. After construction is complete, Alternative B is anticipated to result in long-term beneficial impacts to the Preserve's hydro-ecological functions, thereby benefitting ethnographic resources and cultural landscapes at a local and regional scale. Mitigation measures and best management practices would be applied in accordance with regulatory guidelines, recommendations, and issued project permit conditions to avoid or minimize potential impacts from implementation (see chapter 2.5).

When considering the planned actions described in chapter 3, such as modifications to water management infrastructure, conversion of land use, oil and gas exploration and production operations, and wildland fire management, and the existing condition of the environment, Alternative B would continue to have long-term, beneficial effects.

Impacts of Alternative C

Impacts on ethnographic resources and cultural landscapes under Alternative C would be generally similar to those described for Alternative B. Alternative C includes the elements of Alternative B, plus additional Tier 2 Site-specific projects including limited strategic road removal and bridge addition at major flow-ways that are intersected by limerock roads. As discussed in chapter 2, bridging is essentially an enlarged version of the plug/culvert pair.

Bridging is a larger structural construction operation with larger and longer spans. The greater degree of required engineering and larger footprint would lead to increase in construction duration and disturbance area. Bridging may be more effective at hydrologic restoration, but increased

construction disturbance would increase the potential to encounter and adversely impact ethnographic resources compared to Alternative B.

Conclusion. Under Alternative C, the potential for direct adverse impacts on ethnographic resources and cultural landscapes would be slightly higher than Alternative B, due to the larger construction footprints and increased construction timeframe associated with the bridge addition. However, planned projects, including bridging, would be sited to avoid adverse impacts to known ethnographic resources.

When considering the planned actions described in chapter 3, such as modifications to water management infrastructure, conversion of land use, oil and gas exploration and production operations, and wildland fire management, and the existing condition of the environment, Alternative C would continue to have long-term, beneficial effects.

Chapter 5

Consultation, Coordination, and Public Participation

CHAPTER 5: CONSULTATION, COORDINATION, AND PUBLIC PARTICIPATION

This chapter summarizes public outreach undertaken by the National Park Service (NPS) to contact interested individuals, agencies, and organizations during pre-NEPA civic engagement and NEPA public scoping, for input on the Plan.

5.1 THE SCOPING PROCESS

Scoping is an early and open process for determining the scope of issues to be addressed. The scoping process determines the scope (extent and nature) of issues and alternatives that should be considered during a NEPA review. It includes both internal and external (other agency and public) elements; NPS subject matter experts; and consultation with interested parties, agencies, and the public. The public scoping process gives people an opportunity to comment and contribute early in the decision-making process.

5.2 AGENCY OUTREACH MEETINGS

The NPS conducted three pre-NEPA agency outreach virtual meetings in April and May, 2020 to share and hear feedback from other agencies, organizations and the public. These meetings were held virtually due to the coronavirus pandemic. The major topics of the presentation included a brief introduction of why water is an important consideration for managing the Preserve, an overview of the challenges and opportunities for managing its water, and some of the preliminary concepts the Preserve has in mind. The goal of the presentation was to lay out information and initial concepts in a clear and informative way (including photos, maps, and diagrams) so that virtual meeting attendees could quickly ramp up on the topic and provide some initial feedback and questions. Participants included the Miccosukee Tribe of Indians of Florida, the Seminole Tribe of Florida, U.S. Army Corps of Engineers, South Florida Water Management District – Big Cypress Basin, South Florida Water Management District – West Palm Beach, Florida Panther National Wildlife Refuge, U.S. Fish and Wildlife Service, Florida Fish and Wildlife Conservation Commission, Florida Department of Transportation, Collier County, and Miami-Dade County.

5.3 PUBLIC SCOPING

In June 2021, the NPS released a Public Scoping newsletter for the Plan/EA to the public for review and comment (June 14, 2021 to July 13, 2021). The newsletter provided a description of the scope of this plan, purpose and need, proposed action and preliminary alternatives, potential impact topics, and information on how to get involved in the planning process. The Preserve accepted comments electronically through the NPS's Planning, Environment, and Public Comment (PEPC) website: https://parkplanning.nps.gov/BICY_hydro. Comments were also accepted by mail to the Superintendent, Big Cypress National Preserve.

Due to the coronavirus pandemic, the Preserve hosted two virtual public meetings, on June 22, 2021 from 6:30-8:00 pm ET and June 24, 2021 from 1:00-2:30 pm ET. At these meetings, NPS staff presented information about the Preserve's history, establishment, and the existing water infrastructure; identified issues related to infrastructure and water movement across the landscape; and explained the project purpose and need, proposed action and preliminary alternatives, and the planning timeline. After the presentation, attendees were provided time to ask questions regarding the plan. The questions were then answered in the virtual meeting by Preserve staff, with a reminder that formal comments needed to be submitted online or in writing for them

to be considered. A total of 40 individuals attended the virtual public scoping meetings, with 15 attendees at the June 22 meeting and 25 attendees at the June 24 meeting.

During the public comment period, seven pieces of correspondence were received. Each correspondence was read and specific comments within each correspondence were identified.

The NPS collected public comments during this scoping phase of the planning process to understand the public's perspectives on key issues and management options related to the Preserve's hydrology. During the public scoping period, the NPS received letters from official representatives of the following agencies and organizations: Izaak Walton League, National Parks Conservation Association, Florida Chapter of Backcountry Hunters and Anglers, Audubon Florida/Audubon of the Western Everglades, and Florida Wildlife Federation.

After public scoping ended, the NPS analyzed substantive comments submitted as topics to be addressed in the Plan and incorporated relevant comments into the EA.

As part of the scoping process, the Preserve invited the participation of Federal, State, and Tribal agencies to identify issues of concern early in the process. The Preserve sent scoping letters to the Miccosukee Tribe of Indians of Florida, the Seminole Tribe of Florida, the Seminole Nation of Oklahoma, and the Division of Historical Resources and SHPO in June and July 2021. No feedback was received from the Miccosukee Tribe of Indians of Florida. The Seminole Tribe of Florida responded that review of the Plan and their subsequent response are still in progress, and the Seminole Nation of Oklahoma responded that they have no concerns and they defer to tribes more familiar with the area. The SHPO responded, requesting continued consultation with the Preserve as the Plan is developed. Copies of the scoping letters and responses are provided in **Appendix D.**

The Programmatic Agreement among the National Park Service Big Cypress National Preserve, the Florida State Historic Preservation Officer, and the Advisory Council on Historic Preservation is provided in **Appendix E**.

Appendices


Big Cypress National Preserve
National Park Service
U.S. Department of the Interior
WETLAND
RESTORATION
IN PROGRESS
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APPENDIX A: ACRONYMS

asl	above sea level
BAP	Backcountry Access Plan
CAA	Clean Air Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
EA	Environmental Assessment
EO	Executive Order
FDACS	Florida Department of Agriculture and Consumer Services
FNST	Florida National Scenic Trail
FWC	Florida Fish and Wildlife Conservation Commission
GMP	General Management Plan
IPaC	Information for Planning and Consulting
NEPA	National Environmental Policy Act of 1969, as amended
NPS	National Park Service
ORV	Off-Road Vehicle
PEPC	Planning, Environment, and Public Comment
RV	recreational vehicle
SFWMD	South Florida Water Management District
SHPO	State Historic Preservation Office(r)
SR	State Road
USACE	US Army Corps of Engineers
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
WCA	Water Conservation Area
WERP	Western Everglades Restoration Project

APPENDIX B: IMPACT TOPICS DISMISSED FROM DETAILED ANALYSIS

Wetlands

The majority of the Preserve is classified as wetlands. Wetlands are protected by section 4.6.5 of National Park Service (NPS) *Management Policies 2006* (NPS 2006b); Executive Order (EO) 11990; Director's Order 77-1; and the Clean Water Act (1972). Specifically, Director's Order 77-1, the *National Park Service Procedural Manual #77-1: Wetland Protection* (NPS 2016), provides specific procedures and requirements that have to be addressed when an NPS-proposed action will have new adverse impacts on wetlands.

Upon review of these laws and policies and the proposed alternatives associated with this Environmental Assessment, NPS has determined that none of the proposed alternatives would adversely impact the Preserve's wetlands. For each of the proposed alternatives analyzed in this Environmental Assessment, hydrologic restoration would improve wetland continuity and habitat. While there may be minor short-term construction impacts for some site-specific restoration projects, these impacts are mitigated by best management practices. The plan qualifies for a statement of findings exemption under Director's Order 77-1. Other relevant impacts are captured under water resources in chapter 4, Environmental Consequences. Therefore, this impact topic is not analyzed in detail as a separate topic in this Environmental Assessment.

Wilderness Character

Wilderness in national park system units is governed by the Wilderness Act and NPS *Management Policies 2006* (NPS 2006b). The NPS *Management Policies 2006* require that wilderness considerations be integrated into planning documents to guide the preservation, management, and use of wilderness areas and make sure that wilderness is unimpaired for future use and enjoyment as such.

There is currently no designated wilderness in the Preserve, but lands have been identified as eligible for designation, and some eligible lands in the Addition have been proposed for designation. Lands identified as eligible or proposed for wilderness designation need to be managed to preserve their wilderness character and values in the same manner as designated wilderness until Congress has acted on the recommendations.

Upon review of these laws and policies and the proposed alternatives associated with this Environmental Assessment, NPS has determined that the none of the proposed alternatives would have impacts on the Preserve's potential future wilderness. The majority of the proposed hydrologic restoration projects would be located outside of the Preserve's proposed or eligible wilderness. No identified Tier 2 projects fall within eligible or proposed wilderness, and most Tier 1 projects are located near roads or ORV trails that have a one-quarter mile buffer to proposed or eligible wilderness. A small number of future projects that may fall within proposed or eligible wilderness would have long-term beneficial impacts on wilderness character. Future projects that could occur in wilderness would undergo a minimum requirements analysis. Therefore, this impact topic is not analyzed in detail as a separate topic in this Environmental Assessment.

Water Quality

Water quality is an important issue at the Preserve. NPS policies require protection of water resources in a manner consistent with the Clean Water Act (CWA). The water in the Preserve is relatively unpolluted. The fresh surface waters of the Preserve are designated as Outstanding

Florida Waters. This is a state designation, delegated by the U.S. Environmental Protection Agency under the CWA and intended to protect existing, high-quality waters. The Big Cypress Swamp is also designated as an Area of Critical State Concern by Florida statute (Chapter 380.05). This designation provides the state's Division of Community Planning with oversight on local development projects and comprehensive planning within the designated area (Collier County).

External sources of pollution primarily include nutrient-enriched runoff from upstream agricultural practices and urban activities, especially in the north. External sources of pollution may also result from construction activities, roadway improvements, and from untreated water inputs from connected waterways (such as the Western Everglades Restoration Project). As an example, water quality degradation occurs in the northwest part of the Preserve where polluted water enters through the SR 29 Canal, Okaloacoochee Slough, and Bundschu Grade. Surface water entering the Preserve is nearly completely controlled, and having drained from agricultural and developed areas, is laden with nutrients, dissolved solids, and trace amounts of pesticides and herbicides (SFWMD 1992).

Dirty, nutrient-impaired waters would continue under each alternative, as none of the alternatives directly cleans up waters, and does not involve bringing in "new water" from sources outside the Preserve. Projects that enhance water quality directly, or that bring in new water from outside the Preserve, fall within the Tier 3 category of projects and are outside the scope of this plan. However, in some areas of the Preserve, stormwater is directly discharged into wetlands and waterways. Alternatives could improve water quality in instances where stormwater from roads is retained before direct discharge into wetlands and waterways. Alternatives could also improve freshwater wetland water quality in instances where projects help reduce saltwater intrusion by increasing subsurface recharge of water, especially in areas currently negatively impacted by saltwater intrusion.

The NPS established a long-term water monitoring program for measuring surface water stage and quality in the Preserve in 1988. Water quality samples currently are collected every other month at 20 stations located throughout the Preserve. The objective of this water monitoring program is to provide a long-term record for assessing ambient water quality conditions and contamination threats. The South Florida Water Management District maintains water-quality monitoring programs in lands upstream and adjacent to the Preserve. The most important parameters of interest for tracking long-term water quality conditions include total phosphorus, nitrate, sulfate, and pesticides.

Upon review of these laws and the proposed alternatives associated with this Environmental Assessment, NPS has determined that none of the proposed alternatives would have direct impacts on the Preserve's water quality. In each of the proposed alternatives analyzed in this Environmental Assessment, the National Park Service would continue to protect and conserve the Preserve's water quality as required under the CWA. Therefore, this impact topic is not analyzed in detail as a separate topic in this Environmental Assessment.

Other Wildlife

Rare, threatened, and endangered species in the Preserve are governed by several laws and policies, primarily the National Park Service Organic Act and the Endangered Species Act, as well as state law. The purpose of the Endangered Species Act is to conserve "the ecosystem upon which endangered and threatened species depend" and to conserve and recover listed species. This act mandates that Federal agencies protect listed species and preserve their habitats. NPS *Management Policies 2006* (NPS 2006b) also provide specific guidance for management of threatened or

endangered plants and animals. These policies dictate that the National Park Service survey for, protect, and strive to recover species native to national park system units that are listed under the Endangered Species Act. Additionally, in the state of Florida, laws protecting rare, threatened, and endangered species include the Florida Endangered and Threatened Species Act, the Endangered Species Protection Act, and the Preservation of Native Flora of Florida Act.

Upon review of these laws and the proposed alternatives associated with this Environmental Assessment, NPS has determined that none of the proposed alternatives would have impacts on the endangered Cape Sable seaside sparrow. It is a ground-nesting bird that has been the focus of Everglades Restoration to the east, and it is generally considered to be outside the scope of this Environmental Assessment because the Tier 1 and Tier 2 proposed projects would not impact the species habitat. Cape Sable seaside sparrow is primarily impacted by Tier 3 projects that affect waters in the southeast corner of the Preserve, such as Everglades Restoration projects.

In addition to special status species discussed in chapter 4, Environmental Consequences, other wildlife live in the Preserve. However, the Federally listed species are good indicators for other wildlife species due to the interrelations and inter-dependence of the various flora and fauna in the Preserve. Together, the Federally listed species adequately reflect overall ecosystem health. Therefore, the effects on other wildlife species are not analyzed in detail as a separate topic in this Environmental Assessment.

Natural Soundscapes

In accordance with NPS *Management Policies 2006* (NPS 2006b) and Director's Order 47: Sound Preservation and Noise Management (NPS 2000b), an important part of the NPS mission is preservation of natural soundscapes in national park units. Natural soundscapes exist in the absence of human-caused sound.

Intrusive sounds are of concern to the NPS and visitors because they can degrade the visitor experience and influence the distribution and behavior of animals. Furthermore, visitor use and experience, including natural soundscapes, are central to the Plan and of critical importance. Noise that is considered excessive and out of place has the potential to be a source of conflict among visitors in national park units. Research shows that noise can also affect an animal's physiology and behavior, and if it becomes chronic, can injure an animal's energy budget, reproductive success, and long-term survival (Radle 2007). By definition, noise is human-caused sound that is considered unpleasant and unwanted. Whether a sound is considered unpleasant depends on the individual who hears the sound and the setting and circumstance under which the sound is heard. However, natural sounds throughout the Preserve—including flowing water, animals, and rustling leaves—are not considered noise. The opportunity to experience an unimpaired natural soundscape is an important part of the overall visitor experience, especially because it contributes to the solitude and wilderness experience that is integral to much of the Preserve.

Upon review of these policies and the proposed alternatives associated with this Environmental Assessment, NPS has determined that none of the proposed alternatives would adversely impact the Preserve's natural soundscapes. There could be some impacts during construction, but short-term and relatively minor, plus projects will take place over time, not all at once. Therefore, this impact topic is not analyzed in detail as a separate topic in this Environmental Assessment.

Air Quality

The legal authority for Federal programs regarding air pollution control is based on the 1990 Clean Air Act (CAA) Amendments. These are the latest in a series of amendments made to the CAA. This legislation modified and extended Federal legal authority provided by the earlier Clean Air Acts of 1963 and 1970. The Air Pollution Control Act of 1955 was the first Federal legislation involving air pollution. This act provided funds for Federal research in air pollution. The CAA of 1963 was the first Federal legislation regarding air pollution control. The Air Quality Act of 1967 expanded studies of air pollutant emission inventories, ambient monitoring techniques, and control techniques. The Preserve has been designated a class II area under the CAA. The Preserve is currently within a designated attainment area (i.e., concentrations are below standards) for criteria pollutants.

Upon review of these laws and the proposed alternatives associated with this Environmental Assessment, NPS has determined that the contribution of pollutants resulting from implementation of the proposed alternatives would be similar to current levels and would not result in exceeding criteria established for pollutants, and the differences between the alternatives would not be noticeable. Exhaust emissions could be produced by an increase in visitor use and subsequent vehicle use in the Preserve; however, these activities would not be expected to cause national ambient air quality standards to be exceeded because the increases would be relatively minor. Therefore, this impact topic is not analyzed in detail as a separate topic in this Environmental Assessment.

Floodplains

The Preserve's floodplains are protected under the Organic Act; NPS *Management Policies 2006* (NPS 2006b); Executive Order 11988, Floodplain Management; and Director's Order 77-2: *Floodplain Management*. Floodplains provide a variety of important functions, including flood protection, improved water quality, habitat for wildlife, groundwater recharge, and cycling of nutrients important for food web and agricultural production. Upon review of these laws and policies and the proposed alternatives associated with this Environmental Assessment, NPS has determined that none of the proposed alternatives would have impacts on the Preserve's floodplains. In each of the proposed alternatives analyzed in this Environmental Assessment, the National Park Service would continue to protect and conserve the Preserve's floodplains as required under the Organic Act, NPS *Management Policies 2006*, Executive Order 11988, and Director's Order 77-2. Therefore, this impact topic is not analyzed in detail as a separate topic in this Environmental Assessment.

Night Sky/Lightscapes

Lighting is not a direct component of the proposed alternatives, and no measurable impacts to night sky would occur. Therefore, this impact topic is not analyzed in detail as a separate topic in this Environmental Assessment.

Prime or Unique Farmlands

The Farmland Protection Policy Act (7 USC § 4201 et seq.) and the U.S. Department of the Interior Environmental Statement Memorandum 94-7 – Prime and Unique Agricultural Lands require an evaluation of impacts on prime or unique agricultural lands. Prime farmland is soil that produces general crops such as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables, and nuts.

No prime or unique farmlands exist in the Preserve, according to the U.S. Department of Agriculture Natural Resources Conservation Service. Therefore, this impact topic is not analyzed in detail as a separate topic in this Environmental Assessment.

Environmental Justice

Proposed Federal projects are required to comply with the provisions of Title VI of the Civil Rights Act of 1964, as amended by Title VIII of the Civil Rights Act of 1968. Title VI of the 1964 Civil Rights Act provides that no person will, on the grounds of race, color, religion, sex, national origin, marital status, disability, or family composition, be excluded from participation in, be denied the benefits of, or be otherwise subject to discrimination under a program of the Federal, state, or local government. Title VIII of the 1968 Civil Rights Act guarantees each person equal opportunity in housing. Additionally, Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires Federal agencies to identify and address disproportionately high and adverse human health or environmental effects on minority and low-income populations.

Upon review of these laws and the proposed alternatives associated with this Environmental Assessment, no person would be excluded from or discriminated against in the proposed alternatives considered in this Environmental Assessment. Additionally, minority or low-income populations would be treated the same way as other groups under the alternatives considered in this Plan and the proposed alternatives would not have a disproportionately high or adverse effect on a minority or low-income population or community. Therefore, this impact topic is not analyzed in detail as a separate topic in this Environmental Assessment.

Energy Resources / Energy Efficiency and Conservation Potential

The alternatives being considered would not result in the extraction of energy resources from the Preserve, and the proposed alternatives would not result in a measurable change in energy consumption compared to current conditions. Additionally, the proposed alternatives would not affect ongoing oil and gas operations in the Preserve. Therefore, this impact topic is not analyzed in detail as a separate topic in this Environmental Assessment.

Land Use / Adjacent Land Uses and Policies

Land use plans (outside the Preserve boundaries) would not be affected by actions proposed under the alternatives. In addition, recreational activities described in the proposed alternatives would not induce changes in land use or increase pressure for development within or adjacent to the Preserve. Therefore, this impact topic is not analyzed in detail as a separate topic in this Environmental Assessment.

APPENDIX C: AFFECTED ENVIRONMENT REFERENCE TABLES

TABLE 1. FEDERALLY PROTECTED SPECIES IDENTIFIED IN THE USFWS OFFICIAL SPECIES LIST, AND EVALUATION OF POTENTIAL TO OCCUR IN THE PRESERVE

Common Name	Scientific Name	Listing Status	General Habitat Requirements	Potential to Occur
Mammals				
Florida bonneted bat	*Eumops floridanus*	FE	Roosts in palms, hollow trees, and in buildings. Forages high in the air over natural as well as human-altered landscapes.	**Present.** There is one documented nest site within the Preserve. Additional sites may be present.
Florida panther	*Puma* (=*Felis*) *concolor coryi*	FE	Requires extensive tracts of mostly forested habitats. Large wetlands that are generally inaccessible to humans are important to the panther for diurnal refuge.	**Present.** However, the species is not likely to be affected by the alternatives.
Key Largo woodrat	*Neotoma floridana smalli*	FE	Mature, undisturbed subtropical hammock forest. Builds and nests within a large stick house on the ground, often built around a stump, log, boulder, or other similar object; may occupy old buildings.	Absent. The Preserve is located outside of the species known range; species is restricted to Key Largo.
Puma (mountain lion)	*Puma* (=*Felix*) *concolor* (all susp. except coryi)	SAT	Prefer native, upland forests, especially hammocks and pinelands. Prefer a thick understory of saw palmetto (*Serenoa repens*) for resting and denning.	Absent. The ranges of other *Puma concolor* subspecies (except *coryi)* do not overlap the Preserve.
Silver rice rat	*Oryzomys palustris natator*	FE	Areas containing contiguous mangrove swamps, salt marsh flats, and buttonwood transition vegetation, principally salt marshes where grassy areas with scattered shrubs and trees exist. Shredded grass nests are typically placed in grassy hummocks in areas with scattered shrubs and trees.	Absent. The Preserve is located outside of the species known range; species is restricted to 12 islands of the lower Florida Keys.
West Indian manatee	*Trichechus manatus*	FT, MMPA, DCH	Coastal waters, bays, rivers, and (occasionally) lakes. Requires warm-water refuge such as springs or cooling effluent during cold weather. Sheltered coves are important for feeding, resting, and calving.	**Present.** Known to occur in selected waterways of the Preserve.
Birds				
Audubon's crested caracara	*Polyborus plancus audubonii*	FT	Inhabits areas with open land, such as dry prairie and pasture lands with cabbage palm (*Sabal palmetto*), cabbage palm/live oak (*Quercus* spp.) hammocks, and shallow ponds and sloughs. Prefers to nest in cabbage palm trees and live oaks.	Not likely to occur. Species is rare within the Preserve and typically only found during the spring. Species would not likely be affected by the alternatives.
Bachman's warbler (=wood)	*Vermivora bachmanii*	FE	Moist deciduous woodland and swamp. Regarded as a bird of virgin bottomland forests and swamp forests, and as a second-growth species. Nests in bushes, blackberry vines, or canes, on swamp palmetto leaf, in dense watery swamps.	Not likely to occur. Species breeding and wintering range does not overlap the Preserve. Species may be rare migrant through the Preserve

TABLE 1. FEDERALLY PROTECTED SPECIES IDENTIFIED IN THE USFWS OFFICIAL SPECIES LIST, AND EVALUATION OF POTENTIAL TO OCCUR IN THE PRESERVE

Common Name	Scientific Name	Listing Status	General Habitat Requirements	Potential to Occur
				and would not likely be affected by the alternatives.
Cape Sable seaside sparrow	*Ammodramus maritimus mirabilis*	FE, DCH	Seasonally flooded, brushless, subtropical interior marshes, fresh to slightly brackish; cordgrass, rushes, sawgrass, etc. Adapted to habitat subject to periodic fires. Nests in wetter areas in tufts of herbaceous growth.	**Present.** Only located in southeast corner of the Preserve and not likely to be affected by the alternatives. *DCH is not present in the Preserve but is located just east of the Preserve.*
Everglade snail kite	*Rostrhamus sociabilis plumbeus*	FE	Prefers shallow freshwater marshes and grassy shorelines of lakes. This species feeds almost exclusively on apple snails, which are caught at or near the water's surface.	**Present.** Species is an uncommon breeder and forager within the Preserve.
Florida scrub-jay	*Aphelocoma coerulescens*	FT	Typically persists in areas with well-drained sandy soils and fire-dominated, low-growing, oak scrub habitat. This species sometimes lives in areas with overgrown scrub or sparser oaks, but at much lower populations and with reduced chances of survival.	**Present.** Species is known to occur in uplands of the Preserve; species would not likely be affected by the alternatives.
Ivory-billed woodpecker	*Campephilus principalis*	FE	Native to the forests of southeastern US. This species inhabits cypress swamps and mature bottomland forest.	Absent. Species is believed to be extinct.
Piping plover	*Charadrius melodus*	FT	Shorebird that nests and feeds along coastal sand and gravel beaches. They inhabit sandy beaches, sand flats, and mudflats.	Not likely to occur. Species is uncommon within the Preserve and would not likely be affected by the alternatives.
Red knot	*Calidris canutus rufa*	FT	Small wading shorebird found along shorelines and salt marshes. Their diet is dependent on horseshoe crab eggs. They migrate thousands of miles per year.	Absent. Species has not been documented within the Preserve.
Red-cockaded woodpecker	*Picoides borealis*	FE	Persists in open woodlands with a large range of grass, forb, and shrub species, and prefers mature pines to other forested habitat types. In southern and south-central Florida, species is generally found in slash pine (*Pinus elliottii*) habitat (outside the range of longleaf pine [*Pinus palustris*]), as well as mixed longleaf pine and slash pine habitat.	**Present.** Species is known to occur in upland habitats of the Preserve; not likely to be affected by the alternatives.
Whooping crane	*Grus americana*	EXPN	Breeds, migrates, winters, and forages in a variety of wetland and other habitats, including coastal marshes and estuaries, inland marshes, lakes, ponds, wet meadows and rivers, and agricultural	Not Likely to Occur. Species is not known to occur in the Preserve. Species may be rare migrant through the Preserve and would not

TABLE 1. FEDERALLY PROTECTED SPECIES IDENTIFIED IN THE USFWS OFFICIAL SPECIES LIST, AND EVALUATION OF POTENTIAL TO OCCUR IN THE PRESERVE

Common Name	Scientific Name	Listing Status	General Habitat Requirements	Potential to Occur
			fields. They are omnivorous, probing soil subsurface with their bills.	likely be affected by the alternatives.
Wood stork	*Mycteria americana*	FT	Nests in colonies; nesting occurs in inundated forested wetlands (including cypress strands and domes), mixed hardwood swamps, mangroves, and sloughs. Also found in artificial habitats such as impoundments and dredged areas with native or exotic vegetation. Forages in shallow water in habitats such as freshwater marshes, lagoons, swamps, ponds, tidal creeks, and flooded pastures and ditches.	**Present.** Sporadic nester within the Preserve.
Reptiles				
American alligator	*Alligator mississippiensis*	SAT	Inhabits freshwater marshes and cypress swamps; they will also spend time within manmade water bodies such as stormwater retention areas.	**Present.** Well documented within the Preserve.
American crocodile	*Crocodylus acutus*	FT	Habitat includes coastal mangrove swamps, brackish and saltwater bays, lagoons, marshes, tidal rivers, and brackish creeks, as well as abandoned coastal canals and borrow pits.	**Present.** Documented within the Preserve.
Eastern indigo snake	*Drymarchon corais couperi*	FT	Inhabits scrub, sandhill, wet prairies, and mangrove swamps, and needs large tracts of land to persist. Spends winters in gopher tortoise (*Gopherus polyphemus*) burrows in sandy uplands.	**Present.** However, the species occurs in uplands and is unlikely to be affected by the alternatives.
Hawksbill sea turtle	*Eretmochelys imbricata*	FE	Uses a wide range of tropical and subtropical habitats, including shallow coastal waters with rocky bottoms, coral reefs, beds of seagrass or algae, mangrove-bordered bays and estuaries, and submerged mud flats. Nesting occurs on undisturbed, deep-sand, insular or mainland beaches.	Not likely to occur. May occur in marine environments of the Preserve. Marine environments would not likely be affected by the alternatives.
Leatherback sea turtle	*Dermochelys coriacea*	FE	Marine; open ocean, often near edge of continental shelf; also seas, gulfs, bays, and estuaries. Mainly pelagic, seldom approaching land except for nesting. Nests on sloping sandy beaches backed up by vegetation, often near deep water and rough seas. Largest colonies use continental, rather than insular, beaches.	Not likely to occur. May occur in marine environments of the Preserve. Marine environments would not likely be affected by the alternatives.
Loggerhead sea turtle	*Caretta caretta*	FT	Open sea to more than 500 miles from shore, mostly over continental shelf, and in bays, estuaries, lagoons, creeks, and mouths of rivers; mainly warm temperate and subtropical regions not far from shorelines. Nesting occurs usually on open, sandy beaches above high-tide mark.	Not likely to occur. May occur in marine environments of the Preserve. Marine environments would not likely be affected by the alternatives.

TABLE 1. FEDERALLY PROTECTED SPECIES IDENTIFIED IN THE USFWS OFFICIAL SPECIES LIST, AND EVALUATION OF POTENTIAL TO OCCUR IN THE PRESERVE

Common Name	Scientific Name	Listing Status	General Habitat Requirements	Potential to Occur
Fish				
Atlantic sturgeon (gulf subspecies)	*Acipenser oxyrinchus (=oxyrhynchus) desotoi*	FT	Primarily marine/estuarine in winter; migrates to upper rivers in spring for spawning; returns to sea/estuary in fall; some may remain near spawning areas. Spawns in freshwater (sometimes tidal), usually over bottom of hard clay, rubble, gravel, or shell. Feeds primarily on benthic invertebrates and small fishes.	Absent. Preserve does not occur within the species range.
Insects				
Bartram's hairstreak butterfly	*Strymon acis bartrami*	FE	Occurs in tropical pinelands or openings with the larval foodplant, specifically, pine rockland habitat of south Florida. Species host plant and larval food plant is the pineland croton (*Croton linearis*). Feeds on flowers and leaves; adults take nectar from pineland croton and other flowering plants.	Not likely to occur. Species has not been documented within the Preserve. Species is unlikely to be affected by the alternatives.
Florida leafwing butterfly	*Anaea troglodyta floridalis*	FE	Tropical dry pine scrub on limestone, usually seen near patches of the foodplant, pineland croton (*Croton linearis*). Adults feed on rotting fruit, dung, probably sap and at least occasionally flowers.	Not likely to occur. Species has not been documented within the Preserve. Species is unlikely to be affected by the alternatives.
Miami blue butterfly	*Cyclargus (=Hemiargus) thomasi*	FE	Tropical hammocks with the foodplants (developing pods of balloon vine (*Cardiospoermum halicacabum*) and an oviposition has been observed on snowberry (*Chiococca alba*).	Not likely to occur. Species has not been documented within the Preserve. Species is unlikely to be affected by the alternatives.
Flowering Plants				
Beach jacquemontia	*Jacquemontia reclinata*	FE	Beach dunes, strand openings.	Not likely to occur. Species is not known to occur in the Preserve.
Big Pine partridge pea	*Chamaecrista lineata keyensis*	FE	Pine rocklands.	Absent: Only known to occur in the Florida Keys.
Blodgett's silverbush	*Argythamnia blodgettii*	FT	Pine rocklands, coastal rock barrens.	Not likely to occur. Species is not known to occur in the Preserve.
Cape Sable thoroughwort	*Chromolaena frustrata*	FE	Coastal hammocks.	Absent. Only known to occur in the Florida Keys.
Carter's mustard	*Warea carteri*	FE	Pinelands, scrub, sandhills.	Not likely to occur. Not known to occur in the Preserve and is believed extirpated from Miami-Dade County. Species unlikely to be affected by the alternatives.

TABLE 1. FEDERALLY PROTECTED SPECIES IDENTIFIED IN THE USFWS OFFICIAL SPECIES LIST, AND EVALUATION OF POTENTIAL TO OCCUR IN THE PRESERVE

Common Name	Scientific Name	Listing Status	General Habitat Requirements	Potential to Occur
Carter's small-flowered flax	*Linum carteri carteri*	FE	Pine rocklands, roadsides.	Absent. Species historical and current ranges do not overlap the Preserve.
Crenulate lead-plant	*Amorpha crenulata*	FE	Pine rocklands, marl prairies.	Absent. Species historical and current ranges do not overlap the Preserve.
Deltoid spurge	*Chamaesyce deltoidea* ssp. *deltoidea*	FE	Pine rocklands.	Absent. Species historical and current ranges do not overlap the Preserve.
Everglades bully	*Sideroxylon reclinatum* ssp. *austro oridense*	FT	Calcareous glades.	**Present.** Known from limited distribution within the Preserve near Gum Slough within the Lostman's Pines area.
Florida brickell-bush	*Brickellia mosieri*	FE	Pine rocklands, sandy soil over limestone.	Absent. Species historical and current ranges do not overlap the Preserve.
Florida pineland crabgrass	*Digitaria pauciflora*	FT	Pine rocklands, marl prairies.	**Present.** Species is known from nine separate occurrences within the Preserve.
Florida prairie-clover	*Dalea carthagenensis floridana*	FE	Pinelands, hammocks.	**Present.** Three populations are known to occur in the Preserve: north of Oasis Visitor Center, 11-Mile Road, and Pinecrest.
Florida semaphore cactus	*Consolea corallicola*	FE	Rocky hammocks.	Absent. Only known to occur in the Florida Keys.
Garber's spurge	*Chamaesyce garberi*	FT	Pine rocklands, coastal grassland.	Absent. Species historical and current ranges do not overlap the Preserve.
Key tree cactus	*Pilosocereus robinii*	FE	Rockland hammocks.	Absent. Only known to occur in the Florida Keys.
Pineland sandmat	*Chamaesyce deltoidea pinetorum*	FT	Pine rocklands.	Absent. Only known to occur in the lower Miami Rock Ridge.
Sand flax	*Linum arenicola*	FE	Pine rocklands.	Absent. Only known to occur in the Florida Keys.
Small's milkpea	*Galactia smallii*	FE	Pine rocklands.	Absent. Only known to occur in a small geographic area of Miami Rock Ridge.

TABLE 1. FEDERALLY PROTECTED SPECIES IDENTIFIED IN THE USFWS OFFICIAL SPECIES LIST, AND EVALUATION OF POTENTIAL TO OCCUR IN THE PRESERVE

Common Name	Scientific Name	Listing Status	General Habitat Requirements	Potential to Occur
Tiny polygala	*Polygala smallii*	FE	Pine rocklands, rosemary scrub, sandhills.	Not likely to occur. Not known to occur in the Preserve; Preserve appears to be outside of the species range.
Wedge spurge	*Chamaesyce deltoidea serpyllum*	FE	Pine rocklands.	Absent. Only known to occur in Big Pine Key.
Ferns and Allies				
Florida bristle fern	*Trichomanes punctatum* ssp. *floridanum*	FE	Limestone sinks in rockland hammocks.	Not likely to occur. Not known to occur in the Preserve; Preserve appears to be outside of the species range.

Sources:

FDACS. 2018. Florida Update Endangered, Threatened and Commercially Exploited Plants of Florida. Excel Table. Available online at: https://www.fdacs.gov/Divisions-Offices/Plant-Industry/Bureaus-and-Services/Entomology-Nematology-Plant-Pathology/Botany/Florida-s-Endangered-Plants/Endangered-Threatened-and-Commercially-Exploited-Plants-of-Florida.

FE=Federal Endangered
FT=Federal Threatened
EXPN=Experimental non-essential population
DCH=Designated Critical Habitat
SAT= Threatened due to similarity of appearance
MMPA=Marine Mammal Protection Act

TABLE 2. PROTECTED PLANT SPECIES IN THE PRESERVE

Common Name	Scientific Name	Designated Status		Habitat in the Preserve
		Federal	State	
Federally Listed Species				
Florida prairie clover	*Dalea carthagenensis* var. *floridana*	FE	SE	Pineland, hammock, prairie
Florida pineland crabgrass / twospike crabgrass / Everglades grass	*Digitaria pauciflora*	FT	SE	Pineland, prairie
Everglades bully	*Sideroxylon reclinatum* ssp. *austrofloridense*	FT	SE	Pineland, prairie, hammock
State Listed Species				
Everglades palm, paurotis palm	*Acoelorraphe wrightii*	--	ST	Hammock
Golden leather fern	*Acrostichum aureum*	--	ST	Hammock, marsh
Brittle maidenhair	*Adiantum tenerum*	--	SE	Hammock
Meadow jointvetch	*Aeschynomene pratensis*	--	SE	Pineland
White colic-root, bracted colic-root	*Aletris bracteata*	--	SE	Pineland, prairie
Pineland-allamanda, pineland golden trumpet	*Angadenia berteroi*	--	ST	Pineland
Eared spleenwort	*Asplenium erosum*	--	SE	Hammocks, cypress
Wild birdnest fern	*Asplenium serratum*	--	SE	Hammock, mixed hardwood swamp
Pinepink	*Bletia purpurea*	--	ST	Pineland, cypress
Fahkahatchee bluethread	*Burmannia flava*	--	SE	Cypress
Manyflower grasspink	*Calopogon multiflorus*	--	ST	Pineland
Spicewood, pale lidflower	*Calyptranthes pallens*	--	ST	Hammock
Leafless bentspur orchid	*Campylocentrum pachyrrhizum*	--	SE	Mixed hardwood swamp
Narrow strap fern, narrow-leaved strap fern	*Campyloneurum angustifolium*	--	SE	Hammock, mixed hardwood swamp
Tailed strap fern	*Campyloneurum costatum*	--	SE	Hammock, mixed hardwood swamp
Powdery strap airplant	*Catopsis berteroniana*	--	SE	Hammock, mixed hardwood swamp
Florida strap airplant	*Catopsis floribunda*	--	SE	Hammock, mixed hardwood swamp
Southern Florida sandmat	*Chamaesyce pergamena*	--	ST	Pineland
Porter's sandmat	*Chamaesyce porteriana*	--	SE	Pineland
Satinleaf	*Chrysophyllum oliviforme*	--	ST	Hammock, pineland
Coffee colubrina, greenheart	*Colubrina arborescens*	--	SE	Hammock
Butterflybush, Curacao bush	*Cordia globosa*	--	SE	Hammock
Quailberry, Christmasberry	*Crossopetalum ilicifolium*	--	ST	Pineland, hammock
Pepperbush	*Croton humilis*	--	SE	Hammock, disturbed
Florida tree fern, red-hair comb fern	*Ctenitis sloanei*	--	SE	Hammock, mixed hardwood swamp
Blodgett's swallowwort	*Cynanchum blodgettii*	--	ST	Hammock
Cowhorn orchid	*Cyrtopodium punctatum*	--	SE	Hammock, prairie, mixed hardwood swamp

TABLE 2. PROTECTED PLANT SPECIES IN THE PRESERVE

Common Name	Scientific Name	Designated Status		Habitat in the Preserve
		Federal	State	
Caribbean crabgrass	*Digitaria filiformis* var. *dolichophylla*	--	ST	Pineland
Guiana-plum	*Drypetes lateriflora*	--	ST	Hammock
Clamshell orchid	*Encyclia cochleata*	--	SE	Hammock, mixed hardwood swamp
Tampa butterfly orchid	*Encyclia tampensis*	--	CE	Hammock, mixed hardwood swamp, cypress
Brown-flowered butterfly orchid	*Epidendrum anceps*	--	SE	Hammock
Acuna's star orchid	*Epidendrum blancheanum*	--	SE	Cypress
Umbrella star orchid	*Epidendrum floridense*	--	SE	Mixed hardwood swamp
Night scented orchid	*Epidendrum nocturnum*	--	SE	Hammock, mixed hardwood swamp
Stiff flower star orchid	*Epidendrum rigidum*	--	SE	Hammock, mixed hardwood swamp
Sanibel Island love grass	*Eragrostis tracyi*	--	SE	Hammock
Beach verbena, coastal mock vervain	*Glandularia maritima*	--	SE	Hammock
Tampa mock vervain	*Glandularia tampensis*	--	SE	Hammock, pineland, disturbed
Wild cotton, upland cotton	*Gossypium hirsutum*	--	SE	Hammock
West Indian tufted airplant	*Guzmania monostachia*	--	SE	Hammock
Snowy orchid	*Habenaria nivea*	--	ST	Prairie
Needleroot airplant orchid	*Harrisella porrecta*	--	ST	Mixed hardwood swamp, hammock
Poeppig's rosemallow	*Hibiscus poeppigii*	--	SE	Hammock
Hanging club-moss	*Huperzia dichotoma*	--	SE	Cypress, hammock, mixed hardwood swamp
Delicate violet orchid	*Ionopsis utricularioides*	--	SE	Hammock, mixed hardwood swamp
Rockland morningglory	*Ipomoea tenuissima*	--	SE	Pineland
Pineland clustervine	*Jacquemontia curtissii*	--	ST	Pineland, prairie
Skyblue clustervine	*Jacquemontia pentanthos*	--	SE	Hammock
East coast lantana, Florida shrubverbena	*Lantana depressa* var. *floridana*	--	SE	Pineland, prairie
West coast lantana, Sanibel shrubverbena	*Lantana depressa* var. *sanibelensis*	--	SE	Pineland
Pine lily	*Lilium catesbaei*	--	ST	Pineland, prairie
Small's flax	*Linum carteri* var. *smallii*	--	SE	Pineland
Pantropical widelip orchid	*Liparis nervosa*	--	SE	Cypress, marsh
Nodding club-moss	*Lycopodiella cernua*	--	SC	Cypress, mixed hardwood swamp, pinelands
Hidden orchid	*Maxillaria crassifolia*	--	SE	Mixed hardwood swamp
Pineland blackanthers	*Melanthera parvifolia*	--	ST	Pineland, prairie

TABLE 2. PROTECTED PLANT SPECIES IN THE PRESERVE

Common Name	Scientific Name	Designated Status		Habitat in the Preserve
		Federal	State	
Climbing vine fern	*Microgramma heterophylla*	--	SE	Hammock
Twinberry, Simpson's stopper	*Myrcianthes fragrans*	--	ST	Hammock
Giant swordfern	*Nephrolepis biserrata*	--	ST	Hammock, mixed hardwood swamp
Wild basil, Wild sweet basil	*Ocimum campechianum*	--	SE	Disturbed
Florida dancinglady orchid	*Oncidium ensatum*	--	SE	Pineland, hammock, mixed hardwood swamp
Hand fern	*Ophioglossum palmatum*	--	SE	Hammock, mixed hardwood swamp
Erect pricklypear	*Opuntia stricta*	--	ST	Hammock
Royal fern	*Osmunda regalis* var. *spectabilis*	--	CE	Mixed hardwood swamp, marsh
Pineland passionflower	*Passiflora pallens*	--	SE	Hammock
Comb polypody	*Pecluma ptilodon* var. *caespitosa*	--	SE	Hammock, mixed hardwood swamp
Cypress peperomia	*Peperomia glabella*	--	SE	Hammock
Baby rubberplant	*Peperomia obtusifolia*	--	SE	Hammock, mixed hardwood swamp
Yerba linda	*Peperomia rotundifolia*	--	SE	Mixed hardwood swamp
Southern fogfruit	*Phyla stoechadifolia*	--	SE	Pineland
Yellow butterwort	*Pinguicula lutea*	--	ST	Pineland, prairie
Ghost orchid, Palmpolly	*Polyradicion lindenii*	--	SE	Hammock, mixed hardwood swamp
Greater yellowspike orchid	*Polystachya concreta*	--	SE	Mixed hardwood swamp
Bahama brake	*Pteris bahamensis*	--	ST	Pineland, hammock
Swartz's snoutbean	*Rhynchosia swartzii*	--	SE	Hammock
Royal palm, Florida royal palm	*Roystonea regia*	--	SE	Hammock, mixed hardwood swamp
Leafless beaked lady's-tresses	*Sacoila lanceolata*	--	ST	Pineland, disturbed
Ray fern	*Schizaea pennula*	--	SE	Hammock
Florida Keys nutrush	*Scleria lithosperma*	--	SE	Pinelands, hammock
Mullein nightshade	*Solanum verbascifolium*	--	ST	Hammock, pineland
Everglades Keys false buttonweed	*Spermacoce terminalis*	--	ST	Pineland
Texas lady's tresses	*Spiranthes brevilabris*	--	SE	Pineland
Lacelip lady's tresses	*Spiranthes laciniata*	--	ST	Marsh, mixed hardwood swamp, disturbed
Giantspiral lady's tresses	*Spiranthes longilabris*	--	ST	Prairies, pinelands, marshes
Southern lady's-tresses	*Spiranthes torta*	--	SE	Pineland, prairie
West Indian mahogany	*Swietenia mahagoni*	--	ST	Hammock
Broad halbard fern	*Tectaria heracleifolia*	--	ST	Hammock
Latticevein fern	*Thelypteris reticulate*	--	SE	Hammock, cypress
Northern needleleaf	*Tillandsia balbisiana*	--	ST	Hammock, cypress, pineland

TABLE 2. PROTECTED PLANT SPECIES IN THE PRESERVE

Common Name	Scientific Name	Designated Status		Habitat in the Preserve
		Federal	State	
Giant airplant	*Tillandsia fasciculata* var. *densispica*	--	SE	Hammock, cypress, pineland
Twisted airplant	*Tillandsia flexuosa*	--	ST	Hammock, cypress, mangrove
Fuzzywuzzy airplant	*Tillandsia pruinosa*	--	SE	Mixed hardwood swamp
Spreading airplant	*Tillandsia utriculata*	--	SE	Hammock, cypress, pineland
Soft-leaved wild-pine, leatherleaf airplant	*Tillandsia variabilis*	--	ST	Hammock, mixed hardwood swamp
Chiggery grapes	*Tournefortia hirsutissima*	--	SE	Hammock
Entire-winged bristle fern	*Trichomanes holopterum*	--	SE	Mixed hardwood swamp
Hoopvine	*Trichostigma octandrum*	--	SE	Hammock
Florida gamagrass	*Tripsacum floridanum*	--	ST	Pineland
Leafy vanilla	*Vanilla phaeantha*	--	SE	Mixed hardwood swamp
Rain-lily, redmargin zephyrlily	*Zephyranthes simpsonii*	--	ST	Pineland

Source: Personal Communication, Pernas 2016

-- = Not listed

SE = state endangered FT = federal threatened

FE = federal endangered ST = state threatened

CE = commercially exploited

APPENDIX D: SCOPING LETTERS

United States Department of the Interior

NATIONAL PARK SERVICE
Big Cypress National Preserve
33100 Tamiami Trail East
Ochopee, Florida 34141-9710

IN REPLY REFER TO:
1.A.2 (RM)

16 June 2021

Mr. Billy Cypress
Chairman
Miccosukee Tribe of Indians of Florida
Tamiami Station
P.O. Box 440021
Miami, FL 33144

Attention: Kevin Donaldson, Real Estate Director

Re: Scoping for the Hydrologic Restoration Plan Newsletter, Big Cypress National Preserve

Big Cypress National Preserve has begun planning to better address hydrologic restoration in the Preserve. The attached newsletter provides information about the purpose and need for planning, as well as the proposed action and preliminary alternatives that describe proposed actions to further restore the Preserve's hydrology. During this preliminary scoping phase of the project, we wish to engage the Miccosukee Tribe of Indians of Florida regarding the newsletter as we gather input on any issues, concerns, and suggestions on the preliminary alternatives provided.

While we have identified a proposed action, a preferred alternative has not yet been identified, nor have the impacts of the preliminary alternatives been analyzed at this stage of the planning process. Once fully developed, one of these alternatives could be identified as the preferred alternative, or a new alternative could emerge that combines elements from some or all of the preliminary alternatives.

The public will have two opportunities to comment formally on the project: first during public scoping (June 14 – July 13); and second following release of the Environmental Assessment later this fall. The Preserve will also be hosting two virtual public scoping meetings, on June 22 from 6:30-8pm ET and June 24 from 1-2:30 ET. Links to these meetings are provided in the newsletter, and you are invited to participate. If you would prefer a separate meeting, or need additional time to provide comments, please contact Tony Pernas, Chief of Resource Management 239-695-1111, *tony_pernas@nps.gov* and Jobe Chakuchin, Environmental Protection Specialist/ American Indian Affairs Liaison 239-695-1192 jobe_chakuchin@nps.gov.

Thank you for your interest and participation in the development of the Big Cypress National Preserve Hydrologic Restoration Management Plan EA. We hope to hear more from you soon!

Sincerely,

Tom Forsyth, Superintendent
Big Cypress National Preserve

Enclosure: BICY Hydrologic Restoration Plan Newsletter

United States Department of the Interior

NATIONAL PARK SERVICE
Big Cypress National Preserve
33100 Tamiami Trail East
Ochopee, Florida 34141-9710

IN REPLY REFER TO:
1.A.2

7 July 2021

Kevin Donaldson
Tribal Consultation
Real Estate Director
Miccosukee Tribe of Indians of Florida

RE: Big Cypress National Preserve Hydrologic Restoration Management Plan

Dear Mr. Donaldson,

The National Park Service (NPS) would like to follow up on our previous letter regarding the development of a Hydrologic Restoration Management Plan (the Plan) for Big Cypress National Preserve and initiate consultation under 36 CFR 800 of the National Historic Preservation Act (NHPA) with the Miccosukee Tribe of Indians of Florida. The purpose of the Plan will be to provide a framework for re-engineering the drainage infrastructure to help revitalize the hydrologic processes of the Big Cypress National Preserve by enhancing the interrelationship between surface and groundwater to improve the quantity, timing, and distribution of water throughout the Preserve's watershed including discharge into downstream environments, while preserving and enhancing visitor experience.

Plan Description

The current plan being developed will identify the methods, geographic areas and strategy for implementing hydrologic restoration in the Preserve. Projects proposed under the Plan would include passive water management actions to restore sheet-flow such as:

- Plugging and filling in canals and ditches
- Culverting roadbeds
- Breaching impounding structures such as roads, levees, trams, and berms
- Fill removal – removal of elevated fill pads to match adjacent grades.
- Vegetation management – manipulating vegetation to restore managed flows
- Maintenance activities to maintain plugs, culverts, and breaches

None of the proposed projects would actively manage water by pumping or other means.

The Preserve would evaluate potential hydrologic restoration projects using a tiered ranking system, in which Tier 1 projects are the simplest and most feasible, Tier 2 projects are more complex, but still within the Preserve's jurisdiction, and Tier 3 projects are the most complex, falling outside the Preserve's jurisdiction and boundary. Tier 1 and Tier 2 projects would be the focus of the Plan, whereas Tier 3 projects were determined to fall outside the scope of the Plan.

Tier 1 projects would be focused primarily on land-development centric disruptions associated with logging, farming, and residential and commercial developments. These projects would be contained entirely within and managed by the Preserve, without assistance from outside state or Federal agencies.

Tier 2 projects would be focused primarily on transportation-centric disruptions, such as the more than one-hundred miles of paved and gravel (limestone) roads located within and adjacent to the Preserve. These roads were elevated above natural grade using a cut and fill construction technique, which formed elevated driving surfaces and adjacent canals. The elevated roadbeds form barriers and the canals diversionary channels to the swamp's shallow surface and groundwater regime. The projects would include water ways that may involve an additional jurisdiction, such as a county or state road easement, but are not tied to regional and multi-use water management infrastructure and schemes that extend outside the Preserve. The primary tool (i.e. design concept) for the transportation-centric hydrologic disruptions is the culvert/plug pair. In the same way the roadbed and adjacent canal function together to alter flows, strategic installation of culverts and plugs near one another can improve the performance of both the culvert and plug, and together deliver the best hydrologic outcome at the lowest cost.

Tier 3 would include projects that fall outside of the jurisdiction of the Preserve and have a multi-water use function beyond the Preserve's mission. While these projects may provide the biggest benefit and rank highest in terms of priority for the Preserve, because they lie outside the Preserve's jurisdiction and involve many stakeholders and serve multi-use water management goals, these projects would be considered separately and independently of the Plan. These projects include upstream flood control, water quality treatment and active water management (i.e. pumps, regulations schedules, gates) components that fall outside the scope of this Plan.

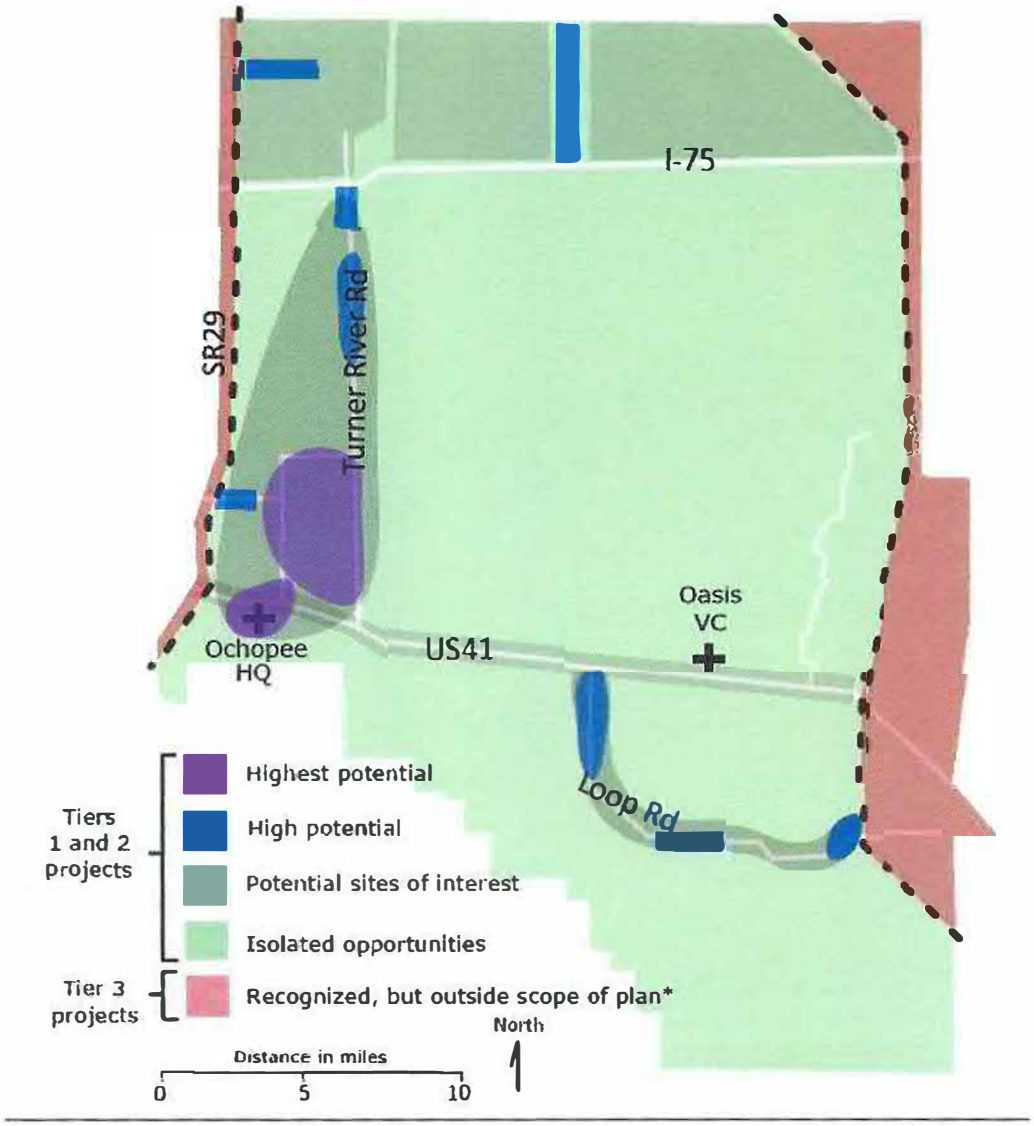
All proposed projects under the Plan would receive additional site-specific review as needed in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, the Endangered Species Act, Section 404 of the Clean Water Act and Florida's Water Resources Act, and any other required consultations, prior to land disturbance.

Restoration efforts would not apply to some hydrologic disruptions that are currently active in the Preserve and addressed under separate permitting authorities, such as oil and gas operations and private property rights. Restoration efforts would be located, where possible, to avoid adverse effects to private property, roadways, historic and archaeological resources, sensitive resource areas, and other improved areas.

The Preserve is also considering an alternative to the proposed Plan that would include the Tier 1 and Tier 2 projects described above, but also include strategic replacement of roads with bridges at major flow-ways that are intersected by limerock roads. In particular, bridging would be an additional tool for addressing transportation-centric hydrologic disruptions. Bridging is essentially an enlarged version of the plug/culvert pair, but it is structurally different than plugs and culverts due to the larger and longer spans. They also have different load bearing requirements. Bridging is a larger structural construction operation; whereas a culvert/plug pair can be completed in in a few weeks, bridges require a greater degree of engineering and construction time. A bridge's function in this instance is to convey sheet-flow, not span a water body, so the bridge would be low to the ground but longer than a plug/culvert pair (100 to 1000s of feet long), and generally wide enough to accommodate vehicle traffic. Bridging is generally more expansive than the plug/culvert pair, although it may be more effective at hydrologic restoration and may provide enhanced wildlife and scenic vista benefits.

Please see the map below for an approximation of locations associated with potential Tier 1 and 2 projects, and Tier 3 projects (that would be outside the scope of the Plan).

Hydrologic Restoration Prioritization Map for Big Cypress National Preserve



Area of Potential Effects (APE)

The Plan would encompass the Big Cypress National Preserve located in southern Florida, roughly centered between the cities of Miami and Naples, and bordering Everglades National Park (EVER) on its southern boundary. The preserve extends from the northern boundary of EVER to 11 kilometers (km) north of I-75 (Alligator Alley). US Highway 41 (Tamiami Trail) crosses through the southern half of the preserve. The preserve is mostly located within Collier and Monroe counties, as well as in a small area of western Miami-Dade County.

Legal location for the undertaking:
T 49S, R 30-34E
T 50S, R 30-33E
T 51S, R 30-34E
T 52S, R 30-35E
T 53S, R 29-33E

BICY is proposing that the APE for the Plan include the entire Preserve. The APE for the individual undertakings (projects) proposed under the Plan will be consulted on as those are developed, this will be stipulated in the Programmatic Agreement that is being proposed.

The projects under this Plan have the potential to affect historic properties. However, presently there is not enough information to arrive at a Determination of Effect for historic properties located within the Plan's APE. Under 36 CFR 800 Subpart B 800.5(b)(1)(ii) (ii), when effects on historic properties cannot be fully determined prior to approval of an undertaking, the agency may enter a programmatic agreement to address how section 106 of the National Historic Preservation Act will be completed for the undertaking. Therefore, the NPS is proposing the development of a programmatic agreement in consultation with the Advisory Council on Historic Preservation, the Florida State Historic Preservation Office, the Seminole Tribe of Florida, the Miccosukee Tribe of Indians of Florida, the Seminole Nation of Oklahoma, and other consulting parties.

At this time, we are asking 1) would your office like to consult on the development of the Hydrologic Restoration Management Plan and 2) would your office be interested in being a consulting party and/ or signatory on a Programmatic Agreement for Cultural Resources Survey of the projects that will be proposed under this Plan.

The Preserve appreciates your time and consideration in this matter. Additional documents related to the Plan and its development, such as the Public Scoping Letter and Presentation, can be viewed on our PEPC website at https://parkplanning.nps.gov/ under the project title "Prepare Hydrologic Restoration Management".

If you have any questions or requests for additional information regarding this project, please contact Victoria Menchaca, Big Cypress National Preserve Archeologist, at (239) 695-1137 or at victoria_menchaca@nps.gov ; or Jaci Wells, Southern Florida National Parks and Preserve Chief of Cultural Resources, at 305-242-7755 or jaci_wells@nps.gov ; or Robert Sobczak, Hydrologist, at (239) 695-1151 or robert_sobczak@nps.gov.

Sincerely,

Tom Forsyth, Superintendent

Big Cypress National Preserve

United States Department of the Interior

NATIONAL PARK SERVICE
Big Cypress National Preserve
33100 Tamiami Trail East
Ochopee, Florida 34141-9710

IN REPLY REFER TO:
1.A.2 (RM)

16 June 2021

Paul N. Backhouse, Ph.D.
Senior Director, Heritage and Environment Resources Office
Tribal Historic Preservation Office
Seminole Tribe of Florida
30290 Josie Billie Highway, PMB 1004
Clewiston, FL 33440

Attention: THPO Compliance Review Section

Re: Scoping for the Hydrologic Restoration Plan Newsletter, Big Cypress National Preserve

Big Cypress National Preserve has begun planning to better address hydrologic restoration in the Preserve. The attached newsletter provides information about the purpose and need for planning, as well as the proposed action and preliminary alternatives that describe proposed actions to further restore the Preserve's hydrology. During this preliminary scoping phase of the project, we wish to engage the Seminole Tribe of Indians of Florida regarding the newsletter as we gather input on any issues, concerns, and suggestions on the preliminary alternatives provided.

While we have identified a proposed action, a preferred alternative has not yet been identified, nor have the impacts of the preliminary alternatives been analyzed at this stage of the planning process. Once fully developed, one of these alternatives could be identified as the preferred alternative, or a new alternative could emerge that combines elements from some or all of the preliminary alternatives.

The public will have two opportunities to comment formally on the project: first during public scoping (June 14 – July 13); and second following release of the Environmental Assessment later this fall. The Preserve will also be hosting two virtual public scoping meetings, on June 22 from 6:30-8pm ET and June 24 from 1-2:30 ET. Links to these meetings are provided in the newsletter, and you are invited to participate. If you would prefer a separate meeting, or need additional time to provide comments, please contact Tony Pernas, Chief of Resource Management 239-695-1111, *tony_pernas@nps.gov* and Jobe Chakuchin, Environmental Protection Specialist/ American Indian Affairs Liaison 239-695-1192 jobe_chakuchin@nps.gov.

Thank you for your interest and participation in the development of the Big Cypress National Preserve Hydrologic Restoration Management Plan EA. We hope to hear more from you soon!

Sincerely,

Tom Forsyth, Superintendent
Big Cypress National Preserve

Enclosure: BICY Hydrologic Restoration Plan Newsletter

United States Department of the Interior

NATIONAL PARK SERVICE
Big Cypress National Preserve
33100 Tamiami Trail East
Ochopee, Florida 34141-9710

IN REPLY REFER TO:
1.A.2

7 July 2021

Paul N. Backhouse, Ph.D
Senior Director, Heritage and Environment Resources Office
Tribal Historic Preservation Office
Seminole Tribe of Florida

Attention: THPO Compliance Review Section

Dear Dr. Backhouse,

The National Park Service (NPS) would like to follow up on our previous letter regarding the development of a Hydrologic Restoration Management Plan (the Plan) for Big Cypress National Preserve and initiate consultation under 36 CFR 800 of the National Historic Preservation Act (NHPA) with the Seminole Tribe of Florida. The purpose of the Plan will be to provide a framework for re-engineering the drainage infrastructure to help revitalize the hydrologic processes of the Big Cypress National Preserve by enhancing the interrelationship between surface and groundwater to improve the quantity, timing, and distribution of water throughout the Preserve's watershed including discharge into downstream environments, while preserving and enhancing visitor experience.

Plan Description

The current plan being developed will identify the methods, geographic areas and strategy for implementing hydrologic restoration in the Preserve. Projects proposed under the Plan would include passive water management actions to restore sheet-flow such as:

- Plugging and filling in canals and ditches
- Culverting roadbeds
- Breaching impounding structures such as roads, levees, trams, and berms
- Fill removal – removal of elevated fill pads to match adjacent grades.
- Vegetation management – manipulating vegetation to restore managed flows
- Maintenance activities to maintain plugs, culverts, and breaches

None of the proposed projects would actively manage water by pumping or other means.

The Preserve would evaluate potential hydrologic restoration projects using a tiered ranking system, in which Tier 1 projects are the simplest and most feasible, Tier 2 projects are more complex, but still within the Preserve's jurisdiction, and Tier 3 projects are the most complex, falling outside the Preserve's jurisdiction and boundary. Tier 1 and Tier 2 projects would be the focus of the Plan, whereas Tier 3 projects were determined to fall outside the scope of the Plan.

Tier 1 projects would be focused primarily on land-development centric disruptions associated with logging, farming, and residential and commercial developments. These projects would be contained entirely within and managed by the Preserve, without assistance from outside state or Federal agencies.

Tier 2 projects would be focused primarily on transportation-centric disruptions, such as the more than one-hundred miles of paved and gravel (limestone) roads located within and adjacent to the Preserve. These roads were elevated above natural grade using a cut and fill construction technique, which formed elevated driving surfaces and adjacent canals. The elevated roadbeds form barriers and the canals diversionary channels to the swamp's shallow surface and groundwater regime. The projects would include water ways that may involve an additional jurisdiction, such as a county or state road easement, but are not tied to regional and multi-use water management infrastructure and schemes that extend outside the Preserve. The primary tool (i.e. design concept) for the transportation-centric hydrologic disruptions is the culvert/plug pair. In the same way the roadbed and adjacent canal function together to alter flows, strategic installation of culverts and plugs near one another can improve the performance of both the culvert and plug, and together deliver the best hydrologic outcome at the lowest cost.

Tier 3 would include projects that fall outside of the jurisdiction of the Preserve and have a multi-water use function beyond the Preserve's mission. While these projects may provide the biggest benefit and rank highest in terms of priority for the Preserve, because they lie outside the Preserve's jurisdiction and involve many stakeholders and serve multi-use water management goals, these projects would be considered separately and independently of the Plan. These projects include upstream flood control, water quality treatment and active water management (i.e. pumps, regulations schedules, gates) components that fall outside the scope of this Plan.

All proposed projects under the Plan would receive additional site-specific review as needed in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, the Endangered Species Act, Section 404 of the Clean Water Act and Florida's Water Resources Act, and any other required consultations, prior to land disturbance.

Restoration efforts would not apply to some hydrologic disruptions that are currently active in the Preserve and addressed under separate permitting authorities, such as oil and gas operations and private property rights. Restoration efforts would be located, where possible, to avoid adverse effects to private property, roadways, historic and archaeological resources, sensitive resource areas, and other improved areas.

The Preserve is also considering an alternative to the proposed Plan that would include the Tier 1 and Tier 2 projects described above, but also include strategic replacement of roads with bridges at major flow-ways that are intersected by limerock roads. In particular, bridging would be an additional tool for addressing transportation-centric hydrologic disruptions. Bridging is essentially an enlarged version of the plug/culvert pair, but it is structurally different than plugs and culverts due to the larger and longer spans. They also have different load bearing requirements. Bridging is a larger structural construction operation; whereas a culvert/plug pair can be completed in in a few weeks, bridges require a greater degree of engineering and construction time. A bridge's function in this instance is to convey sheet-flow, not span a water body, so the bridge would be low to the ground but longer than a plug/culvert pair (100 to 1000s of feet long), and generally wide enough to accommodate vehicle traffic. Bridging is generally more expansive than the plug/culvert pair, although it may be more effective at hydrologic restoration and may provide enhanced wildlife and scenic vista benefits.

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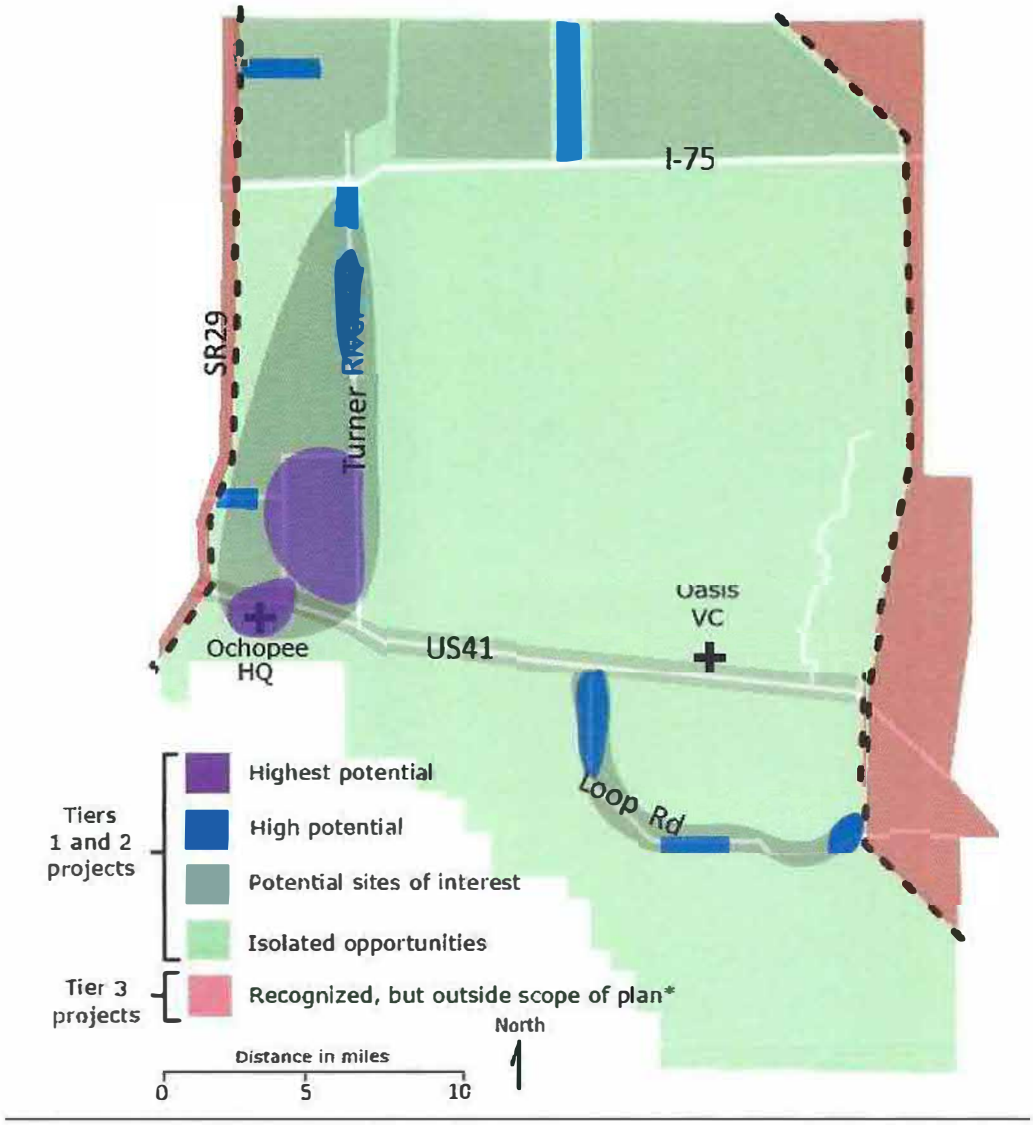
Hydrologic Restoration Prioritization Map for Big Cypress National Preserve



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Legal location for the undertaking:
T 49S, R 30-34E
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BICY is proposing that the APE for the Plan include the entire Preserve. The APE for the individual undertakings (projects) proposed under the Plan will be consulted on as those are developed, this will be stipulated in the Programmatic Agreement that is being proposed.

The projects under this Plan have the potential to affect historic properties. However, presently there is not enough information to arrive at a Determination of Effect for historic properties located within the Plan's APE. Under 36 CFR 800 Subpart B 800.5(b)(1)(ii) (ii), when effects on historic properties cannot be fully determined prior to approval of an undertaking, the agency may enter a programmatic agreement to address how section 106 of the National Historic Preservation Act will be completed for the undertaking. Therefore, the NPS is proposing the development of a programmatic agreement in consultation with the Advisory Council on Historic Preservation, the Florida State Historic Preservation Office, the Seminole Tribe of Florida, the Miccosukee Tribe of Indians of Florida, the Seminole Nation of Oklahoma, and other consulting parties.

At this time, we are asking 1) would your office like to consult on the development of the Hydrologic Restoration Management Plan and 2) would your office be interested in being a consulting party and/ or signatory on a Programmatic Agreement for Cultural Resources Survey of the projects that will be proposed under this Plan.

The Preserve appreciates your time and consideration in this matter. Additional documents related to the Plan and its development, such as the Public Scoping Letter and Presentation, can be viewed on our PEPC website at https://parkplanning.nps.gov/ under the project title "Prepare Hydrologic Restoration Management".

If you have any questions or requests for additional information regarding this project, please contact Victoria Menchaca, Big Cypress National Preserve Archeologist, at (239) 695-1137 or at victoria_menchaca@nps.gov ; or Jaci Wells, Southern Florida National Parks and Preserve Chief of Cultural Resources, at 305-242-7755 or jaci_wells@nps.gov ; or Robert Sobczak, Hydrologist, at (239) 695-1151 or robert_sobczak@nps.gov.

Sincerely,

Tom Forsyth, Superintendent

From: Danielle Simon
To: Menchaca, Victoria L
Subject: RE: [EXTERNAL] RE: Section 106 Initiation for the Big Cypress National Preserve Hydrologic Restoration Management Plan
Date: Friday, October 1, 2021 11:38:22 AM

Hi Victoria,

I do not have a response for you at this time as this project is still under internal review by THPO and ERMD. While the STOF THPO will definitely want to consult on this plan, I am still awaiting an answer on how involved we want to be (if at all) with the development/signing of a PA. I will keep you updated!

Thank you for your patience, apologies for any delays, and I hope you have an excellent weekend!

Danielle

Danielle A. Simon, MA, RPA
Compliance Review Specialist
Tribal Historic Preservation Office, Compliance Review Section
30290 Josie Billie Highway, PMB 1004
Clewiston, Florida 33440
Email: daniellesimon@semtribe.com

From: Menchaca, Victoria L <victoria_menchaca@nps.gov>
Sent: Friday, October 1, 2021 11:24 AM
To: Danielle Simon <daniellesimon@semtribe.com>
Subject: RE: [EXTERNAL] RE: Section 106 Initiation for the Big Cypress National Preserve Hydrologic Restoration Management Plan

Hi Danielle,

I just wanted to check on this? I thought you guys had replied to this but I can't find any email with a reply.

Thanks,

Victoria Menchaca
Archeologist
Section 106 Coordinator
Big Cypress National Preserve
33100 Tamiami Trail E
Ochopee, FL 34141
Email: victoria_menchaca@nps.gov

Office: 239-695-1137
Cell: 239-272-0727

From: Danielle Simon <daniellesimon@semtribe.com>
Sent: Friday, August 27, 2021 9:30 AM
To: Menchaca, Victoria L <victoria_menchaca@nps.gov>
Subject: [EXTERNAL] RE: Section 106 Initiation for the Big Cypress National Preserve Hydrologic Restoration Management Plan

Thank you so much for sending this along, Victoria! I have forwarded to management for review and advisement. I hope to have a response for you ASAP. Thank you for your patience and I hope you have an excellent Friday/weekend!!

Kind regards,
Danielle

Danielle A. Simon, MA, RPA
Compliance Review Specialist
Tribal Historic Preservation Office, Compliance Review Section
30290 Josie Billie Highway, PMB 1004
Clewiston, Florida 33440
Email: daniellesimon@semtribe.com

From: Menchaca, Victoria L <victoria_menchaca@nps.gov>
Sent: Friday, August 27, 2021 9:04 AM
To: Danielle Simon <daniellesimon@semtribe.com>; THPO Compliance <THPOCompliance@semtribe.com>
Subject: FW: Section 106 Initiation for the Big Cypress National Preserve Hydrologic Restoration Management Plan
Importance: High

Hi Danielle,

I wanted to follow up on this request to initiate Section 106 consultation for this project as the response deadline has passed. At this point we just want to know 1) Will the STOF THPO want to consult on this plan and 2) Will STOF THPO also want to consult on the Section 106 Programmatic Agreement that will be developed for the projects under this plan?

Thanks,

Victoria Menchaca
Archeologist
Section 106 Coordinator
Big Cypress National Preserve
33100 Tamiami Trail E
Ochopee, FL 34141
Email: victoria_menchaca@nps.gov
Office: 239-695-1137
Cell: 239-272-0727

From: Menchaca, Victoria L
Sent: Thursday, July 8, 2021 4:50 PM
To: THPO Compliance <THPOCompliance@semtribe.com>
Cc: Danielle Simon <daniellesimon@semtribe.com>; Forsyth, Thomas P <thomas_forsyth@nps.gov>; Pernas, Tony <Tony_Pernas@nps.gov>; Wells, Jaci D <jaci_wells@nps.gov>; Chakuchin, Hubert (Jobe) <Jobe_Chakuchin@nps.gov>
Subject: Section 106 Initiation for the Big Cypress National Preserve Hydrologic Restoration Management Plan

Good Afternoon,

The National Park Service would like to initiate consultation under 36 CFR 800 of the National Historic Preservation Act on the development of a Hydrologic Restoration Management Plan for Big Cypress National Preserve. Please see the attached consultation letter.

If you have any questions please do not hesitate to reach out.

Sincerely,

Victoria Menchaca
Archeologist
Section 106 Coordinator
Big Cypress National Preserve
33100 Tamiami Trail E
Ochopee, FL 34141
Email: victoria_menchaca@nps.gov

Office: 239-695-1137

United States Department of the Interior

NATIONAL PARK SERVICE
Big Cypress National Preserve
33100 Tamiami Trail East
Ochopee, Florida 34141-9710

IN REPLY REFER TO:
1.A.2

7 July 2021

David Frank
Tribal Historic Preservation Officer
Seminole Nation of Oklahoma

RE: Big Cypress National Preserve Hydrologic Restoration Management Plan

Dear Mr. Frank,

The National Park Service (NPS) would like to follow up on our previous letter regarding the development of a Hydrologic Restoration Management Plan (the Plan) for Big Cypress National Preserve and initiate consultation under 36 CFR 800 of the National Historic Preservation Act (NHPA) with the Seminole Nation of Oklahoma. The purpose of the Plan will be to provide a framework for re-engineering the drainage infrastructure to help revitalize the hydrologic processes of the Big Cypress National Preserve by enhancing the interrelationship between surface and groundwater to improve the quantity, timing, and distribution of water throughout the Preserve's watershed including discharge into downstream environments, while preserving and enhancing visitor experience.

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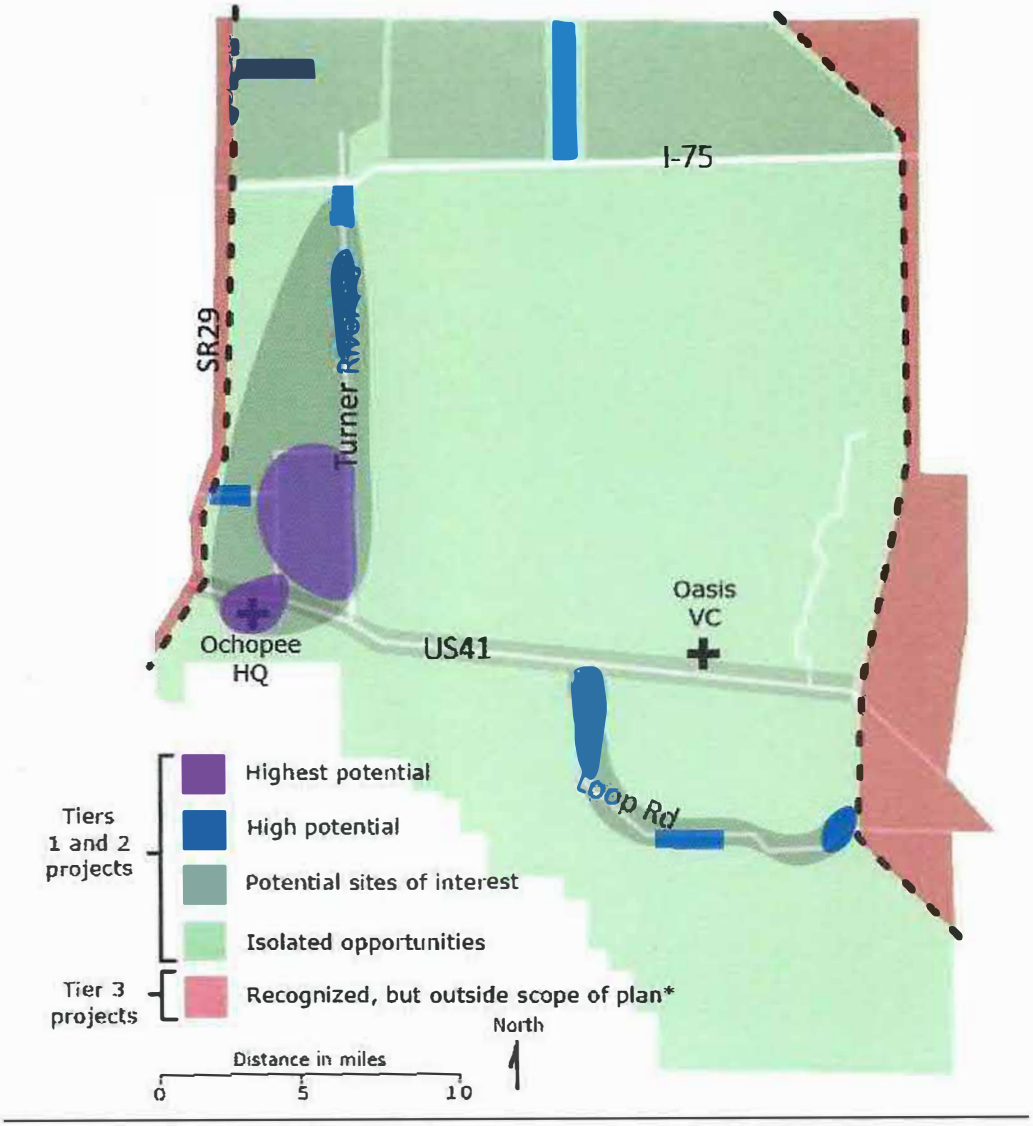

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Legal location for the undertaking:
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Sincerely,

Tom Forsyth, Superintendent
Big Cypress National Preserve

From:	David Franks
To:	Menchaca, Victoria L
Subject:	[EXTERNAL] RE: Section 106 Initiation for the Big Cypress National Preserve Hydrologic Restoration Management Plan
Date:	Friday, July 9, 2021 11:54:06 AM

We have no concerns and defer to the tribes more familiar with the area.

From: Menchaca, Victoria L [mailto:victoria_menchaca@nps.gov]
Sent: Thursday, July 8, 2021 3:45 PM
To: David Franks <Franks.D@sno-nsn.gov>; Edwin Marshall <marshall.e@sno-nsn.gov>
Cc: Pernas, Tony <Tony_Pernas@nps.gov>; Wells, Jaci D <jaci_wells@nps.gov>; Forsyth, Thomas P <thomas_forsyth@nps.gov>; Chakuchin, Hubert (Jobe) <Jobe_Chakuchin@nps.gov>
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United States Department of the Interior

NATIONAL PARK SERVICE
Big Cypress National Preserve
33100 Tamiami Trail East
Ochopee, Florida 34141-9710

IN REPLY REFER TO:
1.A.2

7 July 2021

Timothy A. Parsons, Ph.D.,RPA
Director, Florida Division of Historical Resources
& State Historic Preservation Officer

Attention: Jason Aldridge, Compliance Review Supervisor and Deputy State Historic Preservation Officer

RE: Big Cypress National Preserve Hydrologic Restoration Management Plan

Dear Dr. Parsons,

The National Park Service (NPS) would like to follow up on our previous letter regarding the development of a Hydrologic Restoration Management Plan (the Plan) for Big Cypress National Preserve and initiate consultation under 36 CFR 800 of the National Historic Preservation Act (NHPA) with the Florida State Historic Preservation Office. The purpose of the Plan will be to provide a framework for re-engineering the drainage infrastructure to help revitalize the hydrologic processes of the Big Cypress National Preserve by enhancing the interrelationship between surface and groundwater to improve the quantity, timing, and distribution of water throughout the Preserve's watershed including discharge into downstream environments, while preserving and enhancing visitor experience.

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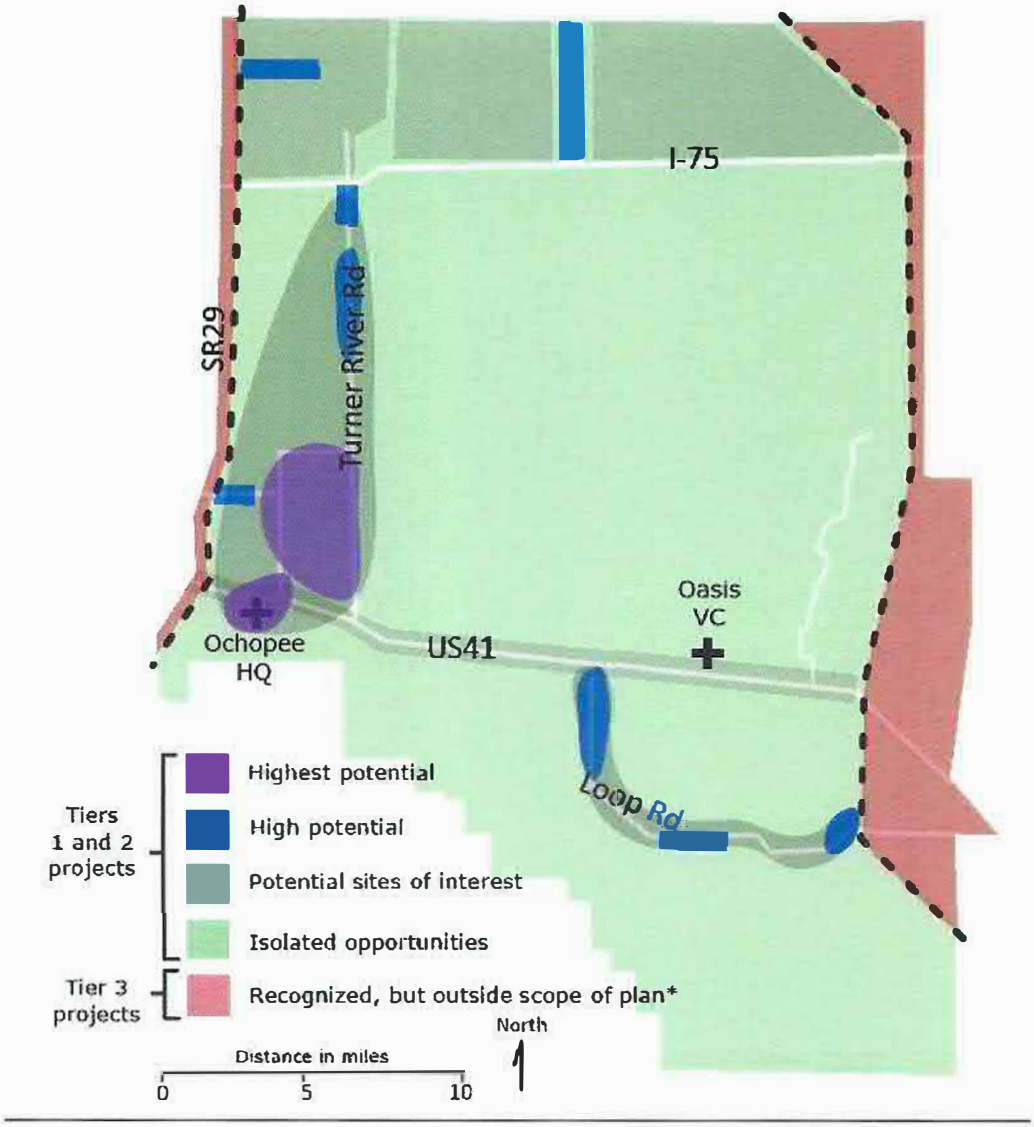

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T 52S, R 30-35E
T 53S, R 29-33E

BICY is proposing that the APE for the Plan include the entire Preserve. The APE for the individual undertakings (projects) proposed under the Plan will be consulted on as those are developed, this will be stipulated in the Programmatic Agreement that is being proposed.

The projects under this Plan have the potential to affect historic properties. However, presently there is not enough information to arrive at a Determination of Effect for historic properties located within the Plan's APE. Under 36 CFR 800 Subpart B 800.5(b)(1)(ii) (ii), when effects on historic properties cannot be fully determined prior to approval of an undertaking, the agency may enter a programmatic agreement to address how section 106 of the National Historic Preservation Act will be completed for the undertaking. Therefore, the NPS is proposing the development of a programmatic agreement in consultation with the Advisory Council on Historic Preservation, the Florida State Historic Preservation Office, the Seminole Tribe of Florida, the Miccosukee Tribe of Indians of Florida, the Seminole Nation of Oklahoma, and other consulting parties.

At this time, we are asking 1) would your office like to consult on the development of the Hydrologic Restoration Management Plan and 2) would your office be interested in being a consulting party and/ or signatory on a Programmatic Agreement for Cultural Resources Survey of the projects that will be proposed under this Plan.

The Preserve appreciates your time and consideration in this matter. Additional documents related to the Plan and its development, such as the Public Scoping Letter and Presentation, can be viewed on our PEPC website at https://parkplanning.nps.gov/ under the project title "Prepare Hydrologic Restoration Management".

If you have any questions or requests for additional information regarding this project, please contact Victoria Menchaca, Big Cypress National Preserve Archeologist, at (239) 695-1137 or at victoria_menchaca@nps.gov ; or Jaci Wells, Southern Florida National Parks and Preserve Chief of Cultural Resources, at 305-242-7755 or jaci_wells@nps.gov ; or Robert Sobczak, Hydrologist, at (239) 695-1151 or robert_sobczak@nps.gov.

Sincerely,

Tom Forsyth, Superintendent
Big Cypress National Preserve

FLORIDA DEPARTMENT of STATE

RON DESANTIS
Governor

LAUREL M. LEE
Secretary of State

Tom Forsyth
Superintendent
Big Cypress National Preserve
33100 Tamiami Trail East
Ochopee, Florida 34141-9710

August 16, 2021

RE: DHR Project File No.: 2021-4960, Received by DHR: July 9, 2021
Big Cypress National Preserve Hydrologic Restoration Management Plan

Dear Mr. Forsyth:

The Florida State Historic Preservation Officer reviewed the referenced project for possible effects on historic properties listed, or eligible for listing, on the *National Register of Historic Places (NRHP).* The review was conducted in accordance with Section 106 of the *National Historic Preservation Act of 1966*, as amended, and its implementing regulations in *36 CFR Part 800: Protection of Historic Properties.*

Thank you for initiating consultation with our office regarding the development of the Hydrologic Restoration Management Plan (the Plan) for Big Cypress National Preserve. As noted in your letter, the Plan will provide a framework for re-engineering the drainage infrastructure to help revitalize the hydrologic processes of the Preserve. The Preserve states that the types of projects carried out under the Plan will have the potential to effect historic properties. However, the Preserve notes that the Plan is still under development and that there is insufficient information to reach a Determination of Effect for the Plan. To address the nature of the Plan and the numerous specific projects that the Plan will include, the Preserve intends to develop a Programmatic Agreement to carryout project specific consultation, address the necessary historic preservation identification efforts, and evaluate effects to historic properties.

Our office requests to continue consultation with the Preserve as the Plan is developed. We also look forward to coordinating with the Preserve to develop a Programmatic Agreement (PA) for the Plan. If you have any questions, please contact me by email at *Jason.Aldridge@dos.myflorida.com*, or by telephone at 850-245-6344.

Sincerely,

Jason Aldridge
For

Timothy A Parsons, Ph.D.
Director, Division of Historical Resources
& State Historic Preservation Officer

APPENDIX E: SECTION 106 PROGRAMMATIC AGREEMENT

DRAFT 11-04-2021

PROGRAMMATIC AGREEMENT AMONG

THE NATIONAL PARK SERVICE BIG CYPRESS NATIONAL PRESERVE,

THE FLORIDA STATE HISTORIC PRESERVATION OFFICER,

AND THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

REGARDING

HYDROLOGIC RESTORATION PLAN, COLLIER AND MIAMI-DADE COUNTIES, FLORIDA

WHEREAS, Big Cypress National Preserve (BICY) proposes the development of a Hydrologic Restoration Plan (the Plan) with the objective to take passive water management actions to restore sheet-flow such as plugging and filling canals and ditches, culverting roadbeds, breaching impounding structures such as roads, levees, trams, and berms, fill removal – removal of elevated fill pads to match adjacent grades, vegetation management, and maintenance activities to maintain plugs, culverts, and breaches (the Undertaking); and

WHEREAS, the National Park Service (NPS), of which Big Cypress National Preserve is a part of, has determined the Undertaking is subject to review under Section 106 of the National Historic Preservation Act (NHPA), Title 54 U.S.C. § 306108, and its implementing regulations, 36 Code of Federal Regulations (CFR) Part 800 (referred collectively to as "Section 106"); and

WHEREAS, the NPS, of which Big Cypress National Preserve is a part, has determined this is an Undertaking as defined under 36 CFR 800.16(y) with the potential to affect historic properties; and

WHEREAS, the NPS has determined this is an Undertaking as defined under 36 CFR 800.16(y), and is a collection of individual undertakings (herein after referred to as Projects) that have the potential to affect Historic Properties; and

WHEREAS, the NPS, in consultation with the Florida State Historic Preservation Office (SHPO), have identified the Area of Potential Effect (APE) for the Undertaking as encompassing the entire Big Cypress National Preserve (see attached map)

WHEREAS, the NPS is preparing an Environmental Assessment (EA) to analyze the potential environmental impacts of the Undertaking in accordance with the National Environmental Policy Act (NEPA); and

WHEREAS, the NPS has identified Alternative C as its preferred alternative; and proposed management actions under Alternative C would include the following passive water management actions to restore sheet-flow:

- Plugging and filling in canals and ditches
- Culverting roadbeds
- Breaching impounding structures such as roads, levees, trams, and berms
- Fill removal – removal of elevated fill pads to match adjacent grades.
- Vegetation management – manipulating vegetation to restore managed flows
- Maintenance activities to maintain plugs, culverts, and breaches

Alternative C would also include limited strategic road removal and bridge additions at major flow-ways that are intersected by limerock roads as an additional tool for addressing transportation-centric hydrologic disruptions. Bridging is essentially an enlarged version of the plug/culvert pair, but it is structurally different than plugs and culverts due to the larger and longer spans.

WHEREAS, NPS-administered public lands in the BICY contain numerous historic properties and these properties are archeological, historical, of traditional and/or cultural importance to Native American tribes in the region and by their very nature, are non-renewable resources and of great worth to the American public; and

WHEREAS, the NPS plans for, operates, manages, and administers the National Park System (the System) and is responsible for identifying, preserving, maintaining, and interpreting the historic properties of the System unimpaired for the enjoyment of future generations in accordance with the 1916 National Park Service Organic Act, the NPS Management Policies (2006), and applicable NPS Directors Orders; and

WHEREAS, the NPS has determined that the exact location and design of all individual Projects cannot be fully determined prior to approval of the EA, and under 36 CFR 800 Subpart C 800.14(b)(1)(ii) has developed this Programmatic Agreement (Agreement) pursuant to 36 CFR 800.14(b)(3). This Agreement will be administered as part of planning for and prior to any individual Projects being authorized under the Plan EA; and

WHEREAS, in accordance with 36 CFR 800.6(a)(1), the NPS has notified the Advisory Council on Historic Preservation (ACHP) of the determination that effects on historic properties cannot be fully determined prior to approval of the Undertaking with specified documentation, and on XX the ACHP agreed to participate as a Signatory to this agreement; and [NOTE THAT NPS IS WAITING ON ACHP REPLY]

WHEREAS, pursuant to 36 CFR 800.2(c)(1), the Florida State Historic Preservation Officer (SHPO) has responsibilities under the NHPA to advise and assist the NPS in complying with its Section 106 responsibilities for proposed Undertaking and is a Signatory to this Agreement; and

WHEREAS, pursuant to the special relationship between the federal government and Native American tribes, and Section 101(d)(6)(B) of the NHPA (54 USC 302706(b)), 36 CFR 800.2(c)(2)(ii), the NPS is responsible for government-to-government consultation with federally recognized Native American tribes; and

WHEREAS, the NPS has invited the Seminole Tribe of Florida, the Miccosukee Tribe of Indians of Florida, and the Seminole Nation of Oklahoma to participate and be Concurring Parties, and they have agreed; and

WHEREAS, the NPS commits to afford Tribal Officials the appropriate respect and dignity as leaders of sovereign nations and will make every effort to understand and consider Tribal interests in these lands. The NPS has committed to carrying out its responsibilities to consult and coordinate with Native American tribes with the further understanding that, notwithstanding any decision by these Native American tribes to decline concurrence with this Agreement, the NPS shall continue to consult and coordinate with these Native American tribes throughout the implementation of this Agreement; and

WHEREAS, unless otherwise indicated the terms used in this Agreement are defined in Appendix A - Glossary and are consistent with the definitions found in 36 CFR 800.16; and

WHEREAS, for the purposes of this Agreement, "Consulting Parties" collectively refers to the Signatories, and Concurring Parties regardless of their decision to sign this Agreement; and

WHEREAS, the NPS is the federal agency responsible for ensuring that all stipulations of this Agreement are carried out; and

NOW, THEREFORE, the NPS, SHPO and ACHP agree that the Undertaking shall be implemented in accordance with the following stipulations in order to consider the effects of the Undertaking on historic properties.

STIPULATIONS

The NPS will ensure that the following measures are carried out.

I. AREA OF POTENTIAL EFFECT

For the purposes of this Agreement, the NPS, in consultation with the Consulting Parties, has defined the Undertaking to encompass the entire Big Cypress National Preserve. Projects completed under this Agreement for this Undertaking will require refined individual APE's as they are developed due to the nature of their actions. These actions include:

- Plugging and filling in canals and ditches
- Culverting roadbeds
- Breaching impounding structures such as roads, levees, trams, and berms
- Fill removal – removal of elevated fill pads to match adjacent grades.
- Vegetation management – manipulating vegetation to restore managed flows
- Maintenance activities to maintain plugs, culverts, and breaches
- Limited strategic road removal and bridge additions at major flow-ways that are intersected by limerock roads as an additional tool for addressing transportation-centric hydrologic disruptions. Bridging is essentially an enlarged version of the plug/culvert pair, but it is structurally different than plugs and culverts due to the larger and longer spans.

The NPS, in consultation with the Consulting Parties, will define and document the Area of Potential Effects (APE) in accordance with 36 CFR 800.16(d)) for the Projects.

A. The following shall be used as guidance when defining the APE for the individual undertakings under this Agreement

1. Direct Effects: As per the ACHP's memo "Recent court decision regarding the meaning of "direct" in Sections 106 and 110(f) of the National Historic Preservation Act", the meaning of the term "directly" in Section 110(f) refers to the causality, and not the physicality, of the effect. This means that if the effect comes from the undertaking at the same time and place with no intervening cause, it is considered "direct" regardless of its specific type (e.g., whether it is visual, physical, auditory, etc.). A "direct effect" is an effect that will have a direct impact on any of the aspects of integrity that may a property eligible for the National Register of Historic Places

2. Indirect Effects: As per the ACHP's memo "Recent court decision regarding the meaning of "direct" in Sections 106 and 110(f) of the National Historic Preservation Act", "indirect" effects are those caused by the undertaking that are later in time or farther removed in distance but are still reasonably foreseeable.,

3. Cumulative effects: Cumulative effects are the impact on the historic properties that result from the total impact of the Undertaking. For the purposes of this Agreement, the APE for cumulative effects will be the Preserve.

B. If the APE includes or is located immediately adjacent to a Traditional Cultural Properties (TCP) or properties of religious or cultural significance; or other classes of historic properties for which setting, feeling and/or association contribute to eligibility, additional analysis of the APE shall be required. This analysis should be conducted on a case-by-case basis in consultation with the Consulting Parties in accordance with the provisions and timelines of Stipulation IX and X.

C. Modifying the APE. The APE shall be modified when additional research, cultural surveys, consultation with the Consulting Parties, or changes to the scope of the Undertaking indicate that historic properties located outside the boundaries of a previously defined APE may be affected directly, indirectly, or cumulatively by the Undertaking. Modifications to the APE shall be allowed only when there is sufficient evidence that the APE is larger than the APE described above; decreases to the APE are not permitted. The APE shall be modified through the following steps:

1. A proposal for modification of the APE shall be made by the BICY Superintendent or a Consulting Party with written justification for, and a graphic illustration of, the proposed APE modification(s).

2. The BICY Superintendent shall communicate the modification proposal(s) to all Consulting Parties in accordance with the provisions and timelines of Stipulations IX.

3. Following consultation, the BICY Superintendent shall decide on the proposed modification(s), notify the Consulting Parties within seven (7) calendar days and request concurrence by the SHPO. The BICY Superintendent shall proceed with identification

and evaluation of historic properties, assessment of effect, and resolution of adverse effects for the modified APE in accordance with the processes outlined in Stipulations II through VI.

II. IDENTIFICATION OF HISTORIC PROPERTIES

Inventory is meant to ensure that the nature and distribution of historic properties in areas affected by the NPS undertaking is identified by professional cultural resource staff that meet or exceed the Secretary of Interior Standards as defined by 36 CFR 800.2(a)(1)

The NPS shall make a reasonable and good faith effort to identify historic properties (including those of cultural and religious significance) located within the APE for the Undertaking.

Consistent with the phased process for Section 106 compliance under this PA, the NPS shall submit separate Section 106 consultation letters with site-specific development information for Projects.

A. Existing Information Inventory: At the beginning of the planning process for each project the NPS will conduct a records search and archival/literature review of the APE including a 1-mile buffer for information pertaining to the presence of previously recorded sites and the history of conditions within Project APE. The NPS will also solicit and take into account information provided by the Consulting Parties.

The NPS will utilize the results of the completed records search and information provided by the Consulting Parties when determining the level of inventory necessary within the APE.

1. If the NPS cultural resource specialist determines that previous ground disturbance has modified the surface so that the probability of finding intact Historic Properties within the boundaries of the proposed ground disturbance for a Project is negligible, it may be exempt from a full Cultural Resources Assessment Survey (CRAS).
    a. When such a determination is made the NPS will consult with the Consulting Parties in accordance with Stipulations IX and X of this Agreement.

B. Cultural Resources Assessment Survey: When the results of the completed records search and information provided by the Consulting Parties indicate a CRAS is needed for the Project APE, the NPS will adhere to the following guidelines.

1. The NPS will complete a CRAS in the Project APE using the probability model previously developed by SEAC (Ehrenrad 1980; Schwadron 2002) and/or any new accepted probability models to identify areas of high, medium, and low probability.

a. Each probability area will be surveyed in accordance with the CRAS standards set forth in the Florida Division of Historical Resources Module 3: Guidelines for Use by Historic Preservation Professionals.

b. The model will not be used to predict historic period sites. The placement of historic sites on the landscape likely corresponds to different variables than those of prehistoric sites, and almost certainly varies between historic site types (e.g. agriculture, ranching, and logging). In addition, archeologists often find

historical sites using other archival information, such as General Land Office (GLO) records and land patents.

2. Burial Sites and Traditional Cultural Properties (TCPs)

a. The NPS will identify these areas in consultation with Native American tribes, applicable local communities, and other Consulting Parties.

i. The NPS will avoid excavating or shovel testing any areas that are identified as burial sites, TCPs, important or religious or sacred sites by the Native American tribes.

b. The probability model will not be used to predict areas that are likely to contain specialized prehistoric and protohistoric site types, such as burial sites and TCPs or places that are important for other reasons besides cultural materials or environmental variables.

C. Fieldwork

Prior to beginning of fieldwork for the CRAS the NPS will submit a Research Design addressing the Preserve's identification efforts within the Project APE for review by the Consulting Parties. The Research Design for each Project APE will be an Appendix to this Agreement.

1. The Consulting Parties will have 30 calendar days from receipt of the Research Design to forward comments to the NPS. The NPS will revise the Research Design, as necessary, to address these comments until agreement has been reached. If a Consulting Party fails to submit written comments within 30 calendar days of receipt of the Research Design and does not request a review extension either verbally or in writing within this period, the NPS may assume that Consulting Party has no comments on the Research Design or objections to its adequacy.

Upon completion of the fieldwork for the Project APE, the NPS will share the results in a report with the Consulting Parties and follow the process for evaluation, assessment of adverse effects and resolution of adverse effects as described in Stipulations III – VI.

D. Timeframe for completing fieldwork: The timeframe will be dependent on resources available to the NPS (e.g. budget and staffing levels) and the fieldwork phases. The NPS will seek additional funding opportunities and partnerships to complete fieldwork, where appropriate, with the goal to complete investigation of all APEs prior to the implementation of the Projects developed for this Undertaking.

III. EVALUATION OF HISTORIC PROPERTIES

A. National Register Eligibility: In consultation with the SHPO and any Native American tribe that attaches religious and cultural significance to any prehistoric or historic district, site, building, structure or object, except those defined in Stipulation II.A.3 and guided by the Secretary's Standards and Guidelines for Evaluation, the NPS shall apply the National Register criteria (36 CFR 63) to cultural resources identified within the APE.

The NPS shall ensure that archeological, ethnographic, historic or other supporting information provided by its Consulting Parties or other knowledgeable sources will be appropriately used to support determinations of eligibility. All previously recorded eligible sites or sites that need additional data to determine NRHP eligibility within the APE must be revisited. Sites that need additional data will be treated as eligible properties for the purposes of inventory and preservation until and/or if determined otherwise. Sites determined not eligible do not require revisits during inventory and evaluation; however, the NPS archeologist may request that ineligible sites be revisited on a case-by-case basis. If the NPS determines that any of the National Register criteria for evaluation (36 CFR 60.4) are met, the resource retains integrity and the SHPO concurs, the cultural resource shall be considered eligible for the National Register (36 CFR 800.4(c)(1) and (2)). All documentation for new and existing sites will be documented on Florida Master Site File forms and adhere to the Florida Division of Historical Resources recording standards.

IV. AVOIDANCE AND MINIMIZATION

The following provisions shall be applied to avoid and/or minimize effects to Historic Properties. This Agreement allows for determinations of effect to be made after avoidance and minimization measures through standard treatment measures and/or best management practices have been integrated into the Undertaking's design.

A. Avoidance and Minimization of Effects

1. The NPS shall make a reasonable and good faith effort to avoid and/or minimize any potential adverse effects to Historic Properties within the Undertaking's APE, including properties of traditional religious and cultural importance to the Tribes, through Undertaking design, redesign, relocation of Projects, or by other means in a manner consistent with this Agreement. Any avoidance and/or minimization measures will be incorporated into the decision or authorization for each undertaking.

V. ASSESSMENT OF EFFECTS

Following the application of avoidance and minimization measures as described in Stipulation IV above, the NPS will recommend a finding of effect for all historic properties identified within the APE as defined in 36 CFR 800.

A. Input from Consulting Parties: After each Cultural Resources Assessment Survey (CRAS) is complete, the NPS will provide the Consulting Parties the opportunity to review and comment on the NPS's findings and preliminary eligibility recommendations found in the CRAS report.

1. In accordance with 36 CFR Section 800.4, the NPS acknowledges that Native American tribes and Native Hawaiian organizations possess special expertise in assessing the eligibility of historic properties that may possess religious and cultural significance to them.

B. SHPO consultation: After consulting with Native American tribes the NPS will submit the CRAS report to the SHPO, along with determinations of eligibility, findings of effect and any comments received from Native American tribes.

VI. RESOLUTION OF ADVERSE EFFECTS

A. Historic Properties Treatment Plans: If the NPS determines that the Undertaking may have an adverse effect on a historic property or multiple historic properties, the NPS shall consult with the SHPO, Native American tribes and other Consulting Parties to develop a Historic Properties Treatment Plan (HPTP) that will detail the measures that the NPS will implement to avoid, minimize, or mitigate adverse effects on historic properties in accordance with 36 CFR 800.6. The HPTP will identify the effects of the Undertaking on each historic property and identify the most appropriate treatment strategy(ies).

1. Potential mitigation measures: Potential mitigation measures to resolve adverse effects from the Undertaking may include, but are not limited to, avoidance, Project redesign, or Project relocation. Additional measures could include historical research, interpretation, photo documentation, intensive recording, periodic monitoring, and archeological excavation.

2. Public education: The NPS will continue to dedicate available staff, funding, and other resources to proactively promote and enforce responsible trail uses and ethics. Such efforts will include continuing to support campaigns to reduce vandalism and unauthorized collection of archaeological resources.

B. Input from Native American tribes and other Consulting Parties: After the Native American tribes and other Consulting Parties are provided the HPTP or a summary of treatment recommendations, the NPS will coordinate with the Native American tribes and other Consulting Parties to discuss the treatment recommendations. The NPS will revise the HPTP, as necessary, to address comments from this consultation process.

C. SHPO consultation: After consulting with Native American tribes and seeking input from the other Consulting Parties, the NPS will submit the HPTP to the SHPO along with any comments received. The SHPO will have 30 calendar days from receipt of the report to forward comments to the NPS. The NPS will revise the HPTP, as necessary, to address these comments until agreement has been reached. If SHPO fails to submit written comments within 30 calendar days of receipt of the report and does not request a review extension either verbally or in writing within this period, the NPS may assume the SHPO has no comments on the measures identified in the HPTP or objections to the adequacy of the plan.

VII. MONITORING AND REPORTING

The NPS will submit copies of its determinations and survey reports for each Project to the Consulting Parties and an annual report that details all work completed pursuant to the terms of the Agreement.

A. The NPS shall provide to the Consulting Parties a draft survey report for each Project in electronic or print format as requested describing the findings of the work for a 30-day review and comment period starting upon receipt. Information will be shared with the Consulting Parties, as appropriate and in conformance with ARPA and NHPA Section 304.

B. The draft survey report shall include, as appropriate, recommendations on NRHP eligibility or potential eligibility of all identified archeological sites (and if applicable any newly identified historic properties), recommendations for further archeological investigations, the potential effects of the undertaking on historic properties, and suggested measures to resolve adverse effects through avoidance, minimization or mitigation. The Consulting Parties shall provide their comments to the NPS within thirty (30) days from the date of receipt of the draft survey report. If no comments are received within the 30-day period, the NPS shall assume that the non-responding party has no comments. If the Consulting Parties, concur with the recommendations for that phase, the NPS may proceed with the next phase. If the Consulting Parties, do not concur with the NPS' recommendations for that phase, the parties shall consult further to resolve the issues following the provisions for dispute resolution in Stipulation IX of this document.

C. The NPS shall ensure that the draft survey reports for all Projects conducted for the Undertaking are incorporated into an annual report. The Consulting Parties shall provide their comments on the draft annual report to the NPS within thirty (30) calendar days from date of receipt of the draft annual report. If the NPS does not receive comments within the thirty (30) day comment period, the NPS shall assume that the non-responding party has no comments. A lack of comments has the same effect as a concurrence, it is not an impediment. The NPS shall ensure that all comments on the draft annual report received during the 30-day period are considered in preparation of the final annual report. The NPS shall submit two (2) archivally bound hardcopies and one electronic copy in Adobe® Portable Document Format (.pdf) of its approved annual report to the Consulting Parties, in an agreed upon format.

D. All cultural resource work performed under the terms of this Agreement shall be carried out by or under the direct supervision of a professional who meets the Secretary of the Interior 's Professional Qualifications Standards (48 FR 44739) in the appropriate discipline.

E. All archeological studies conducted pursuant to this Agreement shall be consistent with the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation (48 FR 44716-44742, September 1983), the ACHP's Section 106 Archeology Guidance (June 2007) and the SHPO's Guidelines (Module 3: Guidelines for Use by Historic Preservation Professionals; and Archaeological Reports Standards and Guidelines, Chapter 1A-46, Florida Administrative Code).

VIII. PROFESSIONAL QUALIFICATIONS AND STANDARDS

The NPS shall ensure that all work undertaken to satisfy the terms of this Agreement shall conform to the Secretary of Interior's Professional Qualifications and Standards for Archaeology and Historic

Preservation, [48 Fed. Reg.44716, September 29, 1983], the ACHP guidance on archaeology (http://www.achp.gov/archguide), the appropriate SHPO standards and requirements.

A. Professional Qualifications: The NPS shall ensure that all activities relating to identification, evaluation and resolution of adverse effect undertaken as a part of this Agreement are carried out by or under the direct supervision of a person or persons meeting, at a minimum, the applicable professional qualification standards set forth in the Secretary's Standards [48 Fed. Reg. 44716, September 29, 1983 and 36 CFR 61], the Office of Personnel Management NPS professional qualifications for archaeological and historic preservation and any written professional or permitting requirements of the SHPO.

B. Archaeological Resource Protection Act (ARPA) Permits: Identification and evaluation activities conducted under this Agreement by non-NPS staff shall be conducted only after qualified cultural resource professionals have obtained ARPA Permits for field work.

IX. CONSULTATION

Throughout the duration of this Agreement, the NPS shall seek, discuss, and consider the views of the Consulting Parties and shall, where feasible, seek agreement with them when making decisions under the stipulations of this Agreement.

A. The NPS shall submit documentation relating to the Undertaking under this Agreement to the ACHP, if required, and to the Consulting Parties following the provisions of this Agreement. Unless otherwise agreed, or specified within a Stipulation to this Agreement, those parties shall have thirty (30) calendar days from receipt of the request to review the submitted documentation and provide response, comment, or request additional time (the NPS will ensure all due dates for input are included on any correspondence).

1. If a Consulting Party has not responded to the submitted documentation within thirty (30) calendar days of receipt, the NPS shall make at least one attempt to follow-up with them, via electronic mail and telephone, to verify that the Consulting Party does not have any input about the issue under consideration. If, after this effort to reach an unresponsive Consulting Party, there has still been no response, the NPS shall proceed to the next step in the relevant process under this Agreement.

2. If a Consulting Party requires additional time for consultation, they may request an extension in writing. The NPS shall attempt to accommodate such requests if they do not negatively affect other scheduled planning efforts.

3. If comments received from a Consulting Party require only minor editorial corrections, such as spelling, grammatical, formatting and punctuation errors, the NPS shall execute the changes and shall consider the consultation completed.

4. If substantive changes, meaning changes other than spelling, typographical and grammatical corrections are required, the NPS shall execute and provide draft copies of the revised documents to the Consulting Parties with a request for second review and comment. The Consulting Parties shall have 30 calendar days to provide comments on

the revised draft. The NPS may, in consultation with the Consulting Parties and the SHPO, modify the duration of further review periods depending on the nature and complexity of the documentation in question.

5. The NPS shall consider all comments submitted during the review period and shall consult with the Consulting Parties to resolve differences or disagreements. If the comment cannot be incorporated into the document, the NPS shall provide a written response outlining the Agency's position.

B. Communications among Consulting Parties: Official correspondence from the BICY Superintendent to Consulting Parties regarding the Agreement and the Undertakings covered by this Agreement will be conducted primarily through electronic mail. If a Consulting Party desires hard copy communication for all or portions of the correspondence and documentation regarding the Agreement and the Undertakings covered in this Agreement, they must submit notification of their desires to the BICY Superintendent. The BICY Superintendent shall then identify alternative arrangements with the Consulting Party, which will allow the Consulting Party the opportunity to consult by other than electronic means within the timeframes specified in this Agreement. Consulting Parties may, at any time, notify the BICY Superintendent of their desires to change the format that consultation is conducted in. The BICY Superintendent is required to identify alternative arrangements within thirty (30) calendar days of receipt of notification by a Consulting Party (the NPS will ensure all due dates for input are included on any correspondence).

C. Final Agreement: The final Agreement, any amendments to the Agreement, any agreements that flow from the Stipulations of this Agreement and all reports associated with this Agreement shall be posted on the NPS webpage and/or made otherwise accessible to the public, subject to the confidentiality considerations defined in Stipulation XI.

X. TRIBAL CONSULTATION

The NPS is the federal agency responsible for notification, coordination, and consultation with the federally recognized Native American tribes under this Agreement. The NPS shall coordinate and consult on a government-to-government basis with the Native American tribes in the identification, evaluation, and treatment of resources to which the Native American tribes may attach religious and cultural significance and in the determination of whether they are historic properties. Government-to-government consultation with Native American tribes shall continue through the life of this Agreement.

A. The NPS shall seek Tribal participation in association with Section 106 identification, evaluation and treatment efforts associated with the Projects of the Undertaking throughout the life of this Agreement. When identifying Consulting Parties, the BICY Superintendent shall review and familiarize themselves with previous consultations to identify Tribal Consulting Parties. Government-to-government consultation and coordination shall be consistent with NPS standards and guidelines

B. Throughout the life of this Agreement, Native American tribes may identify specific resources that: (1) meet the definitions of historic properties [36 CFR 800.16(l) and 36 CFR 60.3], defined

as districts, sites, buildings, structures and objects and properties of traditional religious and cultural importance [36 CFR 800.16 (I)(l)] or (2) meet the definitions of TCPs or Native American sacred sites (see National Register Bulletin 38 and Executive Order 13007).

C. Communication between the NPS and the Native American tribes shall follow the standards and timelines identified in Stipulation IX (the NPS will ensure all due dates for input are included on any correspondence).

D. Points of Contact.

1. The BICY Superintendent, or their designee, shall be the NPS point of contact for government-to-government communication correspondence relating to this Agreement.

2. The elected Tribal official of federally recognized Native American tribes shall be the official point of contact for government-to-government communication. A representative(s), in addition to the elected Tribal official, may be designated by the Tribal Government to represent the tribe for purposes of coordination. Representatives appointed by Native American tribes could include but are not limited to; Cultural Preservation Departments, Cultural Representatives, and/or Tribal Historic Preservation Officers (THPOs).

XI. CONFIDENTIALITY AND SENSITIVE INFORMATION

Information concerning the nature and location of all historic properties, archaeological resources (historic or prehistoric) or other confidential cultural resources shall be considered sensitive and protected from release under the provisions of the Freedom of Information Act (FOIA) (5 U.S.C. § 552, as amended by Public Law No. 104-231, 110 Stat. 3048), Section 9 of the Archaeological Resources Protection Act (ARPA), as amended (16 U.S.C. § 470hh), Section 304 of the NHPA (54 U.S.C. § 307103) and Executive Order 13007.

Consideration may result in the sharing of summary reports that do not contain sensitive location information. Other than the FL SHPO, the Tribal Consulting Parties, and ACHP, the NPS will only consider the release of complete reports or other information concerning the nature and location of all historic properties, archaeological resource or other confidential cultural resource to a Consulting Party with a demonstrated interest in the information requested. All Consulting Parties will ensure that all sensitive information, as defined in Section 9 of ARPA, as amended (16 USC § 470hh) and Section 304 of the NHPA (54 USC § 307103) and excluded under the Freedom of Information Act (FOIA) (5 USC § 552, as amended by Public Law No. 104-231, 110 Stat. 3048) is protected from release.

XII. CURATION

The NPS shall curate any archeological materials and records which result from activities undertaken as part of this Agreement or the associated Undertaking(s) in accordance with federal laws and regulations, including 36 CFR 79. These materials and records shall be curated in repositories that meet these federal standards and do not violate federal laws or regulations. Big Cypress National Preserve archeological materials and records are curated at two NPS facilities in Florida: The Southeast Archeological Center in Tallahassee and the South Florida Collections Management Center in Everglades National Park. Both facilities follow the NPS Museum Handbook, NPS Director's Orders, and Department of the Interior

regulations applicable to archeological materials and records.

XIII. UNANTICIPATED DISCOVERIES

There is the potential for encountering previously unrecorded properties or for affecting properties in an unanticipated manner during the course of these undertakings. According to the 2008 National Park Service Programmatic Agreement Section VI, if previously unidentified cultural resources are discovered during the implementation of the Projects all work in that area will stop and the Superintendent, Preserve Archeologist, or Chief of Cultural Resources will be notified immediately. If items protected by the Native American Graves Protection and Repatriation Act (NAGPRA) are discovered during the implementation of the Projects all activity will cease in the area of discovery and immediate notice will be made to the Superintendent, as well as the appropriate federally recognized tribes and State Historic Preservation Officer.

XIV. RECOGNIZING OTHER FEDERAL LAW REQUIREMENTS

A. Anti-Deficiency Act: The NPS's obligations under this Agreement are subject to the availability of appropriated funds, and the stipulations of this Agreement are subject to the provisions of the Anti-Deficiency Act. The NPS shall make reasonable and good faith efforts to secure the necessary funds to implement this Agreement in its entirety. If compliance with the Anti-Deficiency Act alters or impairs the NPS's ability to implement the stipulations of this Agreement, the NPS shall consult in accordance with the amendment and termination procedures found at Stipulation XIV (C) and (E) of this Agreement.

XV. ANNUAL REPORT

A. On or before January 31 of each year, the NPS shall prepare and provide to all consulting parties of this Agreement an annual report addressing, at a minimum, the following topics:
   1. a general summary of how this Agreement has been implemented during the preceding year;
   2. a listing of Projects reviewed and carried out in accordance with stipulations II and III, including a listing of all historic properties affected by the Undertaking;
   3. NPS' assessment of the effectiveness of this Agreement;
   4. any recommendations NPS may have for improving the Agreement.

B. The consulting parties shall have the opportunity to review the annual report and within thirty (30) days of its receipt and to provide comments to the NPS. Any objections to the handling of specific undertakings or way the Agreement is implemented may be assessed using the process outlined in Stipulation IX. The NPS shall make the annual report available to the public on its Planning, Environment and Public Comment website.

XVI. ADMINISTRATIVE PROVISIONS

A. Dispute Resolution Procedures: Should any Signatory (sole authority to execute, amend or terminate the Agreement), Invited Signatory (authority to amend and terminate the Agreement) or Concurring Party object to implementation of this Agreement, they shall provide written

notice to the NPS of their objection with supporting justification. The NPS will consult with the objecting party(ies) to resolve the objection. If the NPS Superintendent determines that the objection cannot be resolved within 30-calendar days, the Superintendent shall forward all documentation relevant to the dispute to the other Signatories and Invited Signatories in this Agreement. If the dispute cannot be resolved between the NPS and the other Signatories and Invited Signatories, the NPS shall forward all documentation relevant to the dispute to the ACHP. Within 30 days after receipt of all pertinent documentation, the ACHP shall either provide the NPS with recommendations, which the NPS shall take into account in reaching a final decision regarding the dispute; or notify the NPS that it will comment within an additional 30 days. The NPS will take into account any ACHP comment provided in response to such a request in accordance with 36 CFR 800.7(c)(4) with reference to the subject of the dispute.

B. Amendments to the Agreement: Any Signatory or Invited Signatory may request that the Agreement (including appendices) be amended by informing the Superintendent in writing of the reason for the request and the proposed amendment language. The NPS may also request an amendment to the Agreement. The Superintendent shall notify all Signatories and Invited Signatories and interested Native American tribes and Concurring Parties of the proposed amendment. The Signatories and Invited Signatories will consult to reach agreement in 30 days, unless the Signatories and Invited Signatories agree to a longer period of consultation or the party of the proposed amendment retracts its proposal. During this time, the Superintendent will determine if a meeting with the Signatories and Invited Signatories, and potentially interested Native American tribes and Concurring Parties is needed. The amendment will be effective on the signature date of the last Signatory to sign the amended Agreement. The Superintendent will notify all interested Native American tribes and Concurring Parties of the amendment and provide them and opportunity to sign the amended Agreement. Amendments to the appendices attached to this Agreement may be made without the formal amendment process outlined above.

C. Termination of the Agreement: Any Signatory or Invited Signatory may terminate this Agreement by providing a concurrent 90-calendar day notice to the other Signatories and Invited Signatories, provided that during this period the Signatories and Invited Signatories attempt in good faith to find a collaborative resolution that would avoid terminating this Agreement. The Superintendent will determine if a meeting with Signatories, Invited Signatories, interested Native American tribes and other Concurring Parties is needed to discuss potential termination of this Agreement. If the Agreement is terminated, the NPS will comply with Section 106 of the NHPA by following the implementing regulations at 36 CFR 800. The NPS will notify all interested Native American tribes and other Concurring Parties that this Agreement has been terminated.

E. Agreement duration: This Agreement shall be in place until the implementation of the Hydrologic Restoration Plan is complete, or for a period of 8 years, whichever comes first.

EXECUTION of this Agreement by the NPS, Florida SHPO and the ACHP and subsequent implementation of its terms shall evidence that the NPS has taken into account the effects of the Undertaking on historic properties and that the NPS has afforded the ACHP an opportunity to comment.

Appendix A: Acronyms, Abbreviations and Definitions

Acronyms:

ACHP	Advisory Council on Historic Preservation
Agreement	Programmatic Agreement, with reference to this Programmatic Agreement
APE	Area of Potential Effects
ARPA	Archaeological Resources Protection Act
BAP	Backcountry Access Plan
BICY	Big Cypress National Preserve
CRAS	Cultural Resources Assessment Survey
GLO	General Land Office
GMP	General Management Plan
HPTP	Historic Properties Treatment Plan
IO	Isolated Occurrence(s)
NAGPRA	Native American Graves Protection and Repatriation Act National Environmental Policy Act
NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
Fed Reg	Federal Register
FLSHPO	Florida State Historic Preservation Office(r)
ORV	Off-Road Vehicle
TCP	Traditional Cultural Property
THPO	Tribal Historic Preservation Officer

Definitions:

Adverse effect - When an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register of Historic Places [NRHP] in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association [36 CFR 800.5(a)(1)][State Protocol, Attachment A].

Agreement - Refers to this Programmatic Agreement, which has been developed to consider adverse effects to historic properties and phased identification and evaluation efforts for the Backcountry Access Plan in the Big Cypress National Preserve.

Annual report - A summary, in writing, submitted on an annual basis to the Signatories and Consulting Parties to this Agreement for review and comment. The report summarizes the activities of the Agreement per fiscal year and provides documentation required under the Agreement.

Archaeological site - The material remains of past human life or activities in history or prehistory, which are of archaeological interest including, but not be limited to pottery, basketry, bottles, weapons, projectiles, tools, structures or portion of structures, pit houses, pueblos, room blocks, roads, trails, rock paintings, rock carvings, intaglios, graves, human skeletal materials, or any portion or piece of any of the forgoing items that are of human design, manufacture, possession or use.

Area of Potential Effects (APE) - The APE is defined as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties per 36 CFR 800.16(d) if such properties exist. The APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking [36 CFR 800.16(d)].

Building - The NRHP defined a building, such as a house, barn, church, hotel, or similar construction, is created principally to shelter any form of human activity. "Building" may also be used to refer to a historically and functionally related unit, such as a courthouse and jail or a house and barn.

Cultural Resources Assessment Survey – an intensive survey focusing on both archaeological sites and historic resources, and associated features. The goal of such surveys is to locate, identify and evaluate cultural resources present within the “area of potential effect” or APE. Site evaluations are in terms of their eligibility for listing in the NRHP (FDHR Module 3).

Closed - A route designation meaning use is prohibited in the area.

Concurring Party - A Concurring Party is a Consulting Party invited to concur in the agreement document but who does not have the authority to amend or terminate the agreement. Like an Invited Signatory’s signature, a Concurring Party signature is not required to execute the agreement; a concurring signature is essentially an endorsement of the agreement. Thus, the refusal to sign by any party asked to concur in the agreement does not prevent the agreement from being executed. Whether any or all other Consulting Parties are invited to concur in an agreement is at the federal agency’s sole discretion [http://www.achp.gov/agreementdocguidance.html].

Consultation - The conduct of mutual, open, and direct two-way communication in good faith to secure meaningful and timely participation in the decision-making process, as allowed by law. See government-to-government consultation for the specific form of tribal consultation.

Consulting Parties - Any party, identified by the BICY Superintendent during the initiation of each individual Undertaking covered by this Agreement (Stipulation IX), who has a consultative role in the Section 106 process for that Undertaking. These include the Florida State Historic Preservation Office, Native American tribes, federal, state, and local land management and governmental agencies and any party with a demonstrated legal or economic relationship or concern regarding the Undertaking.

Coordination - Communication and dialogue between the NPS and Native American tribes involving leadership or staff to increase cooperation between the two parties and the effectiveness of their relationship.

Cultural landscape - A cultural landscape is a geographic area (including both cultural and natural resources and the wildlife or domestic animals therein), associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values. There are at least four general types of cultural landscapes, not mutually exclusive: historic sites, historic designed landscapes, historic vernacular landscapes, and ethnographic landscapes. Cultural landscapes may be evaluated as historic properties and be eligible for the National Register of Historic Places (NPS Preservation Brief 36)."

Cultural resource - A definite location of human activity, occupation, or use, identifiable through field inventory, historic documentation, or oral evidence. The term includes archaeological, historic, or architectural sites, structures, or places with important public and scientific uses, and may include definite locations (sites or places) of traditional cultural or religious importance to specified social and/or cultural groups. Cultural resources are concrete, material places and things that are located, classified, ranked, and managed through the system of identifying, protecting, and utilizing for public benefit. They may be, but are not necessarily, eligible for listing in the National Register.

Designation - The route designation is one of several decisions required to use of a trail or camping areas/campsites. The NPS designates trails and camping areas/campsites as open or closed.

Determination of eligibility - A determination of eligibility is a decision by the Department of the Interior that a district, site, building, structure or object meets the National Register criteria for evaluation although the property is not formally listed in the National Register. A determination of eligibility does not make the property eligible for such benefits as grants, loans, or tax incentives that have listing on the National Register as a prerequisite [36 CFR 60.3(c)].

District - The NRHP defines an historic district is a geographically definable area, urban or rural, possessing a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united by past events or aesthetically by plan or physical development. In addition, historic districts consist of contributing and non-contributing properties. Historic districts possess a concentration, linkage or continuity of the other four types of properties. Objects, structures, buildings and sites within a historic district are usually thematically linked by architectural style or designer, date of development, distinctive urban plan, and/or historic associations [36 C.F.R. 60.3].

Effect - An effect means an alteration to the characteristics of a historic property qualifying it for inclusion in or eligible for the National Register [36 CFR 800.16(i).

Farm - A grouping of historical features (including buildings and structures) found to be associated through archival research and field verification.

Footprint of disturbance - The limits of all ground disturbance associated with an undertaking.

Government-to-government consultation - The consultation between NPS officials with decision making authority and elected tribal officials or those tribal representatives specifically delegated by elected tribal officials to engage in such consultation and decision making. It is built upon the government to government exchange of information and aims to create effective collaboration and informed decision-making. Consultation is an accountable process that ensures meaningful and timely input by tribal officials into the development of regulatory policies and agency decisions that have tribal implications.

Historic property - Historic property means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Native American tribe or Native Hawaiian organization and that meet the National Register criteria [36 CFR 800.16(l)(1)].

Historic Properties Treatment Plan (HPTP) - A document which details the procedures, methodologies, and techniques for resolving adverse effects to historic properties within the APE through avoidance, minimization, and mitigation.

Human remains – the physical remains of a human body.

Identification - The general term for the component of a cultural resource management program that includes locating, recording, and determining the legal, scientific, public, and conservation values of cultural resources, i.e. giving cultural resources a management identity.

Indian tribe (Native American tribe) or tribe - As defined in Section 301 of the National Historic Preservation Act, "an Indian tribe, band, nation, or other organized group or community, including a Native village, Regional Corporation or Village Corporation, as those terms are defined in section 3 of the Alaska Native Claims Settlement Act [43 U.S.C. 1602], which is recognized as eligible for the special programs and services provided by the United States to Native Americans because of their status as Indians."

Indirect effect - Alteration to the characteristics of a historic property, which are caused by the undertaking, may be visual, atmospheric, or audible, and could diminish the integrity of the properties for which setting, feeling, and/or association are qualifying characteristic of NRHP eligibility. For example, additional roads and visitors could increase opportunities for effects from unauthorized excavation and collecting, vandalism of historic properties, and disruption of religious and cultural values.

Inventory - A term used to refer to both a record of cultural resources known to occur within a defined geographic area and the methods used in developing the record. Depending on intended applications for the data, inventories may be based on (a) compilation and synthesis of previously recorded cultural resource data from archival, library, and other indirect sources; (b) systematic examinations (survey) of the ground surface and natural exposures of subsurface deposits for indications of past human activity

as represented by artificial modifications of the land and/or the presence of artifacts; and (c) the use of interviews and related means of locating and describing previously unrecorded or incompletely documented cultural resources, including those that may not be identifiable through physical examination

Invited Signatory - An Invited Signatory, upon signing, has the authority to amend and terminate the agreement. The BICY Superintendent may invite additional parties to sign the agreement, such as an Indian tribe who attaches religious and cultural significance to historic properties affected by the undertaking (off tribal lands), or any party that assumes a responsibility under the agreement. The refusal of an Invited Signatory to sign the agreement does not prevent the agreement from being executed; however, an agreement cannot impose a duty or responsibility on a party that has not signed [http://www.achp.gov/agreementdocguidance.html].

Isolated Find - An isolate refers to one or more culturally modified objects not found in the context of a site as defined below. Note that this definition makes no reference to an absolute quantitative standard for the site/isolate distinction.

Mitigation - A means to remedy or offset an adverse effect or a change in a historic property's qualifying characteristics that diminishes its integrity (http://www.achp.gov/archguide)

Mitigation measures - Measures intended to lessen the severity of a potential adverse effect by application of appropriate protection measures, such as the recovery of archaeological data from sites, or other means.

National Programmatic Agreement - Agreement among the NPS, ACHP, and National Conference of State Historic Preservation Officers which defines how the NPS plans for and manages cultural resources under its jurisdiction in accordance with the spirit and intent of Section 106 of the NHPA, consistent with 36 CFR. 800, and consistent with its other responsibilities for land-use planning and resource management under FLPMA, NEPA, other statutory authorities, and executive orders and policies.

National Register of Historic Places (NRHP) - The National of Historic Places, expanded and maintained by the Secretary of the Interior, as authorized under Section 2(b) of the Historic Sites Act and Section 101(a)(1)(A) of the National Historic Preservation Act. The NRHP lists cultural properties found to qualify for inclusion because of their local, State, or national significance. Eligibility criteria and nomination procedures are found in 36 CFR Part 60. The Secretary's administrative responsibility for the National Register is delegated to the National Park Service.

Native American sacred sites - Specific, discrete, narrowly delineated locations on Federal land that are identified by a Native American tribe, or . . . authoritative representative of a Native American religion, as sacred by virtue of their established religious significance to, or ceremonial use by, a Native American religion (EO 13007).

Object - A material thing of functional, aesthetic, cultural, historical or scientific value that may be, by nature or design, movable yet related to a specific setting or environment. [36 C.F.R. 60.3(j)]

Off Road Vehicle (ORV) - Any motorized vehicle capable of, or designed for, travel on or immediately over land, water, or other natural terrain.

Predictive model - Predictive modeling is an application of basic sampling techniques that projects or extrapolate the number, classes, distribution, and frequencies of cultural resources. Predictive models can be used in land- use planning, during the early stages of planning for an undertaking, for targeting field survey, or other management purpose.

Signatory - A Signatory has the sole authority to execute, amend, or terminate the agreement. The federal agency and the SHPO/THPO are signatories; the ACHP is a signatory as well when it has participated in consultation for the agreement and in all program PAs [http://www.achp.gov/agreementdocguidance.html].

Site - A site is defined as a locus of previous (50-year age minimum) human activity at which the preponderance of evidence suggests either one-time diagnostically interpretable use or repeated use over time, or multiple classes or activates. A site is the location of activities or events, often used loosely to mean the same as cultural resources. In archaeological jargon, the basic meaning of site is a place where archaeological evidence occurs, with precise meanings varying considerably from region to region and among recording institutions within regions. Section 4(c) of the Archaeological Resources Protection Act (see Appendix 8) uses "site" in the term "religious or cultural site" in its common dictionary sense, i.e., as a location, not as a synonym for "archaeological resource." If the Congress had meant “archaeological resource” in Section 4(c), the drafters either would have used that defined term or would have defined “site” to mean the same as “archaeological resource.” According to the Glossary of National Register Terms in National Register Bulletin No. 16A, site means "location of a significant event, a prehistoric or historic occupation or activity, or a building or structure, whether standing, ruined, or vanished, where the location itself possesses historic, cultural, or archeological value regardless of any existing structure"[36 C.F.R. 60.3].

Structure - The term "structure" is used to distinguish from buildings (see definition above) those functional constructions made usually for purposes other than creating human shelter. A work made up of interdependent and interrelated parts in a definite pattern of organization. Constructed by man, it is often an engineering project large in scale [36 C.F.R. 60.3(p)]

Survey - The application of professional methods and techniques for field inventory, used to locate and identify cultural properties

Traditional Cultural Property (TCP) - A property that derives significance from traditional values associated with it by a social and/or cultural group such as an Indian tribe (Native American tribe) or local community. A TCP may qualify for the National Register if it meets the criteria and criteria exceptions at 36 CFR 60.4 (See National Register Bulletin 38)

Undertaking - Undertaking means a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; and those requiring a Federal permit, license or approval [36 CFR 800.16(y)].

APPENDIX F: LIST OF PREPARERS AND CONSULTANTS

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APPENDIX G: LITERATURE CITATIONS

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As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historic places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under US administration.

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Big Cypress National Preserve

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