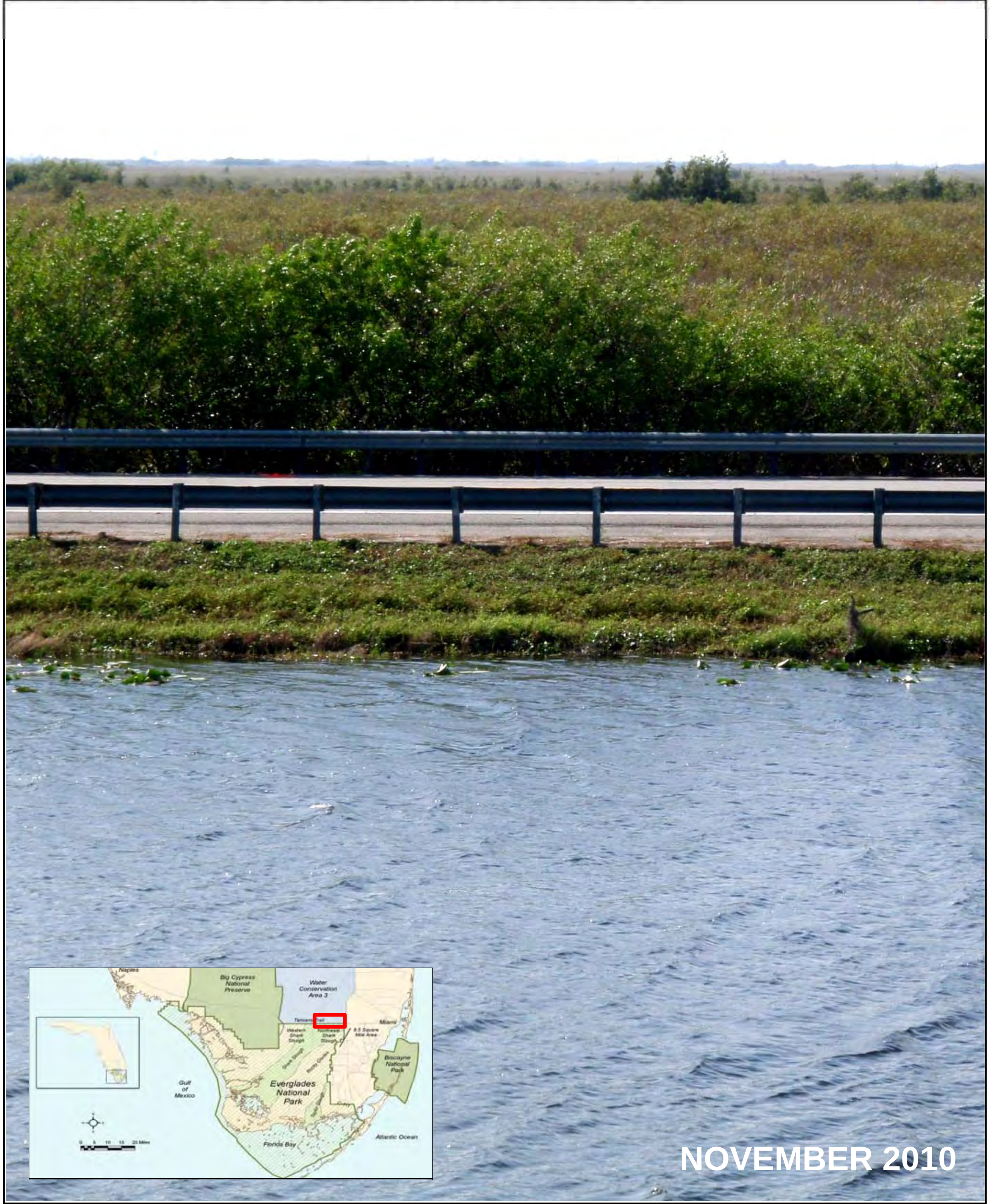
EVERGLADES NATIONAL PARK
TAMIAMI TRAIL MODIFICATIONS: NEXT STEPS
FINAL ENVIRONMENTAL IMPACT STATEMENT



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Tamiami Trail Modifications: Next Steps
Final Environmental Impact Statement

Everglades National Park

Lead Agency: National Park Service

ABSTRACT

Construction of the 264-mile section of U.S. Highway 41/State Road 90 known as Tamiami Trail to connect Tampa and Miami began in 1915 and was completed in 1928. The construction of this roadway created an impediment to natural water flows into the Everglades, slowing and blocking water flow south into the southern Everglades and Everglades National Park (ENP/the "Park").

This project arose as part of the 2009 Omnibus Appropriations Act passed by Congress on March 10, 2009. In this act, Congress directed the National Park Service (NPS) "to immediately evaluate the feasibility of additional bridge length, beyond that to be constructed pursuant to the Modified Water Deliveries (MWD) to Everglades National Park Project (16 U.S.C. SS 410r-S), including a continuous bridge, or additional bridges or some combination thereof, for the Tamiami Trail (U.S. Highway 41) to restore more natural water flow to ENP and Florida Bay and for the purpose of restoring habitat within the Park and the ecological connectivity between the Park and the Water Conservation Areas."[1]

The study area consists of a 10.7-mile stretch of Tamiami Trail, adjacent to the northern edge of ENP. The western terminus of the project corridor is at the S-333 water control structure near the L-67 Extension Levee, and the eastern terminus is at the S-334 water control structure near the L-30 Levee and Canal and the L-31N Levee.

This document presents an environmental analysis of six alternatives that the NPS is currently considering, for public input and review, in accordance with the National Environmental Policy Act (NEPA) of 1969: No-Action Alternative – A 1-mile eastern bridge and elevation of the remaining roadway to allow for 8.5 foot stage in the L-29 Canal [currently being constructed by the U.S. Army Corps of Engineers (USACE)]; Alternative 1 – 2.2 miles of bridges and the remaining highway raised to an elevation of 13.13 feet; Alternative 2a – 3.3 miles of bridges and the remaining highway raised to an elevation of 13.13 feet; Alternative 4 – 1.0 mile of bridges and the remaining highway raised to an elevation of 13.13 feet; Alternative 5 – 1.5 miles of bridges and the remaining highway raised to an elevation of 13.13 feet; and Alternative 6e – 5.5 miles of bridges and the remaining highway raised to an elevation of 13.13 feet.

The environmentally preferred alternative for the project has been determined to be Alternative 6e. The alternative that provides the most value for the project is also Alternative 6e, which provides 5.5 miles of bridging along the corridor. Alternative 6e most closely meets the project

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1 The 2009 Omnibus Appropriations Act only authorizes the NPS to conduct the study contained in this document. All future actions associated with the implementation of the Tamiami Trail Modifications: Next Steps project subsequent to the release of this document will be determined at a later date.

objectives and the NPS mission by having the highest total importance value after summing the importance scores for each of the eight factors for each alternative. While Alternative 6e has the highest benefit, this alternative also has the highest cost. After quantifying the importance (i.e., benefits) for all alternatives using "Choosing By Advantages" (CBA), the alternatives were further evaluated using the cost-to-importance analysis prescribed by the CBA based on the importance scores and the total project costs. When the total project cost is plotted against the importance scores for all alternatives, the results produce a somewhat linear relationship between the variables, indicative of similar benefit-to-cost ratios; however, an inflection point for Alternative 2a indicates this alternative may provide the best cost-to-benefit value. Since it was unclear whether Alternative 2a was a true best value, or simply an artifact of the CBA scoring methodology, the NPS requested that the USACE apply the cost effectiveness analysis technique commonly used in its project assessments. These results showed all alternatives to be cost effective, but Alternative 6e was determined to be a better value (most efficient) when compared to the other alternatives, including Alternative 2a. Therefore, the NPS CBA Importance Analysis, coupled with the USACE cost effectiveness analysis, resulted in the decision to identify Alternative 6e as the preferred alternative.

EXECUTIVE SUMMARY

Introduction

This Environmental Impact Statement (EIS) has been prepared for the Tamiami Trail Modifications: Next Steps project by ENP under the jurisdiction of the NPS. This project arose as part of the 2009 Omnibus Appropriations Act passed by Congress on March 10, 2009. In this act, Congress directed the NPS "to immediately evaluate the feasibility of additional bridge length, beyond that to be constructed pursuant to the MWD Project (16 U.S.C. SS 410r-S), including a continuous bridge, or additional bridges or some combination thereof, for the Tamiami Trail (U.S. Highway 41) to restore more natural water flow to Everglades National Park and Florida Bay and for the purpose of restoring habitat within the Park and the ecological connectivity between the Park and the Water Conservation Areas."[2]

This EIS has been prepared in accordance with NEPA and implementing regulations, 40 Code of Federal Regulations (CFR) 1500-1508, and NPS *Director's Order 12* and associated handbook, *Conservation Planning, Environmental Impact Analysis, and Decision-making* (NPS, 2001).

Per guidance provided from the Department of the Interior (DOI), several issues, while associated with the proposed project, are not addressed by this EIS and will be addressed in future documents [i.e., Everglades National Park General Management Plan (GMP); Combined Operational Plan (COP), as a component of the MWD Project; and associated Comprehensive Everglades Restoration Plan (CERP) projects]. These issues include:

- Modification of water flows (water operations plan) associated with raising operating water levels in the L-29 Canal and the subsequent impact or benefit of increased water flows south of Tamiami Trail into ENP[3]
- Seepage/flood management
- The potential designation of the East Everglades Expansion Area (a 107,600 acre addition to the northeast area of the park in 1989) as wilderness
- Addition of supplementary public access points along Tamiami Trail
- Continued operation of commercial ventures (i.e. commercial airboating) within the boundaries of ENP

Purpose and Need for the Action

<u>Purpose</u>

The project purpose was developed as part of the 2009 Omnibus Appropriations Act passed by Congress on March 10, 2009. The NPS proposes:

"To immediately evaluate the feasibility of additional bridge length, beyond that to be constructed pursuant to the MWD Project (16 U.S.C. SS 410r-S), including a continuous bridge, or additional bridges or some combination thereof, for the Tamiami Trail (U.S. Highway 41) to restore more natural water flow to Everglades National Park and Florida Bay and for the

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[2] The 2009 Omnibus Appropriations Act only authorizes the NPS to conduct the study contained in this document. All future actions associated with the implementation of the Tamiami Trail Modifications: Next Steps project subsequent to the release of this document will be determined at a later date.

[3] Additional explanation of the development of a water operations plan can be found in the cumulative impacts analysis discussion in Section 4.1.3.

purpose of restoring habitat within the Park and the ecological connectivity between the Park and the Water Conservation Areas."[4]

<u>Need for Action</u>

The need for the action is the same as cited in the Mod Waters Tamiami Trail Modification 2003 General Reevaluation Report (GRR)/Supplemental Environmental Impact Statement (SEIS), 2005 Revised GRR (RGRR)/SEIS, and 2008 Limited Reevalation Report (LRR)/Environmental Assessment (EA):

"In its current condition, the segment of Tamiami Trail located between S-334 on the east and S-333 on the west has inadequate capacity to deliver the volumes of water required to restore ENP and in Northeast Shark River Slough without risking damage to the roadbed and its eventual degradation and causing a backwater impact on Water Conservation Area (WCA)-3B potentially drowning tree islands. The recommended plan must address: (1) measures to increase conveyance of water to Northeast Shark River Slough, and (2) modifications to the existing roadbed, if any, required to allow this conveyance."

More precise needs based on specific language in the 2009 Omnibus Appropriations Act are:

(1) to increase potential ecological connectivity (additional bridging) between marshes in Northeast Shark River Slough in ENP and marshes north of the trail,

(2) to restore natural marsh flow patterns (flow rates and distributions) associated with unobstructed flows (removal of roads, canals, and levees) between marshes, and

(3) to restore ridge and slough habitat in ENP by reconnecting sloughs severed by the existing road.

Overview of the Alternatives

Based on the previous preliminary analysis including the 2005 RGRR/SEIS and 2008 LRR/EA, internal scoping with the NPS, and the public input related to the proposed project, the following alternatives were carried forward for analysis in the EIS.

Six action alternatives were identified for detailed engineering evaluation and comparative analysis. The 2005 RGRR/SEIS was used as the basis for developing the initial suite of alternatives. These alternatives were renamed later for ease of use. Through further discussion and refinement other project alternatives emerged and if the adjustments were small, the existing alternative was given a lower case letter designation (e.g. a, b, or c), depending on the order in which it was developed.

All alternatives include bridge construction and reconstruction of the remaining highway, with differences being in the bridge or ConSpan (prefabricated culvert) lengths and locations. The bridge typical sections would satisfy current FDOT standards and be uniform throughout their entire lengths.

All of the proposed alternatives would be built to satisfy FDOT standards. The NPS is only responsible for the content of the information contained in this EIS. All future actions associated with the implementation of the Tamiami Trail Modifications: Next Steps project subsequent to the release of this document, including design, permitting, and construction of the project will be determined at a later date. In addition, it should be noted that before proceeding with

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construction, it will be necessary to obtain FDOT approval on design, plans, and specifications of the project before proceeding to construction. This approval shall include submittal of all plans, designs, and specifications, which will be signed and sealed by a Florida registered Professional Engineer.

The existing Tamiami Trail roadway embankment would be removed from the areas where the bridges would be constructed. The remaining highway embankment would be reconstructed to raise the crown elevation to 13.13 feet, the minimum required to comply with the FDOT *Flexible Pavement Design Manual* and FDOT *Plans Preparation Manual* based on a Design High Water (DHW) elevation of 9.7 feet[5] in the L-29 Canal and the roadway cross section geometry[6]. To meet current FDOT standards for roadway geometry, the higher profile of the roadway would result in a wider roadbed than currently exists. Therefore, expansion of the highway footprint southward would be necessary to avoid impacting the L-29 Canal.

Access facilities, such as ramps to the bridge or elevated roadway, would be provided for existing facilities. The maintenance of traffic (MOT) and construction sequence for the bridge and roadway would be based on the best balance of traffic safety, environmental impacts, and construction cost and duration.

Staging areas for construction equipment and materials may be located at business sites along the corridor. Staging and other functions may also require use of the existing shoulder for temporary periods. Additional staging areas may be necessary near the eastern end of the corridor. This project would generate a large quantity of material excavated from the road bed that could be disposed or recycled for use in other area projects. One disposal site, Rocky Glades, which is owned by SFWMD, is approximately 15 to 20 miles from the construction site. Selected quantities of soils and organic peat may be evaluated for placement in the nearby Broward Water Preserve Area. Asphalt material could be used in other road beds. Excavated fill could be used for backfilling the levee for the L-67 Extension project, where up to 50,000 cubic yards of material could be needed. Storing and recycling material could reduce hauling and disposal costs, as well as provide cost savings on other projects where this type of material is needed. Additionally, FDOT may consider some of the excavated material to be “salvageable materials” that could be used by FDOT for other purposes.

<u>No-Action Alternative</u>

The No-Action Alternative is authorized by the 2008 LRR/EA and consists of construction of a 1-mile eastern bridge with the remaining road raised to allow an increase in the allowable stage in the L-29 Canal from 7.5 feet National Geodetic Vertical Datum (NGVD) to 8.5 feet NGVD.

All of the following action alternatives assume the 1-mile eastern bridge (2008 LRR/EA) has been constructed. The lengths of the bridges, transition areas between the bridges and the roadway, and the roadway are separated in the descriptions.

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5 In the 2005 RGRR/SEIS, the USACE used the Natural Systems Model over a 36-year POR to establish a stage frequency curve for Tamiami Trail. Stages were extrapolated from the curve for particular frequencies to determine the DHW and the peak stage for overtopping criteria. Using the 20-year frequency, the 24-hour stage or DHW for pavement design was 9.7 feet (NGVD 1929).

6 Based on the FDOT *Flexible Pavement Design Manual* and FDOT *Plans Preparation Manual*, the minimum crown elevation for the roadway was calculated to be 13.13 feet based on the following parameters: 9.7-foot DHW; 2-foot base clearance; 10-inch limerock base (OBG 9), LBR 100, SN = 1.8; 3.5-inch type SP structural course (traffic C), SN = 1.54; 0.75-inch friction course FC-5 (traffic C); and 2.88-inch for 2% cross-slope over 12-foot travel lane.

Alternative 1 – 2.2 Miles of Bridges

This alternative includes 4 bridges (for a total of 2.2 miles of bridges): a 0.56-mile bridge (Bridge A1) located between the Osceola Camp and the Lincoln Financial Radio Tower; a 0.45-mile (Bridge B1) located between the Lincoln Financial Radio Tower and Everglades Safari Park facility; a 0.51-mile bridge (Bridge C1) located between the Everglades Safari Park facility and Frog City; a 0.38-mile bridge (Bridge E1) located between Frog City and Gator Park; and a 0.26 ConSpan (ConSpan H1) located just west of Coopertown, at control structure S-355B. The bridges and ConSpan would create a conveyance opening through Tamiami Trail by removing the sections of the existing highway and embankment. Bridges would be constructed approximately 50 feet south of the existing roadway right-of-way (ROW) to maintain motor vehicle traffic during bridge construction. The remaining highway embankment (approximately 4.99 miles) would be reconstructed to raise the crown elevation to 13.13 feet.

Alternative 2a – 3.3 Miles of Bridges

The bridge configurations include: (1) a 0.56 mile bridge located between the Osceola Camp and the Lincoln Financial Radio Tower, (2) a 0.45 mile bridge located between the Lincoln Financial Radio Tower and Everglades Safari Park, (3) a 0.51 mile bridge located between Everglades Safari Park and the Airboat Association, (4) a 0.38 mile bridge located the Airboat Association and the Tiger Tail Camp, (5) a 0.26 mile ConSpan located between the Coopertown facility and the Salem Communications radio tower, (6) a 0.53 bridge located between the Salem Communications radio tower and the existing one-mile bridge and , (7) a 0.66 mile bridge located between the existing 1-mile bridge and the S-334 structure.

Alternative 2a would involve creating conveyance openings through Tamiami Trail by removing 3.3 miles of the existing highway and embankment. Bridges would be constructed approximately 50 feet south of the existing roadway ROW to maintain motor vehicle traffic during bridge construction. The remaining highway embankment would be reconstructed to raise the crown elevation to 13.13.

Alternative 4 – 1.0 Mile of Bridges

This alternative includes 2 bridges: A1 and B1 (for a total of 1.0 mile), as described for Alternative 1. The bridges would create a conveyance opening through Tamiami Trail by removing the sections of the existing highway and embankment. Bridges would be constructed approximately 50 feet south of the existing roadway ROW to maintain motor vehicle traffic during bridge construction. The remaining highway embankment (approximately 7.80 miles) would be reconstructed to raise the crown elevation to 13.13 feet.

Alternative 5 – 1.5 Miles of Bridges

Alternative 5 consists of 3 bridges; bridges A1, B1, and C1 (for a total of 1.5 miles) as described for Alternative 1. The bridges would create a conveyance opening through Tamiami Trail by removing the sections of the existing highway and embankment. Bridges would be constructed approximately 50 feet south of the existing roadway ROW to maintain motor vehicle traffic during bridge construction. The remaining highway embankment (approximately 6.57 miles) would be reconstructed to raise the crown elevation to 13.13 feet.

Alternative 6e – 5.5 Miles of Bridges

Alternative 6e is the maximum bridging option and consists of 5.5 miles of bridges and elevating the remaining roadway. The bridge configurations include: (1) a 2.60 mile bridge located between the Osceola Camp and the Airboat Association, (2) a 0.4 mile bridge located between the Airboat Association and the Tiger Tail Camp, (3) a 1.8 mile bridge located between the Tiger

Tail Camp and the existing one-mile bridge, and (4) a 0.7 mile bridge located between the existing 1-mile bridge and the S-334 structure. The bridges would create a conveyance opening through Tamiami Trail by removing the sections of the existing highway and embankment. The bridges would be constructed approximately 50 feet south of the existing roadway ROW to maintain motor vehicle traffic during bridge construction and avoid impacts to infrastructure north of the project area. The remaining highway embankment would be reconstructed to raise the crown elevation to 13.13 feet.

Down Ramps. Bridge down ramp (access ramp) options were also developed for the purpose of maintaining access to Everglades Safari and Coopertown for Alternative 6e. Four down ramp options were developed for Everglades Safari. Option 4 (Modified Parallel Down Ramp) was selected as the preferred option. Five down ramp options were developed for Coopertown. Option 5 (Parallel Down Ramp with Existing Frontage Road) was selected as the preferred option.

The bridge down ramp typical section includes two 12-foot travel lanes with 5-foot shoulders and outside barriers. Radii of 50 feet are provided between the access road and Tamiami Trail travel lanes. These connections provide access from the bridged areas to properties south of the existing Tamiami Trail roadway. The down ramps were considered as frontage road connections with the same design criteria as collector streets. The elevated portion of the down ramps will be girder bridges supported on pile bents. Varying span lengths will be used to support the ramps along curves.

Environmentally Preferred Alternative

In accordance with *Director's Order 12* (NPS, 2001), the NPS is required to identify the "environmentally preferred alternative" in all environmental documents, including an EIS. According to CEQ guidelines, the environmentally preferred alternative is the alternative that would promote the national environmental policy, as expressed in Section 101 of NEPA, to:

(1) Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;

(2) Assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings;

(3) Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;

(4) Preserve important historic, cultural and natural aspects of our national heritage; and maintain, wherever possible, an environment which supports diversity and variety of individual choices;

(5) Achieve a balance between population and resource use which would permit high standards of living and a wide sharing of life's amenities; and

(6) Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

A description of how each alternative would or would not achieve the requirements of sections 101 and 102(1) of the NEPA criteria is provided below and illustrated through a rating system in ***Table E-1***.

Criterion 1 — Everglades National Park is a unit of the national park system and as the trustee of this place the NPS would continue to fulfill its obligation to protect this area for future generations. The No-Action Alternative would only provide a limited environmental benefit while environmental degradation to wetlands and wildlife habitat would continue because of altered hydrology and limited ecological connectivity. Each of the action alternatives would create the conditions that would allow the enhancement the freshwater marshes within Northeast Shark River Slough and ENP and increased potential ecological connectivity; however, the anticipated incremental improvement to the environment of each alternative increases with increasing bridge lengths. Therefore, Alternative 6e (maximum bridging option) would do a better job at providing a long-term solution for the area and thus would provide the greatest level of protection for Park resources over time.

Criterion 2 — The No-Action Alternative would provide safe and culturally pleasing surroundings; however, because potential environmental benefits are limited to the one existing bridge, potential enhancement to environmental productivity and aesthetics are limited and environmental degradation would continue. All action alternatives would provide for the same level of public health and safety and culturally pleasing surroundings. Action alternatives 1, 4, and 5 would provide for incrementally greater environmental productivity and aesthetics based on their respective bridge openings. Alternatives 2a and 6e would provide maximum potential benefits to environmental productivity and aesthetics based on bridge length and potential amount of flows that can be restored to Northeast Shark River Slough and ENP.

Criterion 3 — The No-Action Alternative would only provide limited environmental benefits, while environmental degradation to wetlands and wildlife habitat would continue because of altered hydrology and limited ecological connectivity. The action alternatives would provide for conditions that would lead to enhanced wetland values and functions and increased ecological connectivity with incremental benefits incurred based on bridge length. All action alternatives would result in permanent impacts to wetlands, soils, and habitats of special status species. Alternatives 2a and 6e would provide for the widest range of beneficial uses based on the potential for ecological enhancement provided by their bridge openings; however, Alternatives 2a and 6e also would incur the highest amount of impacts to wetlands and state and federally listed wading bird species. However, the adverse impacts from construction of the Tamiami Trail Modifications: Next Steps project is anticipated to be outweighed by the overall beneficial effects of implementation of the Tamiami Trail Modifications: Next Steps project in association with other Everglades restoration projects such and the CERP and MWD.

Criterion 4 — The No-Action Alternative allows for maximum preservation of historic and cultural resources and access to opportunities that support diversity and individual choice. All action alternatives are associated with minor to moderate levels of impacts to cultural and historic resources with the exception of Action Alternative 6e, which would have a major cultural resource impact on the Coopertown property. The action alternatives also include the same level of recreational access and opportunities that lead to supporting diversity and individual choice.

Criterion 5 —The No-Action Alternative would offer only limited availability of resource use and enjoyment of amenities as degradation of the resource would continue into the future. The action alternatives would allow for enhanced access and enjoyment of resource amenities with incremental enhancements based on bridge lengths. Alternative 6e offers the maximum ability for access and enjoyment of resource amenities since the bridge length provides maximum increased access for recreation (i.e. boating) and maximizes restoration potential of downstream wetlands.

Criterion 6 — The No-Action Alternative provides for some enhancement of renewable resources, while resulting in the lowest use of depletable resources (fuel) of all alternatives. Each of the action alternatives would result in enhancing the quality of renewable resources through management in the project area. According to the carbon footprint analysis (an analysis of greenhouse gas emissions resulting from the use and combustion of fuel, a non-renewable resource, used for the project) conducted for the project, Alternatives 1, 4, and 5 would result in the lowest level of use of depletable resources. Alternatives 2a and 6e consume the highest amount of fuel and would result in the lowest amount of recycling of depletable resources.

Table E-1 – Environmentally Preferred Alternative Analysis

Criterion	No-Action	1	2a	4	5	6e
1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.	2	3	4	3	3	5
2. Ensure safe, healthful, productive, and aesthetically and culturally pleasing surroundings for all Americans.	2	3	5	3	3	5
3. Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.	2	3	4	3	3	4
4. Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and a variety of individual choices.	5	4	4	4	4	3
5. Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life’s amenities.	2	3	4	3	3	5
6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.	3	4	3	4	4	3
Total Points*	**16**	**20**	**24**	**20**	**20**	**25**

* Five points were given to the alternative if it fully meets the criteria; four points if it meets nearly all of the elements of the criteria; three points if it meets more than one element of the criteria; two points if it meets only one element of the criteria; and one point if the alternative does not meet the criteria.

Based on the analysis above, the environmentally preferred alternative for the Tamiami Trail Modifications: Next Steps project is Alternative 6e. According to the ratings included in ***Table E-1,*** this alternative would surpass the other alternatives in realizing the full range of national environmental policy goals in Section 101 of NEPA. In particular, Alternative 6e best responds to criteria 1, 2, and 5 by providing the greatest level of safety, environmental protection/enhancement, and access to and enjoyment of the resource while minimizing environmental and cultural resource impacts to the greatest extent possible.

NPS Preferred Alternative

On November 4, 2009, the NPS conducted a Value Analysis (VA) and CBA workshop for the purpose of choosing a project alternative to bring forward as the recommended alternative. Workshop participants consisting of NPS staff and cooperating state and federal agency participants reviewed performance measures and project alternatives recommended during previous scoping meetings to choose the alternative that best meets the project purpose and needs.

The CBA team determined that of the performance measure factors that were most closely associated with the purpose and objectives of the project, the advantages of the “Sheet Flow”’ Factor were more important than the advantages of the other factors. Also, the team agreed that the most important or "Paramount Advantage" was represented by the most equitable distribution of overland flow over the 10.7-mile corridor length based on the topographic relief and location of proposed bridges in each alternative. Other important advantages were determined to be conditions in which 1) the greatest ecological connectivity was present, 2) alternatives which reconnected the greatest number of sloughs to restore the ridge-and-slough landscape, and 3) conditions which would pass water from north to south at a velocity closest to natural marsh conditions [0.05 cubic feet per second (cfs)].

Alternative 6e most closely meets the project objectives and the NPS mission by having the highest total importance value after summing the importance scores for each of the eight factors for each alternative. While Alternative 6e has the highest benefit, this alternative also has the highest cost. After quantifying the importance (i.e., benefits) for all alternatives using the CBA method, the alternatives were further evaluated using the cost-to-importance analysis prescribed by the CBA based on the importance scores and the total project costs.

When the total project cost is plotted against the importance scores for all alternatives, the results produce a somewhat linear relationship between the variables, indicative of similar benefit-to-cost ratios; however, an inflection point for Alternative 2a indicates this alternative may provide the best cost-to-benefit value. Since it was unclear whether Alternative 2a was a true best value, or simply an artifact of the CBA scoring methodology, NPS requested that the USACE apply the cost effectiveness analysis technique commonly used in its project assessments. These results are depicted in ***Table E-2*** and resulted in all alternatives being characterized as cost effective, but Alternative 6e was determined to be a better value (most efficient) when compared to the other alternatives, including Alternative 2a. Therefore, the NPS CBA Importance Analysis, coupled with the USACE cost effectiveness analysis, resulted in the decision to identify Alternative 6e as the preferred alternative.

Table E-2 – Results of Cost Effectiveness Analysis performed by USACE

Alternative	Total Cost (M$)	Importance Score	Lift over No-Action	Cost per lift (M$)	Cost Effective
No-Action	$0	70	N/A	N/A	N/A
Alternative 4 – 1.0 mile	$135.5	121	51	$2.66	Yes
Alternative 5 – 1.5 miles	$152.9	168	98	$1.56	Yes
Alternative 1 – 2.2 miles	$178.7	207	137	$1.30	Yes
Alternative 2a – 3.3 miles	$199.2	281	211	$0.94	Yes
Alternative 6e – 5.5 miles	**$310.0**	**402**	**332**	**$0.93**	**Most Efficient**[7]

Alternative 6e, in combination with the 1.0-mile bridge to be constructed under the 2008 LRR/EA plan, would restore a total of 6.5 miles of potential ecological connectivity between ENP and marshes to the north, reconnecting 10 sloughs that have been severed since 1928, and restoring marsh flow patterns across much of Northeast Shark River Slough. The increased connectivity results from the construction of the new bridges coupled with the removal of the existing Tamiami Trail roadway corresponding to the bridge locations. The greater expanse of bridging allows for improved distribution and timing of water flows at velocities of 0.08 feet per

[7] These results indicated that Alternative 6e had the best value for the environmental benefits provided in relation to costs. Alternative 6e was the only alternative exhibiting most efficient cost performance when compared to the other alternatives examined in the study.

second (fps) similar to historical conditions (0.05 fps). The removal of 5.5 miles of roadway would also reduce wildlife mortality and potentially reconnect historic ridge and slough landscape, improving breeding and foraging conditions for some wildlife species. Alternative 6e would provide the conveyance capacity to meet the original MWD Project target water flow of 4,000 cfs and also accommodate future projects, including those of the CERP and recent State of Florida restoration initiatives. Importantly, the increased bridging of Alternative 6e would allow stages in the L-29 Canal to be raised to allow for essentially unconstrained flows between WCA-3 and Northeast Shark River Slough, based on a DHW elevation of 9.7 feet in the L-29 Canal. Hydrological analysis conducted for the 2005 RGRR indicated that substantial bridging, as in Alternative 6e, was needed to provide increased conveyance to Northeast Shark River Slough without adversely impacting ecologically and culturally important tree islands in WCA-3B.

Alternative 6e would result in more impacts to cultural resources and wetland impacts than other alternatives considered. In order to maintain traffic flow during bridge and road construction and avoid impacts to state lands north of the existing highway, Alternative 6e would be constructed south of the existing highway in ENP. The construction easement for the 5.5 miles of bridges extends 50 linear feet (LF) south of the existing highway ROW, while the road-raising easement extends 30 LF south. The total wetland impact area including temporary and permanent impacts would be approximately 89.2 acres (49.2 acres of permanent wetland impacts and 40.0 acres of temporary wetland impacts) and 41.9 acres of existing roadway would be permanently removed and allowed to restore naturally over time; however, the long-term benefits of the improved flow patterns and ecological connectivity are anticipated to outweigh these impacts. Adverse effects to nesting wading birds in the project area including the federal and/or listed state listed wood stork, little blue heron, tricolored heron, snowy egret, and white ibis are anticipated with the implementation of Alternative 6e. However, the long-term benefits of improved hydroperiods and hydropatterns and potential ecological connectivity associated with the Tamiami Trail Modifications: Next Steps project in association with other Everglades restoration projects such as the CERP and the MWD projects are anticipated to outweigh Tamiami Trail Modifications: Next Steps construction-related impacts. It was also determined that Alternative 6e would adversely impact two cultural resources—the existing Tamiami Trail roadway and the Coopertown airboat facility—however, these impacts could be adequately mitigated and were justified based on the substantial environmental benefits of Alternative 6e compared to the other alternatives.

Long-term Regional Restoration Benefits

As stated earlier, it is anticipated that the benefits of the implementation of the Tamiami Trail Modifications: Next Steps project will improve the ecological and hydrological conditions within the immediate vicinity of the project area. However, the NPS also maintains that the benefits of the project will be more expansive, allowing improvements on a regional scale when implemented in conjunction with other planned restoration projects and their associated operational plans. The interdependency of these future restoration projects and the Tamiami Trail Modifications: Next Steps project are detailed in Section 4.1.3 (Cumulative Impacts Analysis) of this document. Three successive phases for restoration of the central and southern Everglades is proposed. Each phase consists of projects that will address storage, conveyance, water quality treatment, seepage management, and operations; this approach recognizes that restoration must fully integrate all these functions. The projects associated with the three phases are summarized in ***Table 4-2*** and graphically in ***Figure 4-3***.

The first phase is associated with the completion of the projects either currently under construction, such as the MWD and C-111 projects, or projects that will soon be initiated. The intent of this first phase is to provide some modest level of restoration benefits but also provide scientific insights into the response of the ecosystem to better implement the features and operations associated with the subsequent phases. In this way, the projects will benefit from a more adaptive management approach to final design of the structural features implemented but more importantly allow for a greater degree of flexibility in the operations of the water management system to benefit the restoration of the ecosystem.

The second phase of the proposed restoration sequencing will allow for more significant regional restoration benefits since the projects associated with this phase include the ability to convey, treat, and store additional water while also maintaining the required levels of flood protection through appropriate levels of seepage management. Implicit to providing the levels of regional benefits associated with Phase 2 is the need to have sufficient infrastructure in place to allow for the restoration to occur. Prior to providing any increased conveyance in Phase 2, the projects needed to treat this water as well as the modifications to the existing barriers to restoration flow, for example, must be completed first. For this reason, the NPS recommends the completion of the Tamiami Trail Modifications: Next Steps and ENP Seepage Management projects in advance or concurrent with the implementation of the Miami Canal portion of the WCA3 Decompartmentalization as well as the projects designed to provide additional conveyance to the central and southern Everglades. Further, it is anticipated that the operations of the Phase 1 will provide critical information needed in the development of the new operational plan of Phase 2. The plan should be based on an evaluation of hydrologic and ecologic data from the existing long-term ecosystem monitoring network and the use of an adaptive management approach to identification of the final Phase 2 operational plan.

The third and final proposed phase of restoration will not be attained until completion of the structural modifications and operational plan implemented in Phase 3. The Phase 3 features include many of the storage, conveyance, water quality, and seepage management components in the CERP. However, the NPS also recommends that the implementation of these CERP components be optimized through consideration of improvements to the functions of the plan components such as the River of Grass initiative in the EAA in order to make more clean water available to the restoration of the central and southern Everglades. The regional restoration benefits of this adaptive management approach would likely produce a more economically sound plan for restoration with enhanced benefits to the ecosystem.

Summary of the Environmental Consequences

<u>No-Action Alternative</u>

Under the No-Action Alternative there would be no additional direct or indirect short- or long-term impacts on geologic resources/soils; water resources (water quality, hydrology, wetlands, and floodplains); wildlife and vegetation; land use; special status species; wilderness/unique ecosystems; cultural resources; visitor use and experience; park management and operations; noise/soundscapes; socioeconomics; transportation; or hazardous, toxic and radioactive waste (HTRW) other than those already realized from construction of the 2008 LRR/EA preferred alternative (1-mile eastern bridge).

The geology, topography, and soils, and water quality within the vicinity of the project area would remain unchanged. The current unnatural altered hydrologic conditions within the vicinity of the project area would continue to have a negative impact on wetland values and functions; floodplain functions; wildlife habitat and vegetation; special status species; and the wilderness character and experience within the WCAs, ENP, and Northeast Shark River Slough. Additionally, movement of wildlife between Northeast Shark River Slough and the WCAs would continue to be hindered by the presence of the Tamiami Trail. Visitor use activities would be expected to continue as currently practiced within the study area and no impacts would be expected to the number of visitors who currently patron ENP. Activities associated with park management and operations (e.g., education and interpretation, maintenance, and enforcement) would be expected to continue as currently practiced within ENP. Commercial activities would also be expected to continue as currently practiced within the study area. Finally, transportation/traffic would be expected to remain unchanged, no impacts would occur to the Park's soundscapes, no changes in land use would occur, and no impacts would be caused by hazardous, toxic, or radioactive wastes. Consequently, there would not be impairment to any of the Park's natural or cultural resources as a result of the No-Action Alternative.

Action Alternatives (Alternatives 1 – 6e)

Since all of the action alternatives include proposed bridging, one of the key differences in impacts expected between the various action alternatives would be associated with bridge length. For most of the impact topics analyzed in this EIS (except where noted), the action alternative with the shortest length of proposed bridging (Alternative 4) would experience the least amount and shortest duration of construction-related adverse impacts as well as the least amount of beneficial long-term effects and vice versa for the alternative with the longest length of proposed bridging (Alternative 6e).

For any of the proposed action alternatives, effects to soils would be directly related to the short-term and long-term effects caused by construction, operations, and maintenance associated with the alternatives. It is anticipated that the soil impacts resulting from temporary construction-related activities would be adverse, local, minor, and short-term. Long-term impacts resulting from implementing any of the action alternatives are anticipated to be adverse, local, and minor.

Any of the action alternatives would have short-term, adverse, minor localized impacts on hydrology associated with project construction and long-term, beneficial effects on hydrology based on the capacity to convey flows and relative low velocities.

Water quality effects would be directly related to the short-term and long-term effects caused by construction, and maintenance associated with any of the action alternatives. It is anticipated that the water quality impacts resulting from construction-related activities would be adverse, local, minor, and short-term. No long-term impacts to water quality are expected to result from construction of any of the action alternatives.

Implementation of any of the action alternatives would result in moderate, adverse, short-term, localized impacts to wetlands associated with construction of temporary work areas. Additionally, implementation of the action alternatives would result in moderate, adverse, long-term, localized impacts to wetlands associated with permanent dredging and filling of wetlands in conjunction with raising the crown of Tamiami Trail and construction of bridges. A future water operational plan will be developed in association with the proposed project's infrastructure[8]; however, since it has not been completed, full project benefits cannot yet be realized. Full realization of project benefits is dependent upon an operational plan that utilizes the structural capacity of the preferred alternative. Potential benefits that would occur once an operational plan is defined and executed include enhancement of degraded wetland habitats within the Northeast Shark River Slough system. It is highly likely that implementation of any of the action alternatives in conjunction with the operational plan would be self-mitigating, and that permanent and temporary wetland impacts associated with the construction of the proposed project would be offset by the enhancement to wetlands. However, long-term effects to wetlands

[8] Additional explanation of the development of a water operations plan can be found in the cumulative impacts analysis discussion in Section 4.1.3.

resulting from operations remain unknown since an operational plan has not yet been developed. Since there is uncertainty as to the level of wetland improvements that would be achieved, if required, mitigation would be conducted at the Hole-in-Donut Mitigation Site at ENP.

Any of the action alternatives would have a short-term, adverse, moderate, localized effect on floodplain values and functions associated with project construction including diminished ability of the floodplain to convey storm and flood events due to temporary fill and rerouting of water flow. However, long-term effects to floodplain functions and values would be beneficial based on the additional capacity the floodplain would have to convey storm and flood events.

Short-term, minor to moderate, adverse, localized impacts to wildlife and vegetation/habitats would result from the construction of any of the action alternatives. Long-term beneficial effects to wildlife and habitat would result from the increased ecological connectivity provided through the implementation of any of the action alternatives in combination with other reasonably foreseeable CERP projects. Consequently, there would be no impairment of wildlife and habitat as a result of the action alternatives.

Implementation of any of the action alternatives would have a minor, short-term, localized, adverse impact associated with project construction and a long-term, localized, adverse, minor impact on land use in association with the conversion of existing land uses to transportation corridor.

Impacts to special status species from construction of Alternative 6e would range from short- to long-term and be adverse, localized, and range in intensity from minor to moderate, dependent upon the species. Alternative 6e may affect but is not likely to adversely affect the Everglades mink, West Indian manatee, Florida panther, American alligator, eastern indigo snake, Cape Sable seaside sparrow, limpkin, marsh wren, reddish egret, American kestrel, Florida sandhill crane, white-crowned pigeon, roseate spoonbill, and the Everglade snail kite. Construction of Alternative 6e may affect and is likely to adversely affect the wood stork due to loss of wading bird colony and foraging, roosting, and loafing habitat. Likewise, short- to long-term, adverse, moderate effects from construction activities are anticipated to state-listed wading birds nesting in the project area including the little blue heron, snowy egret, tricolored heron, and white ibis. Because a water operations plan has not been developed in association with the proposed project's infrastructure, benefits cannot yet be fully realized[9]. Full realization of project benefits is dependent upon an operational plan that utilizes the structural capacity of the preferred alternative. Potential benefits that would occur once an operational plan is defined and executed include enhancement of degraded habitats within the Northeast Shark River Slough system, benefiting multiple special status species and their associated habitats. It is highly likely that implementation of any of the action alternatives in conjunction with the operational plan is self-mitigating, and that permanent and temporary impacts to special status species and their habitats associated with the construction of the proposed project would be offset by the enhancement to special status species' habitats.

Minor, short-term, localized, adverse impacts would occur from the implementation of any of the action alternatives as a result of noise, vibrations, and dust generated during construction activities. Minor, long-term, localized, adverse effects to wilderness would also occur from the implementation of any of the action alternatives as a result of direct footprint impacts to wilderness. Beneficial effects would result from improved connectivity and potential for improved hydrologic flow in the project area and ENP.

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9 Additional explanation of the development of a water operations plan can be found in the cumulative impacts analysis discussion in Section 4.1.3.

The proposed project would have minor, adverse, short-term effects on cultural resources associated with use of temporary construction easements (TCEs). The project would additionally have minor to major adverse long-term effects on cultural resources associated with the construction of the project.

Short-term impacts caused by construction of any of the bridging alternatives would cause visitors utilizing the section of Tamiami Trail within the project corridor to experience minor to moderate inconveniences such as lane closures; reduced speed limits; reduced accessibility to visitor activities; construction-related noise and vibration; reduced quality of wildlife-related recreational activities caused by construction-related noise and vibration impacts that cause wildlife to flee from construction areas; construction-related dust and fumes; and the visual presence of construction vehicles and heavy equipment in construction zones. Visitors would also experience some long-term beneficial effects (i.e., increased wildlife, increased aesthetic qualities, etc.) from the implementation of any of the action alternatives. However, most aspects of visitor use and experience would experience no change or a negligible change due to the implementation of any of the action alternatives proposed for the project. Therefore, minor to moderate, short-term, localized, adverse impacts and long-term beneficial effects to visitor use and experience would result from the implementation of any of the action alternatives.

Activities associated with park management and operations (e.g., education and interpretation, maintenance, and enforcement) would experience no long-term impact due to the implementation of any of the action alternatives. A minor, localized, adverse impact on park management might occur in the short-term due to oversight of construction and monitoring activities that would be required as a result of implementation of any of the action alternatives[10].

By following the NPS management practices and FDOT standards, no unacceptable impacts to noise sensitive sites in the project study area are expected to occur as a result of construction of this project. Likewise, considering the existing conditions and the long-established presence of traffic along the Tamiami Trail, the negligible increase in highway noise predicted to occur with the action alternatives is not expected cause operation and maintenance of this project to result in impairment or unacceptable impacts to nearby noise sensitive sites or the park's soundscape. Therefore it is concluded that the proposed project would cause short-term, moderate, adverse, localized, effects to the Park's soundscape associated with project construction, however, there would be no long-term effects associated with the project's operation.

Implementation of any of the action alternatives would have some positive effect on employment, gross output, and the gross regional product of Miami-Dade County; and to a lesser extent, the State of Florida, and any social impacts would be minimal. Therefore, the long-term impacts from the selection of any of the action alternatives would be beneficial.

Transportation impacts associated with any of the action alternatives would be adverse, local, minor, and short-term and primarily associated with traffic delays related to construction activities. Mitigation of these effects would be though implementation of a MOT plan. No long-term impacts associated with increases in traffic levels are expected.

The Implementation of action alternatives 1, 2, 5, or 6e may lead to a long-term, adverse, negligible to moderate, localized impact to the environment due to potential contamination by

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[10] Please note that the NPS is only responsible for the content of the information contained in this EIS. All future actions associated with the implementation of the Tamiami Trail Modifications: Next Steps project subsequent to the release of this document will be determined at a later date. However, there is a potential that NPS personnel would need to conduct oversight activities for the project regardless of what agency is implementing the project since construction would be occurring on Park lands.

hazardous or toxic waste. The implementation of Action Alternative 4 may lead to a long-term, adverse, negligible, localized effect to the environment due to potential contamination by hazardous or toxic waste.

Consequently, there would not be impairment to any of the Park's natural or cultural resources as a result of implementation of any of the proposed action alternatives.

GUIDE TO THIS ENVIRONMENTAL IMPACT STATEMENT

The contents of this document are as follows:

Chapter 1: Purpose and Need for Action – The first chapter includes a discussion of the purpose and significance of the NPS and ENP, the proposed action's purpose and need, the relationship to laws and other plans, the tribal and public involvement in the process, the impact topics that were selected for detailed analysis, and the impact topics that were dismissed from further analysis.

Chapter 2: Alternatives – This chapter describes the Action Alternatives and the No-Action Alternative. It also discusses alternatives considered but dismissed.

Chapter 3: Affected Environment – This chapter describes existing environmental conditions in the areas potentially affected by the alternatives. This section addresses the following impact topics: geologic resources/soils, water resources (water quality, hydrology, wetlands, and floodplains), wildlife and vegetation, land use, special status species, wilderness/unique ecosystems, cultural resources, visitor use and experience, park management and operations, noise/soundscapes, socioeconomics, transportation, and hazardous/toxic/radioactive waste.

Chapter 4: Environmental Consequences – This chapter presents the methods and analysis of the potential impacts for each topic under each alternative and the No-Action Alternative.

Chapter 5: Environmental Compliance for the Preferred Alternative – This chapter presents the cumulative impacts; unavoidable adverse environmental impacts; irreversible and irretrievable commitment of resources; relationship between local short-term uses of the human environment and the maintenance and enhancement of long-term productivity; effects on energy requirements and conservation potential; compatibility with federal, state, and local objectives; conflicts and controversy; uncertain, unique, or unknown risks; precedent and principle for future actions; environmental commitments; and environmental compliance.

Chapter 6: Consultation and Coordination – This chapter summarizes the consultations undertaken in the preparation and review of this document, including the scoping process, public involvement, and agency and tribal coordination. It also includes a list of document preparers who have contributed to this EIS.

Chapter 7: References – This chapter lists the references cited in this document.

Chapter 8: Glossary – This chapter defines the technical terms, acronyms, and abbreviations used in this document.

Appendices – The appendices are as follows:

- Appendix A – Engineering Report
- Appendix B – Value Analysis / Choosing By Advantages Report
- Appendix C – HEC-RAS Modeling Analysis
- Appendix D – Wetlands Statement of Findings
- Appendix E – Floodplains Statement of Findings
- Appendix F – Cultural Resources Report
- Appendix G – Socioeconomic Report
- Appendix H – Real Estate Report
- Appendix I – Phase I Hazardous, Toxic, and Radioactive Waste Assessment
- Appendix J – Consultation and Coordination Letters
- Appendix K – Agency and Tribal DEIS Comments and NPS Responses

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ACRONYMS AND ABBREVIATIONS

AADT .... Average Annual Daily Traffic
AAoF .... Airboat Association of Florida
ABAAS .... Architectural Barriers Act Accessibility Standards
AIRFA .... American Indian Religious Freedom Act
APE .... Area of Potential Effect
ASR .... Aquifer Storage and Recovery
BEBR .... Bureau of Economic and Business Research
BMPs .... Best Management Practices
BO .... Biological Opinion
C&SF .... Central and Southern Florida Project
CAA .... Clean Air Act
CBA .... Choosing By Advantages
CCATF .... Climate Change Advisory Task Force
CEQ .... Council on Environmental Quality
CERCLA .... Comprehensive Environmental Response Compensation and Liability Act
CERP .... Comprehensive Everglades Restoration Plan
CFA .... Core Foraging Area
CFR .... Code of Federal Regulations
cfs .... Cubic Feet per Second
cm .... Centimeter
COP .... Combined Operational Plan
CWE .... Control Water Elevation
CZMA .... Coastal Zone Management Act
CZMP .... Coastal Zone Management Program
dB .... Decibels
dBA .... A-Weighted Decibels
DECOMP .... WCA-3 Decompartmentalization and Sheetflow Enhancement
DERM .... Miami-Dade County Environmental Resource Management
DHW .... Design High Water
DO .... Dissolved Oxygen
DOI .... U.S. Department of the Interior
DOS .... Department of State
DPM .... Decompartmentalization and Sheetflow Enhancement Physical Model
E&D .... Engineering and Design

EA .... Environmental Assessment
EAA .... Everglades Agricultural Area
EEWS .... East Everglades Wilderness Study
EFA .... Everglades Forever Act
EFH .... Essential Fish Habitat
EIS .... Environmental Impact Statement
ENP .... Everglades National Park
EO .... Executive Order
EPA .... Everglades Protection Area
ERA .... Economics Research Associates
ERTP .... Everglades Restoration Transition Plan
ESA .... Endangered Species Act
ESAL .... Equivalent Single Axle Load
FCC .... Federal Communications Commission
FCMP .... Florida Coastal Management Program
FDACS .... Florida Department of Agriculture and Consumer Services
FDEP .... Florida Department of Environmental Protection
FDER .... Florida Department of Environmental Resources
FDOT .... Florida Department of Transportation
FEIS .... Final Environmental Impact Statement
FFA .... Flood Frequency Analysis
FFWCC .... Florida Fish and Wildlife Conservation Commission
FHWA .... Federal Highway Administration
FLUCFCS .... Florida Land Use, Cover, and Forms Classification System
FONSI .... Finding of No Significant Impact
FP&L .... Florida Power and Light
fps .... Feet Per Second
FWCA .... Fish and Wildlife Coordination Act
GCTL .... Groundwater Cleanup Target Level
GDM .... General Design Memorandum
GIS .... Geographic Information Systems
GMP .... General Management Plan
GRR .... General Reevaluation Report
HAED .... High Accuracy Elevation Data
HEC-RAS .... Hydrologic Engineering Center - River Analysis System

HOOH .... Home Office Overhead
HSWA .... Hazardous and Solid Waste Amendments
HTRW .... Hazardous, Toxic, and Radioactive Waste
IMPLAN .... Impact Analysis for Planning
I-O .... Input-Output
IOP .... Interim Operation Plan
IPCC .... Intergovernmental Panel on Climate Change
ISOP .... Interim Structural and Operation Plan
JOOH .... Job Office Overhead
LAeq1h .... one-hour equivalent noise level
Ldn .... day-night average noise level
LED .... Light-Emitting Diode
LEED .... Leadership in Energy and Environmental Design
Leq .... energy equivalent noise level
LF .... Linear Feet
LNWR .... Loxahatchee National Wildlife Refuge
LO .... Lack of Objections
LOS .... Level of Service
LRR .... Limited Reevaluation Report
LRTP .... Long Range Transportation Plan
LTP .... Long-Term Plan for Achieving Water Quality Goals
LUAC .... Land Use Activity Category
LUST .... Leaking Underground Storage Tank
MOT .... Maintenance of Traffic
MPRSA .... Marine Protection, Research, and Sanctuary Act
Mr .... Resilient Modulus
MTBE .... Methyl Tertiary Butyl Ether
MTCE .... Metric Tons of Carbon Equivalent
MWD .... Modified Water Deliveries
NAAC .... Noise Abatement Approach Criteria
NAAQS .... National Ambient Air Quality Standards
NAC .... Noise Abatement Criteria
NAGPRA .... Native American Graves Protection and Repatriation Act
NEPA .... National Environmental Policy Act
NGVD .... National Geodetic Vertical Datum

NHPA .... National Historic Preservation Act
NMFS .... National Marine Fisheries Service
NOA .... Notice of Availability
NOAA .... National Oceanic and Atmospheric Administration
NOI .... Notice of Intent
NPDES .... National Pollution Discharge Elimination System
NPS .... National Park Service
NRHP .... National Register of Historic Places
NSM .... Natural Systems Model
NTU .... Nephelometric Turbidity Units
OFW .... Outstanding Florida Water
OM% .... Organic Matter Percentage
OSE .... Other Social Effects
PAHs .... Polycyclic Aromatic Hydrocarbons
Park .... Everglades National Park
PCA .... Panther Consultation Area
PD&E .... Project Development and Environment
PEPC .... NPS Planning, Environment, and Public Comment website
PL .... Public Law
POR .... Period of Record
PPA .... Panther Preservation Area
ppb .... Parts per Billion
psi .... Pounds per Square Inch
PSRPA .... Park Service Resource Protection Act
Q&A .... Question and Answer
RCRA .... Resource Conservation and Recovery Act
REC .... Recognized Environmental Concern
RED .... Regional Economic Development
RGRR .... Revised General Reevaluation Report
RMA .... Resource Management Associates Model
ROD .... Record of Decision
ROG .... River of Grass
ROW .... Right-of-Way
S&A .... Supervision and Administration
SARA .... Superfund Amendments and Reauthorization Act

SAS .... Surficial Aquifer System
SCORP .... State Comprehensive Outdoor Recreation Plan
SCTLs .... Soil Cleanup Target Levels
SEIS .... Supplemental Environmental Impact Statement
SFWMD .... South Florida Water Management District
SFWMM .... South Florida Water Management Model
SHPO .... State Historic Preservation Officer
SHS .... State Highway System
SLOPES .... Standard Local Operating Procedures for Endangered Species
SMA .... 8.5 Square Mile Area
SN .... Structural Number
SOF .... Statement of Findings
SpC .... Specific Conductivity
SRF .... Systematic Reconnaissance Flights
SSAC .... Site Specific Alternative Criterion
STA .... Stormwater Treatment Area
TCE .... Temporary Construction Easement
TNM .... Traffic Noise Model
TP .... Total Phosphorous
TSS .... Total Suspended Solids
UF .... University of Florida
UMAM .... Uniform Mitigation Assessment Method
URS .... URS Corporation
USACE .... U.S. Army Corps of Engineers
USC .... United States Code
USEPA .... U.S. Environmental Protection Agency
USFWS .... U.S. Fish and Wildlife Service
USGS .... U.S. Geological Survey
VA .... Value Analysis
VOAs .... Volatile Organic Aromatics
VOCs .... Volatile Organic Compounds
vpd .... vehicles per day
WCA .... Water Conservation Area
WRDA .... Water Resources Development Act

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EVERGLADES NATIONAL PARK
TAMIAMI TRAIL MODIFICATIONS: NEXT STEPS
FINAL ENVIRONMENTAL IMPACT STATEMENT

CHAPTER 1
PURPOSE AND NEED FOR ACTION

CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.1 Introduction

This EIS has been prepared for the Tamiami Trail Modifications: Next Steps project by ENP under the jurisdiction of the NPS. This project arose as part of the 2009 Omnibus Appropriations Act passed by Congress on March 10, 2009. In this act, Congress directed the NPS "to immediately evaluate the feasibility of additional bridge length, beyond that to be constructed pursuant to the MWD Project (16 U.S.C. SS 410r-S), including a continuous bridge, or additional bridges or some combination thereof, for the Tamiami Trail (U.S. Highway 41) to restore more natural water flow to Everglades National Park and Florida Bay and for the purpose of restoring habitat within the Park and the ecological connectivity between the Park and the Water Conservation Areas."[11]

This EIS has been prepared in accordance with NEPA and implementing regulations, 40 CFR 1500-1508, and NPS *Director's Order 12* and associated handbook, *Conservation Planning, Environmental Impact Analysis, and Decision-making* (NPS, 2001).

1.2 Background

Everglades National Park is one of 392 units of the National Park System administered by the NPS DOI. Established in 1947, the Park's original boundaries contained 460,000 acres. Subsequent legislation increased its size to 1,509,000 acres, including most of Florida Bay. The most recent addition came in 1989 when Congress added 107,600 acres in the East Everglades area of the Park.

The Florida Everglades is one of the largest and most complex freshwater wetland ecosystems in the world. Hydroperiods and hydropatterns interacting with water quality, geology, and other ecological processes, determine the distribution and composition of the plant and animal communities of the Everglades. The southernmost end and receiving waters for the 18,000 square mile South Florida Everglades ecosystem is ENP. Virtually all waters delivered to the Park other than direct rainfall are provided by the Central and Southern Florida (C&SF) Project, which was authorized by the *Flood Control Act of 1948* [Public Law (PL) 858, 80th Congress] for flood control, water supply, prevention of salt water intrusion, preservation of fish and wildlife, recreation, and navigation. The C&SF Project divided the shallow and slow-flowing Everglades wetlands into compartments and installed pumps and gated structures to control flow from one segment to another. The USACE began building the C&SF Project in the 1950s. Construction was largely complete by 1962, although some construction continues to this day.

Construction of the 264-mile section of U.S. Highway 41/State Road 90 known as Tamiami Trail to connect Tampa and Miami began in 1915 and was completed in 1928 by the Florida State Road Department [known today as the Florida Department of Transportation (FDOT)]. The construction of this roadway created an impediment to natural water flows into the Everglades, slowing and blocking water flow south into the southern Everglades and ENP. Additional blockage of direct flows occurred with the 1962 construction of the L-28 and L-29 levees which enclosed WCA-3. The WCA-3 was then separated by the L-67A and L-67C levees into independent units, WCAs 3A and 3B, in an effort to reduce ground water seepage through the porous Biscayne aquifer. Enlargement of the L-29 Canal as part of the C&SF project also contributed to flow restriction. The cumulative result of construction of Tamiami Trail and the

[11] The 2009 Omnibus Appropriations Act only authorizes the NPS to conduct the study contained in this document. All future actions associated with the implementation of the Tamiami Trail Modifications: Next Steps project subsequent to the release of this document will be determined at a later date.

C&SF Project was significant reduction in the volume, timing, and duration of water flow to Northeast Shark River Slough.

Until Congress enacted the 1989 Everglades Protection and Expansion Act, ENP was smaller than at present. The large S-12 gate structures on the L-29 Levee at the south end of WCA-3A could deliver water volumes to ENP itself, but most of Northeast Shark River Slough lay in the undeveloped lands between ENP and the developed areas near the east coast. This area received water only from direct rainfall and through culvert sets constructed under the roadway. An extension of the L-67 Levee, running along ENP's eastern boundary, restricted flow into Northeast Shark River Slough from the west. Reduced inflows from the north and west resulting from the compartmentalization of the system led to reduction of flooding depths and durations and loss of long-hydroperiod habitats inside ENP. Ridge and slough habitat, the unique Everglades wetland complex immortalized as the "river of grass" (ROG) by Marjory Stoneman Douglas, was among the most adversely impacted by altered hydroperiods and hydropatterns.

In response to conservationists' concerns over loss of Everglades' values during the 1980s, Congress passed PL 98-191 in 1983, providing for experimental supplemental deliveries of water to ENP. After a series of studies authorized under this act, it became evident that it would be difficult to increase water deliveries to ENP lands without adversely affecting adjacent agricultural lands. In 1989, Congress passed the Everglades National Park Protection and Expansion Act (PL 101-229). This act authorized acquisition of 107,600 acres of privately owned and state lands located south of Tamiami Trail between the L-67 Extension and the L-31 Canal. This area was a major expansion of ENP lands that would eventually allow for their re-hydration; but in 1989, there were minimal structures available to convey water into these newly acquired ENP lands that had previously been kept relatively dry for agricultural and recreational use. Therefore, the act also directed the USACE to increase flows into ENP to the extent practicable.

The USACE prepared a General Design Memorandum (GDM) and EIS for MWD to ENP. The overall purpose of the MWD to ENP project is to restore natural hydrologic conditions in ENP, which were altered by the construction of roads, levees and canals. MWD is one of many foundation projects for CERP. The GDM/EIS was completed in 1992 and included five major components: (1) Flood mitigation for the 8.5 Square Mile Area (SMA), a residential area located just west of the L-31N Levee (the newly authorized eastern Park boundary) that would flood if additional water were discharged into the eastern Park extension; (2) Conveyance and seepage control features, designed to facilitate flow from WCA-3A to WCA-3B and from WCA-3B to the L-29 Canal adjacent to Tamiami Trail, and to limit seepage eastward from WCA-3B and ENP into developed areas of Miami-Dade County; (3) Modifications to Tamiami Trail to raise it in the vicinity of the S-334 structure; (4) Raising Tigertail and Osceola Indian Camps to levels above the expected flood levels; and (5) A new operational plan for the water control structures was recommended that would deliver 55 percent of total water volumes east of L-67 and 45 percent to the west, to better reflect historic flow paths.

The 1992 GDM/EIS noted that maximum rainy season flow volumes into ENP could reach 4,000 cfs and recommended structures to deliver these flows into the L-29 Canal just north of Tamiami Trail. It did not anticipate that the existing culverts would be inadequate to deliver this volume, and recommended raising the Tamiami Trail only to accommodate the S-334 and S-356 pump structures (at the far eastern end of the road segment).

Since 1992, the NPS has acquired nearly all the additional authorized lands east of the old ENP boundary. A flood mitigation plan for the 8.5 SMA, including relocation of the S-357 pump station, was approved in 2000 and reaffirmed in 2003. Tigertail Camp has been raised above the flood elevation. Everglades National Park is in dialog with the Osceola group in preparation for raising this camp as well. The S-356 pump station was built as a temporary pump station at the location indicated in the GDM. The S-355A and S-355B spillways, allowing water flow from the south end of WCA-3B into L-29 Canal, have been built. However, the last remaining conveyance and seepage features, the S-349 spillways and S-345 flow structures that would allow flow through the L-67 Levees between WCAs 3A and 3B, remain to be built.

The 2000 Water Resources Development Act (WRDA) authorized CERP. The restudy of the C&SF Project that led to CERP indicated that further work on reducing barriers to flow in WCA-3 was justified. However, the WRDA also required that the MWD plan be complete before CERP modifications could begin construction.

By the late 1990s it was known that in contrast to the 1992 GDM/EIS assumption, the existing culvert sets along Tamiami Trail were inadequate to pass MWD design flows and that operating with no additional conveyance structures would ultimately damage the roadbed. The GDM/EIS merely recommended changing the flow distribution across Tamiami Trail such that 55 percent of total flows would be delivered east of the L-67 Levee and 45 percent delivered to the west. However, subsequent studies showed that, while the design volumes of water could indeed be passed through Tamiami Trail into Northeast Shark River Slough, this flow rate through the culvert sets would only occur with a high "head" on the north side of the culverts; that is, after water levels on the north side of the road increased enough to force water through. Under current operating conditions, such high levels would occur in the rainy season, except that deliveries are stopped to avoid exceeding a stage of 7.5 feet in L-29 Canal, the level considered safe by FDOT standards. Operational safeguards to prevent damage include closing the S-333 Structure according to stage readings on a gauge south of the Tamiami Trail to avoid high heads in the L-29 Canal. If high levels were to occur regularly or persist for longer periods they would make the road vulnerable to structural damage.

In 2003, a reevaluation of features along the 10.7-mile stretch of Tamiami Trail east of the L-67 Levee recommended a 3,000-foot bridge and a proposed real estate agreement to pay compensation for a flowage easement. The USACE published a GRR/SEIS in 2003, which recommended a 3,000-foot bridge and noted that the original GDM had probably underestimated the DHW stage. The 2003 study used a DHW elevation of 9.7 feet in the L-29 Canal. Although this report recommended acquiring a flowage easement over the un-bridged part of Tamiami Trail and compensation to FDOT for damages, no agreement could be reached with FDOT, and the GRR and SEIS were withdrawn without a signed Record of Decision (ROD).

In 2005, a RGRR and a second SEIS were prepared, which recommended construction of a three-mile, two-bridge alternative and reconstruction of the entire 10.7-mile stretch of Tamiami Trail to accommodate a 9.7-foot DHW elevation. In the 2005 RGRR/SEIS, the USACE used the Natural Systems Model (NSM) over a 36-year period of record (POR) to establish a stage frequency curve for Tamiami Trail. Stages were extrapolated from the curve for particular frequencies to determine the DHW and the peak stage for overtopping criteria. Using the 20-year frequency, the 24-hour stage or DHW for pavement design was 9.7 feet (NGVD 1929). After extensive public and agency coordination a ROD identifying the Selected Plan was signed on January 25, 2006. However, after a period of rapidly rising costs of fuel and raw materials, Congress in 2007 found that the updated cost of the 2005 recommended plan was unacceptable and the Congressional managers drafting the new WRDA (2007) directed the USACE to conduct a reevaluation study.

Under the direction of Congressional managers, a LRR and EA were prepared in 2008. The 2008 LRR/EA recommended features to convey the additional flows from the L-29 Canal, north of the Tamiami Trail, south to ENP. The 2008 LRR/EA recommended the following: (1)

Acquisition of the necessary real estate interests required for construction of the project from the Airboat Association of Florida, Florida Power and Light (FP&L), and FDOT; (2) Construction of a one-mile bridge and reinforcement of the remainder of the Tamiami Trail within the project area in order to counteract the project's higher water levels in the L-29 Canal. (Road reinforcement is part of the Tamiami Trail Modifications and would be paid for by the MWD project. FDOT would contribute $4.5 million to the road reinforcement as part of their normal maintenance program); and (3) Acquisition of real estate interests from FDOT by means of a relocation agreement within the project area to include a channel easement, a flowage easement, a temporary work area easement, and a right-of-entry for construction upon the FDOT lands in order to construct the project features. The Finding of No Significant Impact (FONSI) for the LRR/EA was signed in June 2008.

As part of the 2009 Omnibus Appropriations Act passed by Congress on March 10, 2009, Congress directed the NPS "to immediately evaluate the feasibility of additional bridge length, beyond that to be constructed pursuant to the MWD Project (16 U.S.C. SS 410r-S), including a continuous bridge, or additional bridges or some combination thereof, for the Tamiami Trail (U.S. Highway 41) to restore more natural water flow to Everglades National Park and Florida Bay and for the purpose of restoring habitat within the Park and the ecological connectivity between the Park and the Water Conservation Areas." [12]

Please see ***Figure 1-1***, below, for a timeline of the above referenced studies.

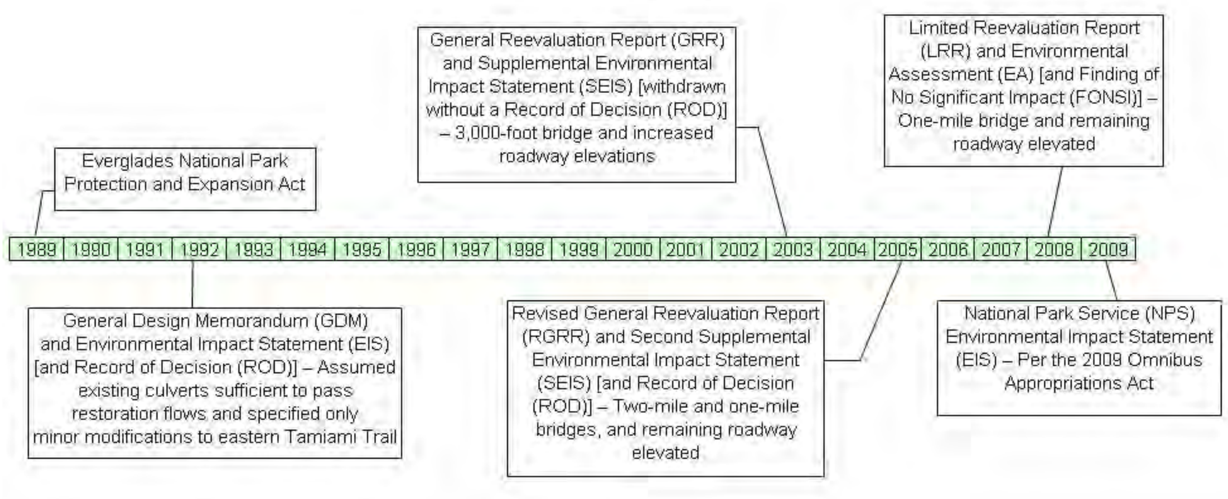

Figure 1-1 – Tamiami Trail Modifications Timeline

1.2.1 Project Site Location and Scope of the Analysis

The study area consists of a 10.7-mile stretch of the portion of U.S. Highway 41 known as the Tamiami Trail, a highway which connects Tampa to Miami. This 10.7-mile section of Tamiami Trail is located in Miami-Dade County within Florida's 25th Congressional District. The western terminus of the project corridor is at the S-333 water control structure near the L-67 Extension Levee, and the eastern terminus is at the S-334 water control structure near the L-30 Levee and Canal and the L-31N Levee. The L-29 Canal (Tamiami Canal) runs along the north side of Tamiami Trail. The L-29 Levee runs along the north side of the L-29 Canal. The levee

[12] The 2009 Omnibus Appropriations Act only authorizes the NPS to conduct the study contained in this document. All future actions associated with the implementation of the Tamiami Trail Modifications: Next Steps project subsequent to the release of this document will be determined at a later date.

comprises the southern boundary of WCA-3B. Everglades National Park borders the roadway on the south side of the project corridor. The specific area of analysis and potential effect is defined for each resource in Chapter 4 – Environmental Consequences.

Please see ***Figures 1-2, 1-3, and 1-4***, below, for maps of the project location and features.

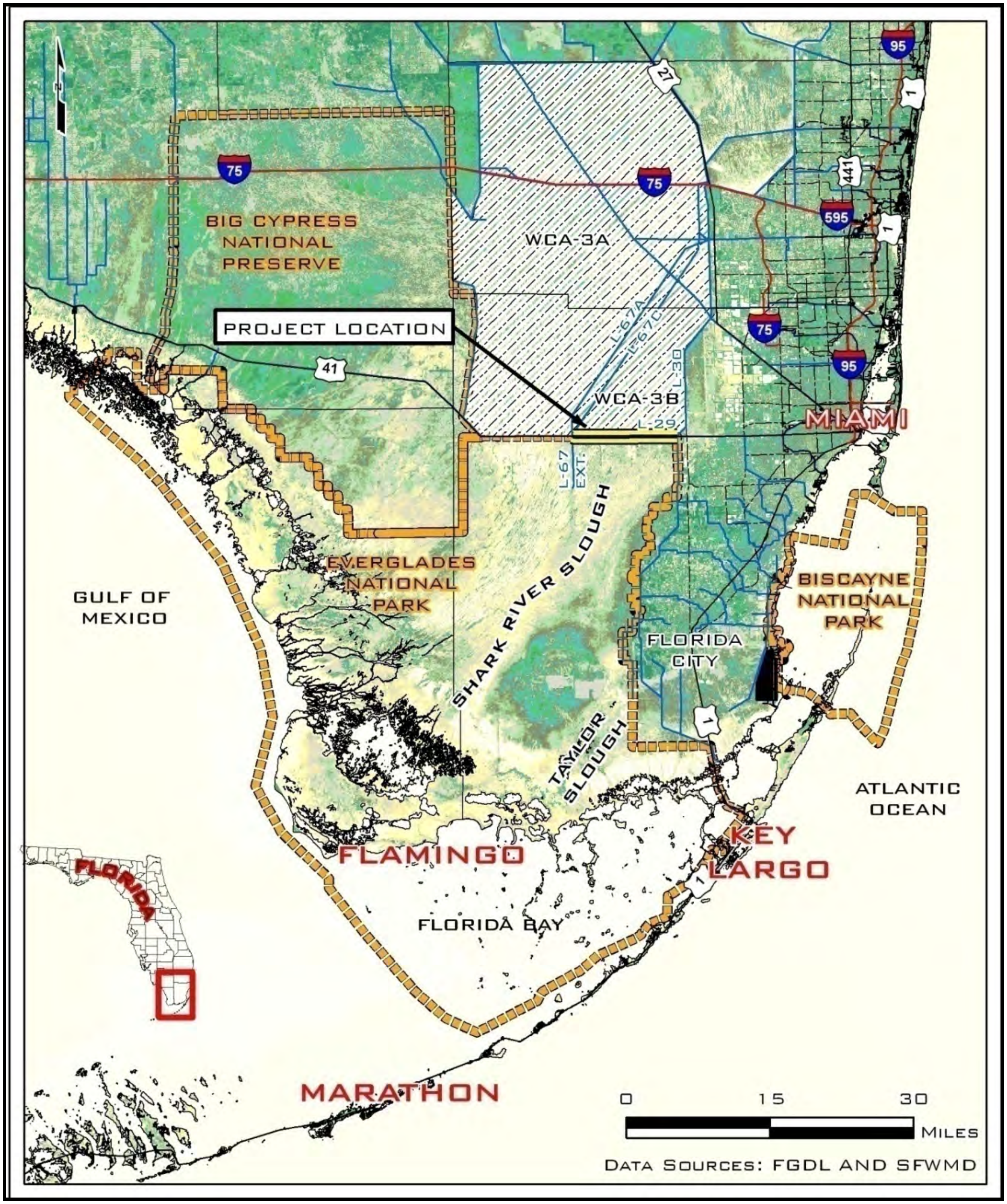

Figure 1-2 – General Project Location Map

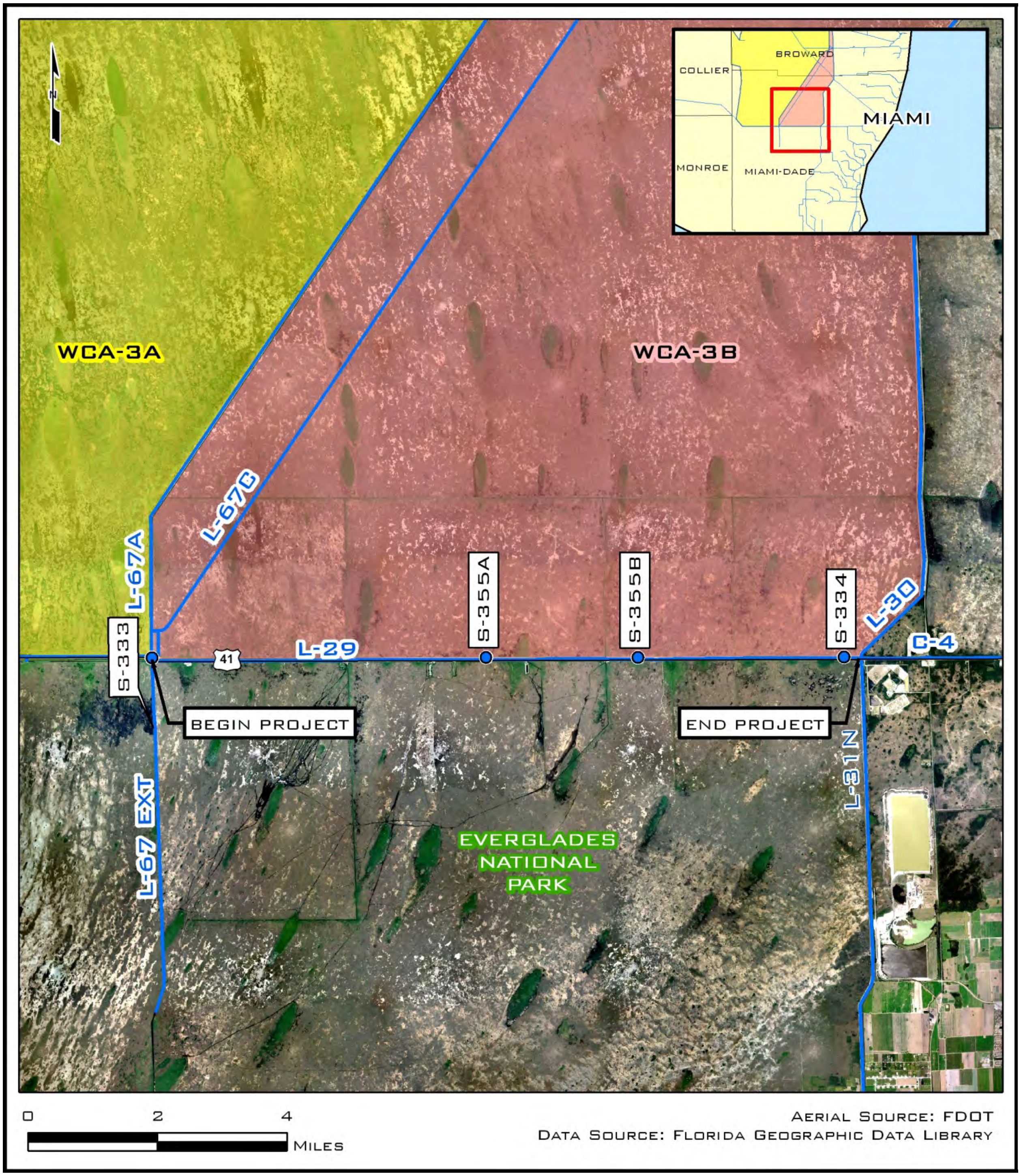

Figure 1-3 – Detailed Project Location Map

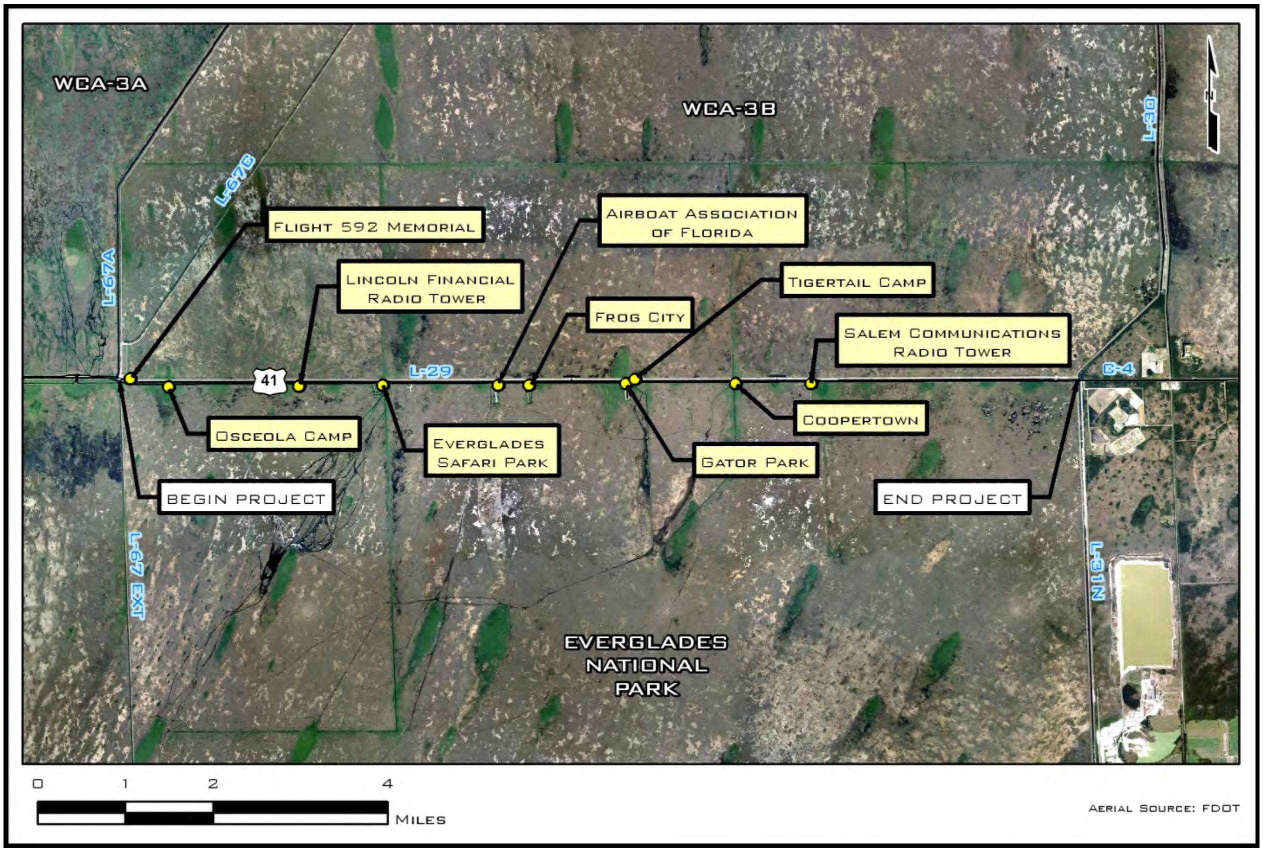

Figure 1-4 – Project Features Map

1.2.2 Purpose and Need for Action

1.2.2.1 Purpose of the Project

"Purpose" is an overarching statement of what the project must do to be considered a success. The project purpose was developed as part of the 2009 Omnibus Appropriations Act passed by Congress on March 10, 2009. The NPS proposes:

"To immediately evaluate the feasibility of additional bridge length, beyond that to be constructed pursuant to the MWD Project (16 U.S.C. SS 410r-S), including a continuous bridge, or additional bridges or some combination thereof, for the Tamiami Trail (U.S. Highway 41) to restore more natural water flow to Everglades National Park and Florida Bay and for the purpose of restoring habitat within the Park and the ecological connectivity between the Park and the Water Conservation Areas."[13]

1.2.2.2 Need for Action

"Need for Action" describes why action is required. It summarizes the most important points of the planning issues and provides the reasons the project is needed at this time.

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[13] The 2009 Omnibus Appropriations Act only authorizes the NPS to conduct the study contained in this document. All future actions associated with the implementation of the Tamiami Trail Modifications: Next Steps project subsequent to the release of this document will be determined at a later date.

The need for the action is the same as cited in the Mod Waters Tamiami Trail Modification 2003 GRR/SEIS, 2005 RGRR/SEIS, and 2008 LRR/EA[14]:

"In its current condition, the segment of Tamiami Trail located between S-334 on the east and S-333 on the west has inadequate capacity to deliver the volumes of water required to restore ENP and in Northeast Shark River Slough without risking damage to the roadbed and its eventual degradation and causing a backwater impact on WCA-3B potentially drowning tree islands. The recommended plan must address: (1) measures to increase conveyance of water to Northeast Shark River Slough, and (2) modifications to the existing roadbed, if any, required to allow this conveyance."

More precise needs based on specific language in the 2009 Omnibus Appropriations Act are:

(1) to increase potential ecological connectivity (additional bridging) between marshes in Northeast Shark River Slough in ENP and marshes north of the trail,

(2) to restore natural marsh flow patterns (flow rates and distributions) associated with unobstructed flows (removal of roads, canals, and levees) between marshes, and

(3) to restore ridge and slough habitat in ENP by reconnecting sloughs severed by the existing road.

1.2.3 Objectives in Taking Action

"Objectives" are specific purpose statements that describe what must be accomplished to a large degree for the action to be considered a success (*Director's Order 12*).

Based on a consideration of the purpose for the project, the problems occurring and the opportunities available to accomplish restoration goals, the following project objectives were developed by the NPS ENP staff:

- Restore more natural water flow to ENP
    - Construct additional bridging and road raising of the Tamiami Trail to provide for unconstrained flows to Northeast Shark River Slough and Florida Bay
- Restore ecological connectivity
    - Improve ecological connectivity by removing obstructions to sheet flow
    - Enhance unobstructed movement of animals between the north and south of Tamiami Trail
- Restore habitat within ENP
    - Restore slough vegetation and the deep water sloughs
    - Restore processes that produce and maintain ridge and slough communities in ENP east of the L-67 Extension

1.3 Purpose and Significance of Everglades National Park

1.3.1 Enabling Legislation

Authorized as a unit of the NPS on May 30, 1934, ENP is one of 392 units of the National Park System administered by the NPS. Congress authorized the establishment of ENP to be

14 While the need for action is the same as cited in the Mod Waters Tamiami Trail Modification 2003 GRR/SEIS, 2005 RGRR/SEIS, and 2008 LRR/EA, the reader should note that a one-mile eastern bridge is being constructed as part of the 2008 LRR/EA.

"…wilderness where no development…or plan for the entertainment of visitors shall be undertaken which would interfere with the preservation of the unique flora and fauna of the essential primitive natural conditions now prevailing in the area." Dubbed by opponents as the "alligator and snake swamp bill," the legislation stalled during the Great Depression and World War II. Finally, on December 6, 1947, President Harry S. Truman dedicated ENP (NPS, 2006).

1.3.2 Purpose and Significance

The following provides the purpose and significance for ENP, which must be taken into account in any Park planning.

Purpose

Everglades National Park is a public park for the benefit of the people. It is set aside as a permanent wilderness preserving essential primitive conditions including the natural abundance, diversity, behavior, and ecological integrity of its flora and fauna.

Significance

Significance statements capture the essence of the Park's importance to our country's natural and cultural heritage. Significance statements represent the Park's distinctiveness and help to place the Park within its regional, national, and international context.

Everglades National Park is nationally and internationally significant because:

- It is the only place in the United States designated as a World Heritage site, an International Biosphere Reserve, and a Wetland of International Significance.
- It comprises the largest designated subtropical wilderness reserve on the North American continent (1,296,000 acres). The Park contains vast subtropical upland and marine ecosystems, including freshwater marshes, tropical hardwood, rock pineland, extensive mangroves, and seagrass ecosystems that support world-class fisheries.
- It serves as a sanctuary for the protection of more than 20 federal- and 70 state-listed rare, threatened, and endangered species.
- It provides important foraging and breeding habitat for more than 400 species of birds (including homeland to world-renowned wading bird populations) and functions as a major corridor for migratory bird populations.
- It includes archaeological and historical resources spanning about 5,000 years of human history. These range from prehistoric sites revealing a fishing-hunting-gathering adaptation to a tropical environment (unique within the continental United States), to surviving structures from a Nike missile installation constructed in the early 1960s as a part of South Florida's Cold War defenses.
- It preserves natural and cultural resources associated with the past and present homeland of Native Americans of Florida (including the Miccosukee Tribe of Indians of Florida, the Seminole Tribe of Florida, and the Seminole Nation of Oklahoma).

1.3.3 General Park Background

Spanning the southern tip of the Florida peninsula and most of Florida Bay, ENP is the largest subtropical wilderness in North America. The Park is only a portion of the Everglades fragile ecosystem. Everglades National Park provides a prime example of the systemic linkages between national parks, the larger ecosystem, and surrounding communities (NPS, 2006). The Park's original boundaries contained 460,000 acres; subsequent additions to the Park have increased its size to 1,509,000 acres, including most of Florida Bay. The most recent addition came in 1989 when Congress added 107,600 acres in the East Everglades area of the Park, including a portion of the Northeast Shark River Slough—a waterway critical for the protection of Park resources (over 220 significant archeological and historic sites) and hydrologic restoration. The Park stretches more than 60 miles north-to-south and 40 miles east-to-west. It holds the largest expanse of wilderness east of the Rocky Mountains. Congress designated 1,296,500 acres of this vast Park as the Marjorie Stoneman Douglas Wilderness to honor this conservation pioneer who brought the beauty and fragility of the Everglades to public attention in her 1947 book *The Everglades: River of Grass.*

Located at the interface of temperate and subtropical environments, the Park has a great diversity of resources. These include more than 400 species of birds, 800 species of land and water vertebrates, 1,600 species of vascular plants, 125 species of fish, 24 varieties of orchids, and over 220 significant archeological and historic sites. The Park is home to more than 20 federally-listed species and 70 state-listed species. Because of its rich diversity and unique landscape, more than one million visitors come to experience the Park each year. Popular activities include canoeing, kayaking, camping, boating, wildlife observation, and fishing.

Visitors access information about the Park via four main contact stations – the Ernest Coe Visitor Center in Homestead, the Flamingo Visitor Center, the Shark Valley Visitor Center, and the Gulf Coast Visitor Center in Everglades City.

1.4 Laws, Regulations, and Policies

Numerous laws, regulations, and policies at the federal, state, and local levels guide the decisions and actions regarding the project. Some of the primary examples of these legal and regulatory constraints and bounds follow.

1.4.1 National Park Service

<u>National Park Service Organic Act (1916) and Management Policies</u>

In the NPS *Organic Act of 1916* (Organic Act), Congress directed the DOI and the NPS to manage parks "to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as would leave them unimpaired for the enjoyment of future generations" [16 U.S. Code (USC) §1]. Congress reiterated this mandate in the Redwood National Park Expansion Act of 1978 by stating that the NPS must conduct its actions in a manner that would ensure no "derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress" (16 USC §1 a-1).

Despite these mandates, the Organic Act and its amendments afford the NPS latitude when making resource decisions that balance visitor experience and resource preservation. By these acts, Congress "empowered [the NPS] with the authority to determine what uses of Park resources are proper and what proportion of the Park resources are available for each use" (*Bicycle Trails Council of Marin v. Babbitt*, 82 F.3d 1445, 1453 [9th Cir. 1996]).

Yet courts consistently interpreted the Organic Act and its amendments to elevate resource conservation above visitor experience. *Michigan United Conservation Clubs v. Lujan*, 949 F2d 202, 206 (6th Cir. 1991) states, "Congress placed specific emphasis on conservation." The court in *National Rifle Association of America v. Potter*, stated "in the Organic Act Congress speaks of but a single purpose, namely, conservation." The NPS *Management Policies 2006* also recognize that resource conservation takes precedence over visitor experience. The policy dictates that "when there is a conflict between conserving resources and values and providing for enjoyment of them, conservation is to be predominant" (NPS *Management Policies 2006*, Section 1.4.3).

Because conservation remains predominant, the NPS seeks to avoid or to minimize adverse impacts on park resources and values. Yet the NPS has discretion to allow negative impacts when necessary (NPS *Management Policies 2006*, Section 1.4.3). While some actions and activities cause impacts, the NPS cannot allow an adverse impact that constitutes resource impairment (NPS *Management Policies 2006*, Section 1.4.3). The Organic Act prohibits actions that permanently impair park resources unless a law directly and specifically allows for the action (16 U.S.C. 1a-1). An action constitutes an impairment when its impacts "harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values" (NPS *Management Policies 2006*, Section 1.4.5). To determine impairment, the NPS must evaluate "the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts" (NPS *Management Policies 2006*, Section 1.4.5).

Because the purposes for establishing national park units vary based on their enabling legislation, natural resources, cultural resources, and missions, management activities appropriate for each unit and for areas in each unit vary as well. An action appropriate in one unit would impair resources in another unit. Thus, this EIS would analyze the context, duration, and intensity of impacts related to the Tamiami Trail Modifications: Next Steps project, as well as the potential for resource impairment, as required by *Director's Order 12: Conservation Planning, Environmental Impact Analysis and Decision-making*.

<u>Management Policies</u>

NPS *Management Policies 2006* establishes Service-wide policies for the preservation, management, and use of park resources and facilities. These policies provide guidelines and direction for management of resources within the Park. The alternatives considered in this EIS would incorporate and comply with the provisions of these mandates and policies. Management policies specifically applicable to each impact topic analyzed in this EIS are discussed in Chapter 4 – Environmental Consequences.

<u>Director's Order 2: Park Planning</u>

Director's Order 2: Park Planning, has been superseded by Chapter 2 of NPS *Management Policies 2006*. Chapter 2 of NPS *Management Policies 2006* states that:

> *Park planning helps define the set of resource conditions, visitor experiences, and management actions that, taken as a whole, will best achieve the mandate to preserve resources unimpaired for the enjoyment of present and future generations. NPS planning processes will flow from broad-scale general management planning through progressively more specific strategic planning, implementation planning, and annual performance planning and reporting, all of which will be grounded in foundation statements.*

This planning process occurs though general principles laid out by the NPS for decision-making; scientific, technical, and scholarly analysis; public participation; and goal orientation. In Chapter 2 of the NPS *Management Policies 2006*, the NPS states the following:

> *The National Park Service will use planning to bring logic, analysis, public involvement, and accountability into the decision-making process. Park planning and decision-making will be conducted as a continuous, dynamic cycle, from broad visions shared with the public to individual, annual work assignments and evaluations …*

> *Decision-makers and planners will use the best available scientific and technical information and scholarly analysis to identify appropriate management actions for protection and use of park resources. Analysis will be interdisciplinary and tiered …*
>
> *The Service will actively seek out and consult with existing and potential visitors, neighbors, American Indians, other people with traditional cultural ties to park lands, scientists and scholars, concessioners, cooperating associations, gateway communities, other partners, and government agencies…*
>
> *Managers will be held accountable for identifying and accomplishing measurable long-term goals and annual goals that are incremental steps to carrying out the park mission. Such planning is a critical and essential part of the NPS performance management system that is designed to improve the Park Service's performance and results.*

<u>Director's Order 12 and Handbook: Conservation Planning, Environmental Impact Analysis, and Decision-Making</u>

Director's Order 12 and the accompanying handbook (NPS, 2001) lay the groundwork for how the NPS complies with NEPA. *Director's Order 12* and the handbook set forth a planning process for incorporating scientific and technical information and establishing a solid administrative record for NPS projects.

Director's Order 12 requires that impacts to park resources be analyzed in terms of their context, duration, and intensity. It is crucial for the public and decision-makers to understand implications of those impacts in the short and long-term, cumulatively, and in context, based on an understanding and interpretation by resource professionals and specialists. *Director's Order 12* also requires that an analysis of impairment to park resources and values be part of the NEPA document.

<u>Director's Order 28: Cultural Resource Management (1998)</u>

This director's order sets forth the guidelines for management of cultural resources, including cultural landscapes, archaeological resources, historic and prehistoric structures, museum objects, and ethnographic resources. This order calls for the NPS to protect and manage cultural resources in its custody through effective research, planning, and stewardship in accordance with the policies and principles contained in the NPS *Management Policies 2006*.

<u>Director's Order 41: Wilderness Preservation and Management</u>

Director's Order 41: Wilderness Preservation and Management has been superceded by Chapter 6 of NPS *Management Policies 2006*. The purpose of Chapter 6 is to provide accountability, consistency, and continuity to the NPS's wilderness management program, and to otherwise guide NPS-wide efforts in meeting the letter and spirit of the 1964 Wilderness Act. Chapter 6 clarifies specific provisions of NPS Management Policies and established specific instructions and requirements concerning the management of all NPS wilderness areas. Chapter 6 is applied to management actions carried out within the framework of a park's GMP, the Government Performance and Results Act, a park's natural and cultural resources plans, and the Park's wilderness management plan.

<u>Director's Order 75A: Civic Engagement and Public Involvement</u>

Director's Order 75A, issued in 2007, elaborates on the Section 1.7, Civic Engagement, of the NPS *Management Policies 2006*. The purpose of this director's order is to articulate the NPS "commitment to civic engagement, and to have all NPS units and offices embrace civic engagement as the essential foundation and framework for creating plans and developing programs." *Director's Order 75A* further states the NPS view that:

Civic engagement is a continuous, dynamic conversation with the public on many levels that reinforces public commitment to the preservation of heritage resources, both cultural and natural, and strengthens public understanding of the full meaning and contemporary relevance of these resources. The foundation of civic engagement is a commitment to building and sustaining relationships with neighbors and communities of interest.

<u>Director's Order 77: Natural Resource Protection</u>

Director's Order 77 addresses Natural Resource Protection, with specific guidance provided in *Reference Manual 77: Natural Resource Management*. This director's order includes *Director's Order 77-1: Wetland Protection* and *Director's Order 77-2: Floodplain Management*, both of which would be considered since the proposed project is located within wetland resources and a mapped floodplain.

Director's Order 77-1, reissued in 2008, establishes policies, requirements, and standards for implementing Executive Order (EO) 11990: Protection of Wetlands. Under this order, the NPS adopts a goal of "no net loss of wetlands." In addition, the NPS would strive to achieve a long-term goal of net gain of wetlands Service-wide. For proposed new development or other new activities, plans, or programs that are either located in or otherwise have the potential for direct or indirect adverse impacts on wetlands, the NPS would employ a sequence of: avoiding adverse wetland impacts to the extent practicable, minimizing impacts that could not be avoided, and compensating for remaining unavoidable adverse wetland impacts by restoring degraded wetlands. If the preferred alternative would result in adverse impacts to wetlands, the NPS would prepare and approve a Statement of Findings (SOF) in accordance with procedures described in *Procedural Manual 77-1: Wetland Protection*. Since wetland resources are located within the study area and would be affected by the proposed project, a SOF has been prepared in accordance with procedures described in *Procedural Manual 77-1*.

Director's Order 77-2, approved in 2003, applies to all NPS proposed actions, including the direct and indirect support of floodplain development that would adversely affect the natural resources and functions of floodplains, including coastal floodplains, or increased flood risks. This director's order also applies to existing actions when they are the subjects of regularly occurring updates of NPS planning documents. Under *Director's Order 77-2*, it is NPS policy to preserve floodplain values and minimize potentially hazardous conditions associated with flooding. In managing floodplains on park lands, the NPS would (1) manage for the preservation of floodplain values; (2) minimize potentially hazardous conditions associated with flooding; and (3) comply with the NPS Organic Act and all other federal laws and Executive Orders related to the management of activities in flood-prone areas, including EO 11988 (Floodplain Management), NEPA, applicable provisions of the Clean Water Act, and the Rivers and Harbors Appropriation Act of 1899. Specifically, the NPS would protect and preserve the natural resources and functions of floodplains; avoid the long- and short-term environmental effects associated with the occupancy and modification of floodplains; and avoid direct and indirect support of floodplain development and actions that would adversely affect the natural resources and functions of floodplains or increase flood risks. When it is not practicable to locate or relocate development or inappropriate human activities to a site outside and not affecting the floodplain, the NPS would prepare and approve a SOF, in accordance with procedures described in *Procedural Manual 77-2: Floodplain Management*, and take all reasonable actions to minimize the impact to the natural resources of floodplains. Since this project is located within a mapped floodplain that would be affected by the proposed project, a SOF has been prepared in accordance with procedures outlined in *Procedural Manual 77-2*.

1.4.2 Other Federal Laws and Executive Orders

The NPS is also required to comply with the following laws, Executive Orders, regulations, and policies in developing this project.

National Environmental Policy Act, 1969, as Amended

Section 102(2)(c) of this act requires that an environmental analysis be prepared for proposed federal actions that may significantly affect the quality of the human environment or are major or controversial federal actions. NEPA is implemented through regulations of the Council on Environmental Quality (CEQ) (40 CFR 1500-1508). The NPS has, in turn, adopted procedures to comply with the act and the CEQ regulations, as found in *Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision Making*, and its accompanying handbook (NPS, 2001). Section 102(2)(c) of this act requires that an EIS be prepared for proposed major federal actions that may significantly affect the quality of the human environment.

National Parks Omnibus Management Act of 1998

This act (16 USC 5901, et seq.) underscores NEPA in that both are fundamental to NPS park management decisions. Both acts provide direction for articulating and connecting the ultimate resource management decision to the analysis of impacts, using appropriate technical and scientific information. Both also recognize that such data may not be readily available and provide options for resource impact analysis in this case.

Redwood National Park Act of 1978, as Amended

All National Park System units are to be managed and protected as parks, whether established as a recreation area, historic site, or any other designation. This act states that the NPS must conduct its actions in a manner that would ensure no "derogation of the values and purposes for which these various areas have been established, except as may have been or shall directly and specifically provided by Congress."

Endangered Species Act (ESA) of 1973, as Amended

This act requires all federal agencies to consult with the Secretary of the Interior on all projects and proposals with the potential to impact federally endangered or threatened plants and animals. It also requires federal agencies to use their authorities in furtherance of the purposes of the *Endangered Species Act* by carrying out programs for the conservation of endangered and threatened species and to ensure that any agency action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of designated critical habitat.

Since Federally-listed threatened and endangered species are located within the study area and would be affected by the proposed project, a Biological Assessment would be required by the U.S. Fish and Wildlife Service (USFWS) for this project. Through ongoing coordination efforts with the USFWS (see Section 6.3.2.2), it has been agreed that the requirements for the Biological Assessment can be met through this EIS document.

National Historic Preservation Act (NHPA) of 1966, as Amended

Section 106 of this act requires federal agencies to consider the effects of their undertakings on properties listed or potentially eligible for listing on the National Register of Historic Places (NRHP). All actions affecting the park's cultural resources must comply with this legislation.

Antiquities Act of 1906

The *Antiquities Act* protects all historic and prehistoric sites on Federal lands and prohibits excavation or destruction of such antiquities unless a permit (Antiquities Permit) is obtained from the Secretary of the department which has the jurisdiction over those lands. It also authorizes the President to declare areas of public lands as National Monuments and to reserve or accept private lands for that purpose.

Archaeological Resources Protection Act of 1979

This act requires Federal agencies to provide notice to the Secretary of the Interior of any dam constructions and, if archeological resources are found, for recovery or salvage of them. The law applies to any agency whenever it received information that a direct or federally assisted activity would cause irreparable harm to prehistoric, historic, or archaeological data. It also increases the penalty for stealing or vandalizing to $500,000 and up to five years in prison.

Native American Graves Protection and Repatriation Act of 1990 (NAGPRA)

This act assigns ownership and control of Native American cultural items, human remains, and associated funerary objects to Native Americans. It also establishes requirements for the treatment of Native American human remains and sacred or cultural objects found on Federal land. This act further provides for the protection, inventory, and repatriation of Native American cultural items, human remains, and associated funerary objects. It requires museums that receive public funds to consult with Native Americans. Native Americans have the power to decide what happens to museum collections of human remains, grave goods, and sacred items. When these items are inadvertently discovered, all activity must cease activity, a reasonable effort must be made to protect the items, and the appropriate Indian tribe(s) and/or Native Hawaiian organization(s) must be notified.

American Indian Religious Freedom Act (AIRFA) of 1978

The *American Indian Religious Freedom Act* affirms the right of Native Americans to have access to their sacred places. If a place of religious importance to American Indians may be affected by an undertaking, AIRFA promotes consultation with Indian religious practitioners, which may be coordinated with Section 106 consultation. Amendments to Section 101 of the NHPA in 1992 strengthened the interface between AIRFA and NHPA by clarifying that:

“Properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization may be determined to be eligible for inclusion on the National Register.”

In carrying out its responsibilities under Section 106, a Federal agency shall consult with any Indian tribe or Native Hawaiian organization that attaches religious and cultural significance to properties described in subparagraph (A). [16 U.S.C. 470a (a)(6)(A) and (B)].

The Secretary of the Interior's Standards for the Treatment of Historic Properties, 1995

Standards for Preservation:

1. A property will be used as it was historically, or be given a new use that maximizes the retention of distinctive materials, features, spaces, and spatial relationships. Where a treatment and use have not been identified, a property will be protected and, if necessary, stabilized until additional work may be undertaken.
2. The historic character of a property will be retained and preserved. The replacement of intact or repairable historic materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.

3. Each property will be recognized as a physical record of its time, place, and use. Work needed to stabilize, consolidate, and conserve existing historic materials and features will be physically and visually compatible, identifiable upon close inspection, and properly documented for future research.
4. Changes to a property that have acquired historic significance in their own right will be retained and preserved.
5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.
6. The existing condition of historic features will be evaluated to determine the appropriate level of intervention needed. Where the severity of deterioration requires repair or limited replacement of a distinctive feature, the new material will match the old in composition, design, color, and texture.
7. Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.
8. Archeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.

<u>Civil Rights Act of 1964</u>

Any proposed federal project must 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 any program of the federal, state, or local government. Title VIII of the 1968 *Civil Rights Act* guarantees each person equal opportunity in housing.

<u>Clean Water Act</u>

The *Federal Pollution Control and Prevention Act of 1972*, commonly known as the *Clean Water Act*, is the primary federal law in the United States governing water pollution. The purpose of the act is to make our nation's waters "fishable and swimmable" by 1983 by eliminating releases of toxic substances, controlling wastewater and storm water pollution of waterways, and instituting water quality standards and associated permitting systems.

The principal body of law currently in effect is based on the *Federal Water Pollution Control Amendments of 1972*, which substantially expanded and strengthened earlier legislation. Major amendments were made to the *Clean Water Act of 1977* enacted by the 95th United States Congress and the *Water Quality Act of 1987* enacted by the 100th United States Congress.

<u>Flood Control Act of 1948</u>

The *Flood Control Act of 1948* authorized the Chief of Engineers of the USACE to approve minor flood control projects without having to get Congressional approval. It also authorized several larger flood control projects and amended the budget set forth in the *Flood Control Act of 1946*.

<u>Coastal Zone Management Act (CZMA), 1966</u>

The *Coastal Zone Management Act* (16 U.S.C. §§1451 et. seq.) seeks to preserve and protect coastal resources. Through the CZMA, states are encouraged to develop coastal zone management programs (CZMPs) to allow economic growth that is compatible with the protection of natural resources, the reduction of coastal hazards, the improvement of water quality, and sensible coastal development. The CZMA provides financial and technical incentives for coastal states to manage their coastal zones in a manner consistent with CZMA standards and goals. Section 307 of the CZMA requires that federal agency activities that affect any land or water use or natural resource of the coastal zone must be consistent to the maximum extent practicable with the enforceable policies of the state CZMP. Federal agencies and applicants for federal approvals must consult with state CZMPs and must provide the CZMP with a determination or certification that the activity is consistent with the CZMP's enforceable policies, where those policies would have a possible effect on state coastal resources, as defined by the CZMP and local land use plans.

The Florida Coastal Management Program (FCMP), the State of Florida's federally approved management program, was approved by the National Oceanic and Atmospheric Administration (NOAA) in 1981. The FCMP consists of a network of 23 Florida Statutes administered by 11 state agencies and four of the five water management districts designed to ensure the wise use and protection of the state's water, cultural, historic, and biological resources; to minimize the state's vulnerability to coastal hazards; to ensure compliance with the state's growth management laws; to protect the state's transportation system; and to protect the state's proprietary interest as the owner of sovereign submerged lands.

The State of Florida's coastal zone includes the area encompassed by the state's 67 counties and its territorial seas. Therefore, federal actions occurring throughout the state are reviewed by the state for consistency with the FCMP. However, the state has limited its federal consistency review of federally licensed and permitted activities to the federal licenses or permits specified in Section 380.23(3)c, Florida Statutes.

Magnuson-Stevens Fishery Conservation and Management Act, as amended

The *Sustainable Fisheries Act of 1996* (PL 104-267) requires all federal agencies to consult with NOAA's National Marine Fisheries Service (NMFS) on all actions, or proposed actions, permitted, funded, or undertaken by the agency, that may adversely affect Essential Fish Habitat (EFH). Essential fish habitat is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." "Waters" include aquatic areas and their associated physical, chemical and biological properties. "Substrate" includes sediment underlying the waters. "Necessary" means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem. Spawning, breeding, feeding, or growth to maturity covers all habitat types utilized by a species throughout its life cycle. The NMFS would provide recommendations on conserving EFH to federal or state agencies for activities that would adversely affect EFH.

Clean Air Act (CAA)

The legal authority for federal programs regarding air pollution control is based on the *1990 Clean Air Act Amendments*. These are the latest in a series of amendments made to the *Clean Air Act*. 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 *Clean Air Act of 1963* was the first federal legislation regarding air pollution control. In 1967, the *Air Quality Act* was enacted in order to expand federal government activities. The *Air Quality Act of 1967* also authorized expanded studies of air pollutant emission inventories, ambient monitoring techniques, and control techniques (USEPA, 2008). Everglades National Park is a designated Class I air quality area under the *Clean Air Act*. Lands with this designation are subject to the most stringent air quality regulations.

Executive Order 11988 - Floodplain Management

This Executive Order directs federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative.

Executive Order 11990 - Protection of Wetlands

This Executive Order directs federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative.

Executive Order 12898 - Environmental Justice

In February 1994, the President of the United States issued Executive Order 12898 (Environmental Justice) requiring federal agencies to analyze and address, as appropriate, disproportionately high adverse human health and environmental effects of federal actions on ethnic and cultural minority populations and low income populations, when such analysis is required by NEPA.

The U.S. Environmental Protection Agency (USEPA) defines environmental justice as:

> *The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.*

"Meaningful involvement" means that: (1) potentially affected community residents have an appropriate opportunity to participate in decisions about a proposed activity that will affect their environment and/or health; (2) the public's contribution can influence the regulatory agency's decision; (3) the concerns of all participants involved will be considered in the decision-making process; and (4) the decision-makers seek out and facilitate the involvement of those potentially affected.

An adverse effect on minority and/or low-income populations occurs when: 1) The adverse effect occurs primarily to a minority and/or low income population; or 2) the adverse effect suffered by the minority and/or low-income population is more severe or greater in magnitude than the adverse effect suffered by the non-minority and/or non-low-income populations.

Executive Order 13112 – Invasive Species

This Executive Order requires federal agencies to prevent the introduction of invasive species, provide for their control, and to minimize the economic, ecological, and human health impacts that invasive species may cause.

Executive Order 13423 – Strengthening Environmental, Energy, and Transportation Management

Executive Order 13423 was signed on January 24, 2007, by President George W. Bush and was codified into law by the 2009 Omnibus Appropriations Act, which was signed on February 17, 2009. Executive Order 13423 consolidates and strengthens the sustainable practices of Executive Orders 13101, 13123, 13134, 13148, and 13149. Executive Order 13423 requires federal agencies to lead by example in advancing the nation's energy security and environmental performance. It requires federal agencies to "conduct their environmental, transportation, and energy-related activities under the law in support of their respective missions in an environmentally, economically and fiscally sound, integrated, continuously improving, efficient, and sustainable manner." It includes requirements for the reduction of greenhouse gases and other energy and water conservation measures. The order requires agencies to reduce greenhouse gas emissions by 3% annually through the end of fiscal year 2015, or 30% by the end of fiscal year 2015, relative to the baseline of the agency's energy use in fiscal year 2003.

<u>Executive Order 13514 – Federal Leadership in Environmental, Energy, and Economic Performance</u>

Executive Order 13514 was signed on October 5, 2009, by President Barack Obama. Executive Order 13514 enhances Executive Order 13423 (which consolidated previous Executive Orders 13101, 13123, 13134, 13148, and 13149), which requires federal agencies to reduce energy and water intensity and achieve other sustainability goals. All the provisions of Executive Order 13423 remain in effect. Executive Order 13514 introduces new greenhouse gas emissions management requirements, expands water reduction requirements for federal agencies, and addresses waste diversion, local planning, sustainable buildings, environmental management, and electronics stewardship.

<u>DOI Secretarial Order 3285 – Climate Change</u>

DOI Secretarial Order 3285, issued on March 11, 2009, makes production and transmission of renewable energy on public lands a priority. This order establishes a DOI-wide approach for applying scientific tools to increase understanding of climate change and to coordinate an effective response to its impacts on tribes and on the land, water, ocean, fish and wildlife, and cultural heritage resources that the DOI manages. This order replaces Secretarial Order 3226 (Amendment No. 1), issued on January 16, 2009, and reinstates the provisions of Secretarial Order 3226, issued on January 19, 2001.

1.4.3 State Laws

<u>Outstanding Florida Waters</u>

All waters that are a part of ENP are defined as Outstanding Florida Waters (OFWs). Section 403.061 (27), Florida Statutes, grants the Florida Department of Environmental Protection (FDEP) power to: Establish rules that provide for a special category of water bodies within the state, to be referred as "Outstanding Florida Waters," which shall be worthy of special protection because of their natural attributes. In general, the FDEP cannot issue permits for direct pollutant discharges to OFWs that would lower ambient (existing) water quality or indirect discharges that would significantly degrade the waters. Permits for new dredging and filling must be clearly in the public interest, taking into consideration whether the:

- Activity would adversely affect the public health, safety, or welfare or property of others;
- Activity would adversely affect the conservation of fish and wildlife, including endangered or threatened species, or their habitats;
- Activity would adversely affect navigation or the flow of water or cause harmful erosion or shoaling;
- Activity would adversely affect the fishing or recreational values or marine productivity in the vicinity of the activity;

- Activity would be of a temporary or permanent nature;
- Activity would adversely affect or enhance significant historical and archaeological resources under the provisions of Sec. 267.061 F.S.; and
- Current condition and relative value of functions being performed by areas affected by the proposed activity (373.414(1)(a), F.S.).

1.4.4 Relationship to other Plans, Policies and Actions

1.4.4.1 National Park Service Plans, Policies and Actions

National Park Service plans, policies, and actions beyond those listed previously that may influence the Tamiami Trail Modifications: Next Steps project are provided below:

<u>*Everglades National Park General Management Plan/East Everglades Wilderness Study*</u>

Everglades National Park is in the process of developing the Draft *GMP/East Everglades Wilderness Study (EEWS)/EIS* – a 20-year vision for the Park's resource protection, visitor experiences, and management. As part of the GMP process, information was collected from the general public and interested parties regarding future management concerns. The Park is currently developing the Draft GMP/EEWS/EIS, which is expected to be released for public review and comment in early 2011. The GMP is scheduled for completion in 2012.

The scope of the GMP/EEWS/EIS was expanded in 2006 to include a Wilderness Study for the East Everglades Expansion Area lands. The expanded GMP process would fully consider all legislated uses and designations and would result in a viable management plan for the entire Park, including the expansion area.

The scope of the GMP/EEWS/EIS also includes the issue of lands that were authorized for acquisition by Congress in the *Everglades National Park Protection and Expansion Act of 1989.* The only parcels excluded within the contiguous ENP Expansion Area were those lands comprising the Airboat Association, located immediately south the current alignment of the Tamiami Trail road corridor. The NPS has completed approximately 99% of the land designated for acquisition within the Area. Lands still in private ownership include the three commercial airboat facilities, Everglades Safari, Gator Park, and Coopertown; the Florida Power and Light lands; and the lands occupied by the two commercial radio tower facilities owned, respectively, by Salem Communications and Lincoln Financial Media. Currently, insufficient funds are available to complete these acquisitions. Therefore, the NPS has included the costs for the acquisition of these parcels in the costs associated with this project since an operational plan subsequent to roadway modifications described in this report will likely increase water levels within the ENP Expansion Area and potentially adversely affect these properties. For additional information about these parcels and their disposition under the *Everglades National Park Protection and Expansion Act of 1989*, refer to Section 4.12.2.

<u>*Modified Water Deliveries to Everglades National Park – Spreader Swale Pilot Project Environmental Assessment*</u>

In October 2008, the NPS prepared an EA for a proposed pilot project to construct spreader swales immediately south of two culverts located along the 10.7-mile Tamiami Trail study corridor. Spreader swale use was proposed by the USACE as a way to increase flows to the Everglades ecosystem lying south of Tamiami Trail. Since the effectiveness and potential level of benefits of the use of spreader swales was unknown a pilot project was proposed to determine if the use of the swales would be effective in increasing the level of water delivery.

South Florida and Caribbean Parks Exotic Plant Management Plan

The NPS has prepared a draft exotic vegetation management plan and EIS to control non-native plant species in the South Florida and Caribbean NPS units. Implementation of the plan would result in continued control and reduction of non-native plant species in the project area and throughout the Park.

1.4.4.2 Other Federal Plans, Policies and Actions

C-111 South Dade Project

The C-111 Canal separates agricultural lands from ENP in southern Miami-Dade County. Because of the excessive permeability of the Biscayne Aquifer in this area the canal controls the water levels in surrounding area. The USACE is undertaking a series of hydrological restoration projects along the C-111 Canal designed to restore fresh water deliveries to the eastern portion of ENP. At this time the USACE has developed an experimental program to test water delivery methods specifically to Shark River and Taylor sloughs.

1.4.4.3 Other State and Local Plans, Policies and Actions

2005-2006 Lower East Coast Water Supply Plan Update

This updated water supply plan was prepared by the SFWMD to revise the 1998 long-term planning document to reflect the increasing demand and decreasing supply of water in the east coast planning unit. Because of increased demands on water resources in the South Florida area the SFWMD’s Board has recommended that the east coast planning unit focus on alternative water sources and projects. The updated plan:

- Describes the legislative, planning, and regulatory framework around which future water use and development decisions in the region will take place.
- Documents existing demands and projects future water demands through 2025 for agricultural and urban water sectors, as well as other water use categories.
- Identifies resource issues, including constraints on development of new traditional freshwater sources and the effects of urbanization on coastal resources.
- Evaluates the water source options available within the planning area. Alternative water supply sources include brackish groundwater, reclaimed water, new storage capacity for surface water or groundwater, and seawater. Water conservation will also play a key role in the region's water supply planning efforts.
- Identifies and discusses water resource development projects.
- Identifies water supply projects that will meet future human and environmental needs. Focuses on alternative water supply projects, such as brackish water from the Floridan Aquifer, captured storm water, aquifer storage and recovery (ASR) systems, and expanded use of reclaimed water.
- Describes funding opportunities available through the SFWMD to foster alternative water supply development.
- Identifies areas where collection of resource data and technical studies are needed. (SFWMD, 2010)

1.5 Scoping Process and Public Participation

1.5.1 Scoping

Project scoping is an early and open process to solicit public and internal concerns relating to a proposed action. In May 2009, NPS staff along with participants from cooperating federal and state agencies met for an internal scoping discussion. The main focus of the scoping meeting was to agree on the definition of the project's purpose and need, discuss project alternatives and performance measures, and to determine impact topics to be studied by the EIS.

During the development of the EIS, the Park actively involved the public in the process. The Park's goals for public participation included: understanding of the project by the public; substantive and valuable input to guide Park decisions; and minimization of conflicts through dissemination of information and starting discussion.

The Park elicited public participation in the discussion of issues, area to be studied, and potential alternatives. A Notice of Intent (NOI) to prepare an EIS was published in the Federal Register on May 29, 2009. A project scoping newsletter was distributed by the NPS by U.S. mail and electronic mail also in May 2009. This notice announced the Park's proposal and described preliminary alternative and resource considerations, and identified opportunities for public participation in the EIS process. A public scoping meeting was held on June 2, 2009, at the South Dade Regional Library in Miami, Florida. The structure of the meeting allowed individuals interested in participating in the planning process to be directly involved. Each of the information stations had a flip chart where comments could be provided. In addition, those attending the meeting were also directed to the EIS newsletter, which provided additional opportunities for comment on the project, including direct comments by mail, e-mail, or through the NPS's Planning, Environment, and Public Comment (PEPC) website.

In November 2009, a CBA workshop was convened for the purpose of choosing a project alternative to bring forward as the recommended alternative. Workshop participants consisting of NPS staff and cooperating state and federal agency participants reviewed performance measures and project alternatives recommended during previous scoping meetings to choose the alternative that best meets the projects purpose and need. See ***Appendix B*** for the Value Analysis / Choosing By Advantages Report.

Chapter 6 – Consultation and Coordination, provides additional details about these meetings and the subsequent public and agency comments received. Public and agency comments were used to help formulate the alternatives and identify the issues and impact topics considered in this document.

1.5.2 Derivation of Issues and Impact Topics

Issues describe problems or concerns associated with current impacts from environmental conditions as well as problems that may arise from the potential future management of Tamiami Trail. Issues and concerns related to the Tamiami Trail project were identified by the Park staff with input from the public, partners, and tribal organizations. Issues were then grouped into areas of similar concerns, which are addressed as impact topics in the EIS. These impact topics were identified based on issues raised during scoping, federal laws, regulations, executive orders, NPS *Management Policies 2006*, and NPS knowledge of resources.

1.5.3 Issues Not Addressed in this Plan

Per guidance provided from the DOI, several issues, while associated with the proposed project, are not addressed by this EIS and will be addressed in future documents (i.e., ENP GMP; COP, as a component of the MWD Project; and associated CERP projects). These issues include:

- Modification of water flows (water operations plan) associated with raising operating water levels in the L-29 Canal and the subsequent impact or benefit of increased water flows south of Tamiami Trail into ENP[15]
- Seepage/flood management
- The potential designation of the East Everglades Expansion Area (a 107,600 acre addition to the northeast area of the park in 1989) as wilderness
- Addition of supplementary public access points along Tamiami Trail
- Continued operation of commercial ventures (i.e. commercial airboating) within the boundaries of ENP

1.5.4 Impact Topics Analyzed in this Environmental Impact Statement

The following impact topics are discussed and analyzed in Chapter 3 – Affected Environment and Chapter 4 – Environmental Consequences. These topics are resources of concern that would be beneficially or adversely affected by the actions proposed under each alternative and are developed to ensure that the alternatives are evaluated and compared based on the most relevant topics. A brief rationale for the selection of each impact topic is given. For those topics that were dismissed from further consideration, an explanation is provided later in this chapter.

1.5.4.1 Geology, Topography and Soils

The soil of the Tamiami Trail project area consists mainly of nearly level, poorly drained soils containing organic material eight to over 51 inches deep over limestone bedrock. Project construction would involve the movement of soils, driving of piles, and excavation into the limestone bedrock. Concerns with impacts to soil resources include removal, compaction, and increase in sedimentation in downstream slough areas that have already experienced sedimentation from previous activities.

1.5.4.2 Water Resources

<u>Hydrology</u>

The Everglades once covered nearly four thousand square miles from Lake Okeechobee to Florida Bay and the Gulf of Mexico. Its original condition clearly showed that it was a flow-way, where shallow water derived from direct rainwater and from wet-season overflows from Lake Okeechobee moved southward as sheet flow to Florida Bay. Water management efforts have diverted this natural flow and have significantly disrupted this natural cycle.

<u>Water Quality</u>

The majority of proposed project activities would take place in wetlands and would have the potential to affect surface water quality. Major water quality concerns are that filling, driving of piles, and excavation of soils within wetlands associated with all project alternatives have the potential to cause elevated levels of turbidity, suspended solids, and lowered levels of dissolved oxygen (DO) within the water column.

<u>Wetlands</u>

The Everglades is comprised of a series of complex interconnected wetland systems. Construction of the proposed project alternatives would involve impacts to several wetland

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[15] Additional explanation of the development of a water operations plan can be found in the cumulative impacts analysis discussion in Section 4.1.3.

habitat types along the 10.7-mile project corridor. Potential negative impacts associated with project construction include loss of wetland habitat by filling or change in wetland function or habitat type through excavation or sedimentation.

<u>Floodplains</u>

Prior to human influence, one of the primary functions of the Everglades was to ameliorate the impact of storm flows and flooding events on adjacent uplands. Flood and water control projects within the South Florida region have greatly reduced the Everglades floodplain values and functions. Of primary concern with the proposed project is that the construction of structures and raised roadway does not worsen existing water flow problems along any of the 10.7-mile project corridor.

1.5.4.3 Wildlife and Vegetation / Habitat

The area surrounding Tamiami Trail provides important habitat for numerous wildlife species. This habitat is home to several protected species and the surrounding wetlands provide foraging and nesting habitat for wading birds and other wildlife species. Potential negative impacts to wildlife habitat may result from construction-related activities such as the driving of piles, the placement of fill material, and soil disturbance. Short-term and temporary noise and vibration impacts from construction would also occur and may disturb wildlife feeding, foraging, breeding, and nesting behaviors.

1.5.4.4 Land Use

The existing land use within the study boundaries varies from preserve lands to commercial uses. Vast portions of South Florida remain natural, although much of it is disturbed land. The dominant natural features are ENP and Biscayne National Park, along with Biscayne and Florida Bay and remnant freshwater and coastal wetland and upland systems within and adjacent to the developed areas along the coast. For the most part, urban development is concentrated along the lower east coast of Miami-Dade County. The focus of this analysis is the area that would be directly affected by the proposed actions, primarily the project footprint plus 50 foot easements, and how the proposed action may change existing land uses.

1.5.4.5 Special Status Species

Federally-listed animals that have the potential to utilize the habitat resources of the Tamiami Trail study area include the Everglade snail kite (*Rostrhamus sociabilis)*, the wood stork (*Mycteria americana*), the West Indian manatee (*Trichechus manatus latirostris*), the Florida panther (*Puma concolor coryi*), the eastern indigo snake (*Drymarchon corais),* and the American alligator (*Alligator mississippiensis*)*.* The Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis*) is not anticipated to occur in the project area but is included our special status species section since a breeding population is found within an approximate 10-mile radius of the project area. Audubon's crested caracara (*Caracara cheriway*) is considered an accidental that is rarely observed in the project area. No known federally-listed plant species occur within the Tamiami Trail study area.

Besides the previously described federally-listed species there are additional species listed by the state of Florida that have the potential to occur in the project area. Avian species of special concern nesting and foraging in the Tamiami Trail project area are the tricolored heron (*Egretta tricolor*), snowy egret (*Egretta thula*), little blue heron (*Egretta caerulea*), and white ibis (*Eudocimus albus*). Other state-listed avian species with the potential to forage and nest in the project area include the limpkin (*Aramus guarauna*) and the Florida sandhill crane (*Grus canadensis pratensis*). Additional state-listed avian species that have the potential to occur in the project area include the reddish egret (*Egretta rufescens*), roseate spoonbill (*Platalea ajaja*), marsh wren (*Cistothorus palustris*), American kestrel (*Falco sparverius paulus*), and white-crowned pigeon (*Patagioenas leucocephala*). The Everglades mink (*Mustela vison evergladensis*) has the potential to occur along the Tamiami Trail corridor. Additionally, there are three endangered, five threatened, and one commercially exploited state-listed plant species that have potential to occur within the project area.

Construction activities associated with the proposed project have the potential to affect listed wildlife species and their habitats.

1.5.4.6 Wilderness/Unique Ecosystems

Everglades National Park is the largest designated wilderness area east of the Rocky Mountains (1,296,000 acres). The areas surrounding Tamiami Trail include both designated submerged and terrestrial wilderness (including areas under consideration to be designated as wilderness). The wilderness areas adjacent to the existing project area have the potential to be negatively impacted by construction noise and disturbance.

1.5.4.7 Cultural Resources

Historic Resources

The project study area contains three properties that are eligible for listing on the NRHP and one property that is potentially eligible. These properties include Tamiami Trail, Airboat Association of Florida, Coopertown Restaurant and Airboat Rides, and the Miccosukee Osceola Camp. Construction activities associated with the proposed project alternatives have the potential to adversely these properties.

1.5.4.8 Visitor Use and Experience

The 10.7-mile section of Tamiami Trail that comprises the project area in Miami-Dade County serves as a gateway not only to visitor recreational opportunities within ENP, which receives over one million visitors annually, but also to the vast recreational opportunities in the South Florida region. Among the numerous activities available are canoeing/kayaking, fishing, diving, snorkeling, camping, hiking, bicycling, boating/airboating, hunting, frogging, saltwater beach recreating, and wildlife viewing. Additionally, a memorial to the victims of ValuJet Flight 592 is located at the western end of the project corridor. Benefits to visitor use and experience might occur from the proposed project as well as short-term impacts associated with construction activity.

1.5.4.9 Park Management and Operations

Park management and operations refers to the quality and effectiveness of ENP staff to maintain and administer Park resources and provide for an effective visitor experience. Activities associated with Park management and operations include education and interpretation, maintenance, and enforcement. While no long-term issues are expected to be associated with this project, minor short-term issues might occur during the construction phase of the project.

1.5.4.10 Noise/Soundscapes

Three noise sensitive sites are located along the proposed project corridor, the Flight 592 Memorial and the Miccosukee Indian Osceola and Tiger Tail camps. The main concern for these noise sensitive locations is that increased traffic associated with improvement to Tamiami Trail would lead to permanent and significant increases in noise.

1.5.4.11 Socioeconomics

This issue includes a discussion of the local economy, demographics, and socioeconomic characteristics of the study area. The people who live in the study area, and the economic activity in which they are engaged, comprise important components of the area's total environment. Adverse changes in the health and condition of the natural system could cause negative impacts on the economic system. Conversely, beneficial changes to the natural system could also have a strong positive effect on the economic system.

1.5.4.12 Transportation

The 264-mile section of U.S. Highway 41 known as Tamiami Trail provides a major transportation link between Florida's east and west coast between Tampa and Miami. At present, the highway within the project area handles average annual daily traffic (AADT) of 5,300 vehicles per day (vpd). Major transportation issues associated with the proposed project include the possibility of traffic load increases due to the improvement of Tamiami Trail and traffic delays associated with project construction.

1.5.4.13 Hazardous, Toxic, and Radioactive Waste

A Phase I HTRW Assessment for the proposed project was completed in September 2009. The assessment found that four sites – Salem Communications radio tower, Coopertown, Gator Park, and Everglades Safari – located along the project corridor contained hazardous substances. The main concern with the presence of these hazardous substances is that they could migrate through groundwater to the construction zone during project construction activities.

1.5.5 Impact Topics Dismissed from Further Analysis

- **Air Quality**: Everglades National Park is a designated Class I air quality area under the *Clean Air Act*. Lands with this designation are subject to the most stringent air quality regulations. Very limited increases in pollution are permitted in the vicinity. The air quality of the area is a valuable Park resource, enhancing visitation by providing clean air and high visibility to match the unique ecosystem experience. The *Clean Air Act of 1963* (42 USC 7401) requires federal land managers to protect air quality, and the NPS *Management Policies 2006* requires air quality to be analyzed when planning Park projects and activities.

  If any of the action alternatives are implemented, emissions generated from transport and construction equipment would be mitigated through the use of best management practices (BMPs) implemented during construction and would not measurably contribute negatively to air quality conditions or adversely affect visitors or staff. Because of the high water table, it is unlikely that large quantities of dust would be generated, and any occurrence of fugitive dust would be localized and very transient. If dust were generated during construction, BMPs for dust suppression would be initiated. Emissions from construction equipment would be kept to a minimum by restricting idling time.

  Based on an analysis of fuel used for construction of the project, the level of greenhouse gas emissions produced would range from 1,357 (Alternative 4) to 2,568 (Alternative 6e)[16] metric tons of carbon equivalent (MTCE). As stated above, BMPs and mitigation measures would be used to minimize the project's carbon footprint and its contribution to global climate change. When compared to the level of greenhouse gas emissions produced in the nation (approximately 6 billion MTCE in 2007) and the region, the

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16 Greenhouse gas emissions based on a calculation of project alternatives fuel usage with the NPS Climate Leadership in Parks (CLIP) tool with a fuel usage rate of one gallon per $1,000 of construction costs (FHWA Technical Advisory T-5080.3 established fuel usage rate for highway/bridge construction).

emissions resulting from this project would be negligible and would not substantially contribute to air quality impacts.

Implementation of any of the alternatives described in the plan would have negligible effects on air quality, and the Class I air quality status of the Park would be unaffected. Therefore, air quality was not analyzed in detail as a separate impact topic and was dismissed from detailed analysis in this EIS.

- **Archaeological Resources:** Studies for archaeological resources were conducted as part of the 2005 RGRR/SEIS to survey potential archaeological sites that might be present within the proposed project area. This work was conducted to comply with Section 106 of the NHPA of 1966, as amended, and the Archaeological and Historic Preservation Act of 1974. Background research was conducted at the Florida Master Site File, the Florida Collection of the Florida State Library. Additional literature was examined at the University of Florida libraries, the Miami-Date Public Library, and the Historical Museum of Southern Florida. The archaeological survey consisted of visual examinations and limited shovel testing along the ROW of the Tamiami Trail. No archaeological resources were identified within the study area and no known archaeological resource exist within the study area.

  To avoid damage to previously unknown archaeological resources, archaeological surveys and testing activities in previously un-surveyed and/or undisturbed areas would be conducted prior to ground-disturbing activities. If any resources are encountered, mitigation of project impacts (in consultation with appropriate agencies) or adjustment of the project design would take place to avoid or limit the adverse effects on prehistoric and historic archaeological resources. Stop-work provisions would be included in the construction documents should archaeological or paleontological resources be uncovered. If previously unknown archaeological resources are discovered, work would be stopped in the area of any discovery and consultation would be initatied with affiliated tribes, pursuant to NAGPRA and the *Draft Park NAGRPA Plan of Action for Inadvertent Discoveries, Everglades National Park and Associated Tribes* (May 2008). However, it should be noted there is a low probability that the project area contains undiscovered archeological resources.

- **Conflicts with Land Use Plans:** The actions included in this EIS are compatible and not in conflict with local land use plans because the project seeks to restore environmental conditions. Therefore, this topic was not analyzed in detail in this EIS.

- **Cultural Landscapes:** According to the NPS's *Director's Order 28: Cultural Resource Management Guideline,* 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 the physical materials, such as roads, buildings, walls, and vegetation, and by use reflecting cultural values and traditions.*

  There are no designated cultural landscapes in the Tamiami Trail area of ENP. Therefore, there would be no impacts to cultural landscapes and this issue was not analyzed in detail as a separate topic in this EIS.

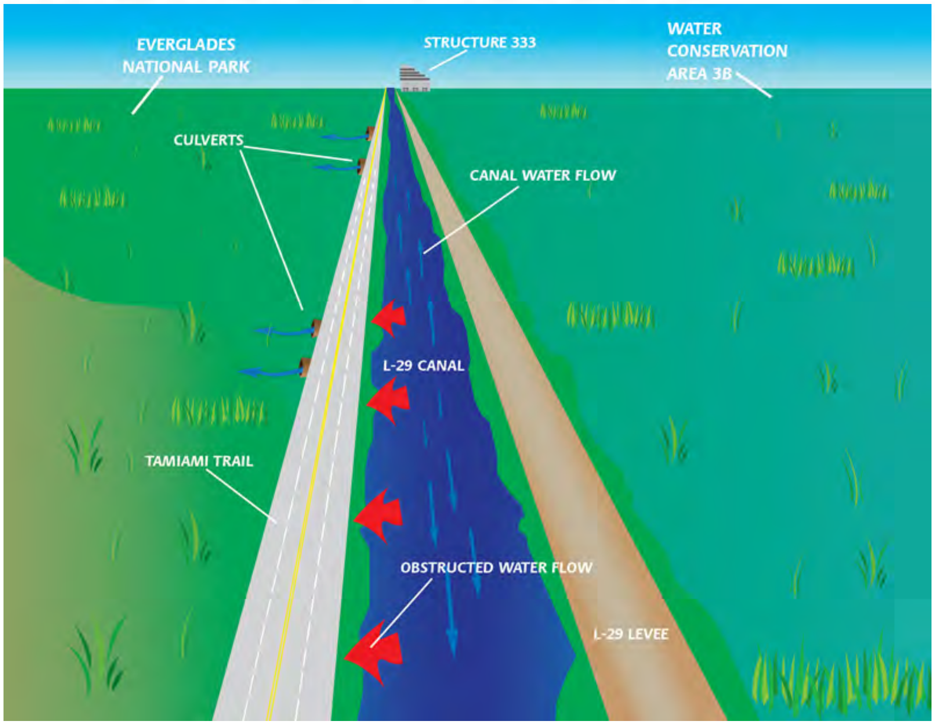
- **Ecologically Critical Areas:** Everglades National Park does not contain any designated ecologically critical areas, wild and scenic rivers, or other unique natural resources, as referenced in 40 CFR 1508.27. Therefore, this issue was not analyzed in detail as a separate impact topic in the EIS.

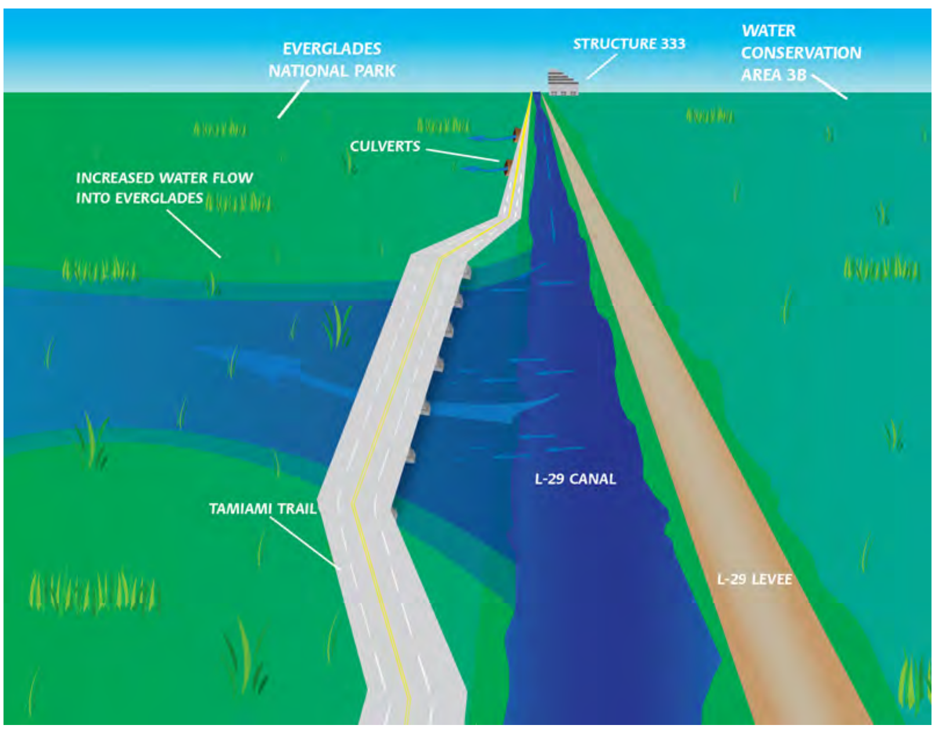
- **Energy Requirements and Conservation Potential:** There would be no permanent energy requirements from the implementation of the project. Energy requirements during construction would be negligible to minor, short-term, and temporary. Therefore, this issue was not analyzed in detail as a separate topic in this EIS.
- **Environmental Justice:** Executive Order 12898, "General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. No alternative would have health or environmental effects on minorities (including American Indian tribes) or low-income populations or communities as defined in the USEPA's *Environmental Justice Guidance* (1998). Therefore, environmental justice was not analyzed in detail as a separate topic in this EIS.
- **Ethnographic Resources:** As defined by the NPS *Management Policies 2006*, ethnographic resources are the cultural and natural features of the Park that are of traditional significance to traditionally associated peoples. These peoples are the contemporary Park neighbors and ethnic or occupational communities that have been associated with the Park for two or more generations (40 years), and whose interests in the Park's resources began before the Park's establishment. Ethnographic resources can include sacred sites that have spiritual and religious significance to tribes and other traditionally associated groups, and may serve as the locations of ceremonial activities. The history of ENP includes settlement and the use of waters for fishing for both sustenance and profit by both Native Americans and early settlers to the area. The Miccosukee and Seminole tribes claim the Everglades as a homeland and traditional use area before the Park's establishment. Fishing for subsistence and profit has occurred at the Park since the early 1900s and may be considered an ethnographic use. However, since the law prohibits commercial fishing, this ethnographic use has been terminated. Project actions would not interfere with any other ethnographic uses. Due to the location, minimal construction footprint of the project, and alternative access routes during construction, impacts from construction, if any, to ethnographic resources would be negligible. Therefore, this issue was not analyzed in detail as a separate impact topic in the EIS.
- **Indian Trust Assets:** Indian trust assets are owned by American Indians but held in trust by the United States. Requirements are included in the Secretary of the Interior's Secretarial Order No. 3206, "American Indian Tribal Rites, Federal – Tribal Trust Responsibilities, and the Endangered Species Act," and Secretarial Order No. 3175, "Departmental Responsibilities for Indian Trust Resources." According to Park staff, Indian trust assets do not occur within ENP. There are no Indian trust resources in the project area. Thus, this issue was not analyzed in detail as a separate topic in this EIS.
- **Museum Collections:** There are no museum collections in the project area that would be affected by the implementation of the project. Therefore, this issue was not analyzed in detail as a separate topic in this EIS.
- **Natural or Depletable Resource Requirements and Conservation Potential:** The NPS uses sustainable practices to minimize the short- and long-term environmental impacts of development and other activities through resource conservation, recycling,

waste minimization, and the use of energy-efficient and ecologically responsible materials and techniques. Project actions would not compete with dominant Park features or interfere with natural processes, such as the seasonal migration of wildlife or hydrologic activity associated with wetlands. Therefore, this issue was not analyzed in detail as a separate topic in this EIS.

- **Night Sky:** Since lighting is not a component of any of the action alternatives and construction activities are anticipated to occur only during daylight hours, no impacts to night sky would occur. Therefore, night sky was not analyzed in detail as a separate impact topic in this EIS.
- **Prime or Unique Farmland:** Prime farmland has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. Unique agricultural land is land other than prime farmland that is used for production of specific high-value food and fiber crops. Both categories require that the land is available for farming uses. Lands within the Park are not available for farming and therefore do not meet the definitions. Therefore, this issue was not analyzed in detail as a separate impact topic in this EIS.
- **Public Health and Safety**: There is no anticipated increase in traffic associated with the project. Additionally, construction of bridges and roadways would be required to meet Federal Highway Administration (FHWA) and FDOT safety design standards. Therefore, this issue was not analyzed in detail as a separate impact topic in this EIS
- **Urban Quality and Gateway Communities:** Although Homestead, Florida City, and the Redland area of South Miami-Dade County are located adjacent to the Park and provide food and lodging for a number of Park visitors, these communities are not officially designated gateway communities for the Park and would not be impacted by the proposed action alternatives. Therefore, this issue was not analyzed in detail as a separate topic in this EIS.

EVERGLADES NATIONAL PARK
TAMIAMI TRAIL MODIFICATIONS: NEXT STEPS
FINAL ENVIRONMENTAL IMPACT STATEMENT





CHAPTER 2
ALTERNATIVES

CHAPTER 2: ALTERNATIVES

2.1 Development of the Alternatives

<u>Guiding Regulations and Policies</u>

NEPA implementing regulations provide guidance on the consideration of alternatives in an EIS. These regulations require the decision-maker to consider the environmental effects of the proposed action, including "no action", on a range of alternatives (40 CFR § 1502.14). The range of alternatives includes reasonable alternatives that must be rigorously and objectively explored, as well as other alternatives that are eliminated from detailed study. To be "reasonable," an alternative must meet the stated purpose of and need for the project. Project alternatives may originate from the proponent agency, local government officials, or members of the public, at public meetings, or during the early stages of project development. Alternatives may also be developed in response to comments from coordinating or cooperating agencies. The alternatives analyzed in this document, in accordance with NEPA, are the result of internal scoping and public scoping.

The purpose of including a No-Action Alternative in the environmental analysis is to ensure that agencies compare the potential impacts of the proposed action to the known impacts of maintaining the status quo. Current conditions are used as a benchmark. By using the current conditions as the No-Action Alternative, impacts of the proposed alternatives could be directly compared to the existing baseline.

The No-Action Alternative represents the current conditions present in the project area. Action alternatives considered in this EIS were developed by the NPS and input by the public during project scoping. The collective efforts of these individuals in documenting the requirements for the project formed the basis for development of the proposed action alternatives, including the Preferred Alternative.

The Preferred Alternative represents the NPS proposed action and defines the rationale for the action in terms of resource protection and management, visitor use and operational use, and other applicable factors.

NEPA regulations require that the action proponent assess means to mitigate adverse environmental impacts associated with implementation of the proposed alternatives (40 CFR § 1502.16). Each alternative analyzed in this EIS includes mitigation measures intended to reduce the environmental effects of restoring connectivity and flow in Northeast Shark River Slough. Mitigation measures, such as BMPs and standard operating procedures that would be implemented under any of the proposed actions are included in the description of the alternatives.

<u>Alternative Development History</u>

In 1989, ENP was expanded by adding the Northeast Shark River Slough, called the "East Everglades Expansion Area" of 107,600 acres. Plans to improve water flows into Northeast Shark River Slough began – a program called Modified Water Deliveries or "Mod Waters." While that work was developing, the separate and far broader Everglades restoration initiative, called the "Restudy," began in 1992, and became CERP after acceptance by Congress in 2000. Research on flows in the pre-drainage Everglades, using the "Natural System Model" developed for CERP, showed that the eastern half of Shark River Slough, including Northeast Shark River Slough, had originally carried 65% of the Everglades flows, with only 35% on the western half. Conversely, the routing established by the C&SF Project put 78% of modern flows to the west, and only 22% through Northeast Shark River Slough. The intent of the alternative development is to find solutions that would allow the full extent of Everglades Restoration to be realized without the Tamiami Trail being a limiting factor on the flows to and through Northeast Shark River Slough that are needed to restore ecological functions in ENP. As such, the effort is neither CERP nor MWD, but seeks ecological benefits within the context of future CERP projects so that modifications to the Trail would only need to be made once.

Alternatives for water conveyance from the L-29 canal across the Tamiami Trail were first evaluated in a GRR/SEIS in 2003. The 2003 Preferred Plan included construction of a 3,000 foot bridge in combination with raising the un-bridged roadway segment. In 2005, a revision of the 2003 GRR/SEIS (called the RGRR/SEIS) analysis was performed to re-evaluate the 2003 GRR/SEIS and additional alternatives. Subsequently nine (9) alternatives and the No-Action alternative were retained for detailed analysis. The 2005 Recommended Plan was Alternative 14 (two-mile long bridge at the western region of the project area and a one-mile long bridge at the eastern end). The total project cost was estimated at approximately $144 Million. A ROD selecting Alternative 14 was signed on January 25, 2006. However, when rapidly rising costs of fuel and raw materials greatly increased the project cost estimate, Congress in 2007 directed the USACE to re-evaluate the 2005 Recommended Plan as well as develop less costly alternatives. In developing these alternatives, the USACE was directed to increase flows to the Park of at least 1,400 cfs, without significantly increasing the risk of roadbed failure. USACE prepared a LRR/EA in 2008. For this report, the USACE considered 27 options including No-Action and the 2005 RGRR plan (Alternative 14). It was determined that the best performing and most cost-effective plan was Alternative 3.2.2.a. This alternative combines a one-mile bridge in the eastern location with raising the stage constraint at L-29 by one foot, to 8.5 feet, and providing road mitigation to this level. The cost for this tentatively selected plan is $225.4 million. The tentatively selected plan developed in the LRR/EA was accepted by and adopted in a ROD.

The 2009 Omnibus Appropriations Act directed the USACE to immediately begin construction of Alternative 3.2.2a (construction should be completed within 3 years). However, considering that the modifications to the Tamiami Trail contained in the 2008 LRR/EA would provide less than half (1,400 to 1,800 cfs) of the flow volume target contained in the original 1992 GDM (4,000 cfs), the 2009 Omnibus Act authorizes the DOI "to immediately evaluate the feasibility of additional bridge length, beyond that to be constructed pursuant to the MWD Project (16 U.S.C. § 410r-S), including a continuous bridge, or additional bridges or some combination thereof, for the Tamiami Trail to restore more natural water flow to Everglades National Park and Florida Bay and for the purpose of restoring habitat within the Park and the ecological connectivity between the Park and the Water Conservation Areas."

Additionally, the culvert analysis in the 2005 RGRR/SEIS indicates the hydraulic head required to deliver desired quantities of water has detrimental impacts to both Tamiami Trail and more importantly WCA-3B. This increased head would require that Tamiami Trail be raised higher than proposed, with only the culvert sets to convey water. In addition, the compounded head loss from the culvert sets and the S-355's would result in higher stages and longer durations within WCA-3B, causing detrimental impact to the ecosystem within this area. The other limitation of the culvert sets is that they provide only point source discharge in an area where the goal of the project is to restore historic sheet flow. The ultimate goal for the restoration of the Greater Everglades Area is to make man-made features (such as roads, levees, canals, etc.) transparent to the movement of water (2005 RGRR/SEIS). Since the purpose of this project is to remove barriers to sheet flow and provide for increased ecological connectivity between marshes in ENP and marshes in WCA-3B, the NPS determined that a culvert-only alternative for this project was inconsistent with the project purposes and objectives.

Therefore, the NPS has developed a range of alternatives that would expand the 2008 LRR/EA plan to include more bridge length and a No-Action Alternative for evaluation in this EIS.

2.2 Project Alternatives

Based on the previous preliminary analysis including the 2005 RGRR/SEIS and 2008 LRR/EA, internal scoping with the NPS, and the public input related to the proposed project, the following alternatives were carried forward for analysis in the EIS. For reference, figures depicting the bridge locations associated with each of the alternatives are included for review at the end of Chapter 2.

Six action alternatives were identified for detailed engineering evaluation and comparative analysis. The 2005 RGRR/SEIS was used as the basis for developing the initial suite of alternatives. These alternatives were renamed later for ease of use. Through further discussion and refinement other project alternatives emerged and if the adjustments were small, the existing alternative was given a lower case letter designation (e.g. a, b, or c) depending on the order in which it was developed.

All alternatives include bridge construction and reconstruction of the remaining highway, with differences being in the bridge or ConSpan (prefabricated culvert) lengths and locations. The bridge typical sections would satisfy current FDOT standards and be uniform throughout their entire lengths.

All of the proposed alternatives would be built to satisfy FDOT standards. The NPS is only responsible for the content of the information contained in this EIS. All future actions associated with the implementation of the Tamiami Trail Modifications: Next Steps project subsequent to the release of this document, including design, permitting, and construction of the project will be determined at a later date. In addition, it should be noted that before proceeding with construction, it will be necessary to obtain FDOT approval on design, plans, and specifications of the project before proceeding to construction. This approval shall include submittal of all plans, designs, and specifications, which will be signed and sealed by a Florida registered Professional Engineer.

The existing Tamiami Trail roadway embankment would be removed from the areas where the bridges would be constructed. The remaining highway embankment would be reconstructed to raise the crown elevation to 13.13 feet, the minimum required to comply with the FDOT *Flexible Pavement Design Manual* and FDOT *Plans Preparation Manual* based on a DHW elevation of 9.7 feet[17] in the L-29 Canal and the roadway cross section geometry[18]. To meet current FDOT standards for roadway geometry, the higher profile of the roadway would result in a wider roadbed than currently exists. Therefore, expansion of the highway footprint southward would be necessary to avoid impacting the L-29 Canal.

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17 In the 2005 RGRR/SEIS, the USACE used the NSM over a 36-year POR to establish a stage frequency curve for Tamiami Trail. Stages were extrapolated from the curve for particular frequencies to determine the DHW and the peak stage for overtopping criteria. Using the 20-year frequency, the 24-hour stage or DHW for pavement design was 9.7 feet (NGVD 1929).

18 Based on the FDOT *Flexible Pavement Design Manual* and FDOT *Plans Preparation Manual*, the minimum crown elevation for the roadway was calculated to be 13.13 feet based on the following parameters: 9.7-foot design high water; 2-foot base clearance; 10-inch limerock base (OBG 9), LBR 100, SN = 1.8; 3.5-inch type SP structural course (traffic C), SN = 1.54; 0.75-inch friction course FC-5 (traffic C); and 2.88-inch for 2% cross-slope over 12-foot travel lane.

Access facilities, such as ramps to the bridge or elevated roadway, would be provided for existing facilities. The MOT and construction sequence for the bridge and roadway would be based on the best balance of traffic safety, environmental impacts, and construction cost and duration.

Staging areas for construction equipment and materials may be located at business sites along the corridor. Staging and other functions may also require use of the existing shoulder for temporary periods. Additional staging areas may be necessary near the eastern end of the corridor. This project would generate a large quantity of material excavated from the road bed that could be disposed or recycled for use in other area projects. One disposal site, Rocky Glades, which is owned by SFWMD, is approximately 15 to 20 miles from the construction site. Selected quantities of soils and organic peat may be evaluated for placement in the nearby Broward Water Preserve Area. Asphalt material could be used in other road beds. Excavated fill could be used for backfilling the levee for the L-67 Extension project, where up to 50,000 cubic yards of material could be needed. Storing and recycling material could reduce hauling and disposal costs, as well as provide cost savings on other projects where this type of material is needed. Additionally, FDOT may consider some of the excavated material to be "salvageable materials" that could be used by FDOT for other purposes.

2.2.1 Hydrological Analysis in Support of the Roadway Design Parameters used for the Tamaimi Trail Modifications: Next Steps Project Alternatives

The Tamiami Trail Modifications: Next Steps project will modify the roadway to eventually allow for water levels in the adjacent marshes to meet the restoration objectives of the CERP. The NSM output best represents the full restoration target for projects affecting water levels within the central Everglades. The stage frequency predicted by the NSM was used as the basis for the design of the roadway, including all proposed bridges and elevated highway portions of the corridor, consistent with FDOT requirements. Water levels from the NSM were used to define a maximum (envelope) hydrologic state for the purpose of designing the roadway modifications. Due to flood control and water supply requirements, CERP likely cannot fully achieve NSM water levels, therefore designing to NSM water levels is a conservative approach to the design of the roadway modifications needed for the Tamiami Trail Modifications: Next Steps project. Direction for completion of this project specifically excluded the development of an operational plan due to time, funding, and technical constraints. Therefore, the purpose of the project is simply to identify the infrastructure that will allow for future unconstrained flow into ENP, following full restoration. What follows is an explanation of the NSM model as well as how the NSM predicted water level data was used for the identification of the FDOT required roadway design parameters.

Natural System Model

The NSM simulates the hydrologic response of the pre-drainage Everglades using recent (1965-2000) rainfall and other climatic records. The NSM does not simulate the natural system using earlier (pre-drainage) climatic inputs. The use of recent records of rainfall and other inputs allow modelers to make meaningful comparisons between the responses of the current managed system to that of the natural system under conditions of identical climatic inputs. In this way, the NSM is a useful planning tool for restoring hydrologic conditions of the Everglades. The NSM boundary encompasses an area from Lake Istokpoga (north of Lake Okeechobee) to Florida Bay.

The NSM was developed from the South Florida Water Management Model (SFWMM) by removing the structures and canals and adding historical drainage features (e.g. transverse glades). The SFWMM incorporates South Florida's unique geologic features and hydrologic processes, including the integrated surface and ground water hydrology with the operation of the C&SF Project. The NSM is based on the SFWMM 2-mile by 2-mile model grid (see ***Figure 2-1***). The NSM uses the same climatic input, model parameters, and computational methods as the SFWMM. As does the SFWMM, the NSM simulates surface water stage and flow in response to time variant hydrologic inputs including rainfall, potential evapotranspiration, and inflow at the model boundary. The NSM simulates the hydrologic system as it would function today without man's influence.

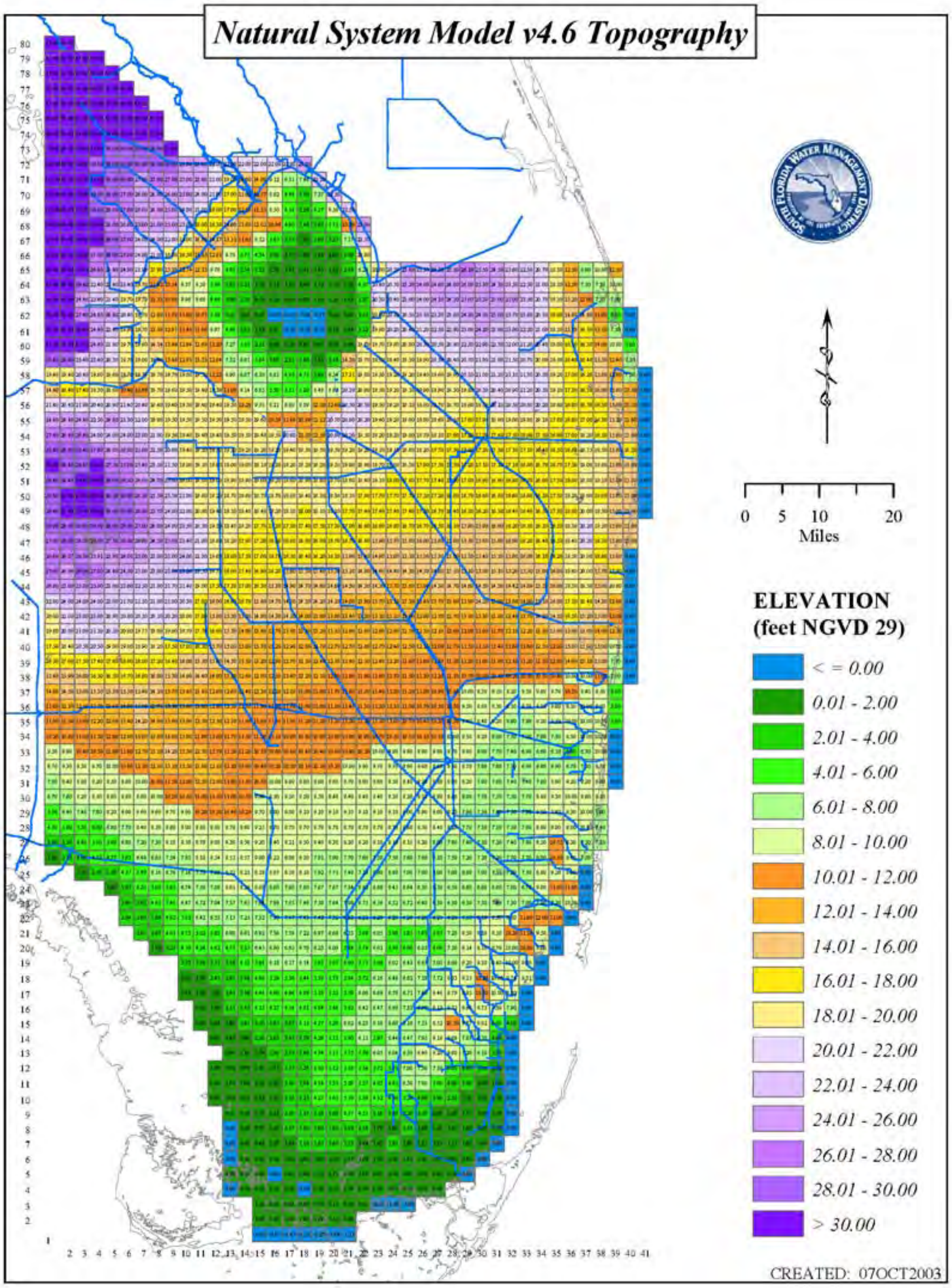

Figure 2-1 – NSM 2X2 Model Grid and Topography

Stage-Frequency Analysis: The NSM model predicts daily average stages based on simulating the response to observed rainfall from the years 1965 to 2000. The water stages in the vicinity of Tamiami Trail predicted by the NSM represent the highest stages that would be compatible with future restoration projects. Using NSM stages represents a conservative approach for determining the DHW and overtopping criteria for roadway design. For validating this approach, ***Figure 2-2*** compares the stage-duration curves in the vicinity of the Tamiami Trail from the NSM with the "full build-out" CERP model run (future conditions with project), Cerp0. This figure shows that the NSM stage levels at Tamiami Trail are higher than those expected following completion of the CERP restoration project, therefore designing the roadway to NSM stages meets or exceeds what is needed for future unconstrained flows.

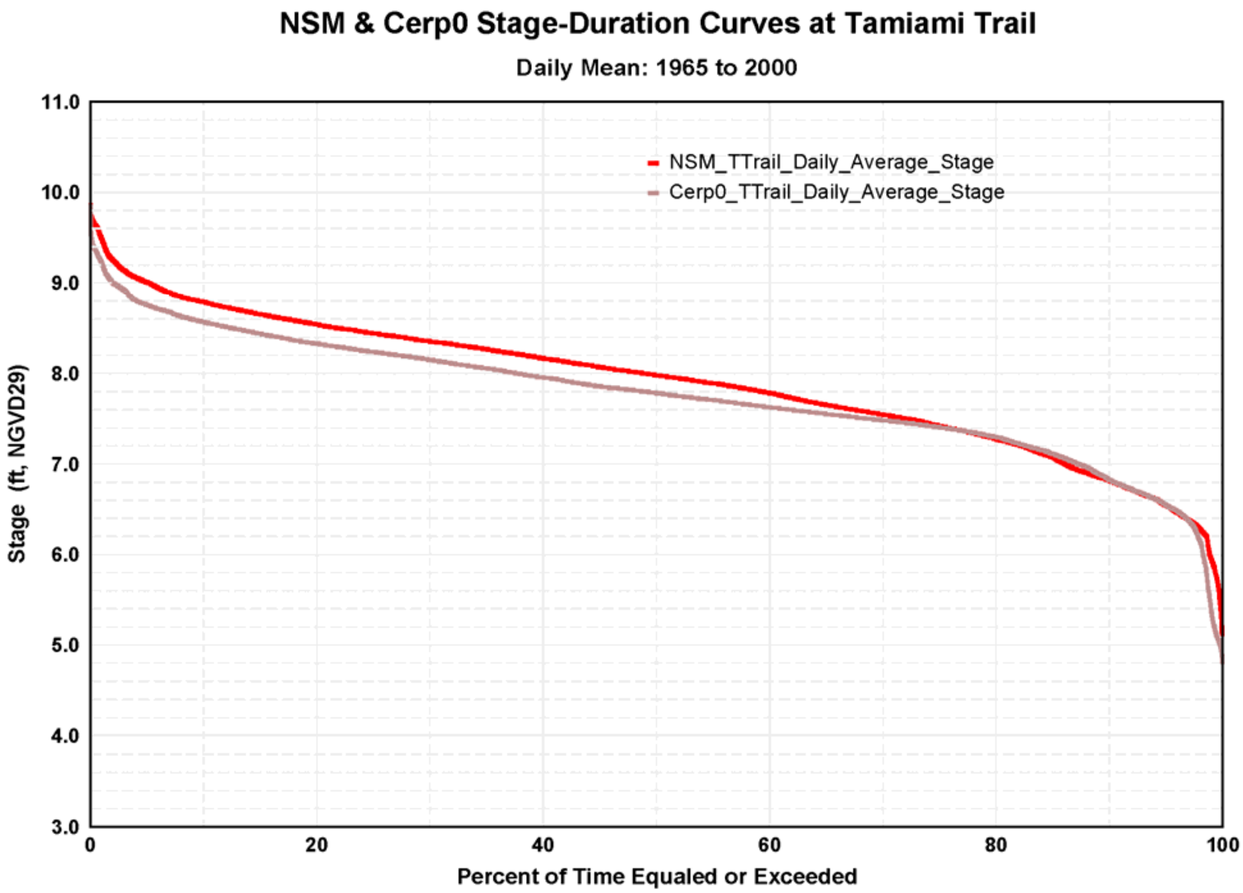

Figure 2-2 – NSM and Cerp0 Daily Stage-Duration Curves at Tamiami Trail

The DHW for the Tamiami Trail roadway was determined by performing a frequency analysis of NSM (version 4.6.2) annual maximum stages using the USACE computer program Flood Frequency Analysis (FFA), which provides a best-fit smooth curve to the data or model output using a Log Pearson Type III distribution. The program may be used with either flow or stage data. The input for FFA was the maximum 24-hour stage for each year of the 1965-2000 period of simulation (36 years). The model output used was the average stage for the five Tamiami Trail model grid cells in Row 22 – Columns 22, 23, 24, 25 and 26. ***Figure 2-3*** shows the expected probability stage-frequency curve for the NSM, using Weibull plotting positions for the model stage output. A frequency analysis using one value per year (the annual maximum event) provides a return period in years for points along the curve. Note that the NSM 1-in-20 year event is 9.7 feet, while the 1-in-100 year event is 10.1 feet (stages are NGVD 29). The NSM annual maximum stage-frequency curve shown in ***Figure 2-3*** (the center blue curve) is shown again on ***Figure 2-4*** as the envelope (red) curve. ***Figure 2-4*** illustrates that using the NSM annual maximum stages provide the most conservative curve for determining the project DHW.

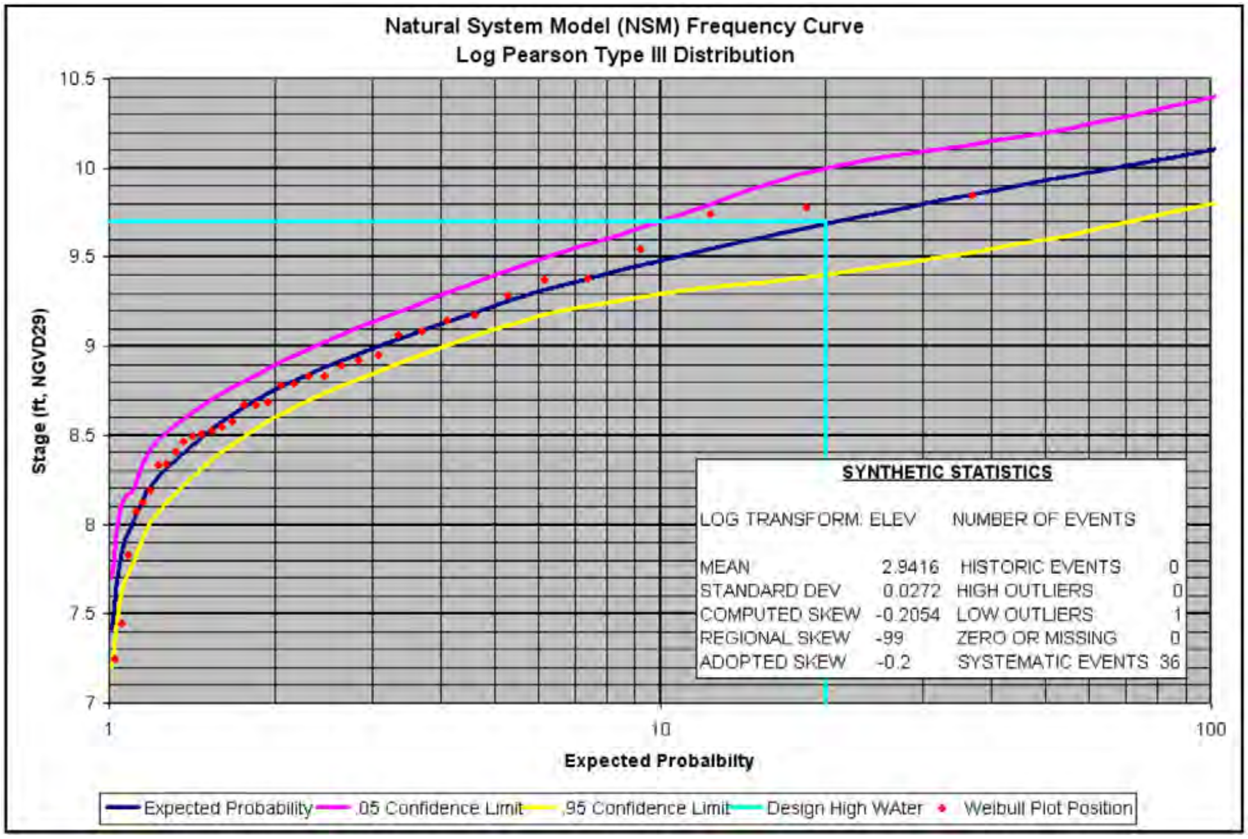

Figure 2-3 – NSM Stage-Frequency Curve at Tamiami Trail

Roadway DHW: Two controlling water surface elevations for the safety of the embankment are required by FDOT design criteria. The first is for the protection of the road base from capillary action, and requires a specific clearance from the DHW to the bottom of the base, dependent on the base material. The other is an overtopping criterion which states that the 100-year stage should not encroach into the travel lanes. For this project, the NSM 20-year, 24-hour stage of 9.7 feet NGVD29 is the DHW for the base clearance. The NSM 100-year, 24-hour stage for the overtopping criteria is 10.1 feet NGVD. The roadway design begins at the 9.7 foot DHW, followed by 2.0-foot base clearance plus 10-inch base plus 3.5-inch structural layer plus 0.75-inch friction course. These total to more than 3.0’. When the roadway course layers are added to the 9.7 foot DHW, the roadway surface will exceed 12.7 feet elevation – greatly exceeding the 10.1-foot overtopping criterion.

Alternative DHW Calculation: If a project area is tidally influenced, existing data is used to calculate the mean October water surface elevation. Storm events (20-year and 100-year) are then added to the mean October water surface elevation to calculate the DHW per the FDOT procedure. For the Tamiami Trail Modifications: Next Steps project, this method was used with the NSM mean October stage at Tamiami Trail to validate the 20-year, 24-hour and 100-year, 24-hour stages from the NSM.

Using the alternative method with the NSM model output at Tamiami Trail, the mean October stage is 8.47 feet (see ***Figure 2-4***). When the 20-year, 24-hour storm event (9.8 inches or 0.82

feet) is added, the stage increases to 9.27 feet, which is less than the 9.7 foot DHW. The 100-year storm equates to 13.2 inches or 1.1 feet of rain, which when added to the mean October stage is 9.55 feet is well under the 10.1 feet used for the overtopping criterion. Also, Cerp0 stages exceed the NSM October mean of 8.47 feet less than 15% of the time (NSM stages exceed 8.47 feet less than 25% of the time – see ***Figure 2-2***). These values indicate that the NSM annual maximum 24-hour stage method for computing DHW is conservative.

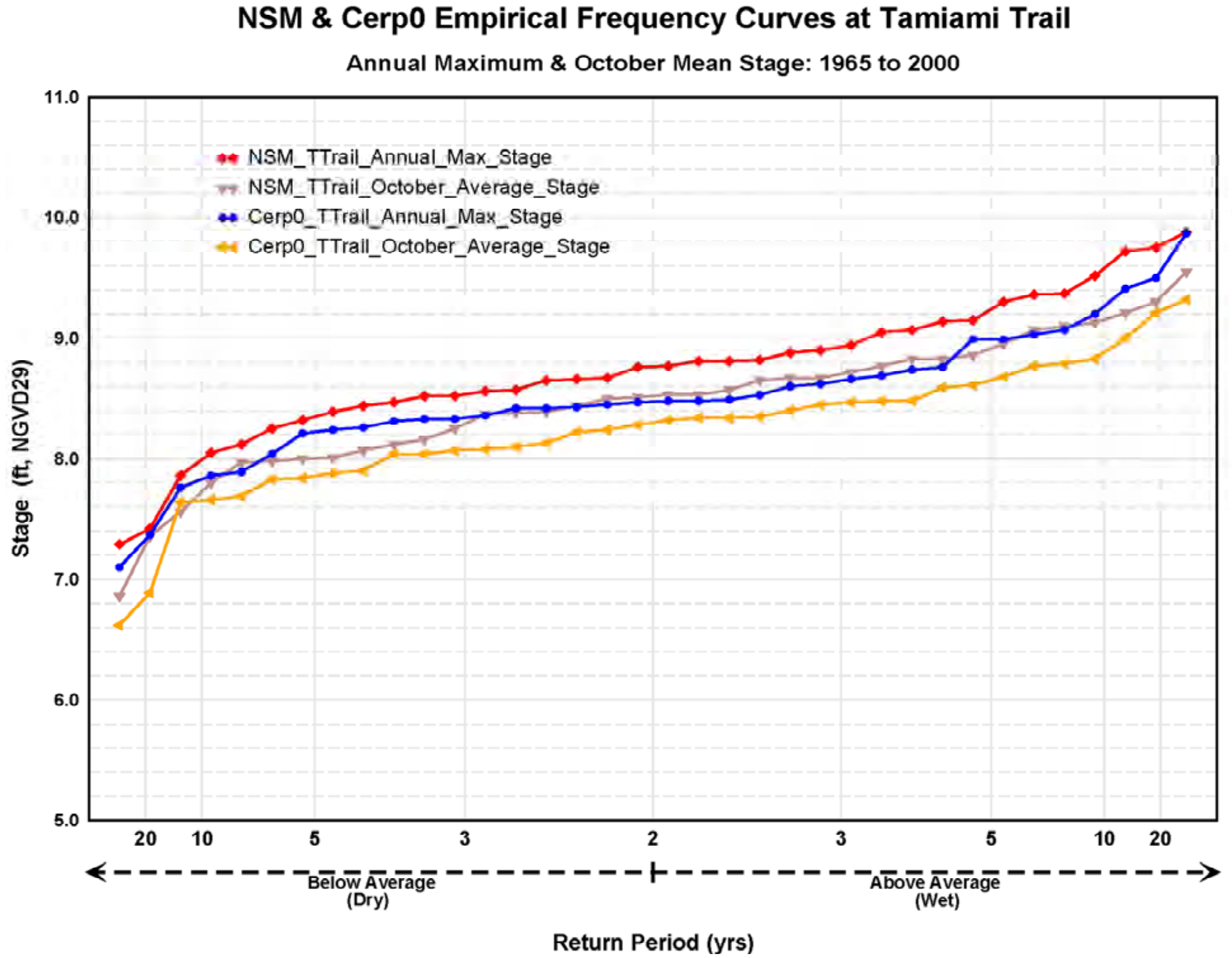

Figure 2-4 – NSM and Cerp0 Annual Maximum and October Mean Stage-Frequency Curves at Tamiami Trail

2.2.2 No-Action Alternative

The No-Action Alternative is authorized by the 2008 LRR/EA and consists of construction of a 1-mile eastern bridge with the remaining road raised to allow an increase in the allowable stage in the L-29 Canal from 7.5 feet NGVD to 8.5 feet NGVD.

All of the following action alternatives assume the 1-mile eastern bridge (2008 LRR/EA) has been constructed. The lengths of the bridges, transition areas between the bridges and the roadway, and the roadway are separated in the descriptions.

2.2.3 Action Alternatives

2.2.3.1 Alternative 1 – 2.2 Miles of Bridges

This alternative includes 4 bridges (for a total of 2.2 miles of bridges): a 0.56-mile bridge (Bridge A1) located between the Osceola Camp and the Lincoln Financial Radio Tower; a 0.45-mile (Bridge B1) located between the Lincoln Financial Radio Tower and Everglades Safari Park facility; a 0.51-mile bridge (Bridge C1) located between the Everglades Safari Park facility and Frog City; a 0.38-mile bridge (Bridge E1) located between Frog City and Gator Park; and a 0.26 ConSpan (ConSpan H1) located just west of Coopertown, at control structure S-355B. The bridges and ConSpan would create a conveyance opening through Tamiami Trail by removing the sections of the existing highway and embankment. Bridges would be constructed approximately 50 feet south of the existing roadway ROW to maintain motor vehicle traffic during bridge construction. The remaining highway embankment (approximately 4.99 miles) would be reconstructed to raise the crown elevation to 13.13 feet. Please refer to ***Table 2-1*** and ***Figure 2-5*** for details.

2.2.3.2 Alternative 2a – 3.3 Miles of Bridges

The bridge configurations include: (1) a 0.56 mile bridge located between the Osceola Camp and the Lincoln Financial Radio Tower, (2) a 0.45 mile bridge located between the Lincoln Financial Radio Tower and Everglades Safari Park, (3) a 0.51 mile bridge located between Everglades Safari Park and the Airboat Association, (4) a 0.38 mile bridge located the Airboat Association and the Tiger Tail Camp, (5) a 0.26 mile ConSpan located between the Coopertown facility and the Salem Communications radio tower, (6) a 0.53 bridge located between the Salem Communications radio tower and the existing one-mile bridge and , (7) a 0.66 mile bridge located between the existing 1-mile bridge and the S-334 structure.

Alternative 2a would involve creating conveyance openings through Tamiami Trail by removing 3.3 miles of the existing highway and embankment. Bridges would be constructed approximately 50 feet south of the existing roadway ROW to maintain motor vehicle traffic during bridge construction. The remaining highway embankment would be reconstructed to raise the crown elevation to 13.13 feet. Please refer to ***Table 2-1*** and ***Figure 2-6*** for details.

2.2.3.3 Alternative 4 – 1.0 Mile of Bridges

This alternative includes 2 bridges: A1 and B1 (for a total of 1.0 mile), as described for Alternative 1. The bridges would create a conveyance opening through Tamiami Trail by removing the sections of the existing highway and embankment. Bridges would be constructed approximately 50 feet south of the existing roadway ROW to maintain motor vehicle traffic during bridge construction. The remaining highway embankment (approximately 7.80 miles) would be reconstructed to raise the crown elevation to 13.13 feet. Please refer to ***Table 2-1*** and ***Figure 2-7*** for details.

2.2.3.4 Alternative 5 – 1.5 Miles of Bridges

Alternative 5 consists of 3 bridges; bridges A1, B1, and C1 (for a total of 1.5 miles) as described for Alternative 1. The bridges would create a conveyance opening through Tamiami Trail by removing the sections of the existing highway and embankment. Bridges would be constructed approximately 50 feet south of the existing roadway ROW to maintain motor vehicle traffic during bridge construction. The remaining highway embankment (approximately 6.57 miles) would be reconstructed to raise the crown elevation to 13.13 feet. Please refer to ***Table 2-1*** and ***Figure 2-8*** for details.

2.2.3.5 *Alternative 6e – 5.5 Miles of Bridges*

Alternative 6e is the maximum bridging option and consist of 5.5 miles of bridges and elevating the remaining roadway. The bridge configurations include: (1) a 2.60 mile bridge located between the Osceola Camp and the Airboat Association, (2) a 0.4 mile bridge located between the Airboat Association and the Tiger Tail Camp, (3) a 1.8 mile bridge located between the Tiger Tail Camp and the existing one-mile bridge, and (4) a 0.7 mile bridge located between the existing 1-mile bridge and the S-334 structure. Bridges would be constructed approximately 50 feet south of the existing roadway ROW to maintain motor vehicle traffic during bridge construction and avoid impacts to infrastructure north of the project area. The remaining highway embankment would be reconstructed to raise the crown elevation to 13.13 feet. Please refer to ***Table 2-1*** and ***Figure 2-9*** for details.

Down Ramps: Bridge down ramp (access ramp) options were also developed for the purpose of maintaining access to Everglades Safari and Coopertown for Alternative 6e. Four down ramp options were developed for Everglades Safari. Option 4 (Modified Parallel down ramp) was selected as the preferred option. Five down ramp options were developed for Coopertown. Option 5 (Parallel down ramp with Existing Frontage Road) was selected as the preferred option.

The bridge down ramp typical section includes two 12-foot travel lanes with 5-foot shoulders and outside barriers. Radii of 50 feet are provided between the access road and Tamiami Trail travel lanes. These connections provide access from the bridged areas to properties south of the existing Tamiami Trail roadway. The down ramps were considered as frontage road connections with the same design criteria as collector streets. The elevated portion of the down ramps will be girder bridges supported on pile bents. Varying span lengths will be used to support the ramps along curves.

Table 2-1 – Action Alternative Comparison

Evaluation Criteria	Alt. 1	Alt. 2a	Alt. 4	Alt. 5	Alt. 6e
Roadway at 12-foot offset (feet)	27,820	17,992	40,060	34,783	13,928
Alignment Transitions (feet)	11,280	16,210	5,080	7,680	9,560
Bridge (feet)[19]	10,016	16,262	5,354	8,031	28,354
Precast Arch-Type Bridge Culverts (feet)[20]	1,378	1,378	0	0	0
Total Length (feet)	50,494	51,842	50,494	50,494	51,842
Total Length (miles)	9.56	9.82	9.56	9.56	9.82

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19 Structures identified as bridges are 47.08 feet wide with a clear distance of 44.00 feet between inside parapet faces. The bridges include two 12-foot travel lanes with 10-foot shoulders and outside barriers. Both the travel lane and shoulder are on a 2% cross slope. The structural system for the proposed bridge structures is based on the least cost structure identified in Appendix D of the 2005 RGRR/SEIS. The proposed bridge structures are Florida Bulb Tee (FBT) 72 beams with a composite CIPC deck, supported on pile bents at 99.15-foot spacing using 24-inch square precast prestressed concrete piles in to rock.

20 Structures identified as precast arch-type bridge culverts are 48 feet wide with a clear distance of 46 feet between inside faces of the spandrel walls and a 9.05-foot vertical rise. The arches are supported on CIPC footings socketed into the bedrock. The typical road section of two 12-foot travel lanes with 10-foot shoulders sits on subgrade above the arches.

Evaluation Criteria	Alt. 1	Alt. 2a	Alt. 4	Alt. 5	Alt. 6e
Number of Bridges	4	6	2	3	4
Number of Precast Arch-Type Bridge Culverts	1	1	0	0	0
Number of Down Ramps	0	0	0	0	2
Estimated Total Project Cost (x $1 million)	$178.7	$199.2	$135.5	$152.9	$310.0
Estimated Construction Duration (years)	3.57	3.16	3.77	3.55	3.67[21]

2.2.4 Elements Common to All Action Alternatives

Several of the elements proposed as a part of this project would be common to all the alternatives considered, excluding the No-Action Alternative. These elements are described below.

- Roadway Typical Section: The typical section consists of two 12-foot wide travel lanes, 5-foot paved shoulders on each side of the roadway, and 6.5-foot grassed shoulders along the outside of the paved shoulders, aligned with the proposed roadway centerline. The travel lanes are on a 2% cross slope and the shoulders are on a 6% cross slope. Guardrail is present along both sides of the roadway for the length of the project. See ***Appendix A*** – Engineering Report (Plate C-1) for the proposed typical section. The only dedicated left turn lanes are at the off ramp locations. No dedicated passing lanes, median buffers, or roadway lighting if proposed. The proposed 5-foot shoulder meets minimum FDOT requirements for adequate on-road bicycle facilities on this roadway.[22] For this reason, the 5-foot shoulder shall be clear of all obstructions such as guardrail, curb or other roadside barrier. If drainage structures are required in the shoulder, they shall be bicycle safe structures.
- Alignment Transition: The roadway alignment transition typical section includes two 12-foot wide travel lanes, 5-foot paved shoulders on each side of the roadway and 6.5-foot grassed shoulders along the outside of the paved shoulders, aligned with the proposed centerline. The majority of the alignment transitions are on a 2% cross slope and the shoulders are on a 6% cross slope. Some transitions are super-elevated to shorten their length to maintain access to existing private parcels. Super-elevated transitions are on a 2.5% maximum cross slope and the shoulders are on a 4.5% and 6.0% cross slope on high side and low side, respectively. Crowned alignment transitions are 1,850 feet long and super-elevated alignment transitions are 1,250 feet long from begin of super-elevation transition to begin of structure. See ***Appendix A*** – Engineering Report (Plates C-3 and C-4) for normal crown and super-elevated alignment transition details.
- Pavement Design: The pavement design will comply with the FDOT *Flexible Pavement Design Manual* and FDOT *Plans Preparation Manual*. The flexible pavement design is based on future traffic loading and the new embankment subgrade Resilient Modulus

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21 This estimated construction duration varies slightly from the estimated construction duration in Table 2-15 for the Preferred Alternative due to weather days and federal holidays.

22 While the proposed roadway design includes a 5-foot shoulder, which meets minimum FDOT requirements for adequate on-road bicycle facilites, the roadway shoulder is not specifically designated for bicycle use and is not recommended for bicycle use due to safety concerns. Please see Section 4.9.3 for a discussion of a bicycle/multi-use path associated with this project.

(Mr). The open-to-traffic date is assumed to be 2018, with a planning horizon year of 2038. As previously summarized, the 2018 AADT is estimated to be 6,500 vpd, the 2028 AADT is estimated to be 8,200 vpd and the 2038 AADT is estimated to be 9,800 vpd. The existing traffic statistics, obtained from the FDOT Florida Traffic Information 2009 CD, were K_{30}=7.98%, D_{30}=59.96%, T=14.47%. The K_{30} factor lies outside of the acceptable range for a rural roadway. Based on the acceptable K_{30} values, as presented in the FDOT Project Traffic Forecasting Handbook, a K_{30} of 11.0% is considered acceptable for this facility. The 18-kip Equivalent Single Axle Load (ESAL) is 4.2 million, based on the 2038 traffic projection, 90% reliability and a 0.96 factor for rural arterials. A design Mr of 12,000 pounds per square inch (psi) was used for new embankment material as this is the Mr used for the new embankment material for the base condition. The Mr was reduced by 25% to 9,000 psi as discussed in the 2008 FDOT *Flexible Pavement Design Manual* for 2-foot base clearance. Three-foot base clearance could be used with no reduction in Mr, but would require additional ROW at all roadway and alignment transition sections. The proposed pavement design uses two-foot base clearance. A pavement section Structural Number (SN) of 4.09 is required for a 20-year forecast 4.2 million ESAL, a subgrade Mr of 9,000 psi (for new A-1 or A-3 embankment material) and 90% reliability. The proposed pavement design provides a SN of 4.30. The pavement design, including separate shoulder requirements, would be refined during the PED phase. The recommended resurfacing interval for this pavement section is 10 years, at the low end of the 10 to 15-year interval typical in Florida. The typical pavement section for new construction consists of:

- 0.75-inch Friction Course FC-5 (Traffic C)
- 3.5-inch Type SP Structural Course (Traffic C), SN = 1.54
- 10-inch Limerock (OBG 9), LBR 100, SN = 1.8
- 12” Type B, LBR 40, SN=0.96
- A-1 or A-3 Embankment, (Design Mr = 9,000 psi).

- Right-of-Way: Within the project limits, the majority of the existing ROW width varies from 58 to 75 feet. The existing ROW widens to 95 feet for approximately 450 feet at the west end of the project. The existing ROW offset from the existing centerline is 32 to 45 feet on the north and 24 to 30 feet on the south. For the roadway, the existing ROW to the south ranges from 24 to 30 feet from the roadway centerline, with an average of approximately 29 feet. As a result of raising the road, the average proposed ROW would increase to 23.5 to 35.5 feet beyond the existing average (i.e. 52.5 to 64.5 feet from the existing roadway centerline). The raised roadway includes a proposed ROW that ranges from 15.4 to 23.5 feet beyond the existing ROW. The bridges include a proposed ROW that is approximately 43 to 55 feet beyond the existing ROW. The roadway alignment transitions include a proposed ROW that varies from 15.4 to 76.5 feet beyond the existing ROW. The roadway and bridge approach sections would require a 10-foot TCE on the south side of the roadway. The girder bridges, down ramps, and precast arch-type bridge culverts would require a 50-foot TCE. All TCE’s would be restored to original condition upon completion of construction activities.
- Waste Management: Waste is primarily expected to be generated from servicing and maintenance of equipment. This waste is expected to be maintained in the construction area. Portable toilets would be arranged and placed at the construction area. The waste from the portable toilets would be pumped out, removed from the Park, and disposed of at an appropriate disposal facility.

- Sediment and Turbidity Control: Construction procedures would include the use of BMPs to contain disturbed sediments and reduce water quality impacts. A turbidity monitoring plan would be implemented during construction to ensure continued compliance with State water quality criteria.
- Construction Monitoring: Anticipated monitoring during construction would include water quality monitoring and monitoring for protected wildlife species. Anticipated long-term monitoring/maintenance would include roadway/bridge monitoring for maintenance activities conducted by the FDOT.
- Construction: Roadway construction would be phased. Maintenance of traffic for this project involves construction of temporary pavement on the existing westbound shoulder to maintain two-way traffic during construction. Once traffic is shifted to the proposed roadway, the existing pavement would be demolished.
- Disposal Sites: While the Appendix A identifies several commercial facilities along with the South Dade landfill as potential material disposal sites, the preferred site would be the L-67 Extension Canal located immediately west of the project area. Filling the L-67 Extention Canal would reduce the overall cost of the project (tipping fees) and improve the distribution of flows across the breadth of the trail (western and eastern sections). Testing would be conducted prior to disposal to ensure suitability as fill material.

2.3 Performance Measures

The NPS, along with a multi-agency team comprised of state and federal agencies, considered the 13 performance measures reviewed in the 2005 RGRR/SEIS, and excluded those below from further consideration in this study due to the identified reasons.

- No hydrologic data were available for the new alternatives for the following performance measures:
    - Average Annual Flow Volumes
    - Shift to open water, spikerush marsh, and slough communities in Northeast Shark River Slough
    - Risk of ridge and tree island peat burning in Northeast Shark River Slough
    - Invasion of exotic woody plant species
    - Total abundance of fishes in ENP marshes
    - Conditions for wading bird foraging and nesting (note: this performance measure was tied closely to the abundance of fish and thus was also removed)
- No new Resource Management Associates (RMA) modeling was available for the following performance measures:
    - Proportion of area with low flow velocity (<0.1 f/s) discharges within one mile of the Tamiami Trail
    - Distribution of flows, east to west [this is largely affected by lengths of opening(s) in Tamiami Trail]

The NPS also considered the performance measures which were used in the 2008 LRR/EA that had not been in the 2005 RGRR/SEIS, excluding those below from further consideration in this study due to the identified reasons.

- No hydrologic data were available for the new alternatives for the following performance measures:
  - One-in-ten year maximum discharge
  - Number of days water depth greater than two feet during wet season peak
  - Number of days water depth greater than three feet during peak wet season
  - Average water depth during wet season peak

Two performance measures from the 2005 RGRR/SEIS, which were revised for the 2008 LRR/EA, were used again for this study, with minor modifications:

- Reverse filling in of sloughs changed to “Number of sloughs crossed by each alternative”
- Flows from L-29 Canal into deep sloughs of Northeast Shark River Slough changed to “Flows into Northeast Shark River Slough provided via bridge”

One performance measure introduced in the 2008 LRR/EA was incorporated into this study:

- Reduction in Wildlife Mortality

The eight performance measures used in the CBA analysis address important characteristics of ENP: connectivity, ridge and slough processes, flows, velocity, wildlife resources, cultural resources (roadway), cultural resources (historic properties), and wetland impacts. These eight performance measures reflect differences among alternative bridge lengths, locations, and openings. In addition, all performance measures represent potential benefits or impacts of the structural alternatives. See ***Appendix B*** for the VA/CBA Report.

A brief description of each of the eight performance measures is provided below, including what they represent, how they were developed, the input information, units of measure, targets, and the methods of calculation or estimation of values.

1. Potential connectivity of WCA-3B marsh and Northeast Shark River Slough as percent of total project length.
2. Number of sloughs crossed by each alternative.
3. Flows into Northeast Shark River Slough provided via bridge.
4. Difference between average velocity in marsh and average velocity at road.
5. Reduction in wildlife mortality.
6. Impacts to Tamiami Trail as a cultural resource.
7. Impacts to historic properties.
8. Impacts to wetlands.

The “bridge length” as described in this section includes the one-mile of bridging associated with the No-Action Alternative. Throughout much of the rest of the EIS, the one mile of bridge length is not included. In addition, it is recognized that in some instances the “opening length” for any alternative might be slightly smaller than the “bridge length” used in this analysis (due to ramping configurations and/or inclusion of ConSpans). Although this discrepancy has been recognized, this difference is not significant and would not change the alternative analysis.

2.3.1 PM-1 – Potential connectivity of Water Conservation Area 3B marsh and Northeast Shark River Slough as percent of total project length

This performance measure describes the potential connection between WCA-3B and Northeast Shark River Slough if the L-29 Levee is removed under a future project. It is calculated by dividing the length of bridge opening in miles by 10.7 miles, the length of the longest possible bridge that could be constructed in the project area.

A 100 percent value indicates full *potential* connectivity and is the target. Note that this marsh to marsh connectivity would also require degrading the L-29 Levee that encloses the WCA-3 impoundments. Degrading L-29 is not authorized under this project.

Table 2-2 – Potential Connectivity of Water Conservation Area 3B Marsh and Northeast Shark River Slough as Percent of Total Project Length

Alternative	Bridge Length (miles)	Connectivity Performance Measure Score
No-Action	1.0	9%
1	3.2	30%
2a	4.3	40%
4	2.0	19%
5	2.5	23%
6e	6.5	61%

2.3.2 PM-2 – Number of sloughs crossed by each alternative

This performance measure is related to the alignment of the bridge with existing degraded sloughs south of Tamiami Trail. Situating a bridge directly upstream of the degraded sloughs would maximize the potential for storm flow velocities to maintain the sloughs through removal of the accumulated organic sediment. The length of the bridge has relevance only to the extent that it can encompass more sloughs within its flow cross-section.

The method used for estimating the number of sloughs crossed is based on the premise that the locations of the 19 sets of culverts were placed to match natural, pre-drainage historic flow-ways (McVoy et al., in press). The performance measure is evaluated by counting the number of culverts that each bridge alternative crosses. Culverts located in the approach areas were not counted. The target for this performance measure is 19, the total number of culverts under Tamiami Trail. This method differs from the 2005 RGRR/SEIS and 2008 LRR/EA analyses of this performance measure in which the High Accuracy Elevation Data (HAED) data was used to estimate the number of sloughs crossed by Tamiami Trail. Due to the locations of the alternatives in this study, the culverts were a better method to estimate the number of historic sloughs crossed by each alternative.

Table 2-3 – Number of Sloughs Crossed by Each Alternative

Alternatives	Bridge Length (miles)	Number of Sloughs Crossed
No-Action	1.0	1
1	3.2	5
2a	4.3	6
4	2.0	2
5	2.5	4
6e	6.5	10

2.3.3 PM-3 – Flows into Northeast Shark River Slough Provided via bridge

While the existing culvert sets provide a hydraulic connection to the deeper sloughs existing within Northeast Shark River Slough, the capacity is not commensurate with the amount of flow expected in these deeper sloughs during both high and low flow conditions. Preferential flow through these deeper sloughs is even more pronounced during drier times.

The eastern portion of Shark Slough (from the L-67 Extension to the L-31N Levee) varies in elevation from about 5.6 feet NGVD to 7.2 feet NGVD. Without the obstruction of Tamiami Trail, the preferential flow path from this varying elevation would be in the deeper sloughs. The distribution of flow within Northeast Shark River Slough would become more uniformly distributed (from west to east) as depth increases and the relative depth differences reduce.

Average and High Flow Conditions

The stages in Northeast Shark River Slough range from about 4 feet NGVD (about two feet below ground surface) to 9 feet NGVD with a median stage of about 7.5 feet NGVD. Ground elevations vary along Tamiami Trail. The median stage of 7.5 feet NGVD results in an average water depth of about 1.1 feet with a maximum depth of about 1.9 feet and a minimum depth of about 0.3 feet.

The increased connection provided by the bridge aligned with deeper portions of Northeast Shark River Slough, facilitates increased flow where it should occur preferentially. When the water level is less than 0.5-foot above the ridges, most of the flow occurs in the deeper sloughs. It is important for water to be rapidly delivered to these deeper sloughs, commensurate with this capacity, during wet periods. Rapid water delivery would produce higher velocities desirable for the redevelopment and maintenance of open water vegetation in these sloughs. This assessment assumes that sheet flow is based on the following equations:

Manning Equation; $Q = (u/n)\ A\ Rh^{(2/3)}\ (hf/L)^{(1/2)}$
A depth dependent Manning n ($n = \sim d^{\ 0.77}$)

Where:
A = Cross Section Flow Area = W * d
W = Flow Width
d = Flow Depth
P = Wetted Perimeter
R = Hydraulic Radium = A/P = (W * d) / W ~ d

Dry Conditions

The importance of these connections during drier periods is increased by the fact that both the existing condition and the expected range of the "with project" conditions (Tamiami Trail Bridge in conjunction with revised operations) are drier than the desired conditions as represented by the NSM[23]. The increased connection that a bridge provides as compared with culverts in terms of capacity and connectivity (sheet flow with low velocity versus higher flow volume through a narrower culvert) is expected, for the same water availability, to have the following effects:

- Better distribution of the water; high water levels with more natural recession rates and less abnormal dry conditions as the limited water available would be able to reach these sloughs.
- A reduction in unnatural predation around the culverts due to their limited area.

Evaluation Procedure

Considering each bridge location, the benefits of different bridge lengths and locations were assessed. A representative "marsh capacity" was estimated on 200-foot wide intervals using the U.S. Geological Survey (USGS) helicopter ground elevations and Manning's "n" based flow equation used in the SFWMM. The location of each bridge was then used to calculate the marsh capacity directly connected by a bridge opening. This marsh capacity for the bridge was then divided by the marsh capacity of the approximately 11 mile wide Northeast Shark River Slough from the L-67 Extension to the L-31N Levee (NAD83 horizontal coordinates from 763,500 to 821,250) and expressed as a percentage.

Table 2-4 – Flows into Northeast Shark River Slough Provided via Bridge

Alternative	Bridge Length (miles)	Flows into Northeast Shark River Slough Provided via Bridge
No-Action	1.0	10
1	3.2	35
2a	4.3	50
4	2.0	26
5	2.5	29
6e	6.5	64

2.3.4 PM-4 –Difference between average velocity in marsh and average velocity at road

One objective of this project is to provide infrastructure that will allow for "unconstrained" flows from WCA-3B to ENP, while providing flow velocities at the bridges approaching velocities seen in the freshwater marsh. Information from South Florida Water Management District's (SFWMD) recently constructed Stormwater Treatment Areas (STAs) indicate that velocities greater than 0.1-foot per second adversely affect vegetation colonization and growth. Sediment scouring is also increased. The total bridge capacity must pass the greatest anticipated flows without

23 The Natural System Model depicts the hydrologic response of the pre-drained system to rainfall and other hydrologic conditions of the period from 1965 through 1995. It does not depict the conditions of the pre-drained Everglades system, although there is a misconception that it does; such data do not exist (1999 *Final Integrated Feasibility Report and Programmatic Environmental Impact Statement*, a product of the *Central and Southern Florida Project Comprehensive Review Study,* also known as the *Restudy*).

exceeding the maximum allowable stage in the L-29 Canal. For this project the Tamiami Trail would be improved to allow for a DHW elevation of 9.7 feet in the L-29 Canal. The Hydrologic Engineering Center - River Analysis System (HEC-RAS) model was used to evaluate the six alternatives (including "No-Action"), plus a 10.7-mile bridge, using steady flow water surface profiles. The HEC-RAS model allows for simulation of multiple bridge and culvert openings by solving the one-dimensional energy equation. Energy losses were computed using a depth-varying Manning's n-value, and contraction/expansion coefficients. The models show that all of the proposed alternatives can pass the maximum anticipated flows (6,200 cfs) at the 9.7-foot DHW elevation. For additional information about the HEC-RAS model, please reference the HEC-RAS Modeling Analysis in ***Appendix C***.

Results for computed velocities at the bridges and in the marsh, and the normalized performance measure scores, are shown in ***Table 2-5***. Performance measure scores are based on a percent increase in flow velocity at bridges over marsh velocity. Scores are normalized on a scale of 0 to 1, and represent lift above base conditions (the No-Action alternative).

Table 2-5 – Difference between Average Velocity in Marsh and Average Velocity at Road

Alternative	Average velocity 200' blw bridge (ft/sec)	Normalized PM Score
No-Action	0.34	0.0
1	0.14	0.7
2a	0.10	0.8
4	0.20	0.5
5	0.16	0.6
6e	0.08	0.9

2.3.5 PM-5 – Estimated reduction in wildlife mortality

This performance measure is based on results of a wildlife mortality study conducted between July 2002 and September 2003 along four transects of the Tamiami Trail between the S-333 structure and the L-31N Canal (USFWS, 2004). The results of the USFWS (2004) study indicated an estimated average annual wildlife mortality rate from vehicle collisions along the Tamiami Trail of 261 mortalities per year that included birds, amphibians, reptiles, and mammals (USFWS, 2004). Reptiles including alligators, turtles, snakes, and lizards had the highest recorded roadside mortality, comprising 84.2% of all roadside mortalities (USFWS, 2004). The USFWS (2004) study likely underestimated actual roadside mortality rates because the estimated mortality rates did not include a carcass detection correction factor or a scavenger removal correction factor.

Wildlife mortality from collisions with automobiles would continue to occur on the sections of Tamiami Trail that would be connected to the adjacent marsh and canal. Wildlife mortality is anticipated to be reduced for wetland-dependent amphibians and reptiles, and potentially some mammals at the bridged sections of Tamiami Trail because there would be no connection between the road surface and the marsh and canal.

The performance measure presents the estimated number of deaths that would be avoided because of the presence of the bridge(s). It is calculated by multiplying 261 deaths per mile per year by the total length of the bridge(s) in miles. Because the L-29 Canal and levee are not eliminated with the Tamiami Trail Modifications: Next Steps project alone and because conditions may be artificially deep under the bridge, limited bridging (e.g., one mile) may simply redirect mammals to cross at other sections of the unbridged Tamiami Trail. Also, avian mortality rates caused by vehicle collisions are not anticipated to be reduced by use of bridges as compared to roadways. However, this performance measure is meant to represent a relative index of the reduction in wildlife mortality rates related to bridging length. Because wetland-dependent reptiles that would directly benefit from reduced wildlife mortality rates from bridges comprised the majority of the wildlife mortality in the USFWS (2004) study, it is appropriate to use this performance measure as a relative index for estimating wildlife mortality rates as they relate to overall total bridging lengths. The anticipated wildlife mortality rate resulting from vehicle collisions is anticipated to be inversely related to the amount of bridge length (***Table 2-6***).

Table 2-6 – Estimated Reduction in Wildlife Mortality

Alternative	Total Bridge Length (miles)	Estimated # Average Annual Deaths Avoided
No-Action	1.0	261
1	3.2	835
2a	4.3	1,122
4	2.0	522
5	2.5	653
6e	6.5	1,697

2.3.6 PM-6 – Impacts to Tamiami Trail as a cultural resource

Tamiami Trail is eligible for listing on the NRHP. Elements of the Tamiami Trail are susceptible to adverse affect or damage due to increased water levels, changes to the embankments intended to protect the roadway from damage, and destruction of the roadway to construct bridges or install ConSpans. This performance is evaluated in terms of how the alternatives under consideration would impact the Tamiami Trail and if there is an advantage of one alternative over another due to a reduced impact on the roadway.

Table 2-7 – Miles of Highway Affected/Protected

Alternative	# of Resources Adversely Effected (Miles of Highway)	# Miles Protected
No-Action	1.0	9.7
1	3.2	7.5
2a	4.3	6.4
4	2.0	8.7
5	2.5	8.2
6e	6.5	4.2

2.3.7 PM-7 – Impacts to historic properties

The properties adjacent to Tamiami Trail are also susceptible to adverse affect or damage resulting from this project. A cultural resources evaluation of properties located within the project corridor conducted in July 2009 found two properties, Coopertown Restaurant and Airboat Rides and Airboat Association of Florida, eligible for listing in the NRHP. A third property, the Miccosukee Osceola Camp, is potentially eligible. There are no intact historic buildings at the camp (Fred Dayhoff, personal communication). Shovel testing has not been conducted to check for buried cultural resources since fill has been placed at the site. Aerial photography indicates there is a tree island on the north side of the highway, to the north of the camp, which is a candidate for having archeological resources. The Osceola Camp is on the south tail of this tree island and appears to have been developed in a low area that was raised with fill material. As such, the potential for buried archeological resources in the fill is low. If archeological deposits are present at the camp, they have been covered by the recently placed fill. The evaluation of the NRHP eligibility of the Osceola Camp remains in incomplete, but for purposes of this project, it was considered potentially eligible. Increasing the roadway height would require additional ROW at the ground level or base of the embankment, resulting in loss of usable ground for all three of the historic properties located within the project corridor. Increasing the roadway height may also result in loss of property visibility, which is very important to commercial enterprises. This performance measure is evaluated according to the level of impact on the properties, as cultural resources, which could be expected from the alternatives under consideration. If all the alternatives affect the properties, as cultural resources, to the same degree, there is no advantage to be realized. If there is a difference in the amount of property affected or the location of the properties affected then the lower amount of impact would be considered an advantage for that alternative.

Table 2-8 – Impacts to Historic Properties

Alternative	Total Bridge Length (miles)	Airboat Association	Osceola Camp	Coopertown
No-Action	1.0	No Impact	No Impact	No Impact
1	3.2	Minor Impact	Minor Impact	Moderate Impact
2a	4.3	Minor Impact	Minor Impact	Moderate Impact
4	2.0	Minor Impact	Minor Impact	Moderate Impact
5	2.5	Minor Impact	Minor Impact	Moderate Impact
6e	6.5	Minor Impact	Minor Impact	Major Impact

2.3.8 PM-8 – Impacts to wetlands

A wetlands assessment was conducted for this project to assist in the CBA process. This evaluation was meant to estimate the permanent effects (both impacts and benefits) to the functional value of wetlands resulting from the construction-related activities of the project. This evaluation did not assess any potential long-term benefits to wetlands that could result from implementation of the project with a future operational plan.

In Florida, wetland impacts are typically assessed through the Uniform Mitigation Assessment Method (UMAM), which was developed by the FDEP and the state Water Management Districts and has been adopted for use by the Florida offices of the USACE. A UMAM-type tabletop analysis was performed to assess the effects to the functional value of wetlands[24]. With this method, the wetland functional value is scored both prior to implementation of the project and

24 A full site-specific field UMAM evaluation should be conducted in coordination with the relevant agencies during the permitting phase of the project.

after the project. This method takes into account the value of the landscape, the hydrological characteristics of the area, and the vegetation community composition. Since an official UMAM has not yet been conducted for this project, average UMAM scores that were completed for another project, the Tamiami Trail Pilot Spreader Swales project, within the project area, were used for this analysis. Scores for all vegetated areas prior to project implementation were 18.5/30. Scores for vegetated areas that would be located in the bridging footprints were scored 11/30 after project implementation to account for the functional loss of wetland value to these areas. Areas within road raising, roads and bridging approaches were scored as a 0/30 following project implementation. For areas that were previously road that would be converted to wetlands, these areas were scored 0/30 prior to project implementation and 11/30 following project implementation.

For this analysis, the Geographic Information Systems (GIS) layers depicting the project construction features were intersected with the 2005 Florida Land Use, Cover, and Forms Classification System (FLUCFCS) to estimate the amount of permanent effects to wetlands. This acreage was then multiplied by the average UMAM score to assess the effects to the functional value of the wetlands prior to project implementation. The scores were then summed. Next, the effects to wetlands were assessed in the post project implementation conditions. These scores were then summed. The scores were then combined to assess the overall permanent effects to wetlands from construction-related activities both prior to and following project construction. ***Table 2-9*** below shows the results of the UMAM-type analysis prepared for this project. The “UMAM” score below was calculated per the following equation:

Permanent wetland effects = [UMAM score (after project) x wetland acreage] -
[UMAM score (before project) x wetland acreage)]

Table 2-9 – Estimated Wetland UMAM Scores

Alternative	Total Bridge Length (miles)	UMAM Score
No-Action	1.0	-42.1
1	3.2	-566.4
2a	4.3	-485.9
4	2.0	-571.6
5	2.5	-550.7
6e	6.5	-98.0

Note: The least negative number represents the least amount of permanent wetland impacts. The LRR one-mile bridge is included within the UMAM score for each of the respective action alternatives.

2.4 Alternatives Considered and Dismissed

Due to the aggressive schedule needed to complete this EIS and report to Congress in one year, DOI managers provided guidance for the selection of alternatives and directed NPS to re-evaluate appropriate alternatives from the 2005 RGRR/SEIS and explore the potential to use additional alternatives to meet the project objectives. Each of the alternatives from the 2005 RGRR/SEIS was modified to remove the one-mile eastern bridge portion of each alternative since this plan was approved for construction per the 2008 LRR. Therefore, the one-mile eastern bridge approved for construction per the 2008 LRR/EA is the “No-Action” Alternative for this project. All of the alternatives in the 2005 RGRR elevated the roadway to allow for water levels in the adjacent marshes associated with the restoration objectives of CERP. The frequency of water level conditions as predicted by the NSM was used as the basis for the design of the roadway and in a manner consistent with FDOT requirements. The water levels from the NSM were used to define a maximum hydrologic state for purposes of designing modifications to the roadway that would allow for future unconstrained flow into ENP following restoration. The bridging alternatives shorter than 1.0 mile were dismissed for further consideration due to perceived minimal improvements above the No-Action Alternative (1.0-mile of bridging). The 10.7-mile causeway alternative was dismissed due to potential impacts to Tribal areas (e.g. bridging over the two Tribal areas would result in both visual and auditory impacts to native customs and practices). This resulted in the development of six conceptual alternatives (Alternatives 1 to 6) to carry forward into the project for more detailed engineering analysis. Modified Alternatives 9, 11, 15 and 16 from the 2005 RGRR/SEIS were evaluated during the internal scoping process and were dismissed for the following reasons[25]:

- 2005 RGRR/SEIS Alternative 9 – This alternative was dismissed from consideration in the EIS because the length of bridging was too minimal (once the 2008 LRR/EA Preferred Action Alternative one-mile bridge was removed from the alternative) to be cost efficient for analysis and construction, and would not adequately meet the project objectives.
- 2005 RGRR/SEIS Alternative 11 – This alternative was dismissed from consideration in the EIS because currently, the greatest amount of water flow occurs through culvert sets at the eastern end of the project area due to the proximity to the L-31 Canal; the greatest benefit would be provided by constructing a bridge/span in another location that does not currently receive as great amount of water flow. Therefore, this alternative was dismissed from further analysis since it is similar to other less environmentally damaging alternatives.
- 2005 RGRR/SEIS Alternative 15 – This alternative was dismissed from consideration in the EIS because the length of bridging was too minimal (once the 2008 LRR/EA Preferred Action Alternative one-mile bridge was removed from the alternative) to be cost efficient for analysis and construction, and would not adequately meet the project objectives.
- 2005 RGRR/SEIS Alternative 16 – This alternative was dismissed from consideration in the EIS because the length of bridging was too minimal (once the 2008 LRR/EA Preferred Action Alternative one-mile bridge was removed from the alternative) to be cost efficient for analysis and construction, and would not adequately meet the project objectives.

After further discussion and refinement, Alternatives 2, 2b, 3, 6, 6a, 6b, 6c, and 6d were dismissed for the following reasons:

- Alternative 2 – This alternative included approximately 3.5 miles of bridging along with elevating the remaining roadway within the limits of the project corridor. This alternative,

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[25] NPS *Director's Order 12* states the following reasons that alternatives can be eliminated from further study: "(a) technical or economic infeasibility; (b) inability to meet project objectives or resolve need; (c) duplication with other, less environmentally damaging or less expensive alternatives; (d) conflict with an up-to-date and valid park plan, statement of purpose and significance, or other policy (see section 7-3 of this handbook), such that a major change in the plan or policy would be needed to implement; (e) too great an environmental impact" (NPS, 2006).

along with Alternative 6 were the only alternatives with a 0.7-mile bridge east of the existing 1-mile bridge (No-Action Alternative). Alternative 2 was subsequently split into 2 alternatives, 2a (with 0.7-mile eastern bridge) and 2b (without 0.7-mile eastern bridge).

- Alternative 2b – This alternative included the elements of Alternative 2, above, but with the removal of the approximate 0.7-mile easternmost bridge. However, it was determined that a separate seepage study should be conducted prior to roadway construction and any resulting impacts should be addressed as part of that study. Thus, it was determined that the easternmost bridge be retained in order to maximize the restoration of more natural water flow and ecological connectivity for the purpose of restoring habitat within the Park. Therefore, Alternative 2b was dismissed since it was similar to Alternative 2a, and Alternative 2a was carried forward for further analysis.
- Alternative 3 – This alternative included approximately 2 miles of bridging along with elevating the remaining roadway within the limits of the project corridor. This alternative was dismissed due to the locations of the proposed bridges. It was determined that bridging needs to retain a buffer of approximately 0.5-mile from existing tribal areas to avoid potential impacts from aesthetic and noise-related effects. Therefore, Alternative 3 was dismissed from further analysis because it would cause too great of an environmental impact.
- Alternative 6 – This alternative included approximately 5.1 miles of bridging along with elevating the remaining roadway within the limits of the project corridor and was the alternative sought to maximize bridging. This alternative did not include access down ramps to the two radio tower facilities that exist along the project corridor because it was originally determined during the real estate assessment that the purchase of the two radio towers may be more cost effective than cost-to-cure (retain these facilities in an operational capacity). This alternative was subsequently split into 5 alternatives (Alternatives 6a – 6e) to further analyze variations to this alternative.
- Alternative 6a – This alternative included the elements of Alternative 6, above, including the removal of the access down-ramps from Tamiami Trail to Everglades Safari and Coopertown airboat facilities. This alternative was dismissed from further analysis because not providing access to the airboat facilities was determined to be inconsistent with NPS commitments to provide this access with all viable design alternatives. Therefore, Alternative 6a was dismissed from further analysis.
- Alternative 6b – This alternative included the elements of Alternative 6, above, including provisions for access down-ramps from Tamiami Trail to Everglades Safari and Coopertown airboat facilities. This alternative was dismissed because it did not include access down ramps to the two radio tower facilities that exist along the project corridor, which conflicts with NPS commitments.
- Alternative 6c - This alternative included the elements of Alternative 6b, above, including provisions for access down-ramps from Tamiami Trail to Everglades Safari and Coopertown airboat facilities. In addition, this alternative included the removal of the approximate 0.7-mile easternmost bridge to minimize potential freshwater seepage affects east of the L-31N canal (outside of natural system areas in ENP). However, it was determined that a separate seepage study should be conducted prior to roadway construction and any resulting impacts should be addressed as part of that study. Thus, it was determined that the easternmost bridge be retained in order to maximize the restoration of more natural water flow and ecological connectivity for the purpose of restoring habitat within the Park. In addition, this alternative did not include access down

ramps to the two radio tower facilities that exist along the project corridor. Therefore, Alternative 6c was dismissed from further analysis due to conflicts with NPS commitments.

- Alternative 6d – This alternative included the elements of Alternative 6c, above, including provisions for access down-ramps from Tamiami Trail to Everglades Safari and Coopertown airboat facilities as well as the removal of the approximate 0.7-mile easternmost bridge to minimize potential freshwater seepage affects east of the L-31N canal (outside of natural system areas in ENP). This alternative also included access down ramps to the two radio tower facilities that exist along the project corridor because it was determined during the real estate assessment that these facilities would remain operational. However, it was determined that a separate seepage study should be conducted prior to roadway construction and any resulting impacts should be addressed as part of that study. Thus, it was determined that the easternmost bridge be retained in order to maximize the restoration of more natural water flow and ecological connectivity for the purpose of restoring habitat within the Park. Therefore, Alternative 6d was dismissed from further analysis since it was similar to Alternative 6e.

*2.*5 Mitigation Measures

Mitigation measures and BMPs would be used to prevent or minimize potential adverse impacts associated with the selected alternative, and these measures have been included in the evaluation of impacts of all action alternatives. Mitigation measures that would be undertaken during project implementation include, but are not limited to, those summarized below.

2.5.1 General Construction Mitigation Measures

- Environmental training would be conducted to help educate construction personnel with the intent of reducing impacts on water quality/soils, wetland resources, and wildlife.
- All construction areas would be protected to confine potentially adverse activities to the minimum area required for construction. All protection measures would be clearly stated in the construction specifications, and workers would be instructed to avoid conducting activities beyond the construction zone. The use of previously undisturbed areas would be minimized to the extent possible by selectively choosing staging areas and clearly defining and marking construction zones and perimeters.

2.5.2 Geology, Topography and Soils

- The use of tarps or similar cover materials or equivalent BMPs would be used on stockpiled fill and other erosion prone areas during construction to minimize erosion as a result of storm events.

2.5.3 Water Resources

- Pre- and post-construction erosion control BMPs would be implemented, including the installation and inspection of silt fences, straw bale barriers, sediment traps, or other equivalent measures, and revegetation of area (where feasible) to control erosion, preserve water quality, protect wildlife and habitat, and prevent soil contamination. Erosion and sediment control BMPs would be inspected and maintained on a regular basis and after each measurable rainfall to ensure they are functioning properly.
- Spill prevention, control, and countermeasure procedures, as well as storm water pollution prevention measures would be implemented to protect water quality/soils from erosion and contamination. Areas used for refueling would be limited to areas where

these activities currently occur. Equipment containing fuels would be regularly inspected for leaks.

- A water quality monitoring plan would be implemented to ensure compliance with State permitting requirements.
- Impacts to wetland resources would be avoided and minimized to the maximum extent feasible through the implementation of construction BMPs. All unavoidable impacts would be mitigated.

2.5.4 Wetlands

- Since there is uncertainty as to the level of wetland improvements that would be achieved with the operation of the project, mitigation will be conducted at the Hole-in-the-Donut site in ENP if anticipated project benefits do not adequately offset the project's impacts to wetland value and functions. If needed, wetland impacts would be mitigated; therefore, there would be no impairment of wetland values and functions as a result of implementation of any of the action alternatives.

2.5.5 Wildlife and Vegetation / Habitat

- Steps would be taken to minimize the introduction of non-native species and would include washing equipment before entering the project area; minimizing disturbances; and initiating revegetation of disturbed areas immediately after construction (where feasible). All of the guidelines outlined in the South Florida and Caribbean Parks Exotic Plant Management Plan would be followed during construction.
- Systematic Reconnaissance Flight (SRF) surveys will be performed to monitor nesting wading birds in the Tamiami colonies throughout the nesting season.
- Per NPS *Management Policies 2006*, artificial lighting would not be used in locations where its presence would disrupt wildlife dependent on the dark; minimal-impact lighting techniques would be used (e.g., consideration of yellow versus white lights, use of timers); artificial lighting would be shielded and directed, where necessary, with regard for natural night sky conditions. The use of lighting is not anticipated in view of the fact that all construction activities are expected to take place during daylight hours. However, construction crews may carry emergency/safety lighting and would be instructed to abide by the NPS *Management Policies 2006.*

2.5.6 Special Status Species

- During the environmental training, construction contractors would receive training on federally- and state-listed species and how to recognize and avoid impacts to these species.
- Pre-construction surveys would be conducted to identify any federal- and state-listed species occurring in the project area. Should individuals or active breeding sites be identified, additional measures would be taken to avoid impacts (e.g., providing additional information to contractors about the species) and the Florida Fish and Wildlife Conservation Commission (FFWCC) and the USFWS would be notified of the presence of these species in the project area.
- Mitigation for loss of primary panther habitat will be done as required by the USFWS.
- Everglade snail kite monitoring would be conducted throughout the nesting season in Northeast Shark River Slough, ENP.

- Wood stork and state-listed wading bird (little blue heron, snowy egret, tricolored heron, and white ibis) monitoring would be conducted throughout the nesting season as part of the SRF wading bird surveys.
- Construction would include implementation of standard protection measures for protected species to the maximum practical extent. Additional specific mitigation measures may be identified during Section 7 consultation with the USFWS. Specific planned measures include:
  - The Guidelines for Manatee Conservation during CERP Implementation (CERP Interagency Manatee Task Force, 2006) would be followed during all phases of construction.
  - Nest protection buffers would be provided for the Everglade snail kite as described in the Draft Snail Kite Management Guidelines (USFWS, 2006) during all phases of project construction.
  - The Standard Protection Measures for the East Indigo Snake (USFWS, 2004) would be followed during all phases of project construction.
  - Based on the results of the SRF survey data, the need for wood stork management zone restrictions and state-listed wading bird nest protection buffers would be evaluated throughout the nesting season. Should any redelineation of the wood stork management zones be necessary, such information will be coordinated with the USFWS and the FFWCC.
  - The following protective measures for wood storks will be implemented:
    - Primary Zone (the wood stork colony and a 1,000 ft buffer): From onset of nesting activity through the onset of the rainy season (or when the young have fledged), highway construction *(*e.g., heavy human/equipment activity, pile driving, blasting) should not be permitted in the reach of the highway affected by that alternative. The SRF surveys will be used to determine the nesting status of wood storks.
    - Secondary Zone (a 1,500 ft buffer surrounding the primary zone): No unauthorized human activity (on foot, airboat, or off-road vehicle) should occur at any time of the year within the reach of highway affected by that alternative on the south side of the highway and particularly during the nesting season.
    - Length of Restrictions: These restrictions shall remain in effect during the construction phase of the Tamiami Trail project.
    - Qualified Observer: Subject to the approval of the USFWS, FFWCC, and NPS, a qualified observer(s) shall be stationed onsite during the construction phase of the Tamiami Trail project. The observer shall monitor wood stork activity and shall notify USFWS, FFWCC, and the NPS if wood stork behavior is modified such that roosting, breeding, nesting, foraging, and/or fledging of young is disrupted or otherwise interfered with.
    - Modification of Restrictions: If new information becomes available concerning the wood stork colonies, the NPS, USFWS, and FFWCC should immediately contact each other to determine what modifications, if any, are warranted.
  - A 100 meter nest protective buffer zone would be implemented for state-listed wading birds (little blue heron, snowy egret, tricolored heron, and white ibis) during

the construction phase of the project. Coordination should be conducted with the FFWCC and the USFWS to determine the types of construction related activities that would be restricted should this mitigation measure need to be implemented.

- Should active nests of limpkins or Florida sandhill cranes be encountered in the project area, coordination should be conducted with the FFWCC and the USFWS to develop protective nest buffers for any encountered nests.

- The USFWS Biological Opinion (BO) issued for this project recommends the following conservation recommendations:
  - Continued implementation of the USFWS Standard Local Operating Procedures for Endangered Species (SLOPES) guidance whenever covered species could be encountered within or near a construction area.
  - Consultation with the USFWS and FFWCC if any federal or state listed species nests within the project area while construction is taking place, even if the nests occur in areas not previously considered in the BO.
  - Should it become apparent that adult or juvenile wood storks, or other wading bird species, are having difficulty traversing the elevated bridges thus raising the risk of vehicle strikes, consultation should be conducted with the USFWS and FFWCC on ways to prevent this from occurring.
  - Caution signs should be placed on Tamiami Trail, a reasonable distance from both ends of the project corridor, to alert motorists to the possibility of encountering panthers in the roadway.
  - Should panthers be sighted in and around the project area after construction is complete, fencing of the road embankments should be considered at the ends of appropriate bridge segments. This will serve to funnel panthers under the bridge rather than up onto the roadway. The USFWS should be contacted for specifics regarding the latest fencing specifications.

2.5.7 Wilderness/Unique Ecosystems

- Measures listed above under “Water Resources” and “Wildlife” would serve to protect wilderness values and quality as well.
- Construction procedures would follow the minimum tool analysis for construction and would include provisions to minimize impacts to natural resources that contribute to wilderness values.

2.5.8 Cultural Resources

- To avoid damage to previously unknown archaeological resources, archaeological surveys and testing activities in previously un-surveyed and/or undisturbed areas would be conducted prior to ground-disturbing activities. If any resources are encountered, mitigation of project impacts (in consultation with appropriate agencies) or adjustment of the project design would take place to avoid or limit the adverse effects on prehistoric and historic archaeological resources. Stop-work provisions would be included in the construction documents should archaeological or paleontological resources be uncovered. It should be noted there is a low probability that the project area contains undiscovered archeological resources.
- Monitoring would be done if any excavation exceeds the depth of existing ground disturbance. In the event that cultural resources are encountered during any necessary

excavation work, project work would be halted and the discovery process would be initiated.

- If previously unknown archaeological resources are discovered, work would be stopped in the area of any discovery and consultation would be conducted with affiliated tribes, pursuant to NAGPRA and the *Draft Park NAGRPA Plan of Action for Inadvertent Discoveries, Everglades National Park and Associated Tribes* (May 2008).

2.5.9 Visitor Use and Experience

- Construction information and general information about the project would be posted at the Park, distributed to visitors, and made available on the Park's web site. Signage and notices would be used to inform visitors about the purpose of the project and to protect visitor and staff safety during construction activities.
- Artificial lighting, including minimum illumination levels, light-emitting diodes (LED), limited color spectrum (e.g., yellow) lights, and timers and sensors would be used, where applicable, to ensure safety.
- The use of artificial lighting would be restricted to areas where security, basic human safety, and specific cultural resource requirements must be met.

2.5.10 Noise/Soundscapes

- Construction activities would involve multiple pieces of heavy equipment. Best management practices for noise, such as using mufflers on heavy equipment and noise-muffling construction material, would be implemented, resulting in short-term minor impacts to soundscapes. Assuming that heavy equipment operates at 80 to 90 decibels (dB) measured at a distance of 50 feet, and that sound levels decrease approximately 6 dB with the doubling of distance (Harmon, 2006), it would be estimated that natural attenuation would decrease the noise from these activities to no greater than 50 to 60 dB at a distance of approximately 1,500 feet from the work area; noise would continue to dissipate with increased distance from the construction activities.

2.5.11 Transportation

- In order to reduce traffic impacts from construction, a MOT plan would be implemented and construction would be scheduled during off-peak traffic hours.

2.5.12 Air Quality

- Everglades National Park has a Class I clean air status. If dust were generated during construction, BMPs for dust suppression would be initiated. Emissions from construction vehicles would be kept to a minimum by restricting idling time.

2.6 Cost Analysis of the Alternatives

A preliminary cost analysis of the No-Action and action alternatives was conducted to estimate the financial feasibility of the proposed Tamiami Trail Modifications: Next Steps project under each of the scenarios.

Quantities and Cost Estimates

Quantities were computed based on the current layout and location for the alternatives being considered. The cost estimates were completed utilizing updated material quotes and available unit prices. FDOT average unit prices from 2008 were compared with recent project bid tabulations to determine the most current unit costs.

Therefore, costs provided in this report are in Fiscal Year 2010 dollars and were based on single-unit costs, and costs were not adjusted to account for possible volume discounts or similar cost savings. Detailed cost breakdown estimates for the No-Action alternative and the action alternatives can be found in the Engineering Report provided in ***Appendix A***.

General Mark-ups

The only mark-up applied to these estimates is a 25% contingency. It is generally accepted that FDOT unit prices used for calculating the cost estimates have already factored in general contractor mark-ups for profit, Jobsite Office Overhead (JOOH), Home Office Overhead (HOOH) and bond. The costs of each alternative are to be used to establish a means of comparison between alternatives.

A percentage of the total construction costs without contingency were added for Engineering & Design (E&D) and Supervision & Administration (S&A). These percentages are listed below:

- E&D – 10%
- S&A – 10%

Construction Cost Estimates

A summary of the cost estimates is provided in ***Table 2-10*.**

Table 2-10 – Summary of Estimated Construction Costs

Alternative	Construction Cost	E&D	S&A	Contingency	Real Estate Cost[26]	Total Project Cost[27]
1	$88.6	$8.9	$8.9	$22.1	$50.2	***$178.7***
2a	$102.7	$10.3	$10.3	$25.7	$50.2	***$199.2***
4	$58.8	$5.9	$5.9	$14.7	$50.2	***$135.5***
5	$70.8	$7.1	$7.1	$17.7	$50.2	***$152.9***
6e	$184.8	$14.4	$14.4	$46.2	$50.2	***$310.0***

Note: Costs in dollars x $1 million

2.7 How Alternatives Meet Project Objectives

As stated in Chapter 1, Section 1.2.2 “Purpose of and Need for Action”, all action alternatives selected for analysis must meet all objectives to a large degree to be considered reasonable. The action alternatives must also address the stated purpose of the plan and resolve the need for action. Alternatives were assessed as to how well they would meet the plan objectives. ***Table 2-11*** (located at the end of Chapter 2) summarizes the results of this assessment. The action alternatives would meet the objectives either fully or to a large degree.

[26] Includes fee acquisition, relocation, and management costs ($25.3M), relocation of a telemetry tower operated by the SFWMD (estimated at $2M), compensable business costs (estimated at $8.9M), and demolition costs (estimated at $14M). Any contamination cleanup costs will be the responsibility of the current landowners and will be deducted from the real estate purchase price.

[27] Total project cost is reported in Fiscal Year 2010 dollars and does not include any potential escalation costs that could be related to changes in inflation beyond Fiscal Year 2010.

2.8 Environmentally Preferred Alternative

In accordance with *Director's Order 12* (NPS, 2001), the NPS is required to identify the "environmentally preferred alternative" in all environmental documents, including an EIS. According to CEQ guidelines, the environmentally preferred alternative is the alternative that would promote the national environmental policy, as expressed in Section 101 of NEPA, to:

(1) Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;

(2) Assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings;

(3) Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;

(4) Preserve important historic, cultural and natural aspects of our national heritage; and maintain, wherever possible, an environment which supports diversity, and variety of individual choices;

(5) Achieve a balance between population and resource use which would permit high standards of living and a wide sharing of life's amenities; and

(6) Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

A description of how each alternative would or would not achieve the requirements of sections 101 and 102(1) of the NEPA criteria is provided below and illustrated through a rating system in ***Table 2-12***.

Criterion 1 — Everglades National Park is a unit of the national park system and as the trustee of this place the NPS would continue to fulfill its obligation to protect this area for future generations. The No-Action Alternative would only provide a limited environmental benefit while environmental degradation to wetlands and wildlife habitat would continue because of altered hydrology and limited ecological connectivity. Each of the action alternatives would create the conditions that would allow the enhancement the freshwater marshes within Northeast Shark River Slough and ENP and increased potential ecological connectivity; however, the anticipated incremental improvement to the environment of each alternative increases with increasing bridge lengths. Therefore, Alternative 6e (maximum bridging option) would do a better job at providing a long-term solution for the area and thus would provide the greatest level of protection for Park resources over time.

Criterion 2 — The No-Action Alternative would provide safe and culturally pleasing surroundings; however, because potential environmental benefits are limited to the one existing bridge, potential enhancement to environmental productivity and aesthetics are limited and environmental degradation would continue. All action alternatives would provide for the same level of public health and safety and culturally pleasing surroundings. Action alternatives 1, 4, and 5 would provide for incrementally greater environmental productivity and aesthetics based on their respective bridge openings. Alternatives 2a and 6e would provide maximum potential benefits to environmental productivity and aesthetics based on bridge length and potential amount of flows that can be restored to Northeast Shark River Slough and ENP.

Criterion 3 — The No-Action Alternative would only provide limited environmental benefits, while environmental degradation to wetlands and wildlife habitat would continue because of altered hydrology and limited ecological connectivity. The action alternatives would provide for conditions that would lead to enhanced wetland values and functions and increased ecological connectivity with incremental benefits incurred based on bridge length. All action alternatives would result in permanent impacts to wetlands, soils, and habitats of special status species. Alternatives 2a and 6e would provide for the widest range of beneficial uses based on the potential for ecological enhancement provided by their bridge openings; however, Alternatives 2a and 6e also would incur the highest amount of impacts to wetlands and state and federally listed wading bird species. However, the adverse impacts from construction of the Tamiami Trail Modifications: Next Steps project is anticipated to be outweighed by the overall beneficial effects of implementation of the Tamiami Trail Modifications: Next Steps project in association with other Everglades restoration projects such and the CERP and MWD.

Criterion 4 — The No-Action Alternative allows for maximum preservation of historic and cultural resources and access to opportunities that support diversity and individual choice. All action alternatives are associated with minor to moderate levels of impacts to cultural and historic resources with the exception of Action Alternative 6e, which would have a major cultural resource impact on the Coopertown property. The action alternatives also include the same level of recreational access and opportunities that lead to supporting diversity and individual choice.

Criterion 5 —The No-Action Alternative would offer only limited availability of resource use and enjoyment of amenities as degradation of the resource would continue into the future. The action alternatives would allow for enhanced access and enjoyment of resource amenities with incremental enhancements based on bridge lengths. Alternative 6e offers the maximum ability for access and enjoyment of resource amenities since the bridge length provides maximum increased access for recreation (i.e. boating) and maximizes restoration potential of downstream wetlands.

Criterion 6 — The No-Action Alternative provides for some enhancement of renewable resources, while resulting in the lowest use of depletable resources (fuel) of all alternatives. Each of the action alternatives would result in enhancing the quality of renewable resources through management in the project area. According to the carbon footprint analysis (an analysis of greenhouse gas emissions resulting from the use and combustion of fuel, a non-renewable resource, used for the project) conducted for the project, Alternatives 1, 4, and 5 would result in the lowest level of use of depletable resources. Alternatives 2a and 6e consume the highest amount of fuel and would result in the lowest amount of recycling of depletable resources.

Table 2-12 – Environmentally Preferred Alternative Analysis

Criterion	No-Action	1	2a	4	5	6e
1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.	2	3	4	3	3	5
2. Ensure safe, healthful, productive, and aesthetically and culturally pleasing surroundings for all Americans.	2	3	5	3	3	5
3. Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.	2	3	4	3	3	4
4. Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and a variety of individual choices.	5	4	4	4	4	3

Criterion	No-Action	1	2a	4	5	6e
5. Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities.	2	3	4	3	3	5
6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.	3	4	3	4	4	3
Total Points*	**16**	**20**	**24**	**20**	**20**	**25**

* Five points were given to the alternative if it fully meets the criteria; four points if it meets nearly all of the elements of the criteria; three points if it meets more than one element of the criteria; two points if it meets only one element of the criteria; and one point if the alternative does not meet the criteria.

Based on the analysis above, the environmentally preferred alternative for the Tamiami Trail Modifications: Next Steps project is Alternative 6e. According to the ratings included in ***Table 2-12***, this alternative would surpass the other alternatives in realizing the full range of national environmental policy goals in Section 101 of NEPA. In particular, Alternative 6e best responds to criteria 1, 2, and 5 by providing the greatest level of safety, environmental protection/enhancement, and access to and enjoyment of the resource while minimizing environmental and cultural resource impacts to the greatest extent possible.

For further information on how the environmentally preferred alternative was determined, please reference ***Table 2-13*** (Environmental Consequences Summary) at the end of Chapter 2, which presents a summary comparison of the effects of the alternatives based on the evaluations of the impact topics in the Environmental Consequences section of this environmental assessment. The terms used to define the magnitude or intensity of the effects (e.g., negligible, minor, etc.) are described in Chapter 4.

2.8.1 Summary of Environmental Consequences

Table 2-13 found at the end of this chapter summarizes the environmental consequences associated with the implementation each project alternative including the No-Action Alternative. Additional information on impacts associated with project alternatives can be found in Chapter 3 – Affected Environment and Chapter 4 – Environmental Consequences

2.9 Value Analysis and Preferred Alternative

On November 4, 2009, the NPS conducted a VA and CBA workshop for the purpose of choosing a project alternative to bring forward as the recommended alternative. Workshop participants consisting of NPS staff and cooperating state and federal agency participants reviewed performance measures and project alternatives recommended during previous scoping meetings to choose the alternative that best meets the project purpose and needs.

The CBA team determined that of the performance measures/factors that were most closely associated with the purpose and objectives of the project, the advantages of the "Sheet Flow"' Performance Measure/Factor were more important than the advantages of the other performance measures/factors. Also, the team agreed that the most important or "Paramount Advantage" was represented by the most equitable distribution of overland flow over the 10.7-mile corridor length based on the topographic relief and location of proposed bridges in each alternative. Other important advantages were determined to be conditions in which 1) the greatest ecological connectivity was present, 2) alternatives which reconnected the greatest number of sloughs to restore the ridge-and-slough landscape, and 3) and conditions which would pass water from north to south at a velocity closest to natural marsh conditions (0.05 cfs).

Alternative 6e most closely meets the project objectives and the NPS mission by having the highest total importance value after summing the importance scores for each of the eight performance measures/factors for each alternative. While Alternative 6e has the highest benefit, this alternative also has the highest cost. After quantifying the importance (i.e., benefits) for all alternatives using the CBA method, the alternatives were further evaluated using the cost-to-importance analysis prescribed by the CBA based on the importance scores and the total project costs.

When the total project cost is plotted against the importance scores for all alternatives, the results produce a somewhat linear relationship between the variables, indicative of similar benefit-to-cost ratios; however, an inflection point for Alternative 2a indicates this alternative may provide the best cost-to-benefit value. Since it was unclear whether Alternative 2a was a true best value, or simply an artifact of the CBA scoring methodology, NPS requested that the USACE apply the cost effectiveness analysis technique commonly used in its project assessments. These results are depicted in ***Table 2-14*** and resulted in all alternatives being characterized as cost effective, but Alternative 6e was determined to be a better value (most efficient) when compared to the other alternatives, including Alternative 2a. Therefore, the NPS CBA Importance Analysis, coupled with the USACE cost effectiveness analysis, resulted in the decision to identify Alternative 6e as the preferred alternative (see ***Figure 2-9*** at the end of this chapter**.**).

Table 2-14 – Results of Cost Effectiveness Analysis performed by USACE

Alternative	**Total Cost (M$)**	**Importance Score**	**Lift over No-Action**	**Cost per lift (M$)**	**Cost Effective**
No-Action	$0	70	N/A	N/A	N/A
Alternative 4 – 1.0 mile	$135.5	121	51	$2.66	Yes
Alternative 5 – 1.5 miles	$152.9	168	98	$1.56	Yes
Alternative 1 – 2.2 miles	$178.7	207	137	$1.30	Yes
Alternative 2a – 3.3 miles	$199.2	281	211	$0.94	Yes
Alternative 6e – 5.5 miles	**$310.0**	**402**	**332**	**$0.93**	**Most Efficient**[28]

Alternative 6e, in combination with the 1.0-mile bridge to be constructed under the 2008 LRR/EA plan, would restore a total of 6.5 miles of ecological connectivity between ENP and marshes to the north, potentially reconnecting 10 sloughs that have been severed since 1928, and restoring marsh flow patterns across much of Northeast Shark River Slough. The increased potential connectivity results from the construction of the new bridges coupled with the removal of the existing Tamiami Trail roadway corresponding to the bridge locations. The greater expanse of bridging allows for improved distribution and timing of water flows at velocities of 0.08 fps similar to historical conditions (0.05 fps). The removal of 5.5 miles of roadway would also reduce wildlife mortality and reconnect a large swath of the historic ridge and slough landscape, improving habitat for many aquatic and terrestrial species. Alternative 6e would provide the conveyance capacity to meet the original MWD Project target water flow of 4,000 cfs and also accommodate future projects, including those of the CERP and recent State of Florida restoration initiatives. Importantly, the increased bridging of Alternative 6e would allow for water

[28] These results indicated that Alternative 6e had the best value for the environmental benefits provided in relation to costs. Alternative 6e was the only alternative exhibiting most efficient cost performance when compared to the other alternatives examined in the study.

levels in the L-29 Canal and adjacent marshes, consistent with the NSM. The frequency of water level conditions as predicted by the NSM was used as the basis for the design of the roadway and in a manner consistent with FDOT requirements. The water levels from the NSM were used to define a maximum hydrologic state for purposes of designing modifications to the roadway that would allow for future unconstrained flow into ENP following restoration. Hydrological analysis conducted for the 2005 RGRR indicated that substantial bridging, as in Alternative 6e, was needed for the higher volumes of flows to Northeast Shark River Slough without adversely impacting ecologically and culturally important tree islands in WCA-3B.

Alternative 6e would result in impacts to cultural resources and more direct wetland impacts than other alternatives considered. In order to maintain traffic flow during bridge and road construction and avoid impacts to state lands north of the existing highway, Alternative 6e would be constructed south of the existing highway in ENP. The construction easement for the 5.5 miles of bridges extends approximately 50 LF south of the existing highway ROW, while the road-raising easement extends 30 LF south. The total wetland impact area including temporary and permanent impacts would be approximately 89.2 acres (49.2 acres of permanent wetland impacts and 40.0 acres of temporary wetland impacts) and 41.9 acres of existing roadway would be permanently removed and allowed to restore naturally over time. It was also determined that Alternative 6e would adversely impact two cultural resources—the existing Tamiami Trail roadway and the Coopertown airboat facility—however, these impacts could be adequately mitigated and were justified based on the substantial environmental benefits of Alternative 6e compared to the other alternatives.

2.10 Implementation Schedule

A single construction contract is anticipated, with a construction period estimated to be 43.8 months for the Preferred Alternative. This construction period does not address variables that could affect the construction duration, including but not limited to, design changes, unforeseen construction means and methods, and the ability to secure/procure materials, equipment and labor. This period does not include an allowance for design, ROW acquisition, and other pre-construction activities.

Construction Durations

Construction schedules and durations have been estimated for each of the action alternatives. Details and calculations for each schedule can be found in ***Appendix A*** – Engineering Report. These schedules encompass construction operations only and do not include proposed land acquisition, design and preparation of plans and specifications, funding activities or other non-construction related items.

These schedules are based on a standard 6 to 10-hour/day work week for the majority of the project. The roadway would utilize night crews and bridge work would be completed with day crews. Average production rates were applied to quantities provided to determine these durations. The use of multiple crews was used when calculating schedule durations as it should be easy for a contractor to mobilize more than one crew on this project.

The construction of the roadway was averaged throughout the project alternatives and a standard rate of 29 LF per day per crew was used. It was assumed that the contractor would utilize two crews for the roadway work; one started on opposite ends of the project limits. For Alternatives 4 and 5, it was assumed that there would be less mobilization/demobilization time as the roadway sections are longer. Therefore, it is assumed that crews could tackle bigger sections of roadway work per phase and the production rate was increased to be 33 LF per day per crew. These rates factor in weather days and federal holidays.

It was assumed that the staging of the bridges could accommodate two crews working at one time. Therefore, two bridges are being constructed at one time during the project. The construction of the bridges was averaged throughout the project alternatives and a standard rate of 33 LF per day per crew was used. Staging of the bridge work such as driving piles, steel reinforcing, form work and concrete pouring, can better be accomplished with further detailed scheduling at the final submittal. This rate factors in weather days and federal holidays.

Table 2-15, below, presents a preliminary implementation schedule for the Preferred Alternative.

Table 2-15 – Preliminary Implementation Schedule for the Preferred Alternative

Project Task	Duration (days)
Tamiami Trail Modifications: Next Steps	**1,357**[29]
Notice to Proceed	0
Contractor Mobilization for Construction	10
Pre-Construction Conference	1
Order/Delivery of Foundation Piles	20
Roadway Stage I	**952**
Osceola Camp (Phase I)	274
Osceola Camp (Phase II)	563
Osceola Camp (Phase III)	16
Osceola Camp (Phase IV)	85
Osceola Camp (Phase V)	14
Bridge A2	**346**
Roadway Stage II	**777**
Gator Park (Phase I)	239
Gator Park (Phase II)	439
Gator Park (Phase III)	15
Gator Park (Phase IV)	72
Gator Park (Phase V)	12
Bridge G2	**256**
Roadway Stage III	**367**
Airboat Association (Phase I)	101
Airboat Association (Phase II)	203
Airboat Association (Phase III)	13
Airboat Association (Phase IV)	44
Airboat Association (Phase V)	6
Bridge E1	**122**
Roadway Stage IV	**195**
End Project (Phase I)	26
End Project (Phase II)	117
End Project (Phase III)	4
End Project (Phase IV)	45
End Project (Phase V)	3
Bridge J1	**142**
Project Completion	**7**

29 This estimated construction duration varies slightly from the estimated construction duration in Table 2-1 due to weather days and federal holidays.

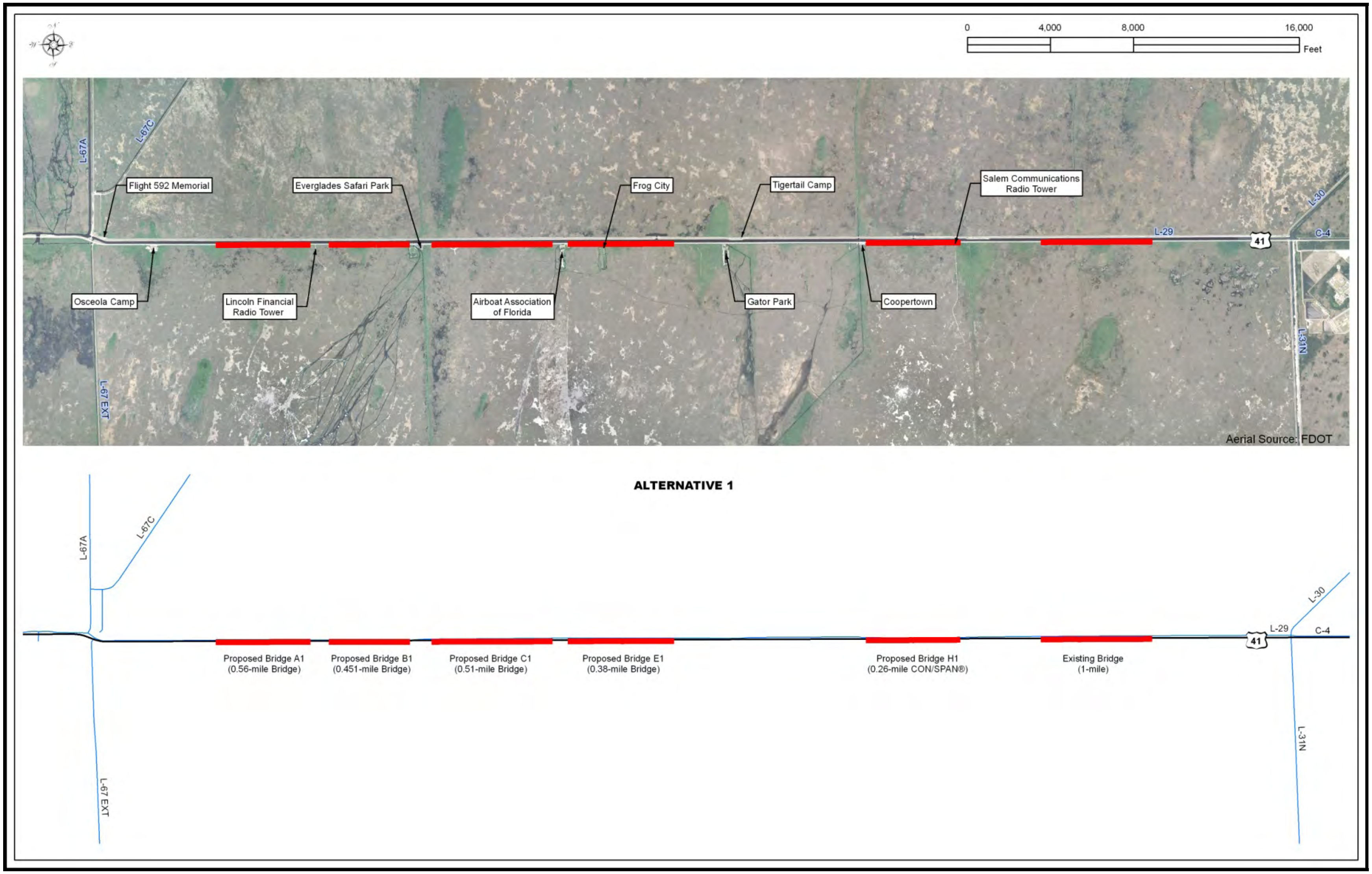

Figure 2-5 – Alternative 1

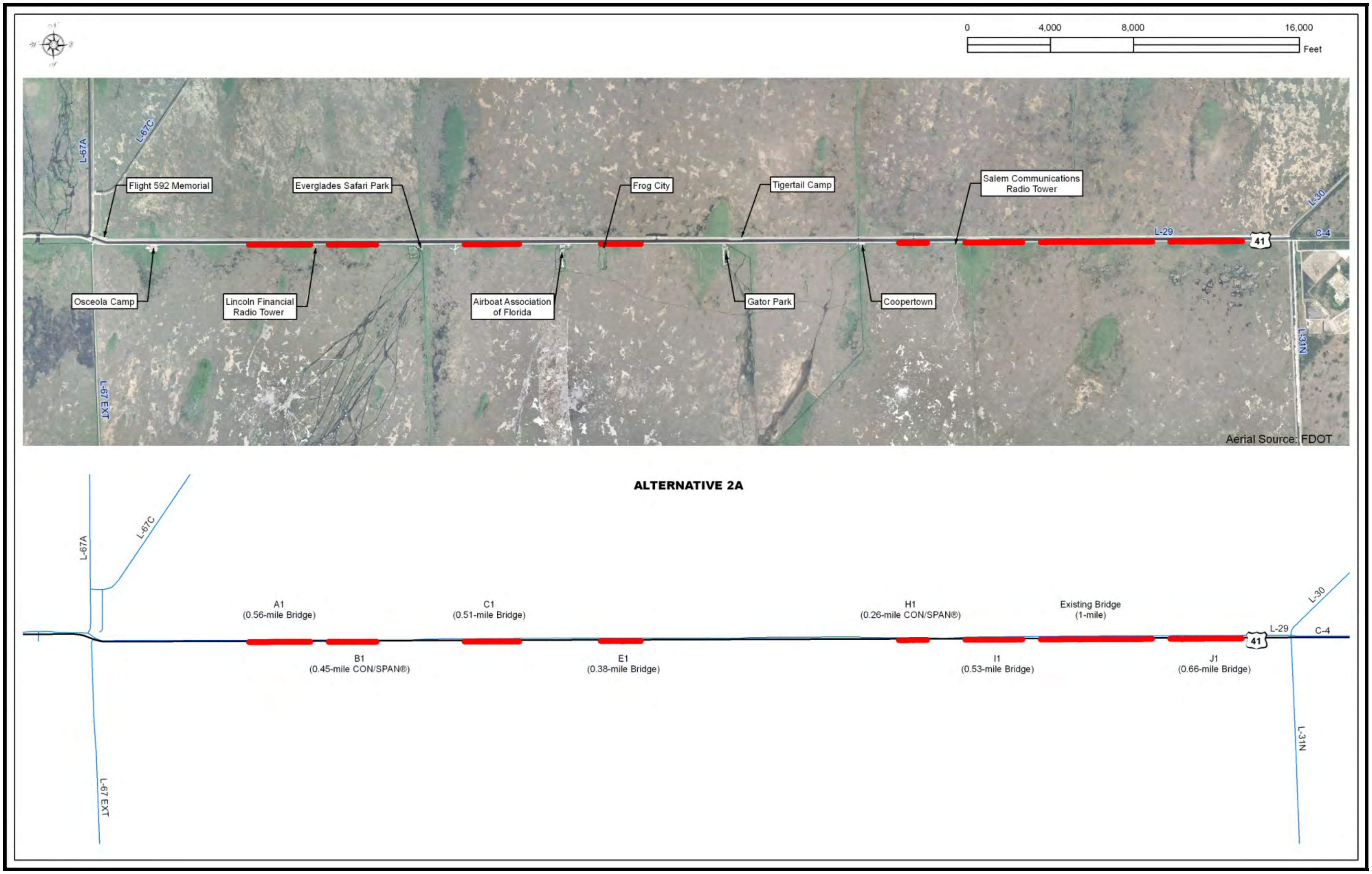

Figure 2-6 – Alternative 2a

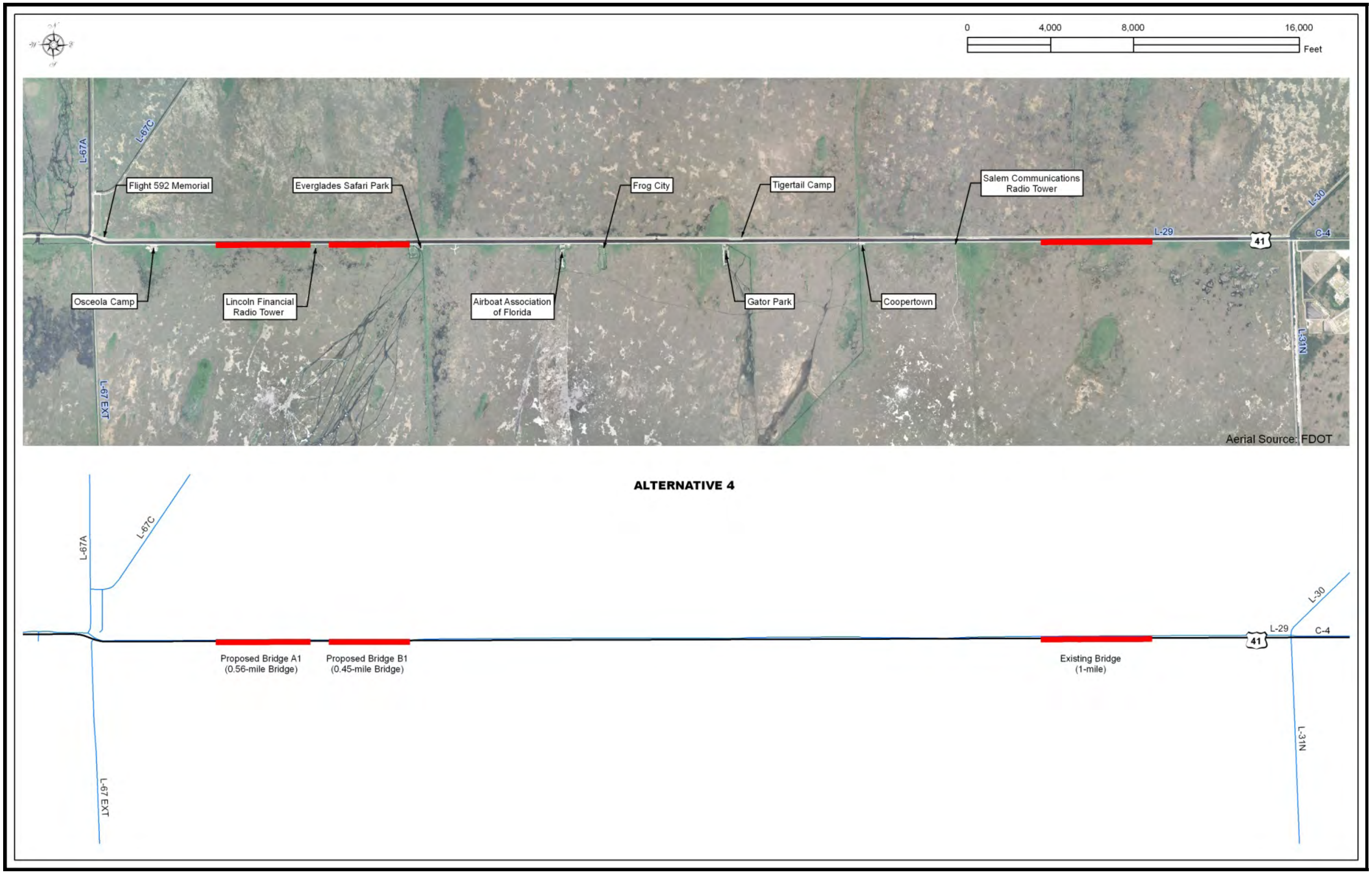

Figure 2-7 – Alternative 4

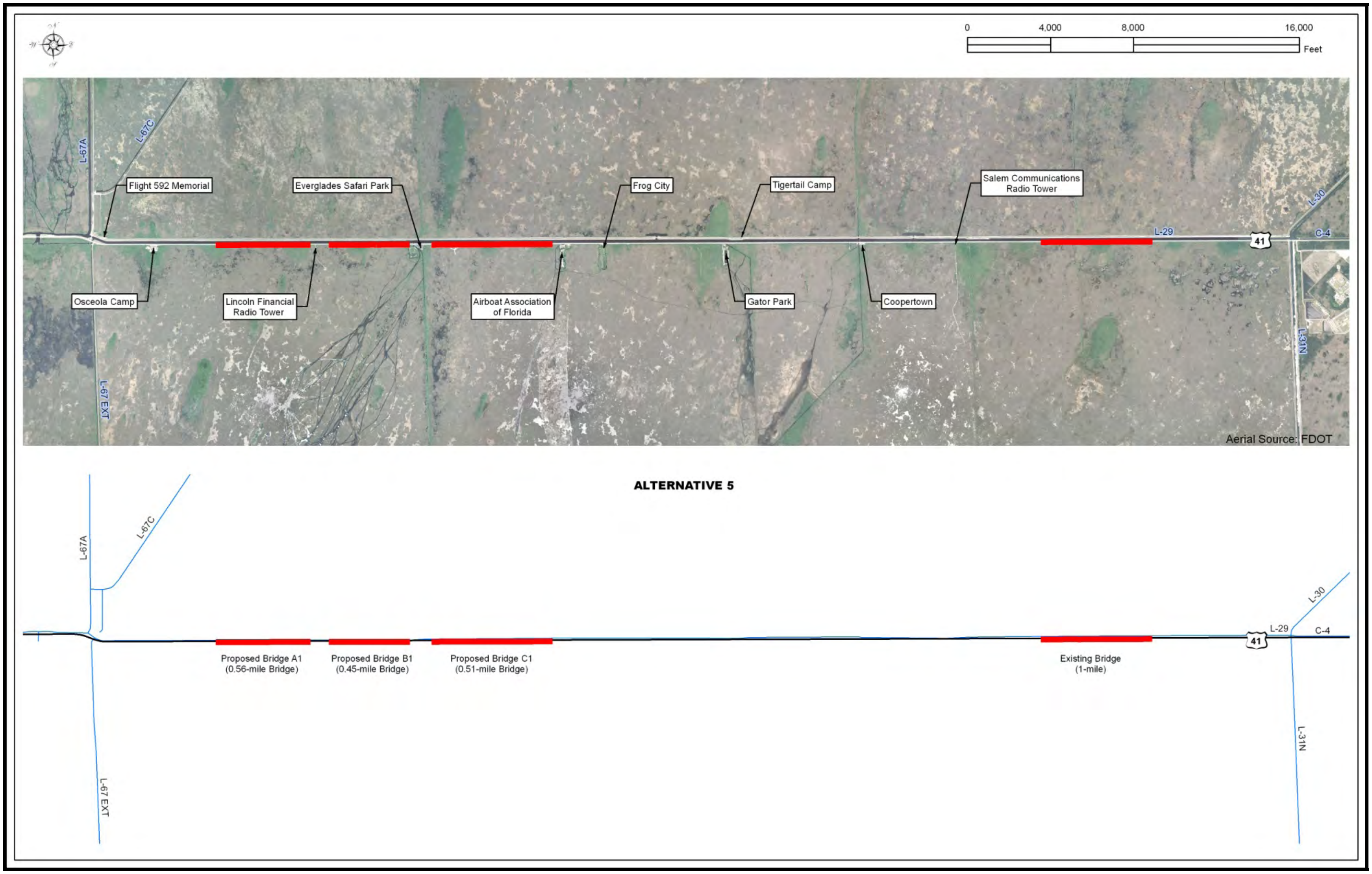

Figure 2-8 – Alternative 5

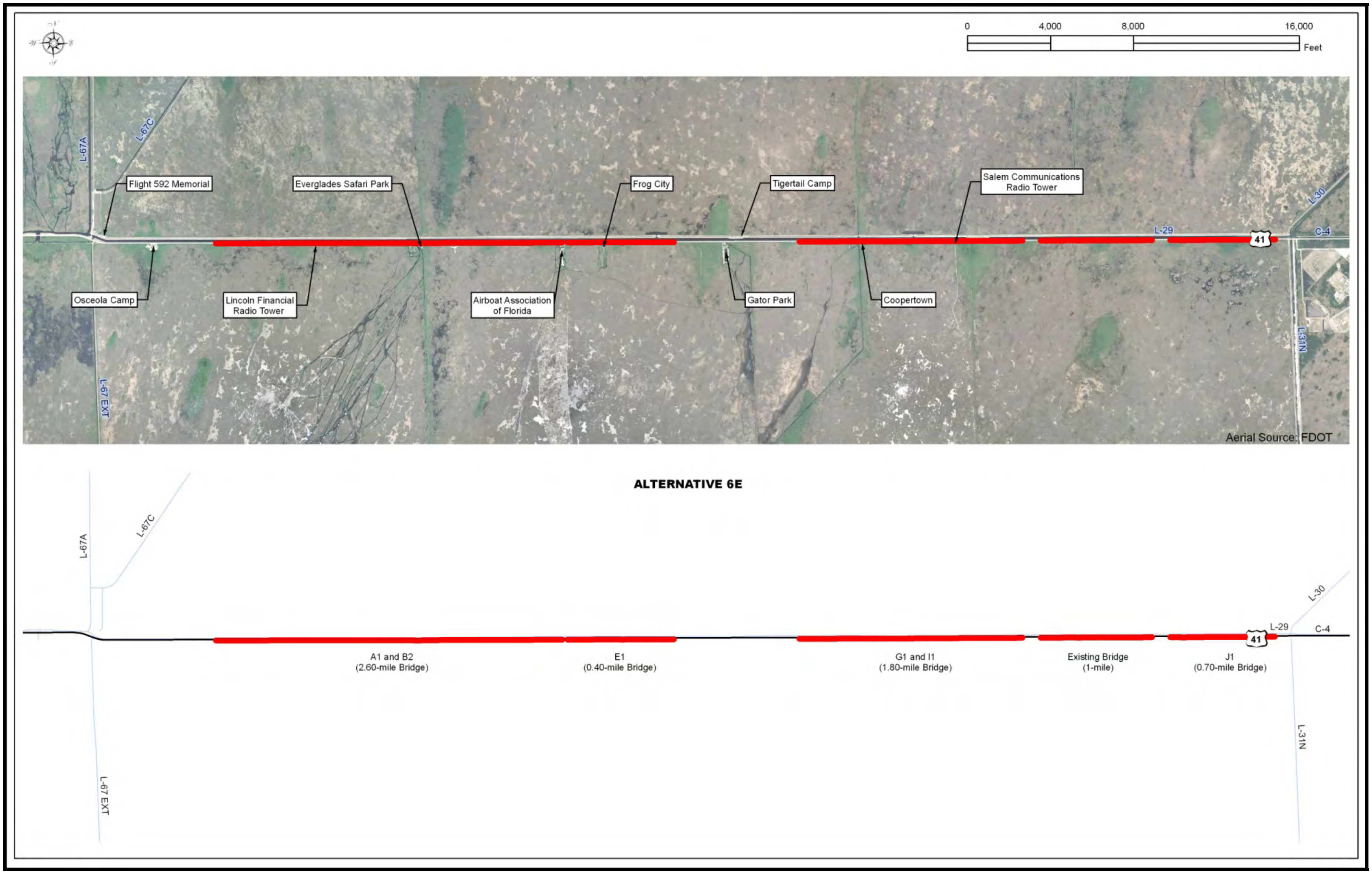

Figure 2-9 – Alternative 6e

Table 2-11 – Analysis of How Alternatives Meet Project Objectives

Project Objective	No-Action (no additional bridging)	Alternative 1 (2.2 miles)	Alternative 2a (3.3 miles)	Alternative 4 (1.0 mile)	Alternative 5 (1.5 miles)	Alternative 6e (5.5 miles)
Restore More Natural Water Flow to ENP						
Construct additional bridging and road raising of the Tamiami Trail to provide for unconstrained flows to Northeast Shark River Slough and Florida Bay	This alternative does not meet project objective since it does not provide for additional bridging or road raising activities other than the 1.0-mile bridge from the 2008 LRR/EA. *Rank: Nil*	This alternative meets the project objective as 2.2 miles of additional bridging would be constructed and the remaining roadway would be raised to accommodate higher water levels in the L-29 Canal. *Rank: Moderate*	This alternative meets the project objective as 3.3 miles of additional bridging would be constructed and the remaining roadway would be raised to accommodate higher water levels in the L-29 Canal. *Rank: Moderate*	This alternative meets the project objective as 1.0 mile of additional bridging would be constructed and the remaining roadway would be raised to accommodate higher water levels in the L-29 Canal. *Rank: Moderate*	This alternative meets the project objective as 1.5 miles of additional bridging would be constructed and the remaining roadway would be raised to accommodate higher water levels in the L-29 Canal. *Rank: Moderate*	This alternative meets the project objective as 5.5 miles of additional bridging would be constructed and the remaining roadway would be raised to accommodate higher water levels in the L-29 Canal. *Rank: High*
Restore Ecological Connectivity						
Improve ecological connectivity by removing obstructions to sheet flow	This alternative does not meet project objective since it does not provide for additional ecological connectivity other than the 1.0-mile bridge from the 2008 LRR/EA. *Rank: Nil*	This alternative meets the project objective as the 2.2 miles of proposed bridging would remove obstructions to sheet flow and increase ecological connectivity. *Rank: Moderate*	This alternative meets the project objective as the 3.3 miles of proposed bridging would remove obstructions to sheet flow and increase ecological connectivity. *Rank: Moderate*	This alternative meets the project objective as the 1.0 mile of proposed bridging would remove obstructions to sheet flow and increase ecological connectivity. *Rank: Moderate*	This alternative meets the project objective as the 1.5 miles of proposed bridging would remove obstructions to sheet flow and increase ecological connectivity. *Rank: Moderate*	This alternative meets the project objective as the 5.5 miles of proposed bridging would remove obstructions to sheet flow and increase ecological connectivity. *Rank: High*
Enhance unobstructed movement of animals between the north and south of Tamiami Trail	This alternative does not meet the project objective since it does not provide for additional animal movement opportunities other than the 1.0-mile bridge from the 2008 LRR/EA. *Rank: Nil*	This alternative meets the project objective as the 2.2 miles of proposed bridging would provide for movement of animals under the bridged portions of Tamiami Trail and reduce wildlife mortality. *Rank: Moderate*	This alternative meets the project objective as the 3.3 miles of proposed bridging would provide for movement of animals under the bridged portions of Tamiami Trail and reduce wildlife mortality. *Rank: Moderate*	This alternative meets the project objective as the 1.0 mile of proposed bridging would provide for movement of animals under the bridged portions of Tamiami Trail and reduce wildlife mortality. *Rank: Moderate*	This alternative meets the project objective as the 1.5 miles of proposed bridging would provide for movement of animals under the bridged portions of Tamiami Trail and reduce wildlife mortality. *Rank: Moderate*	This alternative meets the project objective as the 5.5 miles of proposed bridging would provide for movement of animals under the bridged portions of Tamiami Trail and reduce wildlife mortality. *Rank: High*

Table 2-11 – Analysis of How Alternatives Meet Project Objectives

Project Objective	No-Action (no additional bridging)	Alternative 1 (2.2 miles)	Alternative 2a (3.3 miles)	Alternative 4 (1.0 mile)	Alternative 5 (1.5 miles)	Alternative 6e (5.5 miles)
Restore slough vegetation and the deep water sloughs	This alternative does not meet the project objective since it does not provide for additional water deliveries which would benefit deep water sloughs and associated vegetation other than the 1.0-mile bridge from the 2008 LRR/EA. *Rank: Nil*	This alternative meets the project objective as the proposed alternative would allow for additional water deliveries that would benefit deep water sloughs and associated vegetation. *Rank: Moderate*	This alternative meets the project objective as the proposed alternative would allow for additional water deliveries that would benefit deep water sloughs and associated vegetation. *Rank: Moderate*	This alternative meets the project objective as the proposed alternative would allow for additional water deliveries that would benefit deep water sloughs and associated vegetation. *Rank: Moderate*	This alternative meets the project objective as the proposed alternative would allow for additional water deliveries that would benefit deep water sloughs and associated vegetation. *Rank: Moderate*	This alternative meets the project objective as the proposed alternative would allow for the most additional water deliveries that would benefit deep water sloughs and associated vegetation. *Rank: High*
Restore processes that produce and maintain ridge and slough communities in ENP east of the L-67 Extension	This alternative does not meet the project objective since it does not provide for additional water deliveries which would help to restore processes that produce and maintain ridge and slough communities in ENP east of the L-67 Extension. *Rank: Nil*	This alternative meets the project objective as the proposed alternative would allow for additional water deliveries that would help to restore processes that produce and maintain ridge and slough communities in ENP east of the L-67 Extension. *Rank: Moderate*	This alternative meets the project objective as the proposed alternative would allow for additional water deliveries that would help to restore processes that produce and maintain ridge and slough communities in ENP east of the L-67 Extension. *Rank: Moderate*	This alternative meets the project objective as the proposed alternative would allow for additional water deliveries that would help to restore processes that produce and maintain ridge and slough communities in ENP east of the L-67 Extension. *Rank: Moderate*	This alternative meets the project objective as the proposed alternative would allow for additional water deliveries that would help to restore processes that produce and maintain ridge and slough communities in ENP east of the L-67 Extension. *Rank: Moderate*	This alternative meets the project objective as the proposed alternative would allow for the most additional water deliveries that would help to restore processes that produce and maintain ridge and slough communities in ENP east of the L-67 Extension. *Rank: High*

Legend:
Nil - Does not meet the project objective to any degree
Low - Meets the project objective to a low degree
Moderate - Meets the project objective to a moderate degree
High - Meets the project objective to a high degree

Table 2-13 – Summary of Environmental Consequences by Alternative

Impact Topic	No-Action Alternative – 1.0 mile of bridging	Alternative 1 – 2.2 miles of bridging[30]	Alternative 2a – 3.3 miles of bridging[30]	Alternative 4 – 1.0 mile of bridging[30]	Alternative 5 – 1.5 miles of bridging[30]	Alternative 6e – 5.5 miles of bridging[30]
Geology, Topography, and Soils	Taking no action would cause no additional direct or indirect short- or long-term effects on geology, topography, or soils other than those already realized from construction of the 2008 LRR/EA preferred alternative (1-mile eastern bridge). The geology, topography, and soils within the vicinity of the project area would continue to be adversely impacted in the short- and long-term due to peat loss. **No short- or long-term negative or beneficial effects to geology, topography, and soils** would result from the selection of the No-Action Alternative. There would be no impairment to geology, topography, or soils as a result of the No-Action Alternative.	Effects to soils would be directly related to the short-term and long-term effects caused by construction, operations, and maintenance associated with the alternative. It is anticipated that the soil impacts resulting from temporary construction-related activities would be **adverse, local, minor, and short-term**. **Long-term** impacts resulting from implementing Alternative 1 are anticipated to be **adverse, local, and minor**. No impairment of soils is anticipated from construction and maintenance-related activities associated with the implementation of Alternative 1.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.
Water Resources: Hydrology	Under the No-Action Alternative, there would be no additional direct or indirect short- or long-term impacts on hydrology other than those already realized from construction of the 2008 LRR/EA preferred alternative (1-mile eastern bridge). The project area would continue to experience the unnatural altered hydrologic conditions that currently exist in ENP and Northeast Shark River Slough. **No short- or long-term adverse or beneficial effects** to hydrology would result from the selection of the No-Action Alternative. Consequently, there would be no impairment to hydrology as a result of the No-Action Alternative.	Alternative 1 will have a **short-term, adverse, minor localized** impact on hydrology associated with project construction. Alternative 1 will have a **long-term, beneficial effect** on hydrology based on its capacity to convey flows and relative low velocities, Consequently, there would be no impairment to hydrology as a result of implementation of Alternative 1.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.

30 Bridge length does not include the one-mile bridge from the No-Action Alternative.

Impact Topic	No-Action Alternative – 1.0 mile of bridging	Alternative 1 – 2.2 miles of bridging[30]	Alternative 2a – 3.3 miles of bridging[30]	Alternative 4 – 1.0 mile of bridging[30]	Alternative 5 – 1.5 miles of bridging[30]	Alternative 6e – 5.5 miles of bridging[30]
Water Resources: Water Quality	If no action is taken, there would be no additional direct or indirect short- or long-term effects on water quality other than those already realized from construction of the 2008 LRR/EA preferred alternative (1-mile eastern bridge). The water quality within the vicinity of the project area would remain unchanged. **No short- or long-term negative or beneficial effects** to water quality would result from the selection of the No-Action Alternative. There would be no impairment to water quality as a result of the No-Action Alternative.	Water quality effects would be directly related to the short-term and long-term effects caused by construction, operations, and maintenance associated with Alternative 1. It is anticipated that the water quality impacts resulting from construction-related activities would be **adverse, local, minor, and short-term**. **No long-term impacts** to water quality are anticipated to result from construction-related effects of Alternative 1. No impairment of water quality resources or values would occur from the implementation of Alternative 1.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.

Impact Topic	No-Action Alternative – 1.0 mile of bridging	Alternative 1 – 2.2 miles of bridging[30]	Alternative 2a – 3.3 miles of bridging[30]	Alternative 4 – 1.0 mile of bridging[30]	Alternative 5 – 1.5 miles of bridging[30]	Alternative 6e – 5.5 miles of bridging[30]
Water Resources: Wetlands	If no action is taken, there would be no additional direct or indirect short- or long-term effects on wetlands other than those already realized from construction of the 2008 LRR/EA preferred alternative (1-mile eastern bridge). The current unnatural altered hydrologic conditions within the vicinity of the project area would continue to have a negative impact on wetland values and functions within the WCAs, ENP, and Northeast Shark River Slough. **No short- or long-term negative or beneficial effects** to wetlands would result from the selection of the No-Action Alternative. There would be no impairment of wetland functions and values as a result of the No-Action Alternative.	Overall impact analysis: Implementation of Alternative 1 would result in **moderate, adverse, short-term, localized impacts** to wetlands associated with project construction. Additionally, implementation of the action alternatives would result in **moderate, adverse, long-term, localized impacts** to wetlands associated with permanent dredging and filling of wetlands in conjunction with raising the crown of Tamiami Trail and construction of bridges. Because an operational plan has not been developed in association with the proposed project's infrastructure, full project benefits cannot yet be realized[31]. Full realization of project benefits is dependent upon an operational plan that utilizes the structural capacity of the alternative. Potential benefits that would occur once an operational plan is defined and executed include enhancement of degraded wetland habitats within Northeast Shark River Slough. It is highly likely that implementation of this alternative in conjunction with a future operational plan is self-mitigating, and that permanent and temporary wetland impacts associated with the construction of the proposed project would be offset by the enhancement to wetlands. However, long-term effects to wetlands resulting from operations remain unknown since an operational plan has not yet been developed. Since there is uncertainty as to the level of wetland improvements that would be achieved, if required, mitigation would be conducted at the Hole-in-Donut Mitigation Site at ENP. There would not be an impairment of wetland functions and values as a result of the implementation of Alternative 1. Based on the tabletop UMAM analysis, this alternative (as compared to the other action alternatives) ranked as having the second highest permanent impacts to wetland functional values.	Overall impact analysis same as Alternative 1. Based on the table top UMAM analysis, this alternative (as compared to the other action alternatives) ranked as having the second lowest permanent impacts to wetland functional values.	Overall impact analysis same as Alternative 1. Based on the tabletop UMAM analysis, this alternative (as compared to the other action alternatives) ranked as having the highest permanent impacts to wetland functional values.	Overall impact analysis same as Alternative 1. Based on the UMAM tabletop analysis, this alternative (as compared to the other action alternatives) ranked as the third highest permanent impacts to functional wetland values.	Overall impact analysis same as Alternative 1. Based on the UMAM tabletop analysis, this alternative (as compared to the other action alternatives) had the least amount of permanent impacts to functional wetland values (more than approximately four times fewer impacts than any of the other action alternatives). While this alternative has the largest construction footprint area, it also provides the most restoration benefit for partial restoration of wetland functional values in the existing roadway sections that will be removed.

31 Additional explanation of the development of a water operations plan can be found in the cumulative impacts analysis discussion in Section 4.1.3.

Impact Topic	No-Action Alternative – 1.0 mile of bridging	Alternative 1 – 2.2 miles of bridging[30]	Alternative 2a – 3.3 miles of bridging[30]	Alternative 4 – 1.0 mile of bridging[30]	Alternative 5 – 1.5 miles of bridging[30]	Alternative 6e – 5.5 miles of bridging[30]
Water Resources: Floodplains	If no action is taken, there would be no additional direct or indirect short- or long-term effects on floodplains other than those already realized from construction of the 2008 LRR/EA preferred alternative (1-mile eastern bridge). The current unnatural altered hydrologic conditions within the vicinity of the project area would continue to have a negative impact on floodplain functions and values within the WCAs, ENP, and Northeast Shark River Slough. **No short- or long-term negative or beneficial effects** to floodplains would result from the selection of the No-Action Alternative. Consequently, there would be no impairment to floodplain functions and values as a result of the No-Action Alternative.	Alternative 1 will have a **short-term, adverse, moderate, localized effect** on floodplain values and functions associated with project construction including diminished ability of the floodplain to convey storm and flood events due to temporary fill and rerouting of water flow. However, **long-term effects** to floodplain functions and values would be **beneficial** based on the additional capacity the floodplain would have to convey storm and flood events. There would not be an impairment of floodplain functions and values as a result of the implementation of Alternative 1.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.

Impact Topic	No-Action Alternative – 1.0 mile of bridging	Alternative 1 – 2.2 miles of bridging[30]	Alternative 2a – 3.3 miles of bridging[30]	Alternative 4 – 1.0 mile of bridging[30]	Alternative 5 – 1.5 miles of bridging[30]	Alternative 6e – 5.5 miles of bridging[30]
Wildlife and Vegetation/Habitat	If no action is taken, there would be no additional direct or indirect short- or long-term impacts on wildlife or vegetation/habitats other than those already realized from construction of the 2008 LRR/EA preferred alternative (1-mile eastern bridge). The current unnatural altered hydrologic conditions within the vicinity of the project area would continue to have a negative impact on wildlife habitat and vegetation in ENP, and Northeast Shark River Slough and movement of wildlife between Northeast Shark River Slough and the WCAs would continue to be hindered by the presence of Tamiami Trail. **No short- or long-term adverse or beneficial effects** to wildlife and vegetation/habitats would result from the selection of the No-Action Alternative. Consequently, there would be no impairment to wildlife and vegetation/habitats as a result of the No-Action Alternative.	**Short-term to long-term, minor to moderate, adverse, localized impacts** to wildlife and vegetation/habitats would result from the construction of Alternative 1. **Long-term beneficial effects** to wildlife and habitat would result from the increased ecological connectivity provided through the implementation of Alternative 1. This alternative has fewer impacts to the Tamiami wading bird nesting colony habitats as compared to Alternatives 2a and 6e. Consequently, there would be no impairment of wildlife and habitat as a result of the action alternatives.	Same as Alternative 1, with most incremental differences due to bridge length. However, wetland impacts from construction activities to the Tamiami wading bird nesting colonies are not directly related to bridge length. Alternative 2a (as compared to the other action alternatives) has the highest estimated acreage of wetland impacts to the Tamiami wading bird colonies and is the only alternative that impacts the Tamiami East 2 Wading Bird Colony Habitat.	Same as Alternative 1, with most incremental differences due to bridge length. However, wetland impacts from construction activities to the Tamiami wading bird nesting colonies are not directly related to bridge length. This alternative has fewer impacts to the Tamiami wading bird nesting colony habitats as compared to Alternatives 2a and 6e.	Same as Alternative 1, with most incremental differences due to bridge length. However, wetland impacts from construction activities to the Tamiami wading bird nesting colonies are not directly related to bridge length. This alternative has fewer impacts to the Tamiami wading bird nesting colony habitats as compared to Alternatives 2a and 6e.	Same as Alternative 1, with most incremental differences due to bridge length. Alternative 6e has the second highest (as compared to the other action alternatives) estimated acreage of wetland impacts to the Tamiami wading bird colonies.

Impact Topic	No-Action Alternative – 1.0 mile of bridging	Alternative 1 – 2.2 miles of bridging[30]	Alternative 2a – 3.3 miles of bridging[30]	Alternative 4 – 1.0 mile of bridging[30]	Alternative 5 – 1.5 miles of bridging[30]	Alternative 6e – 5.5 miles of bridging[30]
Land Use	Under the No-Action Alternative, there would be no additional direct or indirect short- or long-term effects on land use other than those already realized from construction of the 2008 LRR/EA preferred alternative (1-mile eastern bridge). The current land uses along the project corridor consisting of a mix of transportation, preserve, recreational, and commercial uses would remain unchanged. **No short- or long-term negative or beneficial effects** to land use would result from the selection of the No-Action Alternative. There would be no impairment of land use as a result of the No-Action Alternative.	Implementation of Alternative 1 would have a **minor, short-term, localized, adverse impact** associated with project construction and a **long-term, localized, adverse, minor impact** on land use in association with the conversion of existing land uses to transportation corridor. There would not be an impairment of land use as a result of the implementation of Alternative 1.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.

Impact Topic	No-Action Alternative – 1.0 mile of bridging	Alternative 1 – 2.2 miles of bridging[30]	Alternative 2a – 3.3 miles of bridging[30]	Alternative 4 – 1.0 mile of bridging[30]	Alternative 5 – 1.5 miles of bridging[30]	Alternative 6e – 5.5 miles of bridging[30]
Special Status Species	If no action is taken, there would be no additional direct or indirect short- or long-term impacts on special status species other than those already realized from construction of the 2008 LRR/EA preferred alternative (1-mile eastern bridge). The current unnatural altered hydrologic conditions within the vicinity of the project area would continue to have a negative impact on special status species in ENP and Northeast Shark River Slough and movement of wildlife between Northeast Shark River Slough and the WCAs would continue to be hindered by the presence of Tamiami Trail. **No short- or long-term adverse or beneficial effects** to special status species would result from the selection of the No-Action Alternative. Consequently, there would be no impairment to special status species as a result of the No-Action Alternative.	**Short-term to long-term, minor to moderate, adverse, impacts** to special status species would result from the construction of Alternative 1. This Alternative may affect but is not likely to adversely affect the Everglades mink, West Indian manatee, Florida panther, American alligator, eastern indigo snake, Cape Sable seaside sparrow, limpkin, marsh wren, reddish egret, American kestrel, Florida sandhill crane, white-crowned pigeon, roseate spoonbill, and the Everglade snail kite. The Alternative may affect and is likely to adversely affect the wood stork, little blue heron, snowy egret, tricolored heron, and the white ibis. This alternative will have adverse, long-term, moderate impacts to wood storks and state-listed wading birds nesting in the Tamiami colonies (little blue heron, snowy egret, tricolored heron, and white ibis) resulting from construction of the project alternative. Because an operational plan has not yet been developed in association with the projposed project's infrastructure, project benefits cannot yet be fully realized[32]. Full realization of project benefits is dependent upon an operational plan that utilizes the structural capacity of the alternative. It is highly likely that implementation of Alternative 1 in conjunction with the operational plan is self-mitigating for most species, and that permanent and temporary impacts to special status species and their habitats associated with the construction of the proposed project would be offset by the enhancement to special status species' habitats. However, long-term effects to habitats resulting from operations currently remain unknown. Mitigation for loss of primary panther habitat will be done as required by the USFWS. This alternative has fewer impacts to the Tamiami wading bird nesting colony habitats as compared to Alternatives 2a and 6e. Consequently, there would be no impairment of special status species as a result of implementation of Alternative 1.	Same as Alternative 1, with most incremental differences due to bridge length. However, wetland impacts from construction activities to the Tamiami wading bird nesting colonies are not directly related to bridge length. Alternative 2a (as compared to the other action alternatives) has the highest estimated acreage of wetland impacts to the Tamiami wading bird colonies and is the only alternative that impacts the Tamiami East 2 Wading Bird Colony Habitat.	Same as Alternative 1, with most incremental differences due to bridge length. However, wetland impacts from construction activities to the Tamiami wading bird nesting colonies are not directly related to bridge length. This alternative has fewer impacts to the Tamiami wading bird nesting colony habitats as compared to Alternatives 2a and 6e.	Same as Alternative 1, with most incremental differences due to bridge length. However, wetland impacts from construction activities to the Tamiami wading bird nesting colonies are not directly related to bridge length. This alternative has fewer impacts to the Tamiami wading bird nesting colony habitats as compared to Alternatives 2a and 6e.	Same as Alternative 1, with most incremental differences due to bridge length. Alternative 6e has the second highest (as compared to the other action alternatives) estimated acreage of wetland impacts to the Tamiami wading bird colonies.

32 Additional explanation of the development of a water operations plan can be found in the cumulative impacts analysis discussion in Section 4.1.3.

Impact Topic	No-Action Alternative – 1.0 mile of bridging	Alternative 1 – 2.2 miles of bridging[30]	Alternative 2a – 3.3 miles of bridging[30]	Alternative 4 – 1.0 mile of bridging[30]	Alternative 5 – 1.5 miles of bridging[30]	Alternative 6e – 5.5 miles of bridging[30]
Wilderness	Under the No-Action Alternative, there would be no additional direct or indirect short- or long-term effects to wilderness other than those already realized from construction of the 2008 LRR/EA preferred alternative (1-mile eastern bridge). The current unnatural altered hydrologic conditions within the vicinity of the project area would continue to have a negative impact on the wilderness character and experience within the WCAs, ENP, and Northeast Shark River Slough. **No short- or long-term negative or beneficial effects** to wilderness would result from the selection of the No-Action Alternative. There would be no impairment of wilderness as a result of the No-Action Alternative.	Minor, short-term, localized, adverse impacts would occur from the implementation of Alternative 1 as a result of noise, vibrations, and dust generated during construction activities. **Minor, long-term, localized, adverse** effects to wilderness would also occur from the implementation of Alternative 1 as a result of direct footprint impacts to wilderness. **Beneficial effects** would result from improved connectivity and potential for improved hydrologic flow in the project area and ENP. There would be no impairment of wilderness as a result of Alternative 1.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.
Cultural Resources	Under the No-Action Alternative, there would be no additional direct or indirect short- or long-term impacts on cultural resources other than those already realized from construction of the 2008 LRR/EA preferred alternative (1-mile eastern bridge). **No short- or long-term adverse or beneficial effects** to cultural resources would result from the selection of the No-Action Alternative. Consequently, there would be no impairment of cultural resources as a result of the No-Action Alternative.	It is concluded that the proposed project would have **minor, adverse, short-term effects** on cultural resources associated with use of TCEs. The project would additionally have **minor to major adverse long-term effects** on cultural resources associated with the construction and operation of the project. Consequently, there would be no impairment of cultural resources as a result of implementation of Alternative 1.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.

Impact Topic	No-Action Alternative – 1.0 mile of bridging	Alternative 1 – 2.2 miles of bridging[30]	Alternative 2a – 3.3 miles of bridging[30]	Alternative 4 – 1.0 mile of bridging[30]	Alternative 5 – 1.5 miles of bridging[30]	Alternative 6e – 5.5 miles of bridging[30]
Visitor Use and Experience	Under the No-Action Alternative, there would be no additional direct or indirect short- or long-term effects on visitor use and experience other than those already realized from construction of the 2008 LRR preferred alternative (1-mile eastern bridge). Visitor use activities (i.e. boating, airboating, fishing, wildlife observation, etc.) would be expected to continue as currently practiced within the study area. Additionally, no impacts would be expected to the number of visitors who currently patron ENP. **No short- or long-term negative or beneficial effects** to visitor use and experience would result from the selection of the No-Action Alternative.	Short-term impacts caused by construction of Alternative 1 would cause visitors utilizing the section of Tamiami Trail within the project corridor to experience minor to moderate inconveniences such as lane closures; reduced speed limits; reduced accessibility to visitor facilities/activities; construction-related noise and vibration; reduced quality of wildlife-related recreational activities caused by construction-related noise and vibration impacts that cause wildlife to flee from construction areas; construction-related dust and fumes; and the visual presence of construction vehicles and heavy equipment in construction zones. Visitors would also experience some long-term beneficial effects (i.e., increased wildlife, increased aesthetic qualities, etc.) from the implementation of Alternative 1. However, most aspects of visitor use and experience would experience no change or a negligible change due to the implementation of Alternative 1 proposed for the project. Therefore, **minor to moderate, short-term, localized, adverse impacts** and **long-term beneficial effects** to visitor use and experience would result from the implementation of Alternative 1.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.

Impact Topic	No-Action Alternative – 1.0 mile of bridging	Alternative 1 – 2.2 miles of bridging[30]	Alternative 2a – 3.3 miles of bridging[30]	Alternative 4 – 1.0 mile of bridging[30]	Alternative 5 – 1.5 miles of bridging[30]	Alternative 6e – 5.5 miles of bridging[30]
Park Management and Operations	Under the No-Action Alternative, there would be no additional direct or indirect short- or long-term effects on park management and operations other than those already realized from construction of the 2008 LRR preferred alternative (1-mile eastern bridge). Activities associated with park management and operations (e.g., education and interpretation, maintenance, and enforcement) would be expected to continue as currently practiced within ENP. **No short- or long-term negative or beneficial effects** to park management and operations would result from the selection of the No-Action Alternative.	Activities associated with park management and operations (e.g., education and interpretation, maintenance, and enforcement) would experience **no long-term impact** due to the implementation of Alternative 1. A **minor, localized, adverse impact** on park management might occur in the **short-term** due to oversight of construction activities that would be required as a result of implementation of Alternative 1.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.
Noise/Soundscapes	Traffic levels along the Tamiami Trail are predicted to grow from the current level of 5,800 vpd to 7,200 vpd by 2038 regardless of project construction. Design Year highway noise levels at noise sensitive sites (Flight 592 Memorial, Osceola Camp, and Tiger Tail Camp) along the project corridor are predicted to only increase by an average of approximately 1 dBA (A-weighted decibels) from the existing conditions, far less than the 3 dBA minimum threshold where most people can detect a change in the sound environment. This slight noise level increase is due to naturally occurring growth in traffic volumes expected by 2038. **No short-term impacts and localized, negligible, long-term, adverse impacts** to soundscapes would result from the selection of the No-Action Alternative. Consequently, there would be no impairment to soundscapes as a result of the No-Action Alternative.	By following the NPS management practices and FDOT standards, no impairment or unacceptable impacts to noise sensitive sites in the project study area are expected to occur as a result of construction of this project. Likewise, considering the existing conditions and the long-established presence of traffic along the Tamiami Trail, the negligible increase in highway noise predicted to occur with the action alternatives is not expected cause operation and maintenance of this project to result in impairment or unacceptable impacts to nearby noise sensitive sites or the park's soundscape. Therefore it is concluded that the proposed project would cause **short-term, moderate, adverse, localized, effects** to the park's soundscape associated with project construction, however there would be **no long term effects** associated with the project's operation. Consequently, there would be no impairment to soundscapes as a result of implementation of Alternative 1.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.

Impact Topic	No-Action Alternative – 1.0 mile of bridging	Alternative 1 – 2.2 miles of bridging[30]	Alternative 2a – 3.3 miles of bridging[30]	Alternative 4 – 1.0 mile of bridging[30]	Alternative 5 – 1.5 miles of bridging[30]	Alternative 6e – 5.5 miles of bridging[30]
Socioeconomics	Under the No-Action Alternative, there would be no additional direct or indirect short- or long-term impacts on socioeconomics other than those already realized from construction of the 2008 LRR preferred alternative (1-mile eastern bridge). Commercial activities would be expected to continue as currently practiced within the study area. **No short- or long-term adverse or beneficial effects** to socioeconomics would result from the selection of the No-Action Alternative.	Implementation of Alternative 1 would have some positive effect on employment, gross output, and the gross regional product of Miami-Dade County; and to a lesser extent, the State of Florida, and any social impacts would be minimal. Therefore, the **long-term impacts** from the selection of Alternative 1 would be **beneficial**.	Same as Alternative 1, with incremental differences due to bridge length	Same as Alternative 1, with incremental differences due to bridge length	Same as Alternative 1, with incremental differences due to bridge length	Same as Alternative 1, with incremental differences due to bridge length
Transportation	Under the No-Action Alternative, there would be no additional direct or indirect short- or long-term impacts on transportation other than those already realized from construction of the 2008 LRR preferred alternative (1-mile eastern bridge). Transportation/traffic would be expected to remain unchanged. **No short- or long-term adverse or beneficial effects** to transportation would result from the selection of the No-Action Alternative.	Transportation impacts associated with Alternative 1 would be **adverse, local, minor, and short-term** and primarily associated with traffic delays related to construction activities. Mitigation of these effects would be though implementation of a MOT plan. **No long-term impacts** associated with increases in traffic levels are expected.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.	Same as Alternative 1, with incremental differences due to bridge length.
Hazardous, Toxic, and Radioactive Waste	**No short- or long-term adverse or beneficial effects** resulting from the presence of hazardous, toxic or radioactive wastes would result from the selection of the No-Action Alternative.	The Implementation of this alternative may lead to a **long-term, adverse, negligible to moderate, localized** impact to the environment due to potential contamination by hazardous or toxic waste.	Same as Alternative 1.	The implementation of Action Alternative 4 may lead to a **long-term, adverse, negligible, localized effect** to the environment due to potential contamination by hazardous or toxic waste.	Same as Alternative 1.	Same as Alternative 1.

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EVERGLADES NATIONAL PARK
TAMIAMI TRAIL MODIFICATIONS: NEXT STEPS
FINAL ENVIRONMENTAL IMPACT STATEMENT

CHAPTER 3
AFFECTED ENVIRONMENT

CHAPTER 3: AFFECTED ENVIRONMENT

This chapter of the Environmental Impact Statement describes existing environmental conditions in the areas potentially affected by the alternatives. This section addresses the following impact topics: geologic resources/soils, water resources (hydrology, wetlands, water quality, and floodplains), wildlife and vegetation, land use, special status species, wilderness/unique ecosystems, cultural resources, visitor use and experience, park management and operations, noise/soundscapes, socioeconomics, transportation, and hazardous/toxic/radioactive waste.

3.1 Geology, Topography, and Soils

Everglades National Park is located at the southern tip of the Florida peninsula. In general, this area consists of a very low, flat topography that is comprised mainly of limestone, which is relatively soft, permeable, and prone to erosion (Crisfield et al., 2005). The lower freshwater Everglades are defined by two subtle limestone topographic highs, a Pliocene ridge to the northwest and a Pleistocene ridge to the southeast. The mainland portion of ENP overlies the unconfined Surficial Aquifer System (SAS), which consists of Miocene to Holocene age siliciclastic and carbonate sediments and varies in thickness from 165 feet to 270 feet. It contains two named carbonate aquifers (Gray Limestone Aquifer and Biscayne Aquifer) and two layers of siliciclastic sediments. The Hawthorn Group forms the base of the SAS. The 550 to 800 foot thick sequence of low permeable sediments of the Hawthorn Group makes it an effective confining unit for the underlying Floridan Aquifer System. In South Florida, the Floridan Aquifer occurs between depths of 820 and 3,280 feet below the land surface and is artesian with a potentiometric surface of about 40 feet above the land surface. The Biscayne Aquifer forms the top of the SAS, and is the principle source of water supply for South Florida. The Biscayne Aquifer is an unconfined karst aquifer dominantly composed of highly porous units of the Fort Thompson and Miami Limestone Formations with the Key Largo formation inter-fingering in some areas. The Biscayne aquifer contains high permeability limestone and calcareous sand units and ranges in thickness from 0 to 80 feet, increasing in thickness toward the east. In many portions of ENP, the Biscayne Aquifer is overlain by marl and peat deposits (Price, 2003).

Throughout the park, marl, peat, sand, and rock outcroppings are the four most common soils and substrate types. The soils occurring within the northern region of the Everglades Expansion Area are mainly characterized as peat or marl. Peat is formed over decades under anaerobic conditions during long periods of inundation, in which the volume of decaying plant material exceeds the ability of microbes to decompose it. Peat deposits lie beneath the surface soils of about one million acres of the central Everglades, or one-third of ENP (NPS, 1997). The northeastern Everglades and Shark River Slough are typified by Loxahatchee peat, a peat type that occurs within the deepest marsh areas that contain remnants of slough vegetation, namely that of *Nymphaea odorata* (white water-lily) (Lodge, 2005). Once exposed to air, microbe populations increase and decomposition accelerates, leading to soil loss. Soil loss and soil subsidence has occurred throughout the Everglades, including the areas in the sawgrass marsh, which subsided from early drainage activities (Ingebritsen et al., 2005) and an associated increased occurrence of unnatural fires.

Marls are the most widespread soil type within the park and are mixtures of calcium-bearing fine sediments with calcite particles, sand, and/or shell fragments. Marls are formed by precipitation of calcite from large mats of submerged blue-green algae called periphyton. These soils were formed in relatively shallow waters with a shorter period of inundation (50 to 150 days each year) and therefore, have higher rates of microbial activity and decomposition of organic matter. These are the soils that cover the extensive peat deposits of the central Everglades (NPS,

1997) and dominate the short-hydroperiod wet prairies near the edges of the southern Everglades (Lodge, 2005).

The soils within the project area consist mainly of the Lauderhill-Dania-Pahokee Association, which is characterized by nearly level, poorly drained soils containing organic material eight to over 51 inches deep over limestone bedrock. These soils are typically black to dark brown, underlain by soft porous limestone, and are characterized by high subsidence, ponding, excess humus, and low strength.

Soils play an important role in the uptake of nutrients within oligotrophic wetland systems such as the Everglades. Soils become phosphorus enriched following the capacity of the biota to uptake phosphorus from the water column or detritus (Gaiser et al., 2005). Community structure has been shown to be altered by even minute phosphorus inputs to the system of as little as 5 µg/L above ambient conditions (in a spikerush/periphyton community in central Shark River Slough). This increase in phosphorus caused changes in soils after three years (Gaiser et al., 2005; Gaiser et al., 2007).

Ross et al. (2003) reported tall sawgrass *(Cladium jamaicense)* stands in northern Shark River Slough that were associated with thicker soils than throughout the rest of the Shark River Slough, but within Northeast Shark River Slough soils thin from west to east, becoming highly calcareous in drier eastern areas. Gaiser et al. (2009) reported that most of the soils in the Northeast Shark River Slough could be considered organically-enriched mineral soils as given by the organic matter contents (OM%) averaging around 30% (***Table 3-1***). Reddy et al. (2009) described soils of the Shark River Slough as shallow to deep histosols (*euic, hyperthermic, lithic haplosaprists*) that are normally inundated year round. The organic matter content of the soil might be especially important to nutrient dynamics as the Pearson Product Moment Correlations showed that the OM% was significantly correlated ($p<0.001$) to total phosphorous (TP) concentration when soil samples from all sites and events were combined for each depth increment and when the data was parsed by soil depth (Gaiser et al., 2009).

Table 3-1 – Selected physicochemical parameters measured in soils at different monitoring sites (Figure 3-1) in September 2006 and September 2008 in Northeast Shark River Slough

Total Phosphorus (µg/g)	Mean ± SE	Data size	Min	Max
September 2006				
0-2 cm	248.83 ± 24.55	30	103.18	666.85
2-10 cm	219.97 ± 19.33	30	47.29	596.88
10-20 cm	178.90 ± 21.92	20	48.40	495.94
September 2008				
0-2 cm	249.09 ± 21.74	30	129.77	580.48
2-10 cm	216.62 ± 15.61	30	117.81	472.90
10-20 cm	137.83 ± 17.67	22	27.99	303.85
Organic Matter (%)	**Mean ± SE**	**Data size**	**Min**	**Max**
September 2006				
0-2 cm	32.60 ± 2.64	30	13.36	70.81
2-10 cm	30.51 ± 3.46	30	5.59	73.05
10-20 cm	27.81 ± 4.13	26	3.97	79.19
September 2008				
0-2 cm	36.79 ± 3.65	30	12.56	89.28
2-10 cm	32.15 ± 4.34	30	9.19	84.97
10-20 cm	32.18 ± 6.00	22	5.72	87.81

(Gaiser et al., 2009)

Soil depths are generally lowest on sites on the southeastern boundary of Northeast Shark River Slough. Soil depth ranged from 3 to more than 100 centimeters (cm), correlated (R^2=0.22) with water depth, being shallower in the southeastern sites than sites to the west and north of Northeast Shark River Slough (Gaiser et al., 2009). The TP concentration of soils tends to decrease with depth with surface soils having greater average TP concentration than at deeper depths (***Table 3-1***). Concentrations of TP in the 0 to 2 cm soil surface layer were higher in the northeastern and eastern portion of the study area during the 2006 sampling, but this pattern was not observed in the 2008 sampling (Gaiser et al., 2009). The TP concentrations in soil at two sites (2 and 4, ***Figure 3-1***) located close to the Tamiami Trail in the northeast corner averaged ~400 µg/g (0-2 cm depth), ~280 µg/g (2-10 cm depth), and ~170 µg/g (10-20 cm depth). The northeastern corner of the study area (***Figure 3-1***) appears to have higher TP concentrations in the 2 to 10 cm soils in Northeast Shark River Slough (Gaiser et al., 2009).

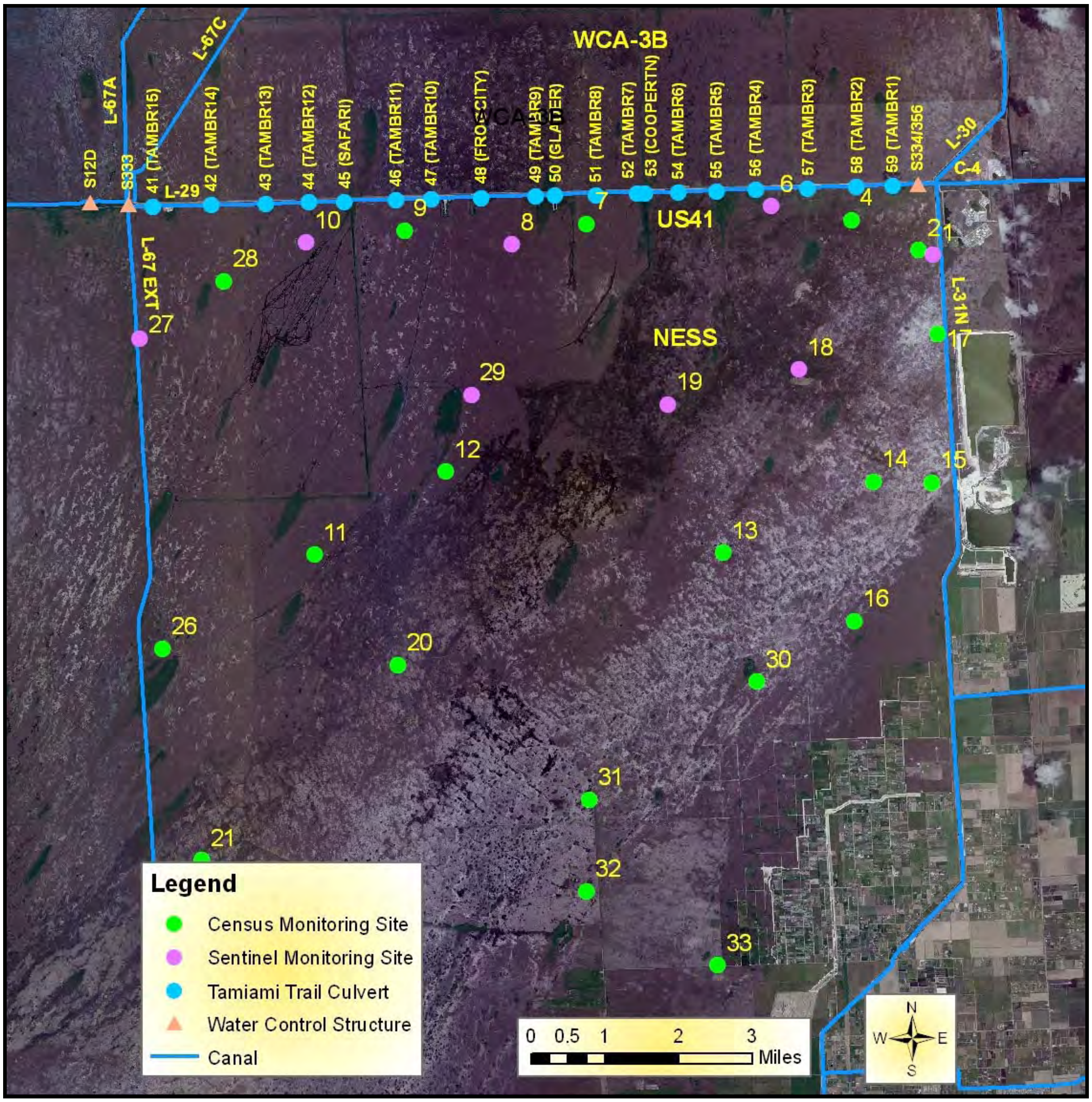


Figure 3-1 – Northeast Shark River Slough monitoring sites

Two transects were established in Shark River Slough to monitor soil nutrient enrichment (Reddy et al., 2009). Transect-2 was located south of the S-12D discharge structure, and Transect-3 was located south of Tamiami Bridge (***Figure 3-2***). Reddy et al. (2009) concluded from the soil survey at these transects that:

- Transect-2 exhibited phosphorus enrichment (soil TP exceeding 500 mg/kg) to about 3,000 m downstream of the L-29 canal (***Figure 3-3***);
- Transect-3 showed moderate phosphorus enrichment (soil TP exceeding 500 mg/kg) proximal to the outfall-29 canal, but not high respective of Transect-2 (***Figure 3-3***).

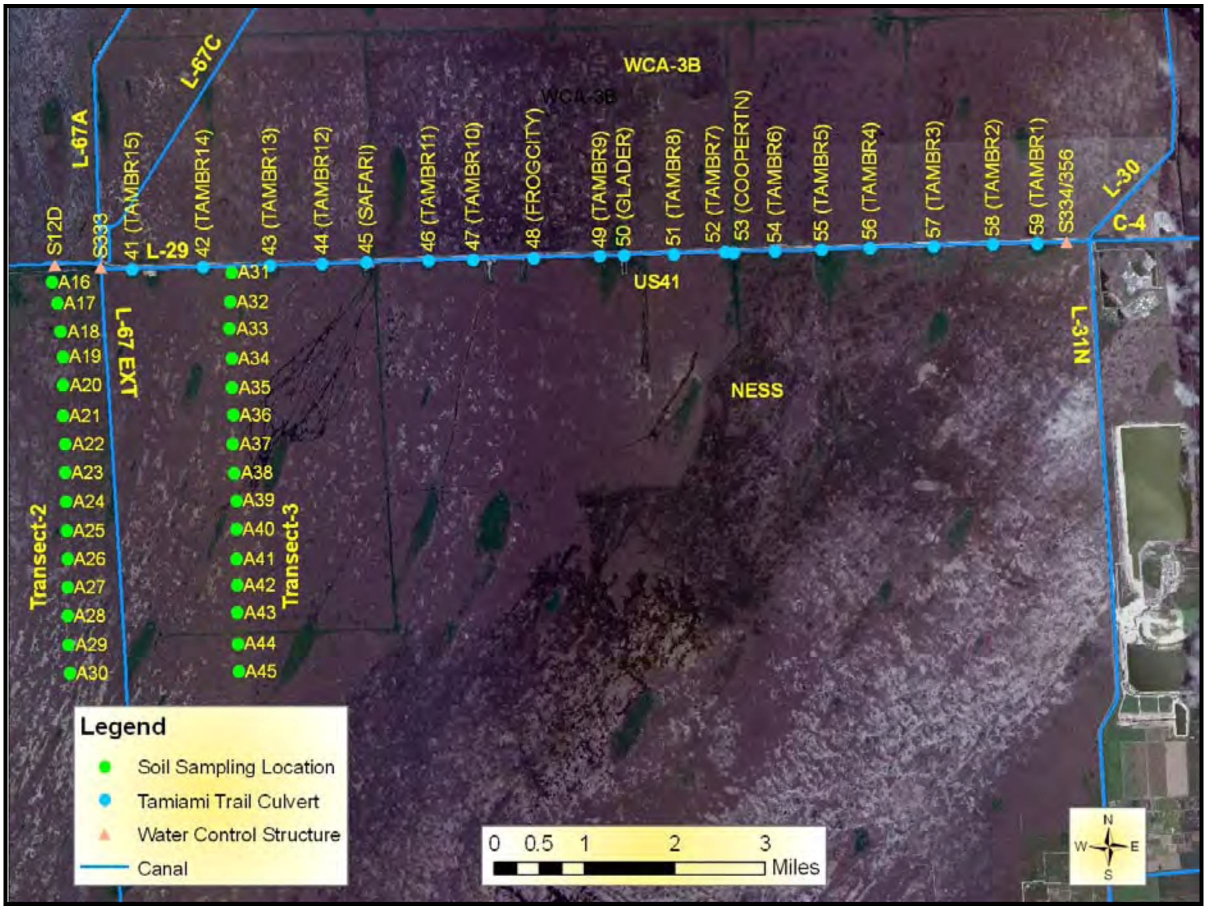


Figure 3-2 – Soil sampling locations downstream of L-29 Canal on two transects west (Transect-2) and east (Transect-3) of L-29 Canal (Reddy et al., 2009)

The predrainage Everglades ridge and slough system was a network of discreet elevated sawgrass strands (ridges) with wide expanses of open water sloughs encompassing WCA-3B and Shark River Slough interspersed with tree islands (SCT, 2003; Gunderson, 1994; Gunderson and Loftus, 1993). The ridges and sloughs were organized in a pattern oriented parallel to the direction of flow; thus, it has been hypothesized that flow volumes in the pre-drainage ridge and slough system were largely responsible for maintaining the sharply discreet community and elevation differences between the ridges and sloughs (Sklar et al., 2000). The sloughs, deeper than the ridges provided critical refuge for wildlife during dry periods. The historic slough vegetation communities were characterized by floating, submerged, and some emergent species found in areas with the longest hydroperiods and deepest water that normally did not dry down.

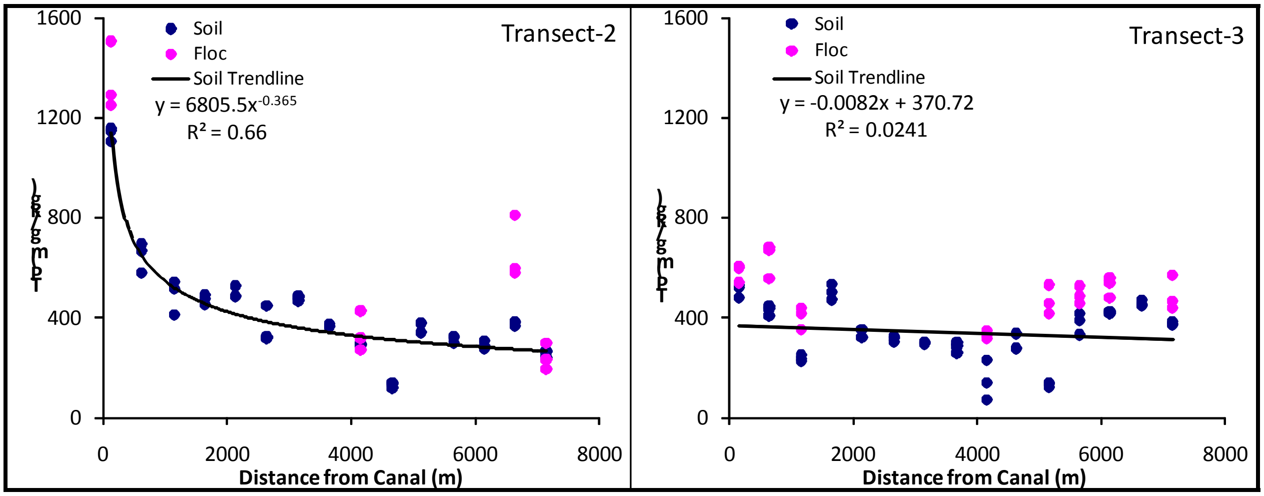


Figure 3-3 – TP in soil and floc for two transects in ENP proximal to L-67 Extension Canal (Reddy et al., 2009)

The reduced water storage capacity of the managed Everglades and the compartmentalization of the northern and central ridge and slough system, have slowed flow rates, have created areas that are either overdrained or are more deeply flooded than was the case in the pre-drainage system, have substantially altered the affects of fire on the marsh communities, and have altered the rates and magnitude of flooding and drying events suppressing the natural processes and functions within Northeast Shark River Slough. The paleoenvironmental seed record has shown that deep water slough plant communities such as those dominated by deep water slough species such as white water lily (*Nymphaea odorata*) within Northeast Shark River Slough have largely been replaced by vast stretches of sawgrass and other species thought to be more characteristic of the transitional ridge environment (Richards et al., 2009).

It is clear that the compartmentalization and related water management activities, which have altered flow and other hydrological parameters such as water levels, are resulting in the loss of ridge and slough landscape. A flattening of the landscape due to a decreased difference between ridge elevations and the elevations of the slough bottoms has occurred, and an associated blurring of the distinct, directional pattern of ridge and slough vegetation. Evidence for this loss arises from alterations in vegetation patterns over time and indications of altered topography. The post-drainage alterations in landscape topography show a clear trend from a highly organized, strongly directional pattern to a degraded, more random, and less directional pattern.

3.2 Water Resources

3.2.1 Hydrology

<u>Historical and Current Conditions</u>

The Everglades once covered nearly four thousand square miles from Lake Okeechobee to Florida Bay and the Gulf of Mexico. The original Everglades were a flow-way, where shallow water derived from direct rainwater and from wet-season overflows from Lake Okeechobee moved southward as sheet flow, not channelized flow as in rivers and streams. Although the flow direction was understandably based on the slope of the terrain, the most impressive evidence of flow came from the shape of plant communities in the landscape. A directional pattern was observed by early explorers and seen on older aerial photographs to have defined most of the Everglades. The orientation of plant communities – deeper sloughs, sawgrass "ridges," and tree islands with downstream "tails" – is called ridge and slough landscape. The Northeast Shark River Slough portion of ENP was fully part of this landscape. Today, degraded ridge and slough landscape only remains in limited areas of the Everglades, and is highly degraded in Northeast Shark River Slough.

Historical Flow Patterns

The historic Everglades were part of a much larger drainage system, originating in south-central Florida in what is now known as the Upper Chain of Lakes near Kissimmee, Florida. The lake system formed the headwaters of the Kissimmee River, a 100-mile-long, meandering, low gradient river that emptied into Lake Okeechobee. The lake, much larger than its present-day surface area of 1,750 km^2, would spill over its southern rim during high water events into the northern part of the Everglades, dominated by vast sawgrass plains. Eventually, the southward movement of water through the sawgrass plains formed the source of water for the ridge and slough landscape. In this sense, the historic Everglades may be viewed as the lower reaches of the Kissimmee River (SCT, 2003).

The central feature of the pre-drainage Everglades hydrology was a 30-mile-wide expanse of relatively shallow water moving downstream through the low-gradient (Northeast Shark River Slough) wetland landscape. The pattern of water flow was remarkable for its regional uniformity across such a broad expanse, and for the absence of any central drainage channel or of any dendritic drainage pattern. Pine flatwoods formed most of the eastern boundary of this flow, and the western boundary was defined by the Immokalee Rise and the relatively higher wetlands and uplands of what is now the Big Cypress National Preserve. Much of the flow discharged south and west through Shark River Slough, through the mangrove estuaries of the southwestern coast, into the Gulf of Mexico. South of and including the New River (Fort Lauderdale), the pine flatwoods were absent and the Atlantic Coastal Ridge became discontinuous, forming a series of islands separated by coastal rivers. These rivers thus resulted in a portion of the flow being discharged eastward into Biscayne Bay and the Atlantic Ocean. The remainder of the flow discharged southward through Taylor Slough into Florida Bay. Because of Florida's porous geology dominated by limestone overlain by thick peat deposits, the boundaries between surface water and ground water flow are not always distinct (SCT, 2003).

The Everglades ecosystem is thought to have been formed over the last 5,000 years as sea levels rose and precipitation increased, promoting water retention in a shallow inland basin, and the portion of the basin south of Lake Okeechobee filled in with peat. The result of peat accumulation in this bedrock basin was the formation of a peat surface, level in the east-west direction, and with a slight north-to-south downward slope. The concavity of the bedrock, coupled with the east-west levelness of the peat, resulted in thicker peat deposits in the middle of the basin and thinner deposits along the edges. By the 1880s, peat had accumulated to about 21 feet above sea level along the south shore of Lake Okeechobee, and had formed the northern edge of a north-to-south elevation gradient that is now less than 3 inches per mile. The southward flow of water down this gradient is thought to have formed to maintain the ridge and slough pattern so characteristic of the Everglades (SCT, 2003).

Everglades' plant and animal communities evolved under the conditions imposed by this flow, within a sub-tropical climate, and under the constraints of nutrient limitation. The habitat types that evolved included vast sawgrass plains south of Lake Okeechobee, in the region presently occupied by the Everglades Agricultural Area (EAA). South and east of the sawgrass plains was the ridge and slough habitat, including what are now WCAs 1, 2, and 3, and ENP. Marl prairies – short hydroperiod marshes with marl sediments – occupied slightly higher elevations east and west of Shark River Slough. The mangrove zone was located from the Ten Thousand Islands south and east around the tip of Florida's peninsula to the shores of Biscayne Bay (SCT, 2003).

<u>Drainage Activities</u>

The first major efforts to drain the Everglades came with Hamilton Disston, an industrialist and real-estate developer. By the 1890s, he had drained over 50,000 acres of wetlands, opened the Kissimmee River for navigation, and linked the Caloosahatchee River to Lake Okeechobee. In addition, he is credited with excavating the first 11 miles of canal south of Lake Okeechobee in the direction of Miami – the precursor to the Miami Canal. By 1917, four major muck-scalped canals traversed the Everglades from Lake Okeechobee to the Atlantic Ocean, short-circuiting the historic, north-to-south pattern of flow and greatly accelerating the removal of water from the Everglades. It has been hypothesized that flow magnitudes through the ROG were significantly higher in the 1800s and early 1900s versus what has been monitored since 1939. Patterns of peat subsidence water tables measured in 1915, and continuously between 1927 and 1939, all suggest that these canals substantially lowered water levels in the northern Everglades, often below the peat surface (SCT, 2003).

Local efforts to surround Lake Okeechobee with a levee began in the early 1900s and were completed with the construction of a levee completely encircling the lake by the mid 1900s. All surface water inflow and outflow points (except one at Fisheating Creek) are now controlled by pumps and/or water control structures.

Major alterations of the Everglades began to take effect with flood control efforts in the second decade of the 1900s, initially designed to reduce water levels in Lake Okeechobee. By the 1910s, Miami was expanding, and plans to drain and develop parts of the Everglades were pursued (SCT, 2003). By 1926, six major canals diverted Okeechobee's waters to tide, lowering the lake and removing much of the Everglades headwaters that affected even the southern Everglades, home of the future ENP. Captain Frank Jaudon, seeking to drain what is now called Northeast Shark Slough, successfully lobbied for creation of Tamiami Trail. Objectors at the time raised what turned out to be a legitimate concern, that the road bed would act as a dam, blocking the southward flow of water out of what is now WCA-3B. In 1928, Tamiami Trail and Tamiami Canal were completed. Wooden bridges were constructed completely across the Everglades to accommodate flow; this construction is believed to have been completed by 1939, which is when the first discharge measurements were taken. Concrete culvert sets in Northeast Shark River Slough were installed around 1952. Tamiami Trail was to become the northern boundary of ENP. Photos from the 1930s show water occasionally spilling over the top, but aerial photos from 1940 suggest that in just 12 years, Tamiami Trail had created two separate landscape types, north and south, where once there had been a continuous landscape type. These early alterations of the hydrology of the Everglades had observed effects, noted in a 1938 reconnaissance report for the future national park, and in mapping of Everglades vegetation done based on 1940 aerial photographs (SCT, 2003). The construction of Tamiami Trail and WCA-3 impounded and altered the slough, effectively creating a barrier through the Everglades, between the northern Everglades and ENP.

Combined with droughts, notably in the early 1940s, the early drainage system excessively depleted waters of the Everglades, causing major soil fires and impairing freshwater supplies for people. Alternatively, the hurricanes in 1926, 1928, and 1947 showed the inadequacy of drainage works in protecting developing agricultural and urban lands from overwhelming floods. Of particular interest are the two hurricanes of 1947, which demonstrated that rainfall on the Everglades, without the full overflows of Lake Okeechobee, could still raise waters to excessive depths, estimated to have been six to eight feet deep over vast areas of the central Everglades. Accordingly, Tamiami Trail was overtopped and impassible for weeks. After water had receded enough to allow access to Tamiami Trail, an eye-witness account related how the water flowing under Tamiami Trail was causing large whirlpools while water was still flowing over the road.

The widespread severity of flooding in 1947 led to the C&SF Project. The C&SF project's many constructed features included three WCAs to conserve water and provide for Everglades wildlife. Water Conservation Area 3 was developed with its south-end levee along Tamiami Trail. Completed in 1963, WCA-3 was divided into two parts – the huge western part, WCA-3A, and the smaller eastern WCA-3B. Separated by a pair of levees, the L-67A and L-67C were designed to stop eastward seepage of water. Water Conservation Area 3B received relatively little water and has gradually deteriorated by the loss of its ridge and slough landscape character. Water Conservation Area 3A serves as an impoundment with regulated releases, altered flow, and water depths that have damaged important wildlife values. Much of the signature of ridge and slough landscape was retained, however, especially in lower-central WCA-3A.

Water Conservation Area 3A was constructed with four control gates along Tamiami Trail to provide flows into ENP. Additionally, a 9-mile levee was constructed south from the Trail along the east side of the park, the "L-67 Extension," to prevent water from moving eastward from the park into Northeast Shark River Slough and to carry water deeper into ENP. Until 1989, the Park only bordered Tamiami Trail from the center of the Everglades west to the border with the Big Cypress Swamp at 40-mile Bend – the 10-mile-wide western side of the Shark River Slough. No provision was made to transfer water from WCA-3B to the east side of the Shark River Slough south of the Trail – the Northeast Shark River Slough. Some of the land ownership in the Northeast Shark River Slough was private, and surface flows reached the area only through culvert sets connecting with the Tamiami Canal under Tamiami Trail. Northeast Shark River Slough remained over-drained as it had been for many years. Until the S-333 water control structure was operational in the early 1980s, there was no inflow or outflow for the section of Tamiami Canal from L-67 to L-30 – essentially, the canal was a lake and the only sources of water were seepage from WCA-3B and rainfall. The source of surface flows didn't change after Northeast Shark River Slough became part of Park. The source of water to Tamiami Canal changed with addition of the S-333 water control structure.

In 1989, ENP was expanded by adding 107,600 acres of Northeast Shark River Slough, called the "East Everglades Expansion Area." Plans to improve water flows into Northeast Shark River Slough began – a program called Modified Water Deliveries or "Mod Waters." While that work was developing, the separate and far broader Everglades restoration initiative, called the "Restudy," began in 1992, and became CERP after acceptance by Congress in 2000. Research on flows in the pre-drainage Everglades, using the "Natural System Model" developed for CERP, showed that the eastern half of Shark River Slough, including Northeast Shark River Slough, had (on average) originally carried greater than 65% of the Everglades flows, with less than 35% on the western half. Conversely, the routing established by the C&SF project put 78% of modern flows to the west, and only 22% through Northeast Shark River Slough.

Summary of Existing Water Management Infrastructure in Vicinity of Project Area

Levees and canals constructed during the last 50 years under the C&SF project have divided the former Everglades into areas designated for development and areas for fish and wildlife benefits, natural system preservation, and water storage. The natural areas consist of the three WCAs located north of Tamiami Trail and ENP to the south. Water flow in the vicinity of the project is primarily from WCA-3A through the S-12 structures directly into marsh in western Shark River Slough, and through the S-333 structure into the L-29 Canal and then through culvert sets into Northeast Shark River Slough.

The WCAs provide detention for water from the agricultural area and parts of the east coast region and for flood discharge from Lake Okeechobee to the sea. Detention of water helps prevent floodwaters from inundating the east coast urban areas; provides water supply and detention for east coast urban and agricultural areas and ENP; improves the water supply for east coast communities by recharging underground freshwater reservoirs; and may ameliorate saltwater intrusion in coastal aquifers. While the WCAs may reduce the severity of the drainage of the Everglades caused by the major canal systems, thus reducing impacts to fish and wildlife caused by the major drainage systems, the levees surrounding the WCAs still function to impound the Everglades, precluding the historic flow patterns. The C&SF system makes it difficult to provide natural timing, volume, and distribution. In wet periods, water is impounded in the WCAs and then discharged to Everglades or coastal canals. During dry periods, water can flow through the canals to coastal areas and bypass the ENP wetlands.

The maintenance of water levels in the WCAs essentially represents the seasonal and monthly limits of storage. The levels vary from high stages in the late fall and winter to low stages at the beginning of the wet season. This permits the storage of runoff during the wet season and the release of stored water to ENP during the dry season and maintains elements of the habitat essential to fish and wildlife. The distribution of water for flood control and water supply varies seasonally. The schedules for the WCAs include a minimum water level below which water releases are not permitted unless water is supplied from another source. When water levels fall below the minimum levels, transfers of water from the EAA or the WCAs are made to meet water supply demands.

The primary source of water from the northern part of the C&SF system to Northeast Shark River Slough is WCA-3A. Water Conservation Area 3A is very large and thus primarily rain fed, though it also receives water deliveries from the north, as well as storm runoff from western Broward County. Water Conservation Area 3A discharges into the L-29 Canal through structure S-333, which is located at the extreme southeast corner of the WCA. Water in the L-29 Canal then passes under Tamiami Trail into ENP through 19 sets of culverts (55 total culverts, three culverts per set in most locations).

Under existing conditions water does not flow directly from WCA-3B into the L-29 Canal. Although there are two discharge structures (S-355A and S-355B) along the L-29 Levee south of WCA-3B that could move water from WCA-3B into the canal, they are not operating at present because of low water stages in WCA-3B. Water stages in WCA-3B are much lower than stages in WCA-3A, due to a lack of inflows into WCA-3B and the reduction of seepage from 3A to 3B due to the design of L-67A and C levees. Water Conservation Area 3B loses seepage to the east by the L-30 borrow canal and to the south by the L-29 borrow canal.

Water deliveries to eastern ENP are controlled by stages in the L-29 Canal and ENP. Water can only flow into ENP when stages in the canal are higher than in the downstream marsh. However, canal stage is strictly controlled due to potential flooding within residential or agricultural areas of Miami-Dade County or potential damage to Tamiami Trail. The canal stage constraint is 7.5 feet NGVD. Higher water levels within the canal may erode the sub-base of the road and create a potential safety hazard. The structures are not operated to directly prevent the L-29 Canal from exceeding 7.5 feet NGVD; however, S-333 flows are controlled, in part, to prevent the water stage at gage G3273 from exceeding an elevation of 6.8 feet NGVD, which effectively prevents the L-29 Canal from exceeding 7.5 feet. In most cases, flows that would result in canal water levels above 7.5 feet NGVD are diverted or held for release at a different time. The management of stage levels is among the most important factors in determining the amount of water entering the ENP.

Water Supply and Demand

The SFWMD is the agency responsible for regulating the region's supply of water and planning for meeting South Florida's future water demands. The SFWMD estimates that the South Florida region will experience a 31 percent increase in population between 2005 and 2025 with over 7 million people living in South Florida in 2025 (SFWMD, 2006a). At present, major water use in the region is for public water supply, agriculture, recreation, and commercial and industrial. By 2025, it is estimated that public water supply demand will increase by 41% and recreational use will increase by 31%. Additionally, because of the increased population and new power generation technologies it is estimated that power generation use of the available water supply will jump by 2,180%. Overall, the SFWMD estimates a 24% increase in water demand by 2025 (SFWMD, 2006a). This increased demand will put additional strain on the region's stressed hydrologic resources. Drawdown of regional aquifers because of water supply demand can lead to lowered ground water tables, oxidation of hydric soils, and disruptions in the timing and durations of hydroperiods within existing wetlands.

At present, 90% of public water demand is met through a combination of traditional groundwater and surface water supplies, as well as alternative supplies such as brackish groundwater (SFWMD, 2006a). Much of the regions fresh groundwater comes from the surficial and Biscayne aquifers, which are recharged by surface waters from the Everglades. With the implementation of Everglades restoration projects and changes in operation levels to Lake Okeechobee it is unsure if available water supplies in the Everglades will be available to meet restoration and water supply goals. Because of uncertainty in the supply of groundwater the use of alternative water supplies is being advocated to meet future demands. At present, the SFWMD is planning on requiring that the majority of future water supply demands be met by alternative supply projects such as reclaimed water, reuse, and desalination.

3.2.2 Water Quality

During pre-drainage conditions, water from the Kissimmee Valley flowed south to Lake Okeechobee where it would periodically overflow its southern shoreline. The water would then continue its slow journey through the northern sawgrass plains to the central and southern Everglades and ultimately to Florida Bay (***Figure 3-4***). Only a few small rivers flowed eastward through the coastal ridge (USACE and SFWMD, 1999). Water through the Everglades principally flowed through the once interconnected ridge and slough topography that comprised the majority of modern-day WCA-1, WCA-2, WCA-3, and Shark River Slough (Lodge, 2005).

Shark River Slough historically flowed from the central portion of the Everglades generally south and southwesterly to Florida Bay. However, the timing, velocity, quantity, and direction of flow have been altered over the last century, most notably by implementation of the C&SF project. Completion of Tamiami Trail in 1928 also impaired water flow into Shark River Slough and the southern Everglades. The cumulative effect of the completion of the Tamiami Trail and implementation of the C&SF project was a significant alteration in the natural hydropatterns that once characterized the Everglades and notably Shark River Slough.

Historically, the central and southern Everglades were a nutrient-limited, oligotrophic system (Lodge, 2005). During pre-drainage conditions, slow water movement throughout the Everglades watershed allowed the wetland's biotic and abiotic components to absorb nutrients and maintain consistent water quality. The C&SF project altered natural hydropatterns and other key ecosystem dynamics such as nutrient assimilation processes in the Everglades, thus affecting the source processes that drive water quality composition.

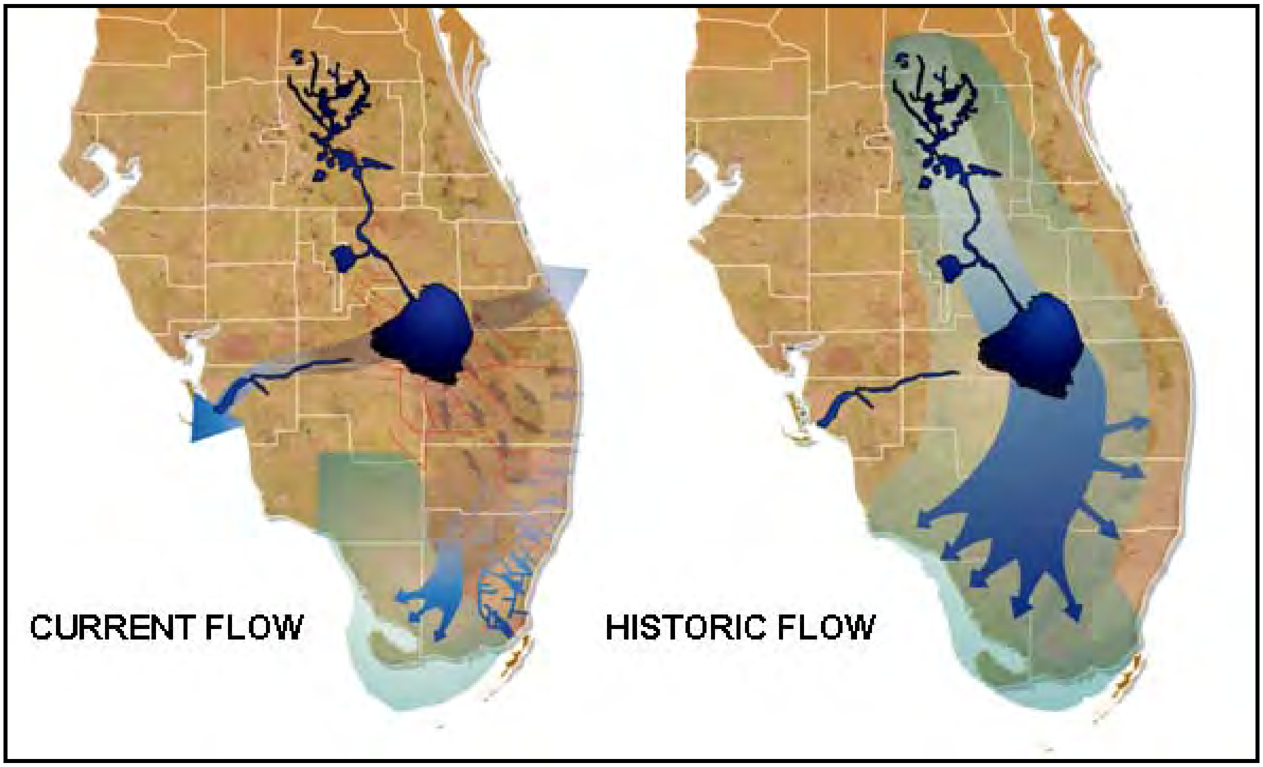


Figure 3-4 – Conceptual historic water flow through Everglades before human impact and current flow (USACE and SFWMD, 1999)

The majority of the surface water now delivered to Shark River Slough originates from surface water runoff and groundwater seepage from WCA-3A and WCA-3B (NPS, 2005). Major inflows into WCA-3A occur through the Miami Canal that drains the EAA, the S-9 pump station that drains urban areas east of the Everglades, and the S-11 structures that drain WCA-2A and the agricultural areas (Porter and Porter, 2002). The EAA is a region characterized by crop production and therefore, pesticides and nutrient laden fertilizers are regularly applied in this region. Source water flows into the L-29 Canal from WCA-3A occur primarily through the S-333 structure. Water discharges from the L-29 Canal through 19 culvert sets that passively flow beneath the Tamiami Trail into Northeast Shark River Slough and through the S-334 structure on the eastern end. Structures S-333 and S-334 are closed for much of the year. The S-355A, S-355B, and S-356 are MWD structures that have undergone short tests, but they are not actively in use. The S-334, a gated structure at the east end of the L-29 Canal, is used to discharge water out of the canal.

To protect the water quality in ENP, it was designated an OFW requiring special consideration. An OFW has narrative criteria that do not allow the degradation of water quality conditions relative to a fixed point in time, which for the ENP is 1978/1979. Since Northeast Shark River Slough was not included in the ENP OFW designation until August 8, 1994, the base year for this portion of the park is 1993/1994.

The federal government, in 1988, sued the SFWMD and the FDEP [formerly Florida Department of Environmental Resources (FDER)] for violations of state water quality standards, particularly phosphorus, in the Loxahatchee National Wildlife Refuge (LNWR) and ENP. In July 1991, the SFWMD, FDEP and U.S. Department of Justice signed a settlement agreement that was then approved by the judge and adopted as a consent decree. The settlement agreement and the consent decree required a series of programs to improve water quality and meet state standards in ENP and LNWR by July 2002. Among its provisions were commitments to construct a series of STAs and to implement a regulatory program requiring agricultural growers to use BMPs within the EAA, located to the north of the Everglades and south of Lake Okeechobee (Rizzardi, 2001). In 1994, the Everglades Protection Act was substantially rewritten; this created the Everglades Forever Act (EFA), F.S. [sections] 373.4592, that required compliance with all water quality standards in the Everglades by December 31, 2006 (Rizzardi, 2001).

Current water quality within the Everglades is affected by non-point (e.g., agricultural and urban stormwater runoff) and point (e.g., wastewater discharges) sources of contamination. Parameters of concern include:

- Nutrients – phosphorus, nitrite/nitrate, and ammonia/non-ionized ammonia;
- Physical parameters – pH, DO, specific conductance, turbidity, oil and grease, temperature, and salinity;
- Metals – mercury, copper, cadmium, lead, zinc, and arsenic;
- Pesticides – DDT and derivatives, atrazine, simazine, ametryn, endosulfan compounds, ethion, bromacil, 2,4-D, aldecarb, and fenamiphos;
- Biological – fecal coliforms, pathogens, and chlorophyll-a; and
- Other constituents – polycyclic aromatic hydrocarbons (PAHs), dioxins and furans, sulfate, chloride, tributylin, polychlorinated biphenyls, and volatile organic compounds.

Generally, the primary parameters of concern in the Everglades include nutrients, DO, sulfate, mercury, biochemical oxygen demand and pesticides.

Water quality is monitored at the S-333 structure and various Tamiami Trail culvert sets along the L-29 Canal at varying frequencies (***Figure 3-5***). Surface water TP, DO, specific conductivity (SpC), pH, sulfate, total suspended solids (TSS) and turbidity monitoring data were downloaded from the DBHYDRO database of the SFWMD for the period January 2004 to September 2009 and analyzed to characterize the water quality discharged into Northeast Shark River Slough east of the L-67 Extension Canal (DBHYDRO, n.d.). In figures presented herein, the monitoring stations are arranged corresponding to their location from the west (S-333) to the east end (S-334) along the L-29 canal to discern the variation in constituent concentrations with distance from the source discharge (S-333). As station S-356 is in very proximate location to S-334, where monitoring has been discontinued, the data for the two stations were merged for analysis and are represented herein as S-334/356.

Box plots are presented to visually depict and summarize the quality of water discharged into Northeast Shark River Slough. Box plots are univariate representations of quantitative data samples and sometimes called "box and whisker diagrams". The minimum, 1st quartile, median, mean, and 3rd quartile are displayed together with both limits (the ends of the "whiskers") beyond which values may be considered anomalous. The mean is displayed by a "•" symbol, and a black line inside the box corresponds to the median. Limits are estimated as 1.5*(Q3 – Q1) drawn from the edge of the box to the nearest point on both ends; where, Q1 is the 1st quartile and Q3 is the 3rd quartile. Values that are outside the [Q1 - 3 (Q3 – Q1); Q3 + 3 (Q3 – Q1)] interval are displayed with the * symbol. Values that are in the [Q1 - 3 (Q3 – Q1); Q1 – 1.5 (Q3 – Q1)] or the [Q3 + 1.5 (Q3 – Q1); Q3 + 3 (Q3 – Q1)] intervals are displayed with the "o" symbol.

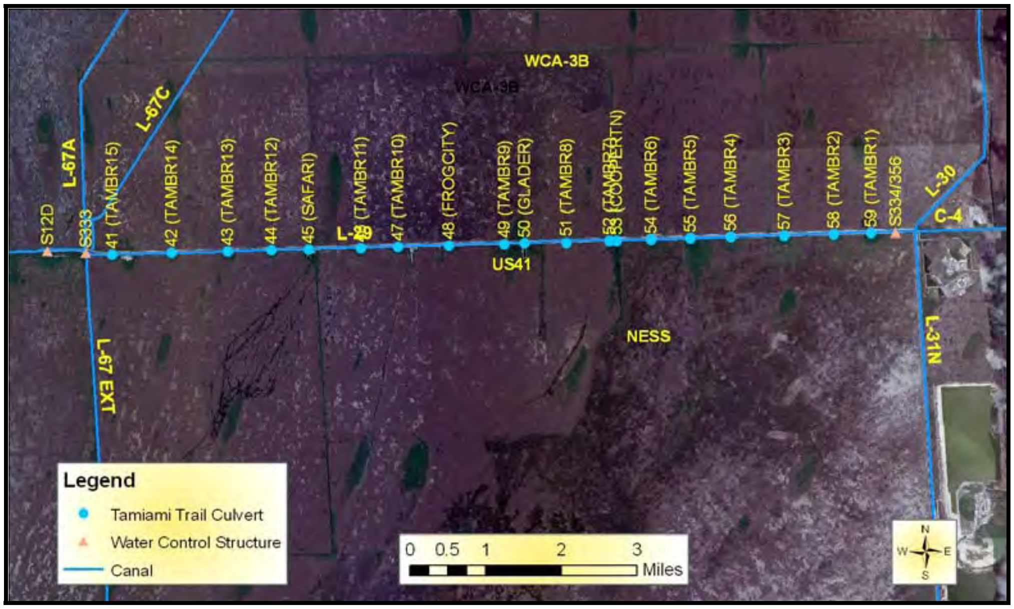


Figure 3-5 – Water quality monitoring stations and culverts along the L-29 Canal

Figure 3-6 summarizes TP concentrations recorded along the L-29 Canal for approximately six years since 2004. During this time period, a mean TP concentration of 0.013 mg/L (min: 0.005 mg/L; max: 0.037 mg/L) was recorded at the S-333 monitoring station; a mean TP concentration of 0.015 mg/L (min: 0.007 mg/L; max: 0.037 mg/L) was recorded at the adjacent Safari monitoring station. A mean TP concentration of 0.012 mg/L (min: 0.007 mg/L; max: 0.031 mg/L) was recorded at the eastern-most L-29 monitoring stations (S-334/356). The highest maximum TP concentration of 0.047 mg/L was recorded at the TAMBR5 monitoring station. The South Florida Environmental Report (SFER-09) in 2009 (SFWMD, 2009) states that in ENP, the mean inflow TP concentration observed for WY2008 was higher than the previous historical periods. The likely cause of the elevated inflow TP concentration for the Park is the dry conditions in upstream areas resulting in oxidation of the sediment and subsequent release of bound phosphorus, which is supported by the higher outflow TP concentrations recorded for WCA-3 during WY2008 (SFWMD, 2009).

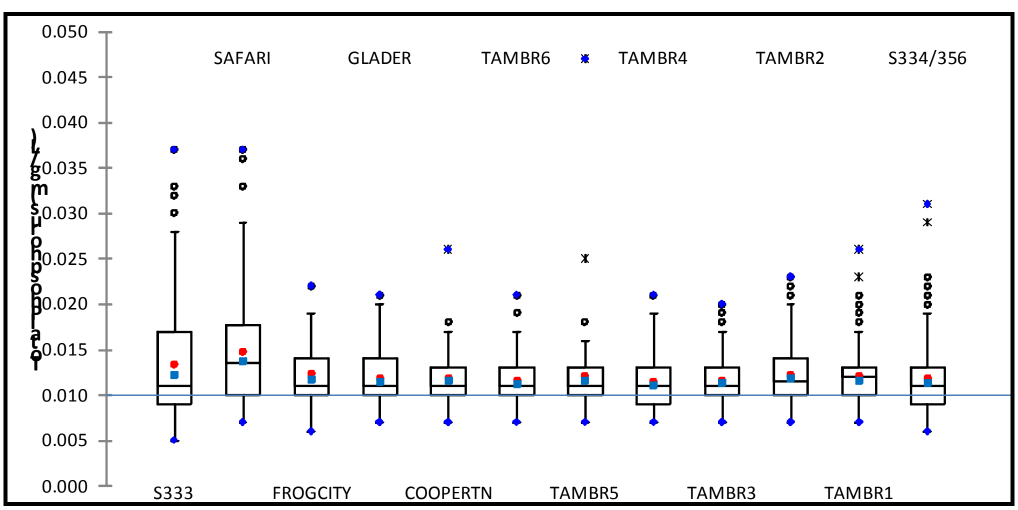


Figure 3-6 – Box plots (with geometric means "■") for total phosphorus (January 2004 – September 2009)

Table 3-2 provides an estimate of the Tamiami Trail culvert flows and the respective TP loads. A mean discharge of 105 K ac-ft with an average TP load of 1,565 kg/water year was observed.

Table 3-2 – Mean water year[¥] (2005 – 2009) discharge*, flows* and TP loads[§] for Tamiami Trail culverts

Culvert #	Name	Discharge K ac-ft	Flows cfs	TP loads (pounds)
culvert_41	TAMBR15	0.91	1.25	30.9
culvert_42	TAMBR14	0.79	1.08	28.7
culvert_43	TAMBR13	0.92	1.28	35.3
culvert_44	TAMBR12	0.78	1.08	30.9
culvert_45	SAFARI	7.66	10.58	304.2
culvert_46	TAMBR11	1.14	1.57	44.1
culvert_47	TAMBR10	0.89	1.23	33.1
culvert_48	FROGCITY	1.24	1.71	41.9
culvert_49	TAMBR9	2.24	3.09	72.8
culvert_50	GLADER	6.69	9.24	213.8
culvert_51	TAMBR8	0.71	0.98	22.0
culvert_52	TAMBR7	0.04	0.06	2.2
culvert_53	COOPERTN	10.36	14.31	335.1
culvert_54	TAMBR6	3.85	5.32	121.3
culvert_55	TAMBR5	7.08	9.78	229.3
culvert_56	TAMBR4	5.79	8.00	183.0
culvert_57	TAMBR3	13.14	18.14	416.7
culvert_58	TAMBR2	16.35	22.58	526.9
culvert_59	TAMBR1	25.02	34.56	782.6
Total		**105.59**	**145.85**	**3454.6**

[¥]: Water year is May 1st to April 30th.

*: Based on USGS unpublished data

[§]: Based on interpolated data for some culverts

The Settlement Agreement/Consent Decree (1995) specified that interim and long-term TP concentration limits for discharges into the ENP through SRS be met by October 1, 2003, and December 31, 2006, respectively. The 12-month flow-weighted means of TP concentrations at the end of water year (October 1 through September 30) (***Figure 3-7***) are evaluated for compliance with the Consent Decree limits. The long-term TP concentration limit for inflows to SRS through structures S-12A, S-12B, S-12C, S-12D, and S-333 represents the concentrations delivered during the OFW baseline period of March 1, 1978, to March 1, 1979, and is adjusted for variations in flow (SFWMD, 2009). Inflow concentrations of TP through SRS are compared to the interim and long-term limits at the end of each water year. ***Figure 3-7*** shows the 12-month flow-weighted mean TP concentrations at inflows (S-12A-D gated structures west of S-333 plus

TAMB culverts) to the ENP through SRS at the end of each water year from 1991 to 2009 compared to the interim and long-term TP limits. The 12-month flow-weighted mean TP concentration for federal water year 2008 and 2009 was 10.2 parts per billion (ppb) and 8.16 ppb, respectively. The corresponding long-term limit, which became effective on December 31, 2006, was also 10.2 ppb and 8.2 ppb, respectively (SFWMD, 2009). The SRS TP concentrations were in compliance for federal water year 2008 and 2009.

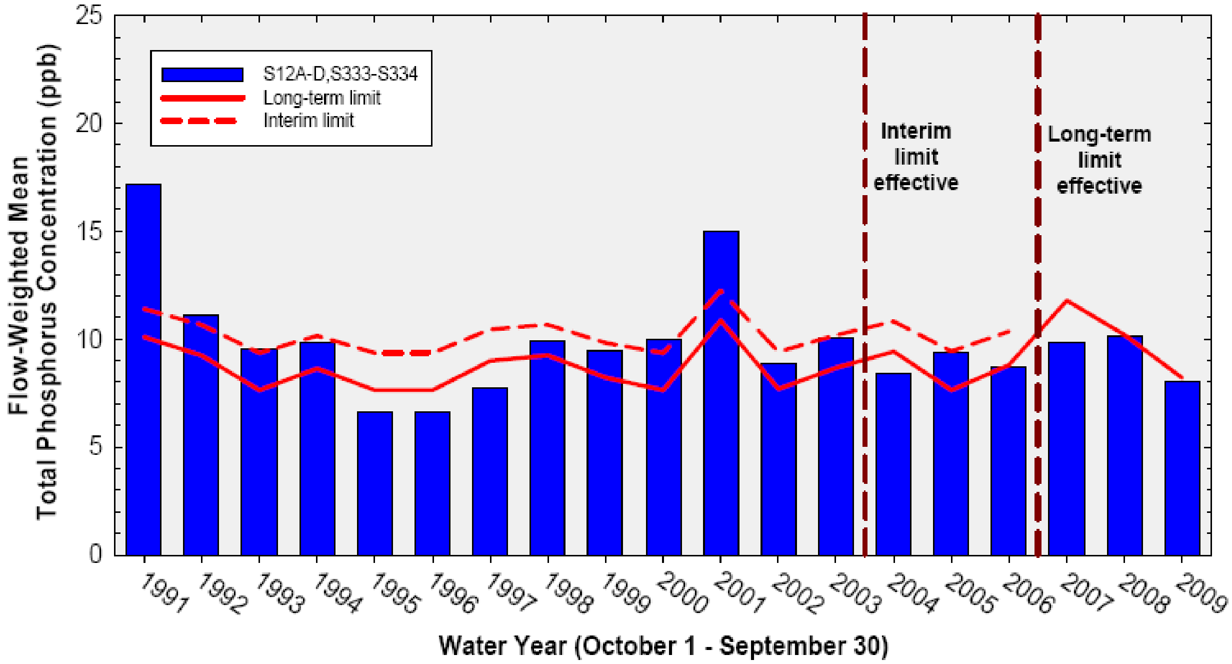


Figure 3-7 – The 12-month flow-weighted mean TP concentrations at inflows to the ENP through Shark River Slough at the end of each water year compared to the interim and long-term TP limits (SFWMD, 2009)

The estimated TP threshold for the Everglades above which it causes an imbalance of the natural flora and fauna is approximately 0.010 mg/L (10 ppb). Results of the TP concentration analysis indicate average TP concentrations (geometric means) recorded in water quality discharges into Northeast Shark River Slough from the Tamiami Trail culvert monitoring stations January 2004 to September 2009 (***Figure 3-6***) are above this ecologically-meaningful threshold; the amount of time that discharges with TP concentrations are above this threshold is unknown since the data collected is from grab samples, not from continuously sampling autosampling equipment. The plant community composition directly downstream of some of the Tamiami Trail culvert sets indicate potential nutrient enrichment, with cattails pluming in some of the immediate downstream culvert pool locations (***Figure 3-8***). This nutrient enrichment downstram of culverts may also be attributed to localized loading.

Figure 3-8 – Cattail plume south of the Culvert 43 (TAMBR13) discharge location
Photograph taken on July 22, 2009, by Alicia Logalbo, ENP

Phosphorus inputs from Tamiami Trail culvert discharges appear to be impacting the downstream plant community composition in Northeast Shark River Slough. Downstream TP transport through oligotrophic, free-flowing wetlands occurs predominantly through the biota, notably the periphyton and the flocculent detrital components rather than through the water column itself (Gaiser et al., 2005). Thus, water quality sampling of TP will not measure the microbially bound phosphorus. Soils become phosphorus enriched following the capacity of the biota to uptake phosphorus from the water column or detritus. Community structure has been shown to be altered by even minute phosphorus inputs to the system of 5 µg/L above ambient conditions, due to increased TP loading; within a spikerush/periphyton community in central Shark River Slough this caused changes in the periphyton and floc after two months, soils after three years, fish after four years, and macrophytes in the fifth year (Gaiser et al., 2005; Gaiser et al., 2007). Since phosphorus enrichment is being detected not only in the water column but also in the plant community composition itself, multiple indicators are providing evidence that the portion of Northeast Shark River Slough downstream of the Tamiami Trail culvert sets is showing signs of nutrient enrichment.

The DO was evaluated following Everglades Marsh DO Site Specific Alternative Criterion (SSAC) (Weaver, 2004). ***Figure 3-9*** shows the annual mean residual DO (Observed DO - lower DO compliance limit) along the L-29 Canal. When the annual average residual is less than zero, then the annual average measured DO concentration is below the range explained by natural background variability and the site is considered as out of compliance with the SSAC (Weaver, 2004). For the six years (2004-2009) of data analyzed, the monitoring locations were in compliance with SSAC except for SAFARI, FROGCITY and TAMBRs-4,3,2,1 that showed atleast one year out of compliance (***Figure 3-9***). The S-334/356 at the eastern edge of L-29 Canal showed the lowest mean SpC (511 µS/cm) that was influenced by some low outlier values (***Figure 3-10***). The maximum SpC (873 µS/cm) was recorded at the GLADER monitoring station.

The mean pH varied between 7.27 (FROGCITY) and 7.49 (TAMBR1) at different locations with little fluctuation along the length of the L-29 canal (***Figure 3-11***). The highest variation in pH was observed at S-334/356 location (min: 6.98; max: 8.90).

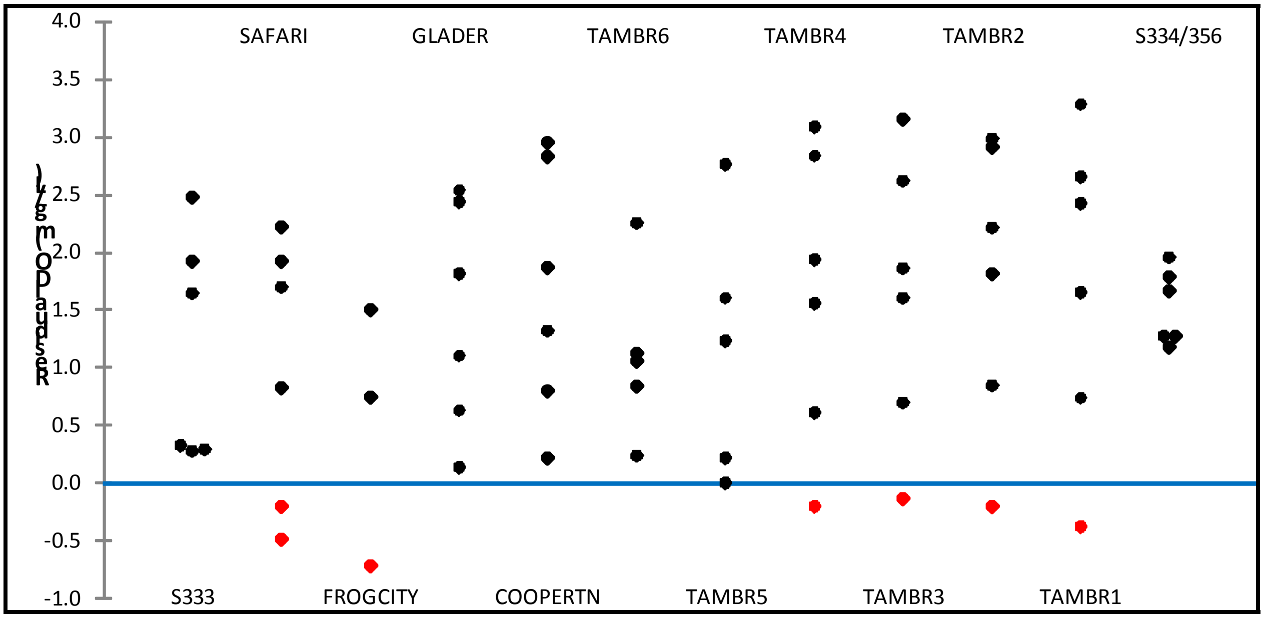


Figure 3-9 – Scattergrams for annual mean residual dissolved oxygen (2004 –2009)

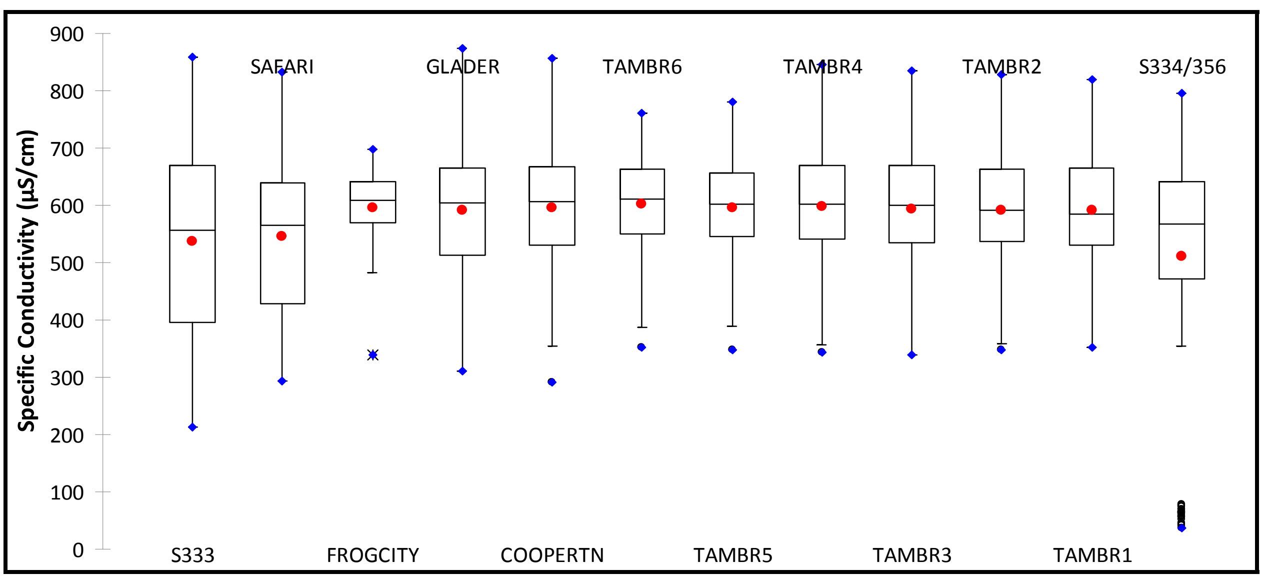


Figure 3-10 –Box plots for specific conductivity (January 2004 – September 2009)

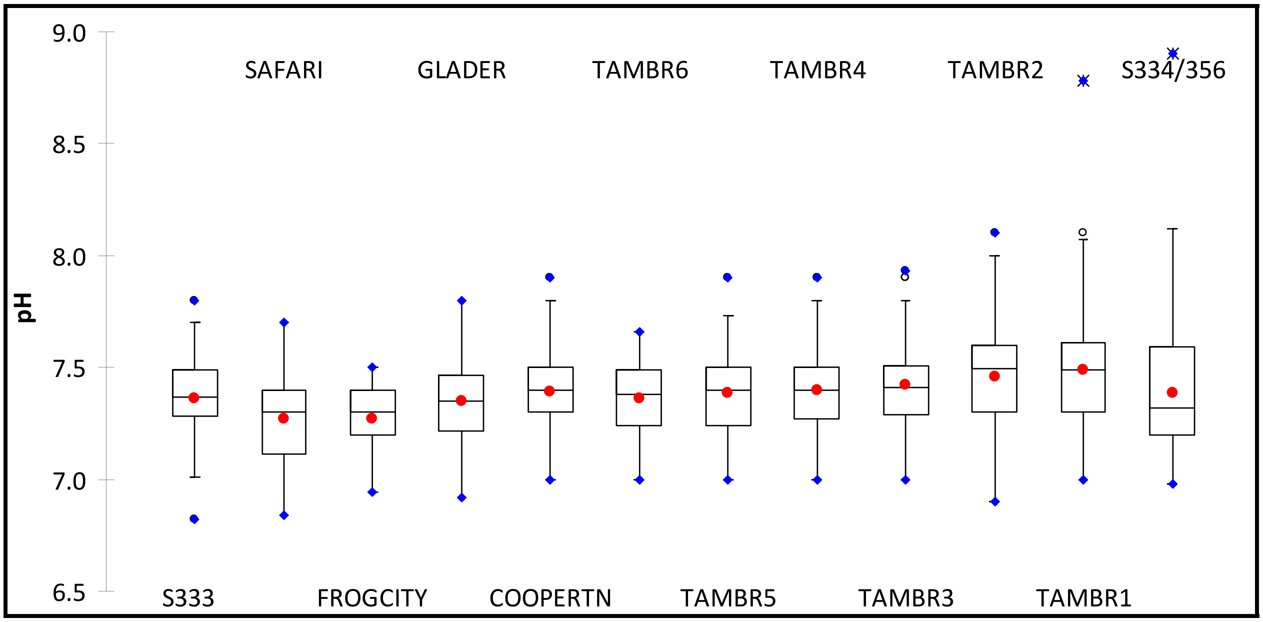


Figure 3-11 –Box plots for pH (January 2004 – September 2009)

The concentrations of sulfate, TSS, and turbidity in surface waters recorded along the L-29 Canal monitoring stations are summarized in ***Figure 3-12***. The TSS and turbidity concentrations showed an inverse pattern at the eastern end of the L-29 Canal (S-334/356) as compared to the western end L-29 Canal monitoring stations (S-333). The mean TSS concentrations were 2.4 and 1.6 mg/L at S-333 and S-334/356, respectively and the mean turbidity concentrations were 1.7 Nephelometric Turbidity Units (NTU) (S-333) and 1.9 NTU (S-334/356). The mean sulfate concentration were 12.8 mg/L at S-333 (min: 0.05 mg/L, max: 35.8 mg/L) and 7.3 mg/L at S-334/356 (min: 0.05 mg/L, max: 28.6 mg/L).

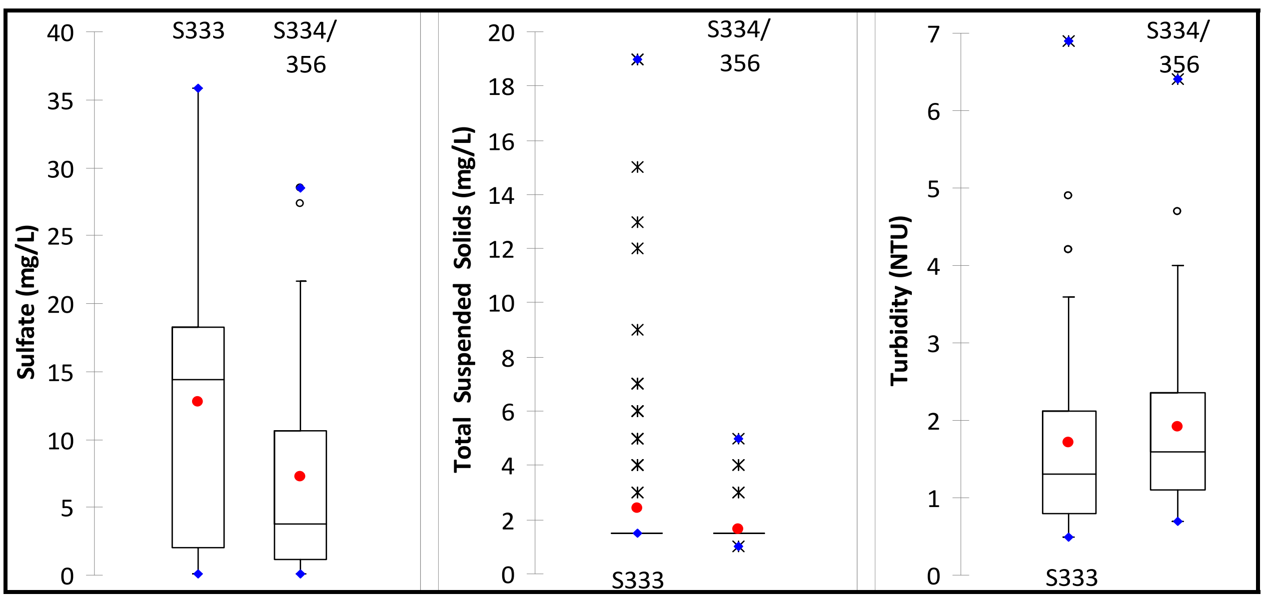


Figure 3-12 –Box plots for sulfate, TSS and turbidity (January 2004 – September 2009)

High concentrations of sulfate cause environmental concern as sulfur is a key water quality parameter that affects the rate of methyl mercury production in aquatic ecosystems. As a biologically active element, sulfur has forms that are highly toxic (sulfide) or that may promote phosphate releases from sediments (sulfate) (SFER-09). Sulfur may exhibit detrimental effects beyond promoting mercury methylation, including sulfide toxicity to aquatic plants and animals, and phosphate and ammonium release from sediments (SFER-09). ***Figure 3-13*** shows the time series for sulfate at S333 and S334/356 monitoring locations.

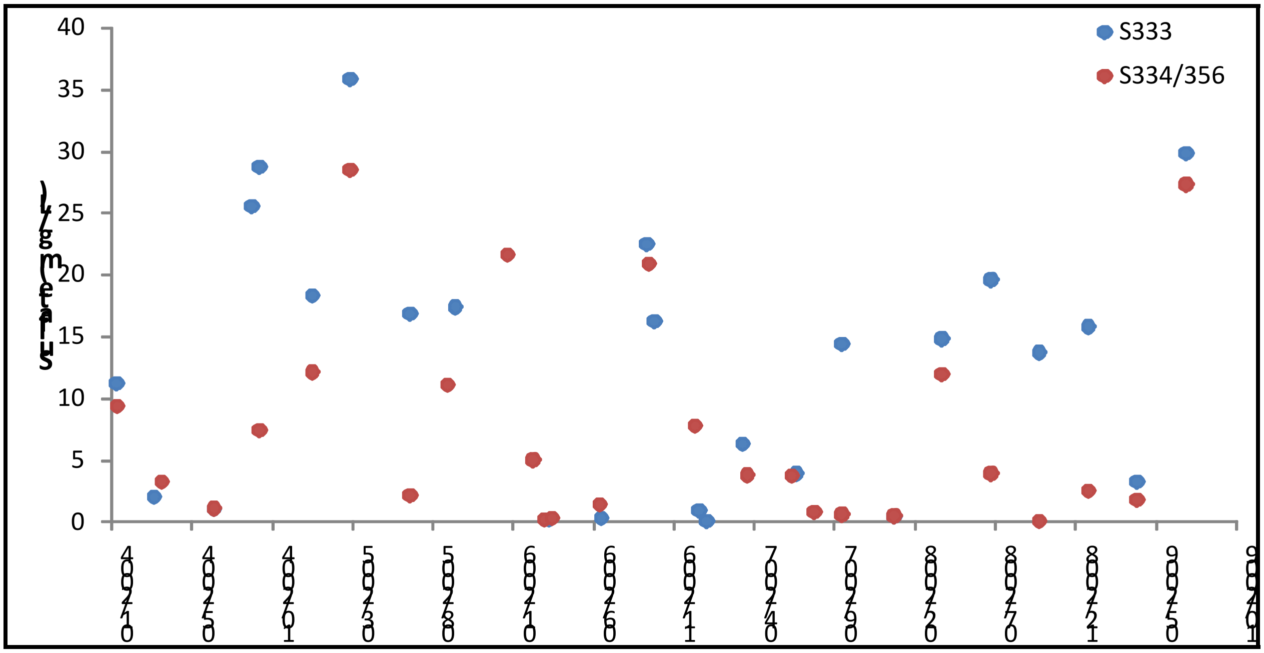


Figure 3-13 – Time series for sulfate at S-333 and S-334/356 (January 2004 – September 2009)

Methyl mercury is a highly toxic form of mercury that bioaccumulates in aquatic food chains. SFER-09 reported that mercury levels in sunfish and largemouth bass from ENP have generally increased over the past decade and are presently at elevated concentrations exceeding both federal predator protection and human health criteria, particularly in the methyl mercury "hot spot" – Shark River Slough – in ENP (SFER-09) (***Figure 3-14***). For Shark River Slough, annual mercury medians for largemouth bass from age cohorts one and two exceeded the USEPA guidance criterion for protection of fish-eating wildlife of 0.346 µg/g for TL 4 fish for all years sampled. Over 99% of age cohort one and two largemouth bass exceeded the USEPA wildlife criterion from 1993 through 2008. These findings continue to suggest that piscivorous avian and mammalian wildlife may experience methyl mercury exposures above the acceptable dose in broad areas of the Everglades Protection Area (EPA), which encompasses WCA-1, WCA-2, WCA-3, and ENP (SFER-09). SFER-09 also observed that in the Shark River Slough mosquitofish (*Gambusia holbrooki*), sunfish, and largemouth bass continue to have higher mercury levels than fish elsewhere across the EPA. New data (from 2007 and 2008) for common snook (*Centropomus undecimalis*) from Shark River Slough indicate that these fish have higher mercury levels than snook elsewhere in ENP, with mean concentrations of 1.6 µg/g and 0.5 µg/g, respectively (SFER-09).

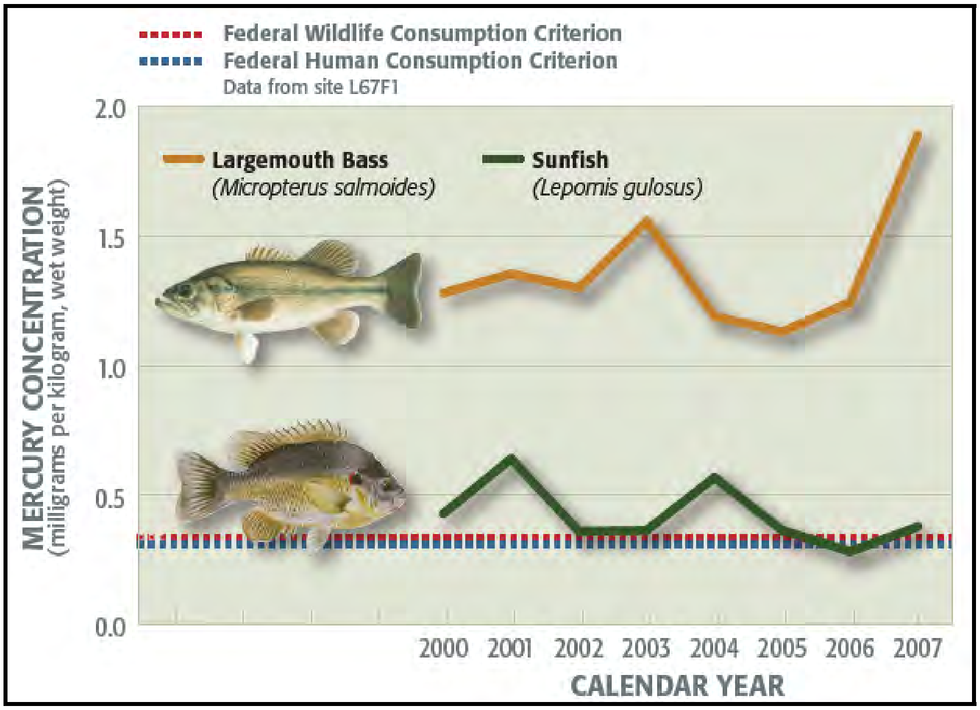


Figure 3-14 – Mercury in fish from ENP (SFER-09)

Surface water concentrations of arsenic, cadmium, copper, iron, lead, and mercury were evaluated from January 1997 to September 2009 at the L-29 Canal monitoring stations east of the L-67 Extension. ***Table 3-3*** summarizes the data for metals and ***Figure 3-15*** provides the box plots for copper, mercury, and methyl mercury.

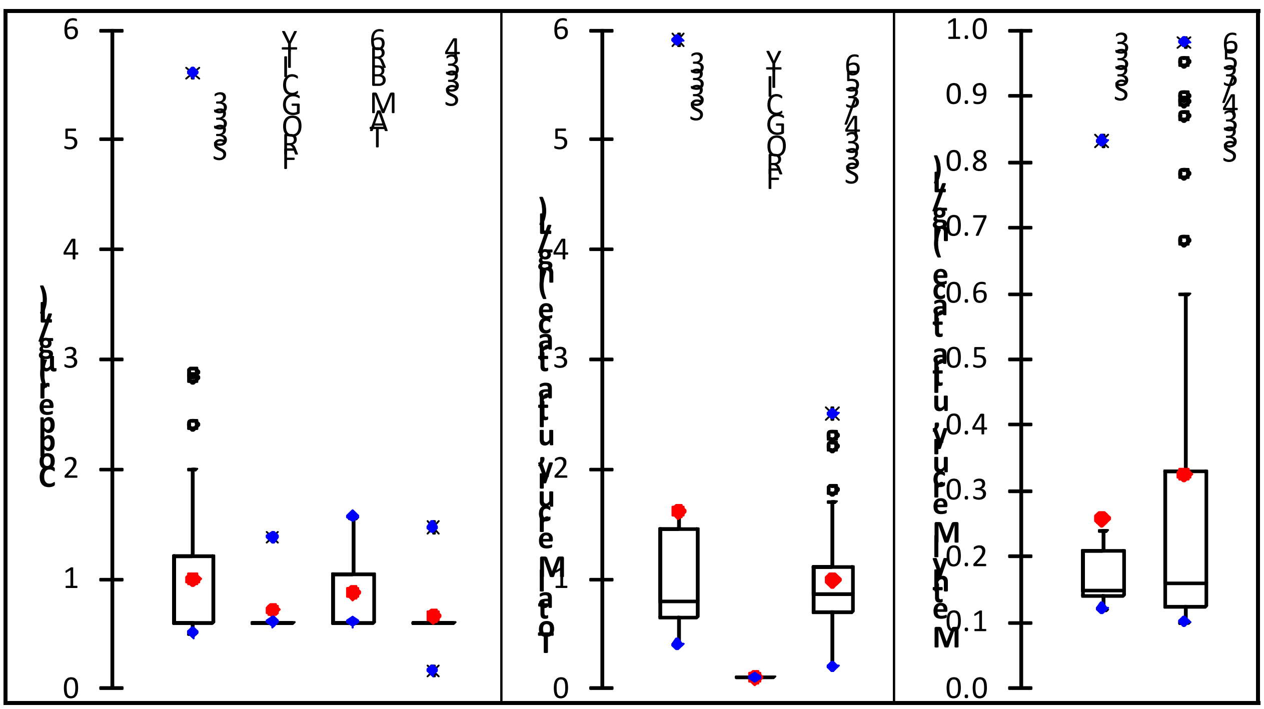


Figure 3-15 –Box plots for copper, mercury and methyl mercury (January 2004 – September 2009)

Table 3-3 – Summary of metal concentrations in L-29 Canal monitoring stations at the S-333, FROGCITY, TAMBR6, and S-334 since 1997

Station	S333	FROGCITY	TAMBR6	S334	Station	S333	FROGCITY	TAMBR6	S334
Arsenic (µg/L)					**Lead (µg/L)**				
POR	Jan. 1997-	Jul. 1997-	Jul. 1997-		**POR**	Jan. 1997-	Jul. 1997-	Jul. 1997-	
	Jan. 2001	Jul. 2000	May 2000			Jan. 2001	Jul. 2000	Jul. 2000	
Sample size	44	7	7		**Sample size**	44	7	7	
Minimum	0.75	0.75	0.75		**Minimum**	0.40	0.40	0.40	
Maximum	2.60	0.75	0.75		**Maximum**	1.60	1.70	0.40	
Median	0.75	0.75	0.75		**Median**	0.40	0.40	0.40	
Mean	0.95	0.75	0.75		**Mean**	0.46	0.65	0.40	
Cadmium (µg/L)					**Mercury, ultra trace (ng/L)**				
POR	Jan. 1997-	Jul. 1997-	Jul. 1997-	Jan. 1998-	**POR**	Oct. 2007-	Jul. 1997-		May 1997-
	Jan. 2007	Jul. 2000	May 2000	May 2004		Jul. 2009	Jan. 2001		Jul. 2009
Sample size	56	7	7	7	**Sample size**	7	6		39
Minimum	0.15	0.15	0.15	0.12	**Minimum**	0.40	0.10		0.20
Maximum	1.50	0.76	0.44	0.40	**Maximum**	5.90	0.10		2.50
Median	0.15	0.15	0.15	0.15	**Median**	0.80	0.10		0.86
Mean	0.22	0.24	0.19	0.18	**Mean**	1.61	0.10		0.98
Copper (µg/L)					**Methyl Mercury, ultra trace (ng/L)**				
POR	Jan. 1997-	Jul. 1997-	Jul. 1997-	Jan. 1998-	**POR**	Oct. 2007-			Nov. 1997-
	Jan. 2007	Jul. 2000	May 2000	May 2004		April 2009			April 2009
Sample size	57	7	7	7	**Sample size**	7			38
Minimum	0.50	0.60	0.60	0.16	**Minimum**	0.12			0.10
Maximum	5.60	1.37	1.56	1.46	**Maximum**	0.83			0.98
Median	0.60	0.60	0.60	0.60	**Median**	0.15			0.16
Mean	0.99	0.71	0.87	0.66	**Mean**	0.26			0.32
Iron (µg/L)					**Zinc (µg/L)**				
POR	Jan. 1997-	April 1997-	April 1997-	Oct. 1997-	**POR**	Jan. 1997-	Jul. 1997-	Jul. 1997-	Jan. 1998-
	Jul. 2007	Jul. 2001	Jul. 2001	Jan. 2006		Jan. 2007	Jul. 2000	Jul. 2000	Jul. 2000
Sample size	107	18	18	19	**Sample size**	57	7	7	6
Minimum	1	25	26	7	**Minimum**	1.4	2.0	2.0	2.0
Maximum	334	966	734	994	**Maximum**	8.0	23.0	15.0	2.0
Median	59	218	169	187	**Median**	2.0	2.0	2.0	2.0
Mean	69	296	262	265	**Mean**	2.9	5.0	3.9	2.0

POR: Period of Record

Pesticide monitoring within SFWMD has been ongoing since 1976 with the routine ambient monitoring program beginning in 1984 (Pfeuffer, 2009). As part of the SFWMD's quarterly ambient monitoring program, unfiltered water and sediment samples are collected and analyzed for over 70 pesticides and/or products of their degradation (Pfeuffer, 2008). The SFWMD pesticide monitoring network includes stations designated in the Everglades Settlement Agreement, the Lake Okeechobee Protection Act Permit, and the non-Everglades Construction Project permit (Pfeuffer, 2008). Water Conservation Area 1 and the ENP are also designated as OFW, to which anti-degradation standards apply. Surface water and sediment are sampled quarterly and semiannually, respectively, upstream at each structure identified in the permit or agreement (Pfeuffer, 2008). The compounds and concentrations found are typical of those expected from an area of intensive historical and contemporary agricultural activity. ***Table 3-4*** summarizes only those pesticides found above the method detection limit since March 2008 monitoring at the S-333, S-334 and S-356 stations. The frequency of detection of atrazine is particularly noticeable.

Table 3-4 – Summary of pesticide residues (µg/L) above the method detection limit found in surface water samples collected by SFWMD (March 2008 – August 2009)

Date	Site	Flow	ametryn	atrazine	atrazine desethyl	metribuzin	simazine	Number of compounds detected at site
03/18/2008	S333	Y	0.031 §	0.82	0.047	-	0.016 §	4
	S356	N	0.032 §	0.53	0.035 §	-	0.014 §	4
06/16/2008	S333	Y	-	-	-	0.023 §	-	1
	S356	N	-	0.020 §	-	-	-	1
09/16/2008	S333	N	-	0.01 §	-	-	-	1
	S356	N	-	-	-	-	-	0
12/08/2008	S333	Y	-	-	-	-	-	0
	S356-334	Y	-	-	-	-	-	0
02/24/2009	S333	Y	-	-	-	-	-	0
	S356-334	N	-	-	-	-	-	0
04/28/2009	S333	N	-	0.039	-	-	-	1
	S356-334	N	-	0.038	-	-	-	1
08/04/2009	S333	Y	-	0.018 §		-	-	1
	S356-334	Y	-	0.022 §		-	-	1

(Pfeuffer, 2008; Pfeuffer, 2009)

N: no and Y: yes

-: denotes that the result is below the MDL

§: value reported is less than the practical quantitation limit, and greater than or equal to the MDL.

In 2006, the SFWMD implemented the S-12D Flow-way Maintenance Plan (***Figure 3-16***) in the upstream inflow channel and the distribution canal downstream of the S-12D structure covering ~11 acres (estimated) of area (SFWMD, 2006). The plan objectives included among others:

- Removal of vegetation within the Old Tamiami canal from S-12E to the FP&L access road;
- Treatment and removal of invasive, non-native vegetation growing along the north and south bank of Old Tamiami Trail from S-12E to the FP&L access road; and
- Dredging in the upstream and downstream channels of S-12D, in conformance with the design specifications of that flow way.

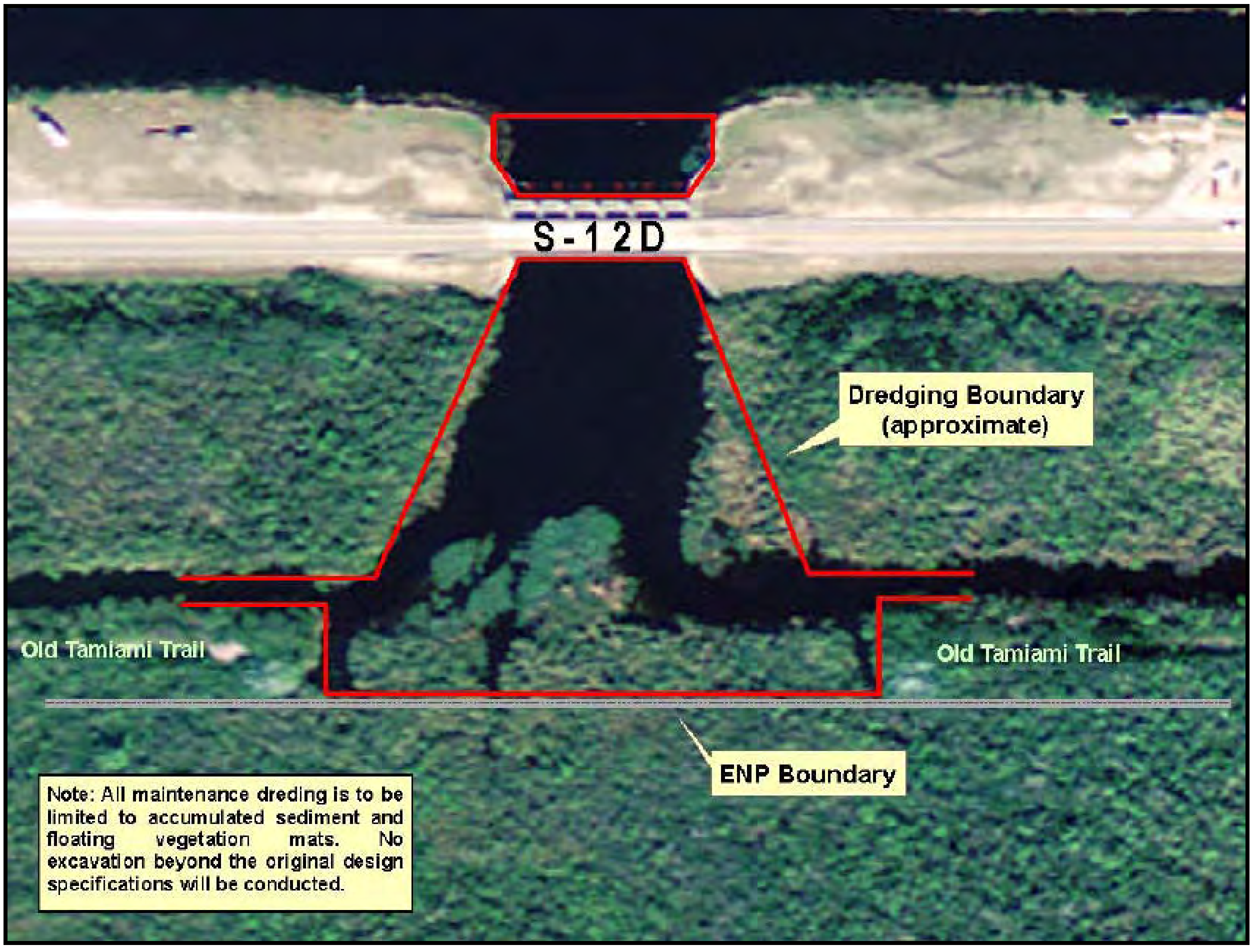


Figure 3-16 – Approximate S-12D Flow Maintenance dredging boundary (SFWMD, 2006)

Dredging involved excavation of accumulated sediment and vegetation within the boundaries of the dredging area (***Figure 3-16***). To address potential downstream water quality impacts, a continuous Aquadam barrier was installed at the downstream limits of the dredging area and extended across the entire getaway channel. Surface water quality monitoring and in situ measurements for baseline conditions were initiated concurrent with maintenance activities. Sampling and in situ measurements continued for approximately one year *(*SFWMD, 2006). Water quality monitoring data (personal communication, Julianne LaRock and Shi Xue, SFWMD, November 19, 2009) collected adjacent to and downstream of the S-12D structure (***Figure 3-17***) from January 2007 to December 2007 were analyzed to examine the effect of S-12D Flow-way Maintenance Project

Figure 3-17 – S-12D Flow Maintenance Project water quality monitoring locations
(SFWMD, 2006)

Surface water TP concentration as high as 19 µg/L was recorded at the S12D0.5 monitoring station six months after the project initiation that lowered to ~7-9 µg/L during later (~December 2007) sampling (***Figure 3-18***). The sampling at one (S12D1.0) and three (S12D3.0) miles downstream done during the later period (~December 2007) showed a maximum TP concentration of 7 and 6 µg/L respectively. Other TP sampling near the project area initially (~January 2007) showed an initial disturbance effect with concentrations as high as ~250-350 µg/L (S12DDE and S12DDW) during January 2007 sampling. These levels dropped in the final sampling (~December 2007) to ~11-15 µg/L (***Figure 3-18***). A similar pattern was exhibited in the concentrations of TSS and turbidity at these monitoring locations with high values of 53 mg/L and 44 NTU, respectively, at site DDE during January 2007 sampling. These values of TSS and turbidity lowered to 1.1 mg/L and 3 NTU, respectively, during December 2007 sampling. Overall, the monitoring data indicate that the surface water TP concentrations were temporarily elevated following the vegetation and soil excavation south of the S-12D structure but the surface water TP concentrations then declined over time and eventually approached background levels after approximately a one year time period. SFWMD (2010) reported based on time series analysis of water quality monitoring parameters and statistical comparison of monitoring data before, during and after dredging the following impacts:

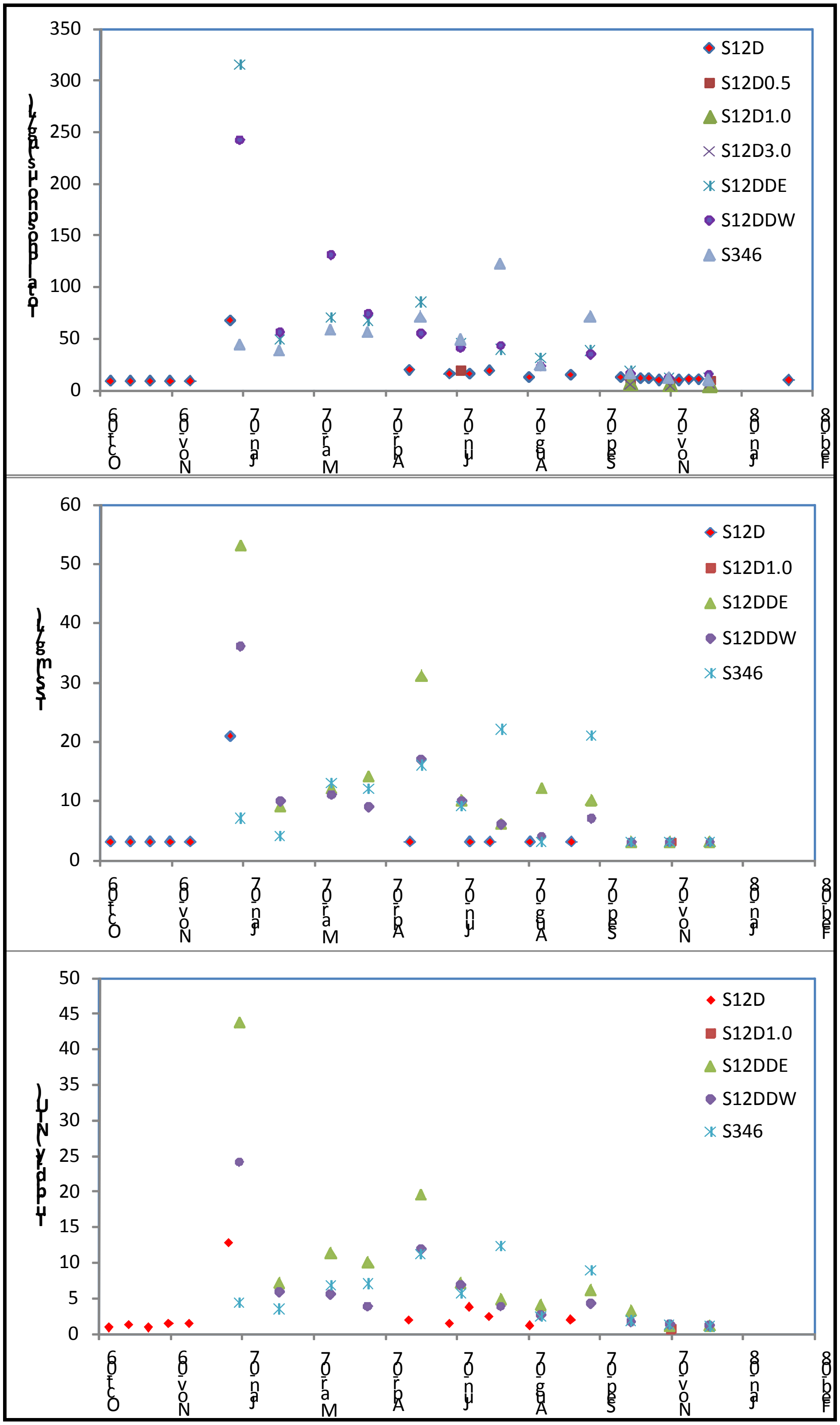


Figure 3-18 – S-12D Flow-way Maintenance Project – TP, TSS, and turbidity monitoring data

- TP concentrations increased temporarily during the dredging project followed by a decreasing trend after the dredging was completed. There was no significant difference in TP before and one year after dredging.
- Ca, hardness, Ortho-P, TSS and turbidity values increased during the first six months of 2007 followed by decreasing values during the second six months. There was no significant difference between the values of Ca, hardness, Ortho-P, and TSS before the dredging and in the second six months after dredging.
- DO concentrations were higher after dredging.
- No impact was observed for Cl, TKN, Mg, NOx, pH, K, Na, specific conductance, sulfate, and temperature.

Northeast Shark River Slough Marsh

Baseline monitoring sites were established (***Figure 3-1***) in the Northeast quadrant of Shark River Slough to characterize the water quality and other ecological indicators prior to implementation of MWD and CERP restoration projects (Gaiser et al., 2009). Thirty census sites (***Figure 3-1***) were sampled during the wet seasons of 2006, 2007, and 2008. A subset of eight of these sites was selected for monitoring three times annually for the latter two years. Census surveys indicated effects from impeded inflow in the northern and eastern boundaries of Northeast Shark River Slough and elevated TP concentrations at sites nearest to the Tamiami Trail. The southeastern boundary region had the shallowest water depths. The water column had TP concentrations averaging 9 µg/L in Northeast Shark River Slough, except for sites in Northeast Shark River Slough along the northern boundary that were enriched (~13 µg/L) above this characteristically low ambient level (Gaiser et al., 2009).

The periphyton cover and biovolume were high, averaging 70% and 3,000 ml/m^2 over the entire study area (***Figure 3-1***), respectively. Periphyton was most abundant in the wet northeastern and western boundary (along the L-67 Extension Levee) of the study area and sparse in the driest sites along the southeastern boundary. The TP concentrations in periphyton averaged 150 µg/g, with higher enriched eutrophic TP levels (>200 µg/g) observed at three sites on the northwestern edge of Northeast Shark River Slough exhibiting strong and consistent relationships to water depth and phosphorus availability (Gaiser et al., 2009).

The plant communities observed were a mix of wet prairie and slough taxa, with the former occurring predominantly along the southeastern boundary and the latter along the deeper western edge of Northeast Shark River Slough. The plant densities averaged 150 stems/m^2 with highest values occurring in sprikerush (*Eleocharis* spp.) that dominated the slough habitat. The TP concentrations in the plant community resembled spatial patterns similar to those of soil, with the highest values occurring along the northern boundary of Northeast Shark River Slough (Gaiser et al., 2009).

A total of 59 species of aquatic consumers were observed, with densities and richness increasing with water depth and periphyton TP and organic content. Exotic fish species were only a small proportion of the total fishes captured (Gaiser et al., 2009). The most sensitive metrics of phosphorous enrichment were periphyton organic content, plant biomass, and consumer biomass and composition (Gaiser et al., 2009).

The TAMB stations are located at the northern border of the Park along the Tamiami Trail, east of the S-333 structure. Water discharged through the TAMB culverts is a mixture of canal water delivered by the S-333 structure (majority) and seepage from WCA-3B. The major findings from this analysis are:

- The mean surface water TP recorded at the S-333 monitoring station was 0.013 µg/L and the lower mean values of TP (~12 mg/L) at other locations in L-29 Canal may reflect contributions from marsh seepage and rainfall.
- The water column had TP averaging 9 µg/L in Northeast Shark River Slough except for sites along the northern boundary that were enriched (~13 µg/L) above this characteristically low ambient level (Gaiser et al., 2009).
- The TP concentrations in periphyton averaged 150 µg/g, with higher enriched eutrophic TP levels (>200 µg/g) observed at three sites on the northwestern edge of Northeast Shark River Slough exhibiting relationships to water depth and phosphorus availability (Gaiser et al., 2009).
- For the six years (2004-2009) of data analyzed, the monitoring locations were in compliance with SSAC except for SAFARI, FROGCITY and TAMBRs-4,3,2,1 that showed atleast one year out of compliance.
- The mean pH varied between 7.3 and 7.5. The lower pHs are observed around stations SAFARI (culvert_45) and FROGCITY (culvert_48).
- The SpC varied from 537 µS/cm at S333 to ~595 µS/cm at the mid to eastern edge of L-29 canal. S-334/356 exhibited lower mean due to some extreme low outlier values.
- The sulfate concentration recorded at the S-333 station had a mean of 12.8 mg/L (January 2004 to September 2009). High concentrations of sulfate cause environmental concern as sulfur is a key water quality issue that affects the rate of methyl mercury production in aquatic ecosystems.
- Several pesticides- ametryn, metribuzin, simazine, atrazine, atrazine-desethyl were detected (***Table 3-4***) during SFWMD quarterly ambient monitoring program. The frequency of detection of atrazine was particularly noticeable.

3.2.3 Wetlands

The historic Everglades were a broad, shallow wetland with water flowing very slowly over 3,900 square miles from Lake Okeechobee to the mangrove zone at the southern tip of Florida. The flow that naturally occurred over this region was influenced by rainfall and a relatively low surface relief and provided the necessary conditions for the development of the Everglades ecosystem (USACE, 2008).

Everglades National Park was authorized by Congress on May 10, 1934, and dedicated by Harry S. Truman on December 6, 1947. The enabling legislation provided the fundamental purpose of the park as being:

> *…permanently reserved as a wilderness, and no development of the project or plan for the entertainment of visitors shall be undertaken which will interfere with the preservation intact of the unique flora and fauna and the essential primitive natural conditions now prevailing in this area.*

The original 460,000 acres in 1947 was expanded to 1.4 million acres by 1958. Recognizing ENP as a nationally and internationally significant resource, Congress passed the “Everglades National Park Protection and Expansion Act” (PL 101-229) in 1989. Section 101(b) states that the purpose of the Act is to:

> *...increase the level of protection of the outstanding natural values of Everglades National Park and to enhance and restore the ecological values, natural hydrologic conditions, and public enjoyment of such area...*

This law authorized the acquisition of additional land, including the portion of the project area just south of Tamiami Trail, to benefit the natural resources of ENP. With this addition, ENP is now approximately 1.5 million acres in size, making it the third largest unit of the National Park System in the lower 48 states (USACE, 2008).

Because ENP possesses "outstanding universal values," it was designated by the United Nations Educational, Scientific, and Cultural Organization as an International Biosphere Reserve in 1976 and subsequently as a World Heritage Site in 1979. The site includes historic Everglades that have been limited in manmade influences. In 1987, the Ramsar Convention designated ENP as a Wetland of International Importance (USACE, 2005).

The majority of the land in Everglades National Park is classified as wetland habitat, an integral component of the ENP landscape. The Everglades ecosystem is thought to have been formed over the last 5,000 years as sea levels rose and precipitation increased, promoting water retention in a shallow inland basin, and the portion of the basin south of Lake Okeechobee accumulated peat (Gleason and Stone, 1984). The result of peat accumulation in this bedrock basin was the formation of a peat surface, level in the east-west direction, and with a slight north-to-south downward slope. The concavity of the bedrock, coupled with the east-west levelness of the peat, resulted in thicker peat deposits in the middle of the basin and thinner deposits along the edges. By the 1880s, peat had accumulated to about 21 feet above sea level along the south shore of Lake Okeechobee (Meigs, 1879), and had formed the northern edge of a north-to-south elevation gradient that is now less than three inches per mile. The southward flow of water down this gradient is thought to have formed to maintain the ridge and slough pattern so characteristic of the Everglades (Kushlan, 1993). Wetlands of the modern Everglades ecosystem include a mosaic of vegetation types, including tree-islands, mangrove forests, cypress swamps, marl prairies, wet prairies, sawgrass marshes, and degraded ridges and sloughs (see ***Figure 3-19***) that extend from the Kissimmee River basin to Florida Bay.

Figure 3-19 – Degraded Everglades Ridge and Slough Habitat

Prior to drainage and development, the ecosystem was characterized by its large spatial extent, a diversity of habitats, and a hydrologic regime featuring dynamic storage of water and unconfined sheet flow over much of the ecosystem south of Lake Okeechobee. A distinctive hydrologic feature of the historical ecosystem was the uninterrupted sheetflow of water from the sawgrass plains south of Lake Okeechobee through a rich mosaic of freshwater wetlands that ultimately discharged to the Gulf of Mexico and the Atlantic Ocean. Drainage and compartmentalization efforts during the 20th century for flood control and water supply purposes interrupted this flow, as well as altering water levels, distribution, and seasonal timing (SCT, 2003). The altered hydrologic system contributed to a decline of the functional value of wetlands in the Everglades ecosystem. Although serving as a critical transportation connection across southern Florida, the Tamiami Trail, which was completed in 1928, is an impediment to flow, slowing and blocking water flow south into Northeast Shark River Slough and the southern Everglades, adversely affecting the Park's natural resources. Additional blockage of direct flows occurred with the 1962 construction of the L-28 and L-29 levees which enclosed WCA-3. The WCA-3 was then separated by the L-67A and L-67C levees into independent units, WCAs 3A and 3B, in an effort to reduce ground water seepage through the porous Biscayne aquifer. Enlargement of the L-29 Canal as part of the central and C&SF project also contributed to flow restriction. The western unit, WCA-3A (approximately 786 square miles), functions as wildlife habitat and a major water supply reservoir. The eastern unit, WCA-3B (approximately 128 square miles), with lower water levels, reduces the head difference to the developed areas to the east. The northern end of the impoundment WCA is shallow and quick to dry, while the southern end may be permanently inundated. This same gradient exists to a lesser extent from the west (where flow of water into the adjoining Big Cypress National Preserve is unimpeded) to the east (Gunderson, 1994).

Compartmentalization, reduced water deliveries, altered distribution, and alterations of the cyclical patterns of water deliveries have reduced downstream sheet flows and suppressed the natural processes and functions within Northeast Shark River Slough. The L-29 Canal and adjacent levee create a damming effect severely restricting water deliveries into ENP. Stage restrictions within the L-29 Canal due to roadbed limitations further contribute to reduced water deliveries, affecting plant communities within the slough (NPS, 2008). Nearly 50 percent of the Everglades wetlands have been lost to draining for agricultural and economical development (SFERTF, 2008). Without benefit of natural surface water flows from the north and largely dependent on the rainfall within this portion of the basin, the area has altered hydrology. Persistent drought and fire beyond natural frequencies have also altered the ecosystem. Thus, the existing condition of the wetlands, and their associated functions, in and near the project area are severely degraded. It is estimated that approximately 250,000 acres of the Park are infested with exotic species (SFERTF, 2008). Exotic plant infestations in ENP may be exacerbated by soil disturbance, increased nutrients, and hydrological modification. Although the ecosystem has been adversely affected by development and long-term water management activities, the remaining portions of the Everglades ecosystem are still defined as wetlands, by both the NPS and by the USACE (NPS, 2008).

The proposed Tamiami Trail project corridor is located at the northeastern extent of ENP stretching from the L-31N Canal (eastern terminus) west to the L-67 Extension Canal (western terminus) for approximately 10.7 miles. The wetland systems in the vicinity of the project corridor include the Northeast Shark River Slough to the south and the L-29 Canal and WCA-3B to the north (see ***Figure 3-20***). These wetland systems are hydrologically connected via a series of 19 culverts beneath the roadway. The culvert capacity, the level of water in the L-29 Canal, and other operational restrictions affect the ability to move water across the Tamiami Trail. The 19 sets of drainage culverts (see ***Figure 3-21***) beneath the Tamiami Trail continue to provide flow to the project area during much of the year (based on the stage of water in the L- 29 Canal). Wetland vegetation is present downstream of all the culvert sets. In addition, some exotic vegetation is present at most of the outlets, with the majority of vegetation cover by native species. Although the flows are altered from the natural pattern, the hydrology, soils, and vegetation of the project area are indicative of a wetland environment (NPS, 2008). Surface waters located within the project corridor includes the L-29 Canal, L-67 Extension Canal, L-31N Canal, L-30 Canal, L-67A Canal, Blue Shanty Canal, and several unnamed narrow canals/linear waterways running south from the roadway corridor into ENP.

Figure 3-20 – View of the Tamiami Trail Project Corridor (Facing West)

Figure 3-21 – One of 19 Sets of Existing Culverts (Facing South from L-29 Levee)

Figure 3-22 shows the approximate limits and wetland/surface water classifications of each distinct wetland/surface water type along the project corridor, based on the available FLUCFCS Geographic Information System (GIS) data layers.

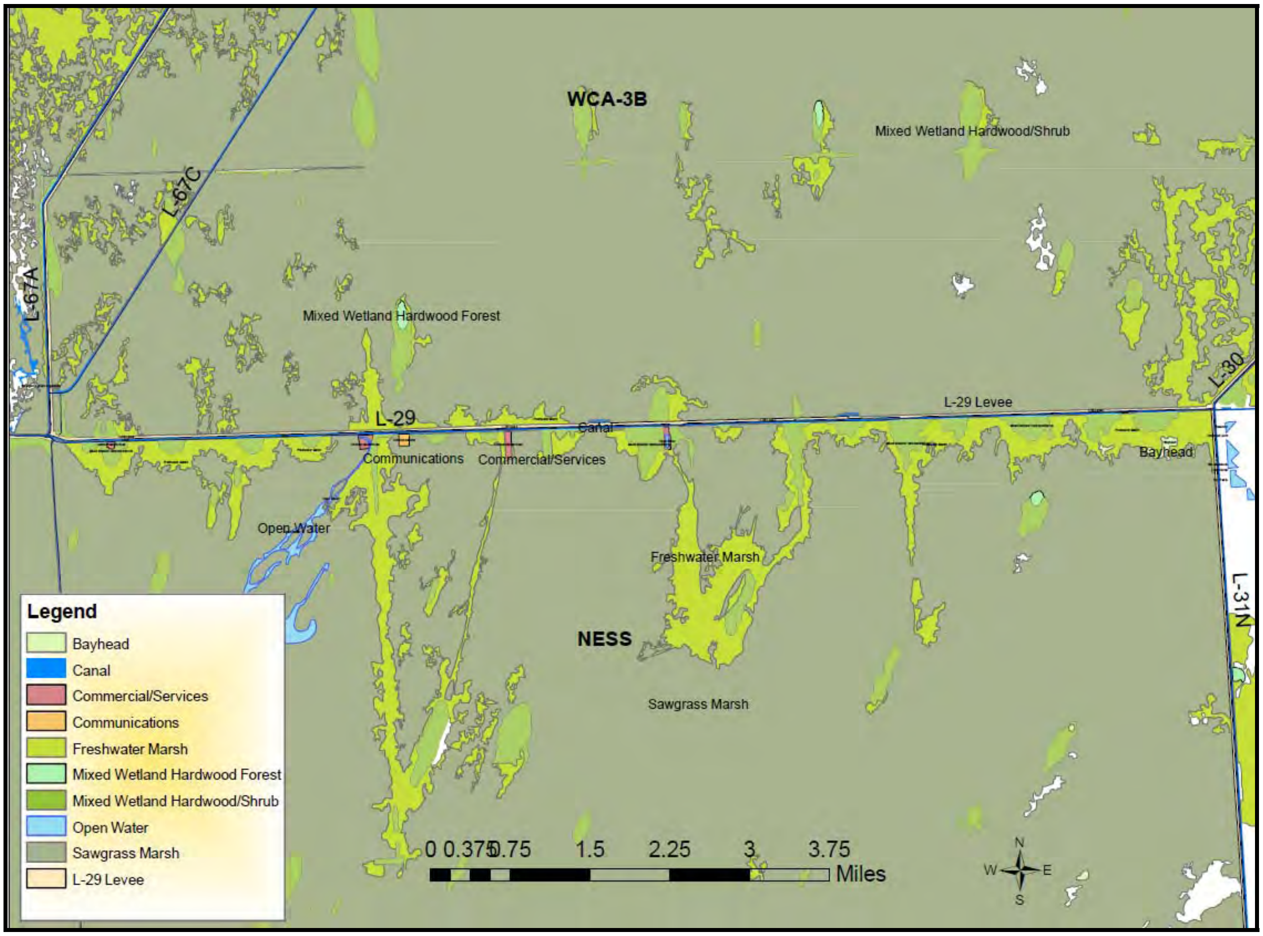


Figure 3-22 – Approximate limits and classifications of wetlands/surface waters along the project corridor

Detailed characterizations of wetland/surface water areas located within and adjacent to the Tamiami Trail project corridor are as follows:

<u>Northeast Shark River Slough – South of Tamiami Trail</u>

Vegetation within the immediate project area has been impacted by human disturbances such as the Tamiami Trail roadbed and culvert construction/maintenance activities, altered hydroperiods and hydropatterns, and nutrient loading from the releases of the S-333 control structure located in the L-29 Canal near the western terminus of the project corridor. Flows into the project area are channelized through the 19 sets of culverts beneath Tamiami Trail forming distinct "vegetation halos" or transitional vegetation progression just downstream of most of the culvert sets (evident upon visual examination of aerial photographs – see ***Figure 3-23***). These vegetation halos appear to have become exacerbated over time (as evidenced through a review of historical aerial photography) by the influx of high levels of sediments and nutrients that are being continuously funneled through the culvert sets.

Figure 3-23 – Vegetation Halo South of Tamiami Trail at a Culvert

Vegetation assemblages within the vegetation halos south of the Tamiami Trail culvert sets vary depending on site conditions. Some of the halos contain a distinct plume of an overgrown woody wetland community dominated by pond apple (*Annona glabra*) and Carolina willow (*Salix caroliniana*) directly south of the culvert sets. Cattail (*Typha* sp.) is also a common component of these areas immediately downstream of the culvert sets and at the downstream edge of the vegetation halos. Lesser components included swamp bay (*Persea palustris*), dahoon holly (*Ilex cassine*), wax myrtle (*Myrica cerifera*), myrsine (*Rapanea punctata*), giant leather fern (*Achrostichum danaeifolium*), strangler fig (*Ficus aurea*), sea-myrtle (*Baccharis halimifolia*), cocoplum (*Chrysobalanus icaco*), and Peruvian primrosewillow (*Ludwigia peruviana*) (***Figure 3-24***). The vegetation eventually transitions into a more uniform sawgrass community downstream within Northeast Shark River Slough. Exotic invasive vegetation species are largely restricted to the open water pools immediately downstream of the culvert sets including hydrilla (*Hydrilla verticillata*), water lettuce (*Pistia stratiotes*), torpedo grass (*Panicum repens*) and Peruvian primrosewillow. In addition, Brazilian-pepper (*Schinus terebinthifolius*) occurs in varying densities in disturbed, drier soils adjacent to the road and in the forested wetland areas where it grows on the bases of native trees. Old World climbing fern (*Lygodium microphyllum*) also occurs in low densities in the forested wetland areas (NPS, 2008).

Figure 3-24 – Typical view of the vegetation assemblage at culvert just south of the Tamiami Trail Roadway Corridor (Facing South)

Along the south side of the Tamiami Trail roadway between the vegetation halos at the culvert sets, the habitat consists of a narrow fringe of woody hardwoods dominated by pond apple and Carolina willow with Brazilian-pepper in the more elevated areas. The narrow woody fringe transitions to freshwater marsh dominated by cattail and sawgrass within approximately 10 to 40 feet from the roadway. Lesser components of the woody fringe include swamp bay, dahoon holly, wax myrtle, myrsine, giant leather fern, and Peruvian primrosewillow (***Figure 3-25***).

Figure 3-25 – View of the narrow fringe of woody hardwoods along the south side of the Tamiami Trail Roadway Corridor (Facing West)

Just south of the narrow woody hardwood fringe along the roadway, the habitat transitions to a sawgrass freshwater marsh community (the northeastern portion of the greater Shark River Slough) (***Figure 3-26***). Historically, Shark River Slough was a 30-mile-wide expanse of water moving downstream through the low-gradient wetland landscape. The pattern of water flow was regionally uniform across a broad expanse and lacked any central drainage channel or dendritic drainage pattern. The slough collected flows from the eastern portion of the Everglades, including the western side of the Atlantic Coastal Ridge and moved that water to the southwest through the mangrove estuaries of the southwestern coast into Florida Bay. Marl prairies, fire-maintained marshes that are intermittently flooded, currently flank both sides of Shark River Slough. A unique feature of the marl prairies is the high species richness of the plant communities. Sawgrass (*Cladium jamaicense)* and muhly grass (*Muhlenbergia capillaris*) are some of most abundant species, although more than 100 species of mostly herbaceous plants have been reported. Higher elevation tropical hammock and pine forests occur as islands within the prairie landscape. These tree islands support plants of West Indian origin that are unique to South Florida and contain the highest number of rare plant species in South Florida (USACE, 2005).

Figure 3-26 – View of the Northeast Shark River Slough just south of the Tamiami Trail Roadway Corridor (Facing South)

The dominant habitats within Northeast Shark River Slough are emergent wetlands [sawgrass marsh, degraded ridge and slough habitat (freshwater marsh), and forested and open water habitats (mixed wetlands – hardwoods and shrubs)]. The primary functions of these wetlands include surface and subsurface water storage, support of the biogeochemical processes (nutrient cycling, peat accretion, etc.), support of characteristic plant community, and providing habitat for native fish and wildlife. These functions appear to be retained, although degraded, following the drainage and compartmentalization efforts. The vegetation in the degraded slough consists of a mosaic of mixed-species patches of several more or less distinct types including sawgrass, muhly grass, spikerush (*Eleocharis* spp.), bayheads, and cattails, interwoven by monotypic stands of sawgrass, which in places exceeds two meters in height. The boundaries between plant communities are thought to be influenced by an interplay of parameters including topography, hydrology, soil depth, water quality, and fire, to name a few (Davis, 1943; Craighead, 1971).

The deep water slough vegetation community is typically dominated by submerged and floating aquatic plants such as bladderworts (*Utricularia* spp.), white waterlily (*Nymphaea odorata)*, big floating heart (*Nymphoides aquatica*), and spatterdock (*Nuphar advena*) (Lodge, 2005). In the USEPA ecosystem assessment of the Everglades (R-EMAP), Stober et al. (2001) noted plant associations across the deep water slough Everglades dominated by white waterlily. However, Stober et al. (2001) only noted one sampling location in ENP sloughs containing white waterlily; the paucity of white waterlily is thought to result from inadequate water depths and hydroperiods caused by artificial draining of the marsh community. This is consistent with vegetation surveys conducted by Davis (1943), Gunderson (1994), and Olmstead and Armentano (1997). White waterlily is more abundant in deeper slough habitats of the Loxahatchee National Wildlife

Refuge and WCA-2 and WCA-3 of the Everglades, less subject to drydown events (Stober et al., 2001). Paleoecological seed data indicates that native ENP slough communities were once dominated by white waterlily and big floating heart prior to the widespread artificial draining of slough communities (Saunders et al., 2007). Thus, white water lily is considered an ecological indicator of restoration progress in the degraded slough habitat within the Everglades. Field studies indicate that white water lily slough vegetation communities are characterized by a near continuous hydroperiod, minimal dry down events, and average annual water depths ranging from approximately 0.8 ft – 3.5 ft (Richards et al, 2009; Givnish et al., 2008; Stober et al, 2001; Powers et al., 2005; Goodrick, 1984; David, 1996; Zaffke, 1983). During experimental mesocosm experiments, white water lily exhibited a negative response to dry down conditions (to ground surface) evidenced by reduced leaf production, cessation of flowering, and miniaturized leaves (Richards et al, 2009). White water lily flower production was highest at the deepest experimental mesocosm depth treatment of 2.5 ft; flower production was 60% higher at this depth as compared to the shallowest treatment of 0.49 ft (Saunders et al, 2007). Mesocosm experiments also showed significantly higher white water lily total leaf biomass in the deeper water treatments of 2.5 ft and 1.48 ft as compared to the shallowest treatment of 0.49 ft (Richards et al, 2009). Comprehensive compilation of historical evidence indicates that pre-drainage water depths in Everglades sloughs had an average annual depth of approximately 2 ft (McVoy et al., in press). Based on compilation of the field, mesocosm, and historical evidence, white water lily slough vegetation communities are characterized by a nearly continuous hydroperiod, few dry down events average annual dry season depths of approximately 1.5 – 2.0 ft and average annual wet season depths of approximately 2.0 – 3.0 ft (RECOVER, 2009). A list of plant species known or anticipated to occur in the project area is provided in ***Table 3-5***.

The predrainage Everglades ridge and slough system was a network of discreet elevated sawgrass strands (ridges) with wide expanses of open water sloughs encompassing WCA-3B and Shark River Slough dominated by white waterlily (RECOVER, 2009) interspersed with tree islands (SCT, 2003; Gunderson, 1994; Gunderson and Loftus, 1993). The ridges and sloughs were organized in a pattern oriented parallel to the direction of flow; thus, the flow volumes in the pre-drainage ridge and slough system likely helped maintain the sharply discreet community and elevation differences between the ridges and sloughs (Sklar et al., 2000). The sloughs, deeper than the ridges, provided critical refuge for wildlife during dry periods. The historic slough vegetation communities were characterized by floating, submerged, and some emergent species found in areas with the longest hydroperiods and deepest water that normally did not dry down.

The reduced water storage capacity of the managed Everglades, and the compartmentalization of the northern and central ridge and slough system, have slowed flow rates, have created areas that are either overdrained or are more deeply flooded than was the case in the pre-drainage system, have substantially altered the affects of fire on the marsh communities, and have altered the rates and magnitude of flooding and drying events suppressing the natural processes and functions within Northeast Shark River Slough. As a result, sawgrass has invaded sloughs and wet prairies, beakrush communities have been lost, woody plants have invaded marsh communities, and the extent and species composition of marsh communities has become extensively altered. The paleoenvironmental seed record has shown that deep water slough plant communities such as those dominated by deep water slough species such as white waterlily within Northeast Shark River Slough have largely been replaced by vast stretches of sawgrass following compartmentalization and other water management practices (Saunders et al., 2007). [While the relevant sampling points for the Saunders et al. (2007) site were located south of the affected environment, it is reasonable to assume this would also apply to the affected environment since the Northeast Shark River Slough was historically a connected expanse of ridge and slough habitat (NPS, 2008).]

Table 3-5 – Representative Plants Found in the Northeast Shark River Slough with the Potential to Occur in the Project Area

Common Name	Scientific Name
Pond apple	*Annona glabra*
Pickerelweed	*Pontederia cordata*
Spatterdock	*Nuphar advena*
American white waterlily	*Nymphaea odorata*
Blue waterhyssop	*Bacopa caroliniana*
Leafy bladderwort	*Utricularia foliosa*
Marsh mermaidweed	*Proserpinaca palustris*
Giant leather fern	*Acrostichum danaeifolium*
Southern shield fern	*Thelypteris kunthii*
Sawgrass	*Cladium jamaicense*
Southern cattail	*Typha domingensis*
Southern beaksedge	*Rhynchospora microcarpa*
Knotted spikerush	*Eleocharis interstincta*
Maidencane	*Panicum hemitomon*
Carolina willow	*Salix caroliniana*
Gulf Coast spikerush	*Eleocharis cellulosa*
Tracy's beakrush	*Rhynchospora tracyi*
Muhly grass	*Muhlenbergia capillaris*
Spreading beaksedge	*Rhynchospora divergens*
Bluejoint panicgrass	*Panicum tenerum*
Alligator lily	*Hymenocallis palmeri*
Florida little bluestem	*Schizachyrium rhizomatum*
Spadeleaf	*Centella asiatica*
Kissimmeegrass	*Paspalidium geminatum*
Bulltongue arrowhead	*Sagittaria lancifolia*
Gulfdune paspalum	*Paspalum monostachyum*
Southern cutgrass	*Leersia hexandra*
Wand goldenrod	*Solidago stricta*
Rosy camphorweed	*Pluchea baccharis*
Arrowfeather threeawn	*Aristida purpurascens*

Common Name	Scientific Name
Meadow jointvetch	*Aeschynomene pratensis*
Water cowbane	*Oxypolis filiformis*
Falsefennel	*Eupatorium leptophyllum*
Green arrow arum	*Peltandra virginica*
Big floatingheart	*Nymphoides aquatica*
Perennial saltmarsh aster	*Symphyotrichum tenuifolium*
Turkey tangle fogfruit	*Phyla nodiflora*
Glade lobelia	*Lobelia glandulosa*
Smallfruit primrosewillow	*Ludwigia microcarpa*

L-29 Canal – North of Tamiami Trail

The L-29 Canal exists along the north side of the entire length of the Tamiami Trail project corridor (***Figure 3-27***). The canal and ROW are maintained by the SFWMD and kept clear of most woody vegetation. Scattered small stands of cattail and common reed occur along the banks along with transgressive individuals of pond apple despite periodic suppression activities by the SFWMD. The canal is predominantly open water with spatterdock often occurring sporadically in an approximate 10 to 15 wide zone along the south bank. Submerged vegetation is dominated by hydrilla, an invasive exotic species. The canal is a conveyor and equalizer for water flows prior to passage into ENP (USACE, 2005). Water deliveries to eastern ENP are controlled by the stage in L-29 Canal, as pressure from the water within the canal (hydraulic head) is required to force water through the culvert sets and into the Park. As canal stage increases, more water is forced beneath the road. However, canal stage is strictly controlled due to potential flooding within residential or agricultural areas of Miami-Dade County or potential damage to Tamiami Trail (USACE, 2005). Stage restrictions within the L- 29 Canal due to roadbed limitations and operational limitations further contribute to reduced water deliveries, affecting plant communities and topographic structure within Northeast Shark River Slough.

Figure 3-27 – L-29 Canal along the Tamiami Trail Project Corridor (Facing West)

Water Conservation Area 3B

WCA-3B, located to the north of the L-29 Levee along the entire length of the project corridor, is managed by FFWCC as the Francis S. Taylor Wildlife Management Area. The area is predominantly a region composed of sawgrass ridges, degraded sloughs, cattail marshes, wet prairies, and scattered tree/shrub islands (***Figure 3-28***). The tree/shrub islands are composed of tropical hardwood species rising above the elevation of the sawgrass ridges. Although seemingly small, the two to three foot difference in elevation between ridge surface and slough bottom was highly significant in the pre-drainage Everglades. During the typical annual rise and fall of wet and dry season water levels, this elevation difference allowed sloughs to remain water-filled throughout the year, while adjacent ridges would be exposed a few months of the year. In the pre-drainage system, native species were adapted to the multiple habitats provided by the tree islands, ridges, and sloughs. Aquatic organisms depended on the sloughs as extensive areas that would remain inundated throughout all but exceptionally dry years (USACE, 2005). The larger tear-drop shaped tree islands were typically developed where there was bedrock near the surface over which peat had accumulated. Common plant species include swamp bay, sweetbay (*Magnolia virginiana*), dahoon holly, wax myrtle, Carolina willow, red maple (*Acer rubrum*), strangler fig, and pond apple. A dense shrub layer is typically found beneath the canopy commonly of cocoplum, but can include other tropical hardwood species.

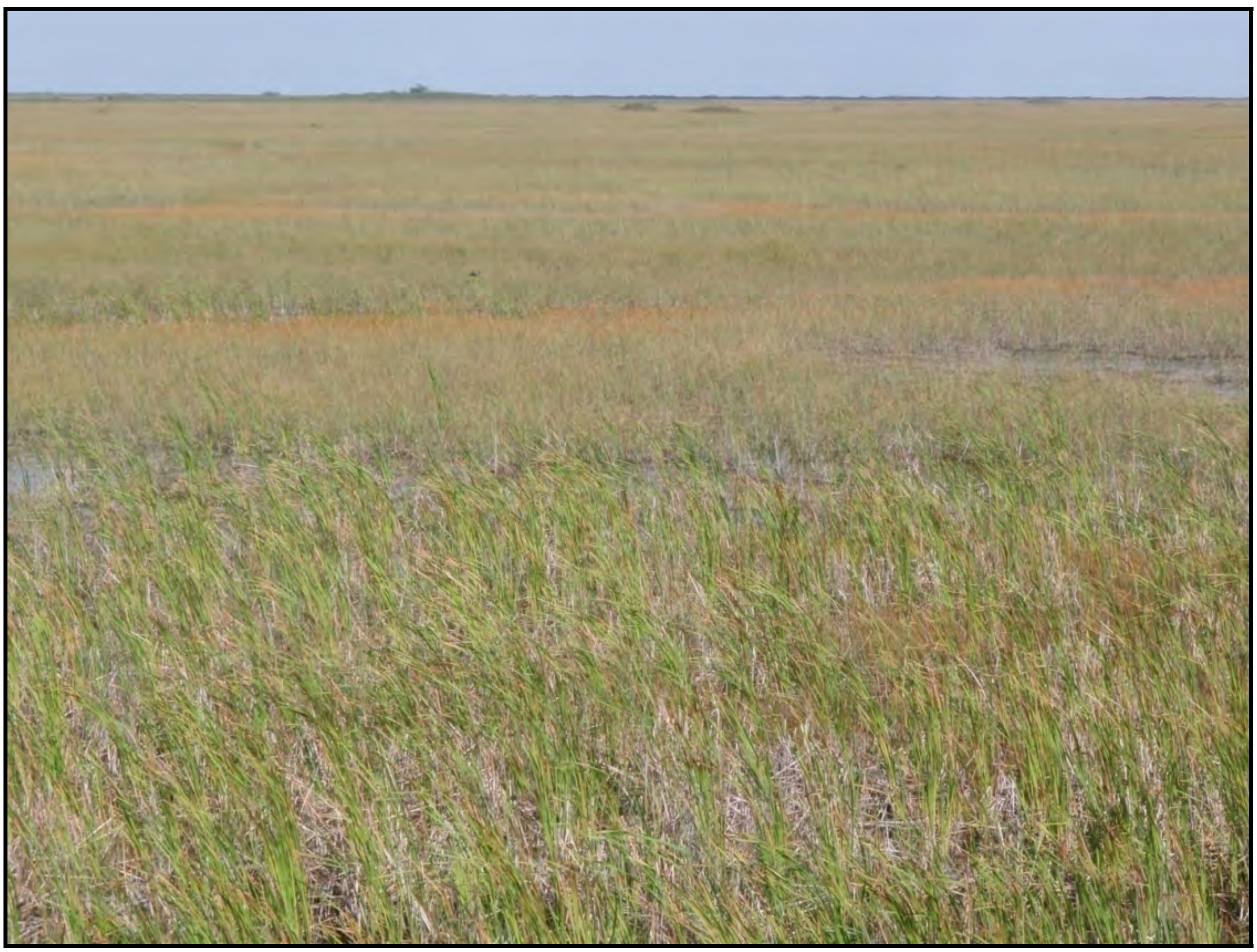


Figure 3-28 – View of WCA-3B from the L-29 Levee (Facing North)

3.3.4 Floodplains

Historically the Everglades have served as a natural flood retention/detention area. With the broad flat topography, the Everglades were able to convey most major storm and high water events away from uplands towards Florida Bay. As development increased in southeastern Florida the drainage of wetlands and conveyance of water away from natural flow ways has altered the Everglades' natural ability to serve flood protection functions.

The Flood Control Act of 1965 authorized a plan to provide seasonal flood protection in Southwest Dade County (now known as Miami-Dade County). The plan consists of levees, canals, water control structures, and pumping stations capable of removing 15 inches of runoff per month in addition to seepage into the area following a 10-year flood. The project was officially de-authorized after Congress expanded ENP to include most of the area that would have been protected.

The WCAs provide a detention reservoir for excess water from the agricultural area and parts of the Lower East Coast region and for flood discharge from Lake Okeechobee. Currently, stages in the L-29 Canal are artificially controlled to provide a target elevation of 7.5 feet or below. The design stage upstream of the L-29 Canal and downstream of Tamiami Trail is nine feet. Prior to the construction of the C&SF project features, flow in the Everglades was uncontrolled, and stages varied greatly and at times overtopped Tamiami Trail. Now that flows are constrained by water control features much of the area south of Tamiami Trail has been impacted by lack of natural flows and the natural character of the ecosystem has experienced drastic changes.

The floodplain within the Tamiami Trail project study area has been altered by the construction of WCA-3B, various canals, and flood control structures, Tamiami Trail, and the filling of the floodplain for use by business and recreational facilities. While this amount of construction within a floodplain would normally raise water levels in the adjacent areas, the management of water resources by the SFWMD keeps water levels in the project area artificially low during much of the year.

Floodplains adjacent to the project area have been mapped as a Flood Hazard Area, Zone A, which are areas where no base flood elevations or flood depths have been set.

3.3 Wildlife and Vegetation / Habitat

The Everglades ecosystem consists of a low, flat plain that supports a variety of distinct and dynamic habitats. These landscapes assemblages each support their own community of plants and wildlife, including approximately 350 birds, more than 40 mammals, over 50 reptiles, and 15 amphibians (NPS, 2010). Not all of these animals or plant communities occur in the project area. Therefore, the following sections focus on the wildlife, including aquatic species, and vegetation that have the potential to occur within the proposed project area.

<u>Wildlife</u>

Man-made impacts including the construction of regional flood control and water management projects and transportation corridors have significantly altered wildlife habitat within the Everglades ecosystem. Within the proposed project area, the construction of Tamiami Trail and the L-29 Canal and Levee has not only altered the natural flow of water but altered the natural movement of wildlife species between habitat components. Additionally, the significant alteration of hydrology in the area has led alteration of historic wildlife habitat in the Northeast Shark River Slough ecosystem. For example, the former ridge and slough habitats have been largely replaced by sawgrass marsh.

More than 10 species of mammals are anticipated to occur in the project area. Everglades' marshes provide habitat to the endangered Florida panther (*Felis concolor coryi*) and the state-listed Everglades mink (*Mustela vison evergladensis*) (both discussed in Section 3.5). The endangered West Indian manatee (*Trichechus manatus*) (discussed in Section 3.5) has a small probability of utilizing the L-29 Canal, with only one manatee reported within the areal-29 Canal in the past 20 years. Other mammals that may occur within the project area include deer, rats, mice, rabbits, and otters.

Northeast Shark River Slough provides foraging, roosting, and breeding habitat to a diverse and abundant assemblage of more than 200 resident and migratory avian species. Migratory birds are protected under the provisions of the Migratory Bird Treaty Act. They are protected species under the jurisdiction of USFWS. ENP is located within the Atlantic Flyway, a major migratory route for birds that breed in temperate North America and winter in the Caribbean and South America (USFWS, 1999). Some of these neotropical migrants are designated as migratory birds of management concern in the south Florida ecosystem by the USFWS (USFWS, 1999) and more than 20 of these are anticipated to occur within Northeast Shark River Slough (NPS, 2006b; Loughlin et al., 1990).

The federally (and state-listed) endangered Everglade snail kite (*Rostrhamus sociabilis plumbeus*) and wood stork (*Mycteria americana*) are known to forage, roost, and breed within Northeast River Slough. Everglade snail kites have previously nested within Northeast Shark River Slough and portions of Shark River Slough are are designated as Everglade snail kite priority management zones. The federally and state-listed threatened Audubon's crested caracara (*Caracara cheriway*) has the potential to occur within the West Preferred Corridor and adjacent areas. The state-listed threatened American kestrel (*Falco sparverius paulus*), white-crowned pigeon (*Patagioenas leucocephala*), and the Florida sandhill crane (*Grus canadensis pratensis*) are known to, or have the potential to, occur in the Northeast Shark River Slough (NPS, 2006b; Loughlin et al., 1990).

Three wading bird colonies, the Tamiami West, Tamiami East 1 and Tamami East 2, are located within the project area and constitute active breeding grounds for the endangered wood stork and the following State-designated Species of Special Concern: snowy egrets (*Egretta thula*), little blue herons (*Egretta caerulea*), tricolored herons (*Egretta tricolor*), and white ibis (*Eudocimus albus*) (Cook and Kobza, 2009; Cook and Kobza, 2008; Cook and Herring, 2007; Cook and Call, 2006; Cook and Call, 2005; Crozier and Cook, 2004; Crozier and Gawlik, 2003; Gawlik, 2002-1997). Other wading bird species that nest within the Tamiami colonies include great egrets (*Ardea alba*), great blue herons (*Ardea herodias*), black-crowned night herons (*Nycticorax nycticorax*), and cattle egrets (*Bubulcus ibis*) (Cook and Kobza, 2009; Cook and Kobza, 2008; Cook and Herring, 2007; Cook and Call, 2006; Cook and Call, 2005; Crozier and Cook, 2004; Crozier and Gawlik, 2003; Gawlik, 2002-1997). ***Figure 3-29*** depicts the estimated locations of the Tamiami colonies based on NPS delineations derived from the 2010 SRF wading bird surveys.

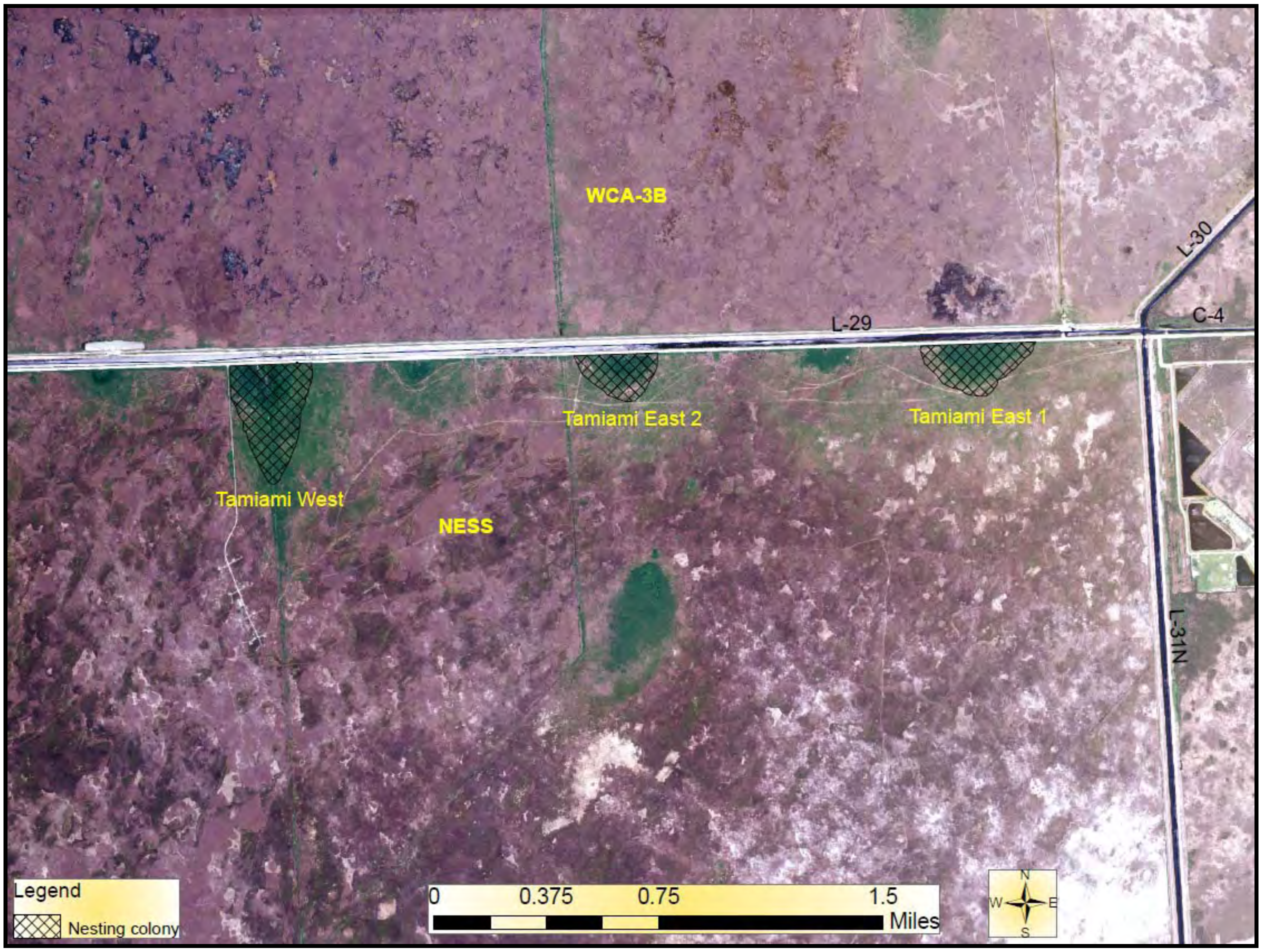


Figure 3-29 – Location of Tamiami Wading Bird Colonies in the Project Area

Table 3-6 summarizes annual SRF wading bird (also includes anhingas) nest survey data collected at the Tamiami colonies during the past thirteen years (Cook and Kobza, 2009; Cook and Kobza, 2008; Cook and Herring, 2007; Cook and Call, 2006; Cook and Call, 2005; Crozier and Cook, 2004; Crozier and Gawlik, 2003; Gawlik, 2002-1997).

Table 3-6 – Numbers of wading bird nests (including anhingas) recorded from SRF surveys conducted at the Tamiami colonies

Species/Bird Group	Survey Year	Tamiami East 1	Tamiami East 2	Tamiami West
Wood storks	1997	0	0	220
Other aquatic nesting birds	1997	70 (GE)	0	150 (GE), 50 (CE)
Wood storks	1998	0	0	0
Other aquatic nesting birds	1998	57 (GE)	0	250 (GE)
Wood storks	1999	0	0	75
Other aquatic nesting birds	1999	41 (GE)	0	400 (GE), 6 (LB), 8 (TH), 10 (BC), 15 (SE), 150 (WI), 35 (CE)

Species/Bird Group	Survey Year	Tamiami East 1	Tamiami East 2	Tamiami West
Wood storks	2000	0	0	1,347
Other aquatic nesting birds	2000	40 (GE)	0	35 (GE), 15 (TH), 2 (BC), 150 (SE), 20 (WI), 30 (CE)
Wood storks	2001	0	0	1,400
Other aquatic nesting birds	2001	0	0	200 (GE), 350 (SE), 100 (WI), 60 (BC)
Wood storks	2002	0	0	450
Other aquatic nesting birds	2002	35 (GE)	0	200 (GE), 400 (WI), SE (+), CE (+), TH (+), LB (+)
Wood storks	2003	0	0	400
Other aquatic nesting birds	2003	20 (GE)	0	200 (GE), 150 (WI), 250 (SE), 400 (CE), 3 (TH), 1 (RS), 4 (BC), 14 (UW)
Wood storks	2004	0	0	50
Other aquatic nesting birds	2004	20 (GE)	15 (GE)	175 (GE), 50 (CE), TH (+), BC (+)
Wood storks	2005	0	0	110
Other aquatic nesting birds	2005	8 (GE)	3 (GE)	75 (GE), 500 (WI), SE (+), TH (+), BC (+)
Wood storks	2006	0	0	400
Other aquatic nesting birds	2006	35 (GE)	15 (GE)	200(GE), 600 (WI), SE (+), TH (+), LB (+), BC (+)
Wood storks	2007	0	0	75
Other aquatic nesting birds	2007	0	8 (GE)	60 (GE), 400 (WI)
Wood storks	2008	0	0	0
Other aquatic nesting birds	2008	0	0	0
Wood storks	2009	10	20	1,300
Other aquatic nesting birds	2009	35 (GE)	15 (GE)	500 (GE), 5,000 (WI), SE (+), 300 (TH), LB (+), GB (+), 800 BC

(Cook and Kobza, 2009; Cook and Kobza, 2008; Cook and Herring, 2007; Cook and Call, 2006; Cook and Call, 2005; Crozier and Cook, 2004; Crozier and Gawlik, 2003; Gawlik, 2002-1997)

Code abbreviations: anhinga (AN), black-crowned night heron (BC), cattle egret (CE), great blue heron (GB), great egret (GE), little blue heron (LB), roseate spoonbill (RS), snowy egret (SE), tricolored heron (TH), unidentified small wading bird (US), unknown small white wader (UW), yellow-crowned night heron (YC), white ibis (WI), + = Species present and nesting but could not determine nest numbers.

The project area provides foraging areas for wading bird species nesting in the Tamiami colonies as well as other state-listed species of special concern including the reddish egret (*Egretta rufescens*) and the limkin (*Aramus guarauna*). Other state-listed species of special concern with the potential to occur and/or forage in Northeast Shark River Slough include the roseate spoonbill (*Platalea ajaja*) and the marsh wren (*Cistothorus palustris*).

More than 40 other bird species that are not threatened, endangered, or special status species are anticipated to nest within Northeast Shark River Slough (NPS, 2006b; Loughlin et al., 1990). ***Table 3-6*** provides a comprehensive list of avian species known or that have the potential to occur in Northeast Shark River Slough.

Northeast Shark River Slough provides habitat to more than an estimated 40 species of reptiles and amphibians. Leopard frogs (*Rana utricularia)* and pig frogs (*Rana grylio*) along with striped mud turtles (*Kinosternon baurii*) and red bellied cooters are found in the deep-water habitats below the Tamiami Trail culvert sets. The American alligator (*Alligator mississippiensis*) (discussed in Section 3.5) utilizes the L-29 Canal as well as deeper waters found south of Tamiami Trail. Its role in forming "gator holes" is important in maintaining ponded areas during the dry season that support a number of other species (Kushlan, 1990). The state and federally-listed threatened eastern indigo snake (*Drymarchon corais*) has the potential to occur in Northeastern Shark River Slough.

There are approximately 28 native fish species that may occur within the project area (Trexler et al., 2000). Most fish species that utilize Everglades marsh systems are minnow-sized, which provides an advantage during dry periods when water availability is low (Kushlan, 1990). Fish species that utilize marsh habitat include mosquitofish (*Gambusia holbrooki*), least killifish (*Heteranda formosa*), and the sailfin molly (*Poecilia latipinna*). Larger sized fish occur in canals and deep-water areas associated with culvert sets. These fish species include bullhead (*Ameiurus* spp.), Florida gar (*Lepisosteus platyrhincus*), bluegill (*Lepomis macrochirus*), and sunfish (*Lepomis* spp.). These large fish support the recreational fishery in the L-29 Canal and culvert pools along Tamiami Trail.

There are also more than 50 exotic fish species found in the Everglades and South Florida (Trexler et al., 2000). Some of the more common exotic fish species include oscars (*Astronotus ocellatus*), Mayan cichlids (*Cichlasoma urophthalmus*), peacock bass (*Cichla ocellaris*) and tilapia (*Tilapia* spp.). Introduced fish species prefer habitats with warmer water temperatures and longer hydroperiods such as canals and culvert holes. Marsh habitats connected to canals tend to have more exotic fish than marshes not connected by canals and culvert holes, and canal fish communities tend to be dominated by non-native fish species (Trexler et al., 2000).

The interaction between native and non-native fish depends on local environmental conditions that can include habitat patches and water temperature. Environmental disturbances such as hurricanes and tropical storms can elevate water levels in the park and increase distribution of non-native fish throughout the park (Trexler et al., 2000). No native fish extinctions resulting from introduction of exotic fish have been noted; however, over time, it is possible that exotic fish species could adversely impact native fish species populations (Trexler et al., 2000).

Wildlife known or anticipated to occur in the project area is listed in ***Table 3-7***.

Table 3-7 – Wildlife Known/With the Potential to Occur Within the Project Area

Scientific Name	Common Name
Mammals	
Blarina brevicauda	short-tailed shrew
Dasypus novemcinctus	nine-banded armadillo
Felis concolor coryi	Florida panther
Lontra canadensis	river otter
Mustela vison evergladensis	Everglades mink

Scientific Name	Common Name
Odocoileus virginianus	white-tailed deer
Oryzomys palustris	marsh rice rat
Peromyscus gossypinus	cotton mouse
Sylvilagus palustris	marsh rabbit
Procyon lotor	raccoon
Sigmodon hispisus	cotton rat
Sus scrofa	domestic pig
Trichechus manatus	West Indian manatee
Birds	
Accipiter cooperii	Cooper's hawk
Accipiter striatus	sharp-shinned hawk
Actitus macularius	spotted sandpiper
Agelaius phoeniceus	red-winged blackbird
Aix sponsa	wood duck
Anas acuta	northern pintail
Anas americana	American wigeon
Anas bahamensis	white-cheeked pintail
Anas clypeata	northern shoveler
Anas crecca	green-winged teal
Anas cyanoptera	cinnamon teal
Anas discors	blue-winged teal
Anas fulvigula	mottled duck
Anas platyrhynchos	mallard
Anas rubripes	American black duck
Anas strepera	gadwall
Anhinga anhinga	anhinga
Aquila chrysaetos	golden eagle
Aramus guarauna	limpkin
Archilochus colubris	ruby-throated hummingbird
Ardea alba	great egret
Ardea herodias	great blue heron
Asio flammeus	short-eared owl
Aythya affinis	lesser scaup

Scientific Name	Common Name
Aythya collaris	ring-necked duck
Aythya marila	greater scaup
Baeolophus bicolor	tufted titmouse
Bartramia longicauda	upland sandpiper
Bombycilla cedrorum	cedar waxwing
Botaurus lentiginosus	American bittern
Branta canadensis	Canada goose
Bubulcus ibis	cattle egret
Bucephala albeola	bufflehead
Buteo brachyurus	short-tailed hawk
Buteo jamaicensis	red-tailed hawk
Buteo lagopus	rough-legged hawk
Buteo lineatus	red-shouldered hawk
Buteo platypterus	broad-winged hawk
Buteo swainsoni	Swainson's hawk
Butorides virescens	green heron
Calidris bairdii	Baird's sandpiper
Calidris himantopus	stilt sandpiper
Calidris melanotos	pectoral sandpiper
Caprimulgus carolinensis	Chuck-will's-widow
Caprimulgus vociferus	whip-poor-will
Caracara cheriway	caracara, Audubon's crested
Cardinalis cardinalis	northern cardinal
Carduelis pinus	pine siskin
Carduelis tristis	American goldfinch
Cathartes aura	turkey vulture
Catharus fuscescens	veery
Catharus guttatus	hermit thrush
Catharus minimus	gray-cheeked thrush
Catharus ustulatus	Swainson's thrush
Chaetura pelagica	chimney swift
Charadrius vociferus	killdeer
Chlidonias niger	black tern

Scientific Name	Common Name
Chordeiles minor	common nighthawk
Circus cyaneus	northern harrier
Cistothorus palustris	marsh wren
Cistothorus platensis	sedge wren
Coccyzus americanus	yellow-billed cuckoo
Coereba flaveola	bananaquit
Colaptes auratus	northern flicker
Columba livia	rock pigeon (dove)
Contopus virens	eastern wood-pewee
Coragyps atratus	black vulture
Corvus brachyrhynchos	American crow
Coturnicops noveboracensis	yellow rail
Crotophaga ani	smooth-billed ani
Crotophaga sulcirostris	grove-billed ani
Cyanocitta cristata	blue jay
Dendrocygna bicolor	Fulvous whistling-duck
Dendroica caerulescens	black-throated blue warbler
Dendroica castanea	bay-breasted warbler
Dendroica cerulea	Cerulean warbler
Dendroica coronata	yellow-rumped warbler
Dendroica discolor	prairie warbler
Dendroica dominica	yellow-throated warbler
Dendroica fusca	blackburnian warbler
Dendroica magnolia	magnolia warbler
Dendroica nigrescens	black-throated gray warbler
Dendroica palmarum	palm warbler
Dendroica pensylvanica	chestnut-sided warbler
Dendroica petechia	yellow warbler
Dendroica striata	blackpoll warbler
Dendroica tigrina	Cape May warbler
Dendroica virens	black-throated green warbler
Dolichonyx oryzivorus	bobolink
Dryocopus pileatus	pileated woodpecker

Scientific Name	Common Name
Dumetella carolinensis	grey catbird
Egretta caerulea	little blue heron
Egretta rufescens	reddish egret
Egretta thula	snowy egret
Egretta tricolor	tricolored heron
Elanoides forficatus	swallow-tailed kite
Elanus leucurus	white-tailed kite
Empidonax minimus	least flycatcher
Empidonax traillii	willow flycatcher
Empidonax virescens	Acadian flycatcher
Eudocimus albus	white ibis
Euphagus cyanocephalus	Brewer's blackbird
Falco columbarius	merlin
Falco peregrinus	peregrine falcon
Falco sparverius paulus	American kestrel
Fulica americana	American coot
Gallinago delicata	Wilson's snipe
Gallinula chloropus	common moorhen
Geothlypis trichas	common yellowthroat
Grus canadensis pratensis	Florida sandhill crane
Haliaeetus leucocephalus	bald eagle
Helmitheros vermivorum	worm-eating warbler
Himantopus mexicanus	black-necked stilt
Hirundo pyrrhonota	cliff swallow
Hirundo rustica	barn swallow
Hylocichla mustelina	wood thrush
Icteria virens	yellow-breasted chat
Icterus bullockii	Bullock's oriole
Icterus galbula	Baltimore oriole
Ictinia mississippiensis	Mississippi kite
Ixobrychus exilis	least bittern
Junco hyemalis	dark-eyed junco
Lanius ludovicianus	loggerhead shrike

Scientific Name	Common Name
Larus argentatus	herring gull
Larus atricilla	laughing gull
Larus delawarensis	ring-billed gull
Larus philadelphia	Bonaparte's gull
Laterallus jamaicensis	black rail
Limnodromus scolopaceus	long-billed dowitcher
Limnothlypis swainsonii	Swainson's warbler
Lophodytes cucullatus	hooded merganser
Megaceryle alcyon	belted kingfisher
Megascops asio	eastern screech-owl
Melanerpes carolinus	red-bellied woodpecker
Melospiza georgiana	swamp sparrow
Melospiza melodia	song sparrow
Mimus polyglottos	northern mockingbird
Mniotilta varia	black-and-white warbler
Mycteria americana	wood stork
Myiarchus crinitus	great crested flycatcher
Myiarchus tyrannulus	brown-crested flycatcher
Nomonyx dominicus	masked duck
Nyctanassa violacea	yellow-crowned night heron
Nycticorax nycticorax	black-crowned night heron
Oporornis agilis	Connecticut warbler
Oporornis formosus	Kentucky warbler
Oporornis philadelphia	mourning warbler
Pandion haliaetus	osprey
Parula americana	northern parula
Passerculus sandwichensis	savannah sparrow
Passerina caerulea	blue grosbeak
Passerina ciris	painted bunting
Passerina cyanea	indigo bunting
Patagioenas leucocephala	white-crowned pigeon
Pelecanus erythrorhynchos	American white pelican
Petrochelidon fulva	cave swallow

Scientific Name	Common Name
Phalacrocorax auritus	double-crested cormorant
Phalaropus tricolor	Wilson's phalarope
Pheucticus ludovicianus	rose-breasted grosbeak
Picoides pubescens	downy woodpecker
Pipilo erythrophthalmus	eastern towhee
Piranga ludoviciana	western tanager
Piranga olivacea	scarlet tanager
Piranga rubra	summer tanager
Platalea ajaja	roseate spoonbill
Plegadis chihi	white-faced ibis
Plegadis falcinellus	glossy ibis
Podilymbus podiceps	pied-billed grebe
Polioptila caerulea	blue-grey gnatcatcher
Porphyrio martinica	purple gallinule
Porzana carolina	sora
Protonotaria citrea	prothonotary warbler
Quiscalus major	boat-tailed grackle
Quiscalus quiscula	common grackle
Rallus elegans	king rail
Rallus limicola	Virginia rail
Regulus calendula	ruby-crowned kinglet
Riparia riparia	bank swallow
Rostrhamus sociabilis plumbeus	Everglade snail kite
Sayornis phoebe	eastern phoebe
Sayornis saya	Sah's phoebe
Scolopax minor	American woodcock
Seiurus aurocapilla	ovenbird
Seiurus motacilla	Louisiana waterthrush
Seiurus noveboracensis	northern waterthrush
Selasphorus rufus	rufous hummingbird
Setophaga ruticilla	American redstart
Sphyrapicus varius	yellow-bellied sapsucker
Spindalis zena	western spindalis

Scientific Name	Common Name
Spiza americana	dickcissel
Spizella pallida	clay-colored sparrow
Spizella passerina	chipping sparrow
Spizella pusilla	field sparrow
Stelgidopteryx serripennis	northern rough-winged swallow
Sterna caspia	Caspian tern
Sterna forsteri	Forster's tern
Strix varia	barred owl
Sturnella magna	eastern meadowlark
Tachycineta bicolor	tree swallow
Thryothorus ludovicianus	Carolina wren
Tiaris bicolor	black-faced grassquit
Toxostoma rufum	brown thrasher
Tringa flavipes	lesser yellowlegs
Tringa melanoleuca	greater yellowlegs
Tringa solitaria	solitary sandpiper
Troglodytes aedon	house wren
Turdus migratorius	American robin
Tyrannus melancholicus	tropical kingbird
Tyrannus tyrannus	eastern kingbird
Tyrannus verticalis	western kingbird
Tyto alba	barn owl
Vermivora celata	orange-crowned warbler
Vermivora chrysoptera	golden-winged warbler
Vermivora peregrina	Tennessee warbler
Vermivora pinus	blue-winged warbler
Vermivora ruficapilla	Nashville warbler
Vireo altiloquus	black-whiskered vireo
Vireo bellii	Bell's vireo
Vireo crassirostris	thick-billed vireo
Vireo flavifrons	yellow-throated vireo
Vireo griseus	white-eyed vireo
Vireo olivaceus	red-eyed vireo

Scientific Name	Common Name
Vireo philadelphicus	Philadelphia vireo
Vireo solitarius	blue-headed vireo
Wilsonia citrina	hooded warbler
Wilsonia pusilla	Wilson's warbler
Zenaida asiatica	white-winged dove
Zenaida macroura	mourning dove
Zonotrichia albicollis	white-throated sparrow
Zonotrichia leucophrys	white-crowned sparrow
Vireo altiloquus	black-whiskered vireo
Vireo bellii	Bell's vireo
Vireo crassirostris	thick-billed vireo
Vireo flavifrons	yellow-throated vireo
Vireo griseus	white-eyed vireo
Vireo olivaceus	red-eyed vireo
Vireo philadelphicus	Philadelphia vireo
Vireo solitarius	blue-headed vireo
Wilsonia citrina	hooded warbler
Wilsonia pusilla	Wilson's warbler
Zenaida asiatica	white-winged dove
Zenaida macroura	mourning dove
Zonotrichia albicollis	white-throated sparrow
Zonotrichia leucophrys	white-crowned sparrow
Reptiles and Amphibians	
Acris gryllus	southern cricket frog
Agkistrodon pisicivorus conanti	Florida cottonmouth
Alligator mississippiensis	American alligator
Amphiuma means	two-toed amphiuma
Anolis carolinensis	green anole
Anolis sagrei	brown anole
Apalone ferox	Florida softshell turtle
Bufo quercicus	oak toad
Bufo terrestris	southern toad
Chelydra serpentina	snapping turtle

Scientific Name	Common Name
Coluber constrictor	black racer
Crotalus adamanteus	eastern diamondback
Deirochelys reticularia	chicken turtle
Drymarchon corais	eastern indigo snake
Elaphe obsoleta rossalleni	Everglades rat snake
Eumeces inexpectatus	southeastern five-lined skink
Farancia abacura	eastern mud snake
Gastrophryne carolinensis	eastern narrow-mouthed toad
Hyla cinerea	green treefrog
Hyla squirella	squirrel treefrog
Kinosternon baurii	striped mud turtle
Kinosternon subrubrum	Florida mud turtle
Lampropeltis getulus	Florida kingsnake
Nerodia fasciata	southern water snake
Nerodia floridana	Florida green water snake
Nerodia taxispilota	brown water snake
Notophthalmus viridescens	peninsula newt
Opheodrys aestivus	rough green snake
Ophisaurus compressus	island glass lizard
Ophisaurus ventralis	eastern glass lizard
Osteopilus septentrionalis	Cuban treefrog
Pseudobranchus axanthusbelli	Everglades dwarf siren
Pseudacris nigrita	southern chorus frog
Pseudacris ocularis	little grass frog
Pseudemys floridana	peninsula cooter
Pseudemys nelsoni	Florida red-bellied cooter
Rana grylio	pig frog
Lithobates sphenocephalus	southern leopard frog
Regina alleni	striped crayfish snake
Seminatrix pygaea	south Florida swamp snake
Siren lacertina	greater siren
Sistrurus miliarius	dusky pigmy rattlesnake
Sternotherus odoratus	stinkpot

Scientific Name	Common Name
Storeria dekayi	Florida brown snake
Thamnophis sauritus	peninsula ribbon snake
Fish	
Ameiurus spp.	bullhead
Amia calva	bowfin
Astronotus ocellatus	oscar
Belonesox belizanus	pike killfish
Cichla ocellaris	peacock bass
Cichlasoma urophthalmus	Mayan cichlid
Cyprinodon variegatus	sheepshead minnow
Elassoma evergladei	Everglades pygmy sunfish
Erimyzon sucetta	lake chubsucker
Fundulus confluentus	marsh killifish
Gambusia affinis	mosquitofish
Heterandria formosa	least killifish
Ictalurus spp.	channel catfishes
Jordanella floridae	flagfish
Labidesthes sicculus	brook silverside
Lepisosteus platyrhincus	Florida gar
Lepomis macrochirus	bluegill
Lepomis microlophus	redear sunfish
Lepomis spp.	sunfishes
Lucania goodei	bluefin killifish
Lucania parva	rainwater killifish
Micropterus salmoides	largemouth bass
Notropis petersoni	coastal shiner
Poecilia latipinna	sailfin molly
Tilapia spp.	tilapia

(Steiner and Loftis, 1991; NPS, 2006b; Robertson and Kushlan, 2006; Loughlin et al., 1990; NPS, 2010; Florida Museum of Natural History, 2010)

Vegetation

Prior to flood control and drainage activities, Northeast Shark River Slough was dominated by large expanses of open water slough and elevated sawgrass “ridges” that were interspersed with tree islands (SCT, 2003). This unique ridge and slough system was organized in a pattern oriented parallel to the direction of flow. In the past, the slough habitats were dominated by floating submerged species, and emergent species that proliferated under continuous hydroperiods and relatively deep waters, while the ridges were drier habitats dominated by sawgrass.

Because of the altered hydroperiods and hydropatters within Northeast Shark River Slough and elsewhere throughout ENP, historic vegetation assemblages have been significantly altered. The deepwater slough systems of Shark River Slough that once were dominated by floating aquatics such as white water lily have been replaced by vast stretches of sawgrass.

Vegetation along the project corridor contains a mixture of native and exotic species in a variety of plant assemblages. Vegetation type and composition within the project study area has been heavily influenced by past anthropogenic disturbances, including the construction of Tamiami Trail and the construction of upstream water control structures. “Vegetation halos” are located downstream of culvert locations along Tamiami Trail and have been influenced by directed water flows through the culvert sets.

Cattail is often found in deep water pools directly downstream of the culvert sets along with invasive aquatic species such as torpedo grass (*Panicum repens*), water lettuce (*Pistia stratitotes*), hydrilla (*Hydrilla verticillata*), and Peruvian primrosewillow (*Ludwigia peruviana*).

Depending on specific site conditions, some vegetation halos contain forested wetland components comprised of pond apple, swamp bay, coco plum (*Chrysobaianus icaco*) and Carolina willow. Exotic vegetation components of these forested areas include Brazilian-pepper that grows along the roadside and at the bases of native trees and Old World climbing fern, which is found in these forested areas at low densities.

A more detailed description of wetland habitats and vegetation is found in Section 3.2.3.

3.4 Land Use

The existing land use within the study boundaries varies from preserve lands to commercial uses. Vast portions of South Florida remain natural, although much of it is disturbed land. The dominant natural features are the ENP and Biscayne National Park, along with Biscayne and Florida Bay and remnant freshwater and coastal wetland and upland systems within and adjacent to the developed areas along the coast. For the most part, urban development is concentrated along the lower east coast of Miami-Dade County.

Land use in Miami-Dade was compiled based on 2004 to 2005 GIS data attributed according to the FLUCFCS. The most significant land use and cover categories in Miami-Dade County are wetlands, urbanized development, water resources, and agriculture. Almost 60 percent of the land cover in Miami-Dade County is classified as wetland. These areas make up the ENP and WCAs in the western part of the county. Urban development constitutes 16 percent of Miami-Dade’s land use, and while starting to move westward, is still concentrated on the coast.

For analysis purposes, land use in the project area was compiled for zones that extends for three to seven miles from the project area and was based on 2004/2005 GIS data according to the FLUCFCS (***Table 3-8***).

Table 3-8 – Land Use in Miami-Dade County and the Project Area

Land Use	Miami-Dade		ZONE-1		ZONE-2		ZONE-3	
	Total Acres	1,461,378	Total Acres	60,106	Total Acres	120,266	Total Acres	196,499
	Acres	%	Acres	%	Acres	%	Acres	%
Urban Development	238,047	16.3%	731	1.2%	5,862	4.9%	18,072	9.2%
Agriculture	77,349	5.3%	-	0.0%	1,035	0.9%	3,766	1.9%
Rangeland, Shrub and Brushland, Abandoned Groves	19,268	1.3%	102	0.2%	168	0.1%	240	0.1%
Upland Hardwood Forests, Melaleuca, Australian Pine, etc.	15,640	1.1%	-	0.0%	154	0.1%	264	0.1%
Reservoirs, Lakes, Canals	221,789	15.2%	662	1.1%	1,616	1.3%	2,352	1.2%
Wetlands, Wetland Hardwood Forest, Marshes, etc.	856,904	58.6%	58,216	96.9%	110,995	92.3%	170,475	86.8%
Barren Land, Levees	2,582	0.2%	350	0.6%	479	0.4%	661	0.3%
Roads,Communications,Power Lines	29,799	2.0%	45	0.1%	111	0.1%	933	0.5%

* Zone 1 = 3 miles from Project Area, Zone 2 = 5 miles from Project Area, Zone 3 = 7 miles from Project Area

Approximately 98% of the land area within 3 miles of the project area is wetlands that are within the boundaries of the ENP or WCAs. These wetlands are an important part of the Everglades ecosystem and are comprised of a variety of wetland habitat types (see Section 3.2.3) Within some of these wetlands are a complex network of canals, levees and control structures that serve to control water levels in the WCA system that is located north of Tamiami Trail.

Urban development is the next most common land use in all zones and within the project corridor. Within the project corridor this land use is primarily represented by commercial and recreational facilities. Four commercial airboat operators currently operate along the Tamiami Trail. Three operators, Coopertown Airboat Rides and Restaurant, Everglades Safari Park and Gator Park operate from facilities located on the south side of Tamiami Trail. The other operator, Airboat USA launches from a public airboat ramp immediately east of Coopertown Airboat Rides. The Airboat Association of Florida (AAoF) is a recreational association with facilities on the south side of the Tamiami Trail about three miles east of the western end of the project area. The Miccosukee Tribe has two residential properties within the project area, Osceola Camp, located on the south side of the Tamiami Trail, west of the Airboat Association of Florida and Tiger Tail Camp, located on the north side of the Tamiami Trail just east of Gator Park and west of Coopertown.

Road and communication use are another important feature within the general project area. Beside wetlands, Tamiami Trail itself is the next most prevalent land use along the project corridor. Of all upland land uses along the project corridor Tamiami Trail accounts for more than 95% of all uplands within the project area. Additionally, there are two active radio tower sites located within the project area, one operated by the SFWMD, and one owned by Salem Communications.

3.5 Special Status Species

This section provides a summary of the state and federally listed species that are anticipated or have the potential to occur in the Tamiami Trail study area within Northeast Shark River Slough. The following references were consulted for inclusion of applicable information into this section: ENP; the Draft South Florida and Caribbean Parks Exotic Plant Management Plan and Preliminary Draft EIS; Section 7, ESA consultation with the USFWS and NOAA's NMFS; USFWS Endangered Species website; USFWS Critical Habitat Portal; NOAA-NMFS, Office of Protected Resources Web site; the FFWCC web site; and the Florida Department of Agriculture and Consumer Services (FDACS) Web site.

Animals and plants federally classified as endangered or threatened are protected under the ESA of 1973, as amended. According to the ESA of 1973, "endangered species" means any plant or animal species in danger of extinction throughout all or a substantial part of its range. A "threatened species" is any species likely to become an endangered species in the foreseeable future throughout all or a substantial part of its range. "Proposed Species" are animal or plant species proposed in the Federal Register to be listed under Section 4 of the ESA. "Candidate Species" are species for which the USFWS and NOAA-NMFS has sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA. Everglades National Park provides habitat for a number of Federally-listed threatened and endangered animal species, including candidate species.

State and federally-listed species having the potential to occur in and around the project study area are described in ***Table 3-9***. [Note: The bald eagle (*Haliaetus leucocephalus*) was delisted in 2007; The American alligator (*Alligator mississippiensis*) is Federally-listed due to its similarity of appearance with the federally listed crocodile (*Crocodylus acutus*), and is discussed in the section below].

Table 3-9 – State and Federally Listed Species with the Potential to Occur in the Tamiami Trail Project Area

Taxonomic Group/Species	Common Name	Federal Status	State of FL Status	Breeding in West Northeast Shark River Slough, ENP
Mammals				
Mustela vison evergladensis	Everglades mink		T	u
Trichechus manatus	West Indian manatee	E	E	
Felis concolor coryi	Florida panther	E	E	
Birds				
Ammodramus maritimus mirabilis	Cape Sable seaside sparrow	E	E	
Aramus guarauna	limpkin		SSC	X
Caracara cheriway	caracara, Audubon's crested	T	T	
Cistothorus palustris	marsh wren		SSC	
Egretta caerulea	little blue heron		SSC	X

Taxonomic Group/Species	Common Name	Federal Status	State of FL Status	Breeding in West Northeast Shark River Slough, ENP
Egretta rufescens	reddish egret		SSC	
Egretta thula	snowy egret		SSC	X
Egretta tricolor	tricolored heron		SSC	X
Eudocimus albus	white ibis		SSC	X
Falco sparverius paulus	American kestrel		T	
Grus canadensis pratensis	Florida sandhill crane		T	X
Mycteria americana	wood stork	E	E	X
Patagioenas leucocephala	white-crowned pigeon		T	
Platalea ajaja	roseate spoonbill		SSC	
Rostrhamus sociabilis plumbeus	Everglade snail kite	E	E	X
Reptiles				
Alligator mississippiensis	American alligator	T	SSC	X
Drymarchon corais	eastern indigo snake	T	T	u

E = endangered

T = threatened

SSC = state of Florida listed species of special concern

u = unknown

West Indian Manatee

The West Indian manatee, listed as endangered under the ESA, is a fully aquatic herbivorous mammal. Manatees have large, seal-shaped bodies with paired flippers and a round, paddle-shaped tail. They are typically grey in color (color can range from black to light brown) and occasionally spotted with barnacles or colored by patches of green or red algae. The muzzle is heavily whiskered and coarse, single hairs are sparsely distributed throughout the body. Adult manatees, on average, are about nine feet long (3 meters) and weigh about 1,000 pounds (200 kilograms). At birth, calves are between three and four feet long (1 meter) and weigh between 40 and 60 pounds (30 kilograms). The West Indian manatee is typically found in coastal or estuarine waters, bays, rivers, and lakes, but may be found in inland canals during winter months. Manatees are grazers and require sheltered coves for feeding, resting, and calving. The manatee occurs in ENP's marine and estuarine systems and spends approximately five hours a day feeding. Submerged aquatic vegetation, such as seagrasses, is a major component of the manatee's diet, and although manatees appear to tolerate marine and hypersaline conditions, they are most frequently found in fresh or brackish waters. Changes in freshwater flow on salinity patterns, submerged vegetation, and the overall quality of the foraging habitat in Florida Bay and elsewhere in the Park, are, along with water temperature, important influences on the distribution and abundance of manatees in the area. Increases in salinity are generally considered to result in less favorable conditions for manatees, although manatees move freely through a wide range of salinities. Manatees may or may not need freshwater to survive, but are frequently reported drinking freshwater from natural sources as well as hoses, sewage outfalls, and culverts in marine and estuarine areas. For the POR of over 20 years, there has been only one record of a manatee utilizing the L-29 Canal adjacent to Tamiami Trail.

<u>Florida Panther</u>

The Florida panther was listed as endangered under the ESA in 1967. The Florida panther is a large, pale brown or buff cat with white underparts and tail tip. Mature males weigh between 100 to 150 pounds and would reach 7 feet from nose to tip of tail. Females are smaller – from 50 to 100 pounds and up to 6 feet in length. They subsist on mammalian prey consisting of white-tailed deer, wild hogs, and raccoon and, in some areas, small game. The Florida panther primarily utilizes upper dry land habitats such as hardwood hammocks, pine flatwoods, and thicket swamps near wetlands. Although it does not like extremely wet places, it would wade across waterways if necessary to find food and drier land. A panther's home range covers 20 to over 450 square miles, with a historic range from eastern Texas through the southeastern states. The only known self-sustaining population occurs in South Florida, generally within the Big Cypress Swamp region. It is estimated that approximately 100 individuals of this subspecies remain in the wild population in South Florida (USFWS, 2008).

Per the USFWS *Florida Panther Recovery Plan, Third Revision* (2008):

> *Three priority zones were identified as important for panther habitat conservation: (1) Primary Zone – lands essential to the long-term viability and persistence of the panther in the wild; (2) Secondary Zone - lands contiguous with the Primary Zone, currently used by few panthers, but which could accommodate expansion of the panther population south of the Caloosahatchee River; and (3) Dispersal Zone - the area which may facilitate future panther expansion north of the Caloosahatchee River (Kautz et al., 2006). The Primary Zone is currently occupied and supports the breeding population of panthers. Although panthers move through the Secondary and Dispersal Zones, they are not currently occupied by resident panthers. Some areas of the Secondary Zone would require restoration to support panthers. These zones vary in size, ownership, and land cover composition.*
>
> *The Primary Zone is 3,548 mi^2 (9,189 km^2) in size, 73% of which is publicly owned, and includes portions of the [Big Cypress National Preserve], ENP, Fakahatchee Strand Preserve State Park, [Florida Panther National Wildlife Refuge], Okaloacoochee Slough State Forest, and Picayune Strand State Forest. This zone's composition is 45% forest, 41% freshwater marsh, 7.6% agriculture lands, 2.6% prairie and shrub lands, and 0.52% urban lands. The Secondary Zone is 1,269 mi^2 (3,287 km^2) in size, 38% of which is public land. This zone's composition is 43% freshwater marsh, 36% agriculture, 11% forest, 6.1% prairie and shrub lands, and 2.3% low-density residential areas and open urban lands. The Dispersal Zone is 44 mi^2 (113 km^2) in size, all of which is privately owned. This zone's composition is 49% agriculture (primarily improved pasture and citrus groves), 29% forest (wetland and upland), 8.8% prairie and shrub land, 7.5% freshwater marsh, and 5.1% barren and urban lands (Kautz et al., 2006).*

Refer to ***Figure 3-30*** for a map depicting the Primary, Secondary, and Dispersal zones for the Florida Panther, as designated by the USFWS.

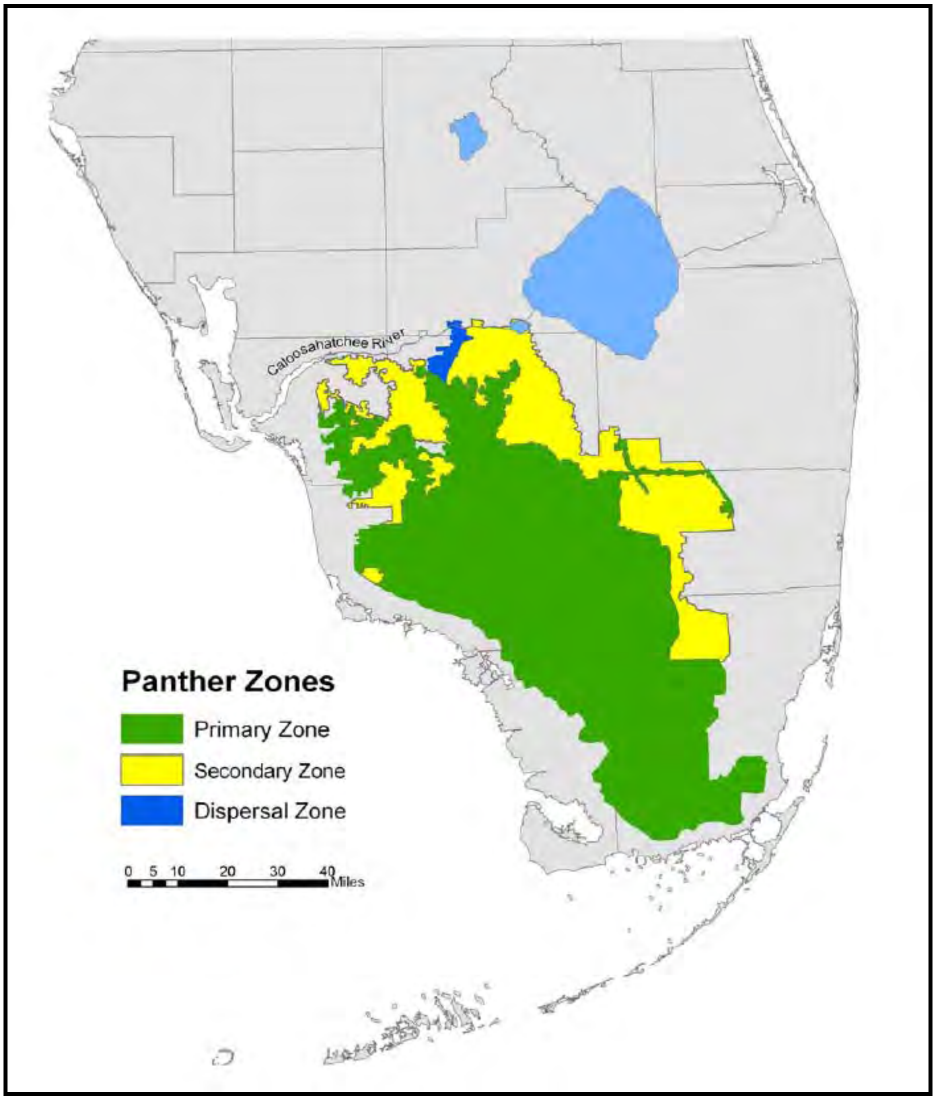


Figure 3-30 – USFWS Designated Florida Panther Priority Habitat Zones (Kautz et al., 2006)

The USFWS also developed SLOPES for the Florida panther (April 18, 2000). According to the SLOPES, the USFWS designated a Panther Consultation Area (PCA) in South Florida that extends from Monroe and Miami-Dade Counties north to Charlotte and Glades Counties, including portions of Collier, Broward, Palm Beach, Lee, and Hendry Counties. Within the designated PCA are Panther Preservation Areas (PPA) ranked as Priority 1 and 2. Also included are areas otherwise designated as Conservation Lands, such as national preserves (Big Cypress), national parks (ENP), state parks (Collier-Seminole), SFWMD Water Conservations Areas (WCA-1, -2, -3), etc.

Throughout the occupied range of the panther, the ENP population represents at least 11 percent of the panther population known to the USFWS. According to radio collar telemetry data, two panthers in ENP have been documented crossing the Shark River Slough into Big Cypress National Preserve; however, no Florida panther activity has been recorded in the project area in the past six years.

Radio telemetry data collected within the Florida Everglades from 1981 to 2003 from over 57,000 radiolocations of 100 Florida panthers and eight introduced Texas cougars (*Puma concolor stanlyana*) provides evidence that panthers actively selected forested habitats and avoided open water wetlands within their home range (Cox et al., 2006). The habitat within Northeast Shark River Slough, ENP was included in the radio telemetry studies and was classified as the open water wetland habitat that panthers actively avoid (Cox et al., 2006). However, panthers have been recorded in Northeast Shark River Slough, ENP and are known to use a mosaic of habitats while they select their home range and traverse through less preferred habitats to reach more preferred forested habitats (Cox et al., 2006). The radio telemetry studies provide evidence that panthers are avoiding crossing the Tamiami Trail from ENP to WCA-3B in the location of the Tamiami Trail Modifications: Next Steps project (***Figure 3-31***) (Cox et al., 2006). It is possible that the Tamiami Trail is acting as a barrier to Florida panther movements.

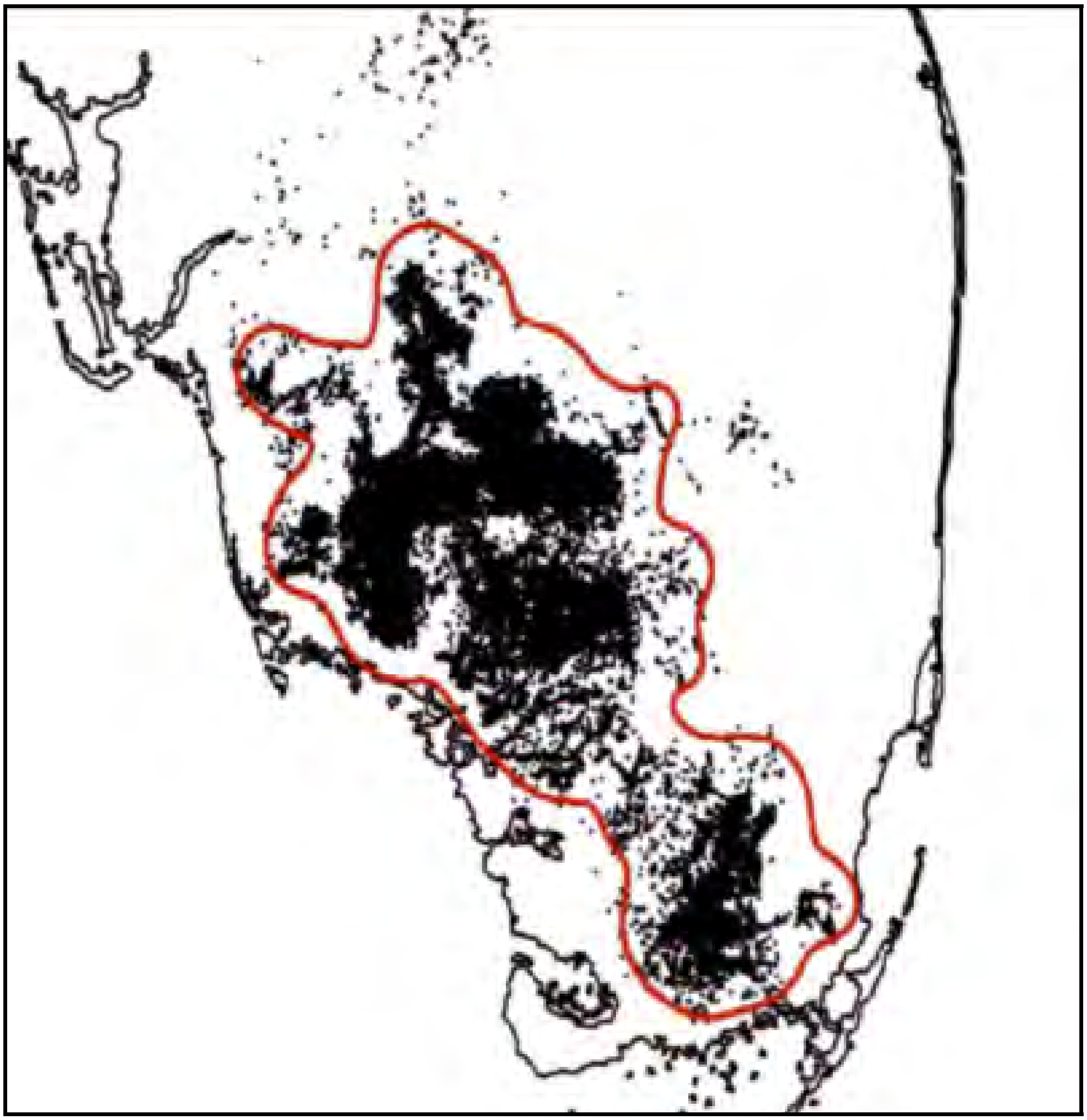


Figure 3-31 – Radio telemetry locations of Florida panthers from 1981 to 2003
(Cox et al., 2006)

Cape Sable Seaside Sparrow

The Cape Sable seaside sparrow is one of eight extant subspecies of seaside sparrow in North America. Its distribution is limited to the short-hydroperiod wetlands in the greater Everglades system, on the southern tip of mainland Florida. In the 1930s, Cape Sable was the only known breeding range for the sparrow. Areas on Cape Sable that were occupied by Cape Sable seaside sparrow in the 1930s have experienced a shift in vegetative communities from freshwater vegetation to mangroves, bare mud flats, and salt-tolerant plants such as *Batis maritima* and *Borrichia frutescens*. The hurricane of 1935 is believed to have initiated the succession of the plant community on Cape Sable from one dominated by freshwater plants to one dominated by salt tolerant plants. Sea level rise, reduced freshwater flows to the area resulting from upstream water management practices, and another hurricane in 1960 were also likely factors in this habitat change. As a result, the Cape Sable seaside sparrow no longer uses this area. The currently preferred nesting habitat of the Cape Sable seaside sparrow appears to be a mixed marl prairie community that often includes muhly grass. These short-hydroperiod, mixed marl prairies contain moderately dense, clumped grasses with open space permitting ground movements by the sparrow. Sparrows tend to avoid tall, dense, sawgrass-dominated communities, spikerush marshes, extensive cattail monocultures, long hydroperiod wetlands with tall, dense vegetative cover, and sites supporting woody vegetation. The birds also avoid sites with permanent water cover. The suitability of short-hydroperiod, mixed marl prairie communities for the sparrow is driven by a combination of hydroperiod and periodic fires. Fires prevent hardwood species from invading these communities and prevent the accretion of dead plant material, both of which decrease the suitability of habitat for Cape Sable seaside sparrows.

The Cape Sable seaside sparrow was first provided protection when it was listed on March 11, 1967, under the Endangered Species Preservation Act of 1967 (32 Federal Register 4001). That protection was continued under the Endangered Species Conservation Act of 1969. The sparrow and all other species listed under the Endangered Species Conservation Act were the first species protected under the Act of 1973, as amended. The Cape Sable seaside sparrow inhabits six distinct subpopulations called A, B, C, D, E, and F. Critical habitat for this species was designated on August 11, 1977 (42 FR 42840). Currently, the critical habitat includes areas of land, water, and airspace in the Taylor Slough vicinity of Collier, Miami-Dade, and Monroe Counties. Much of this area is within the boundaries of ENP. Because this was one of the first critical habitat designations under the Act, there were no primary constituent elements defined. The designated area encompasses about 197,260 acres (79,828 hectares), and includes portions of subpopulations B through F. The Cape Sable seaside sparrow Subpopulation A is the only area occupied by sparrows that does not have associated designated critical habitat. This subpopulation flanks the area west of Shark River Slough and is in the direct path of discharge from WCA-3A through the S-12 discharges. Water levels within the subpopulation are also thought to be affected by discharges from the upstream S-343A and S-343B structures and water concentrations within WCA-3A. This subpopulation, once estimated to be the largest subpopulation besides Subpopulation B, is thought to provide a critical role to the overall survival of the species.

The Cape Sable seaside sparrow Subpopulation A drastically declined approximately 84% from an estimated 2,608 birds in 1992 to only 432 birds in 1993 (Pimm et al, 2002). To prevent extirpation of the remaining Cape Sable seaside sparrow Subpopulation A, the USFWS issued a BO providing recommendations to the USACE on how to better manage water levels in nesting habitat. The USACE responded by developing changes in water management operations that are still currently in effect. The decline of Subpopulation A has been attributed to upstream water management practices and a recent analysis by ENP scientists indicated that this decline cannot be attributed solely to rainfall increases (Kotun, 2009).

Survey and nesting monitoring within Subpopulation A indicate this is an extant, functional subpopulation but that no significant recovery of the subpopulation has occurred since the massive crash in 1993 (Virzi et al., 2009). In 2009, 19 pairs of breeding pairs were detected in Subpopulation A. The 2009 survey revealed few unmated males in Subpopulation A, and no significant differences in clutch sizes, adult return rates, or proportion of early to late nesters as compared to the largest and most stable Subpopulation, Subpopulation B (Virzi et al, 2009).

Audubon's crested caracara

Audubon's crested caracara is a raptor that is approximately 50-64 cm long and has an approximate wingspan of 120 cm (USFWS, 1999). This species is characterized by its crest, naked face, elongate neck and unusually long legs. The distribution of the Audubon's crested caracara ranges includes Florida, southwestern Arizona, northern Baja Californmia, through Mexico and Central America to Panama, including Cuba and the Isle of Pines (USFWS, 1999). Previously this species was relatively common in Florida from northern Brevard County, south to Fort Pierce, Lake Okeechobee, and Hendry County (USFWS, 1999). The Audubon's crested caracara is now mainly found in a five-county area north and west of Lake Okeechobee (USFWS, 1999).

The preferred habitat of the Florida population consists of dry or wet prairie areas containing cabbage palms; however, this species is also found in wooded habitats (USFWS, 1999). This species is typically found in association with improved pasture areas and appears to prefer to nest in cabbage palms near open land (USFWS, 1999). The Audubon's crested caracara is considered an accidental within freshwater marshes of ENP with no regular pattern of occurrence and fewer than 10 reported records of occurrence within ENP (Loughlin et al., 1990). Aububon's crested caracara has the potential to occur and forage within Northeast Shark River Slough.

Wood Stork

The wood stork is a large, long-legged wading bird, standing about 50 inches tall, with a wingspan over 60 inches. It has white plumage and a short, black tail. Their bill is black, thick at the base, and curved. Their U.S. range consists of parts of Florida, Georgia, and South Carolina. Wood storks forage mainly in shallow water in freshwater marshes, swamps, lagoons, ponds, tidal creeks, flooded pastures and ditches, where they are attracted to falling water levels that concentrate food sources (mainly fish). Wood storks use thermal drafts for soaring, and may travel over 80 miles from nest to foraging sites. These birds eat small fish and probe with their bills for their food in shallow water. Highly social, these birds nest in large rookeries and feed in flocks. They are long-lived and first breed at approximately 4 years old. In South Florida, nesting occurs as early as October, with young leaving the nest in February or March. Much of the decline in wood stork populations is attributed to loss of habitat by destruction of wetlands and alteration of the natural hydroperiods and hydropatterns that characterized the pre-drainage Everglades. To minimize adverse effects to the wood stork due to any loss of wetlands, the USFWS recommends that any lost foraging habitat resulting from a project be replaced with construction of new wetlands or enhancement of existing wetlands within the Core Foraging Area (CFA) which USFWS defines as an approximate radius of 18.6 miles from the rookery.

Overall nesting colony trends in ENP have indicated an increasing wood stork colony in ENP since 1985 with peak nesting years occurring in 1994, 2000, 2007, and 2009 (Cook and Kobza, 2009) (***Figure 3-32***). 2009 marked a banner year for wood stork production in south Florida, with the largest nesting success since the predrainage period (Cook and Kobza, 2009). There were an estimated 6,452 wood stork nests in south Florida in 2009, constituting a 203% increase over the last decade (Cook and Kobza, 2009). The lack of dry season rainfall and reversals likely allowed for the optimal foraging conditions during 2009 that lead to such a successful breeding season (Cook and Kobza, 2009).

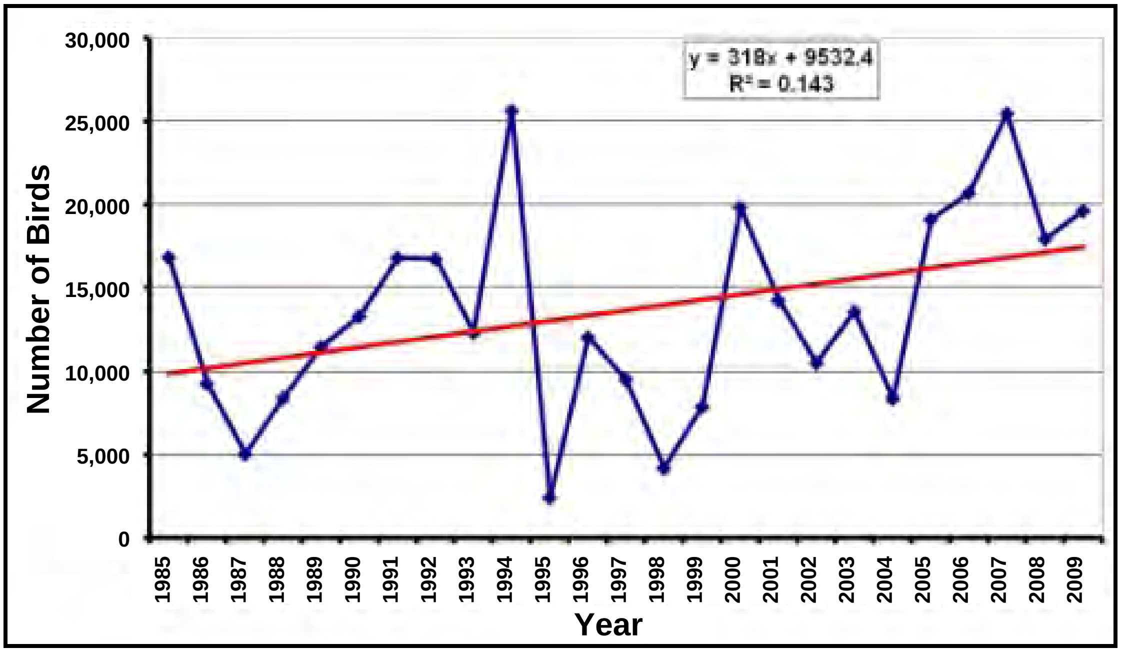


Figure 3-32 – Wood Stork Nesting Colony Trends in ENP

Three wood stork rookeries occur at pond apple stands along the south side of the Tamiami Trail project study area: the Tamiami Trail West Rookery and the Tamiami Trail East 1 and Tamiami Trail East 2 Rookeries (see ***Figure 3-33***). The pond apple forest creates a visual barrier between the rookeries and Tamiami Trail and the storks appear to have become somewhat acclimated to highway traffic noise.

Based on photographs and observations during SRF wading bird surveys of the Tamiami colonies in 2010, the Tamiami colony boundaries were delineated by the NPS. Using the NAIP (2007) GIS layer and the 2010 SRF wading bird survey information, the wading bird colonies were manually digitized into a GIS shape file depicting the estimated wood stork colony locations using ArcMap (v. 9.3). The revised GIS shape file also contains the estimated wood stork primary and secondary management zones for each of the respective Tamiami Colonies. A primary management zone buffer of 1,000 ft surrounding the boundary of each of the Tamiami colonies was designated. A 1,500 ft buffer surrounding the boundary of the primary management zone was designated to delineate the boundary of the secondary management zone. The revised management zone delineations meet the requirements described in the Draft USFWS Habitat Management Guidelines for the wood stork in the southeastern United States (2006).

The primary and secondary management zones are designed to protect wood stork nesting, roosting, and foraging activities and place restrictions on certain human activities, such as construction activities, during the active wood stork nesting season.

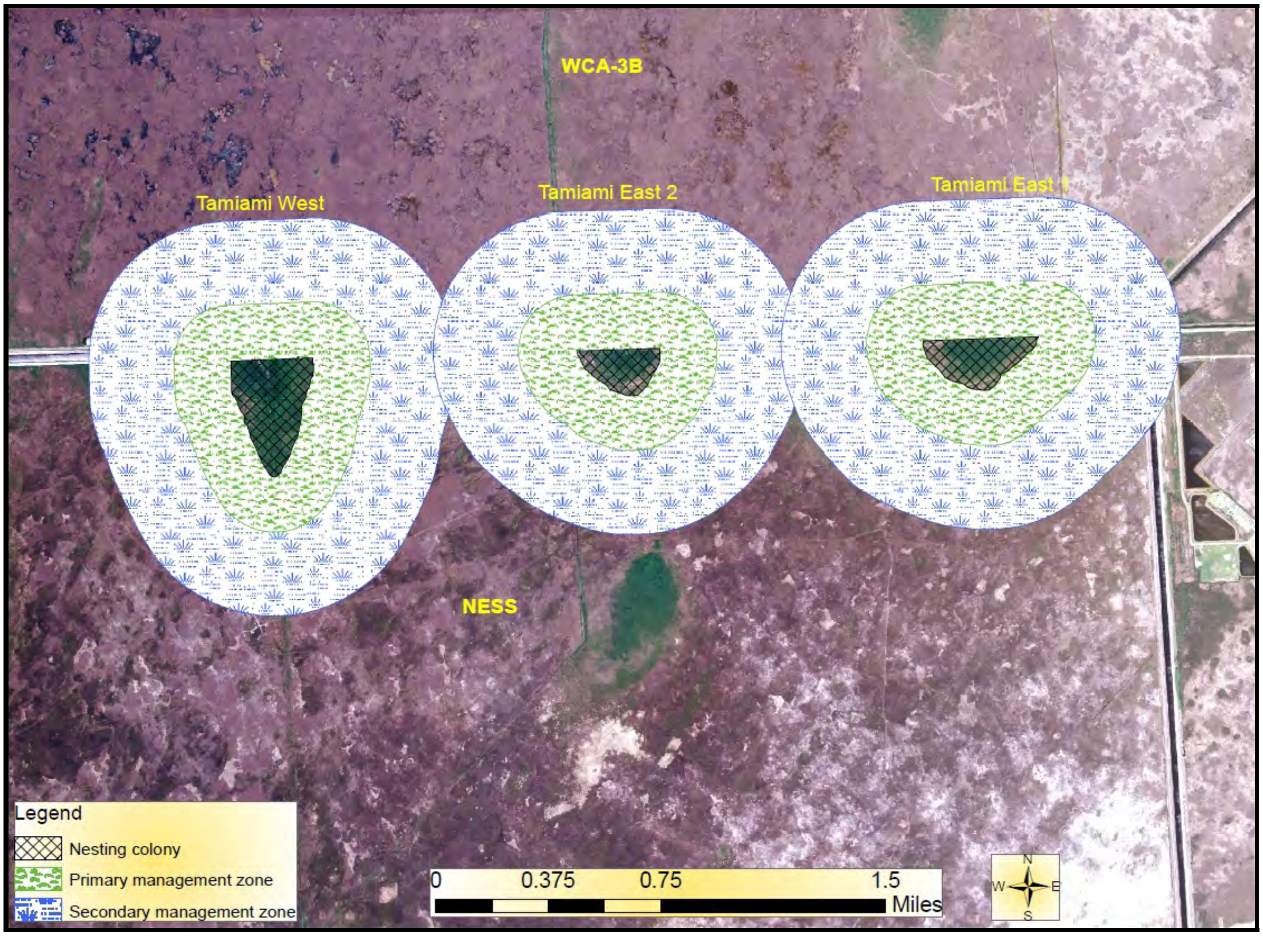


Figure 3-33 – Wood Stork Colonies and Management Zones along the Project Corridor

<u>Everglade snail kite</u>

The Everglade snail kite, listed as endangered under the ESA in 1967, is a medium-sized hawk with a wingspan of approximately 45 inches. The adult males are slate gray with a black head and wing tips, a white patch at the base of a square tail, and red legs. The female has a buff-colored body, heavily streaked with dark lines, a white line above the eye, a white tail patch, yellow legs, and red eyes. Immature Everglade snail kites resemble the females, only they are darker in color and their eyes are brown. Their beaks are slender and very hooked. Everglade snail kites require long hydroperiod wetlands that remain inundated throughout the year. This preference is associated with the freshwater apple snail (*Pomacea paludosa*), its primary food source. Suitable habitats for the Everglade snail kite include freshwater marsh and shallow, vegetated lake margins where apple snails can be found. Preferred nesting habitat includes small trees and shrubs such as willow, bald cypress, pond apple, sweet bay, dahoon holly, southern bayberry, and elderberry. During dry periods when suitable shrubs and trees experience dry conditions, herbaceous species such as sawgrass, cattail, bulrush, and common reed are used for nest sites. Critical habitat for the Everglade snail kite was designated in 1977 and includes WCA-1, -2, and -3A, and portions of ENP, as well as Lake Okeechobee shorelines and portions of the St. Johns marsh.

The USFWS drafted management guidelines for the Everglade snail kite in 2006. According to the USFWS, Everglade snail kite nesting does not occur randomly within wetland systems. Instead, there are generally areas within wetlands, where Everglade snail kite nesting is concentrated. The density of kite nests, frequency of nesting within each area, and the sizes of these "priority Everglade snail kite nesting areas" are highly variable, but identifying these areas may help to focus management actions. In most years, the majority of kite nesting is anticipated to occur within the priority management zones, though new nesting areas may become active. Based on compilation of the 2000-2009 Everglade snail kite nesting data in Florida, the USFWS identified snail kite priority management zones. Snail kite priority management zones are designated in Northeast Shark River Slough, ENP (***Figure 3-34***).

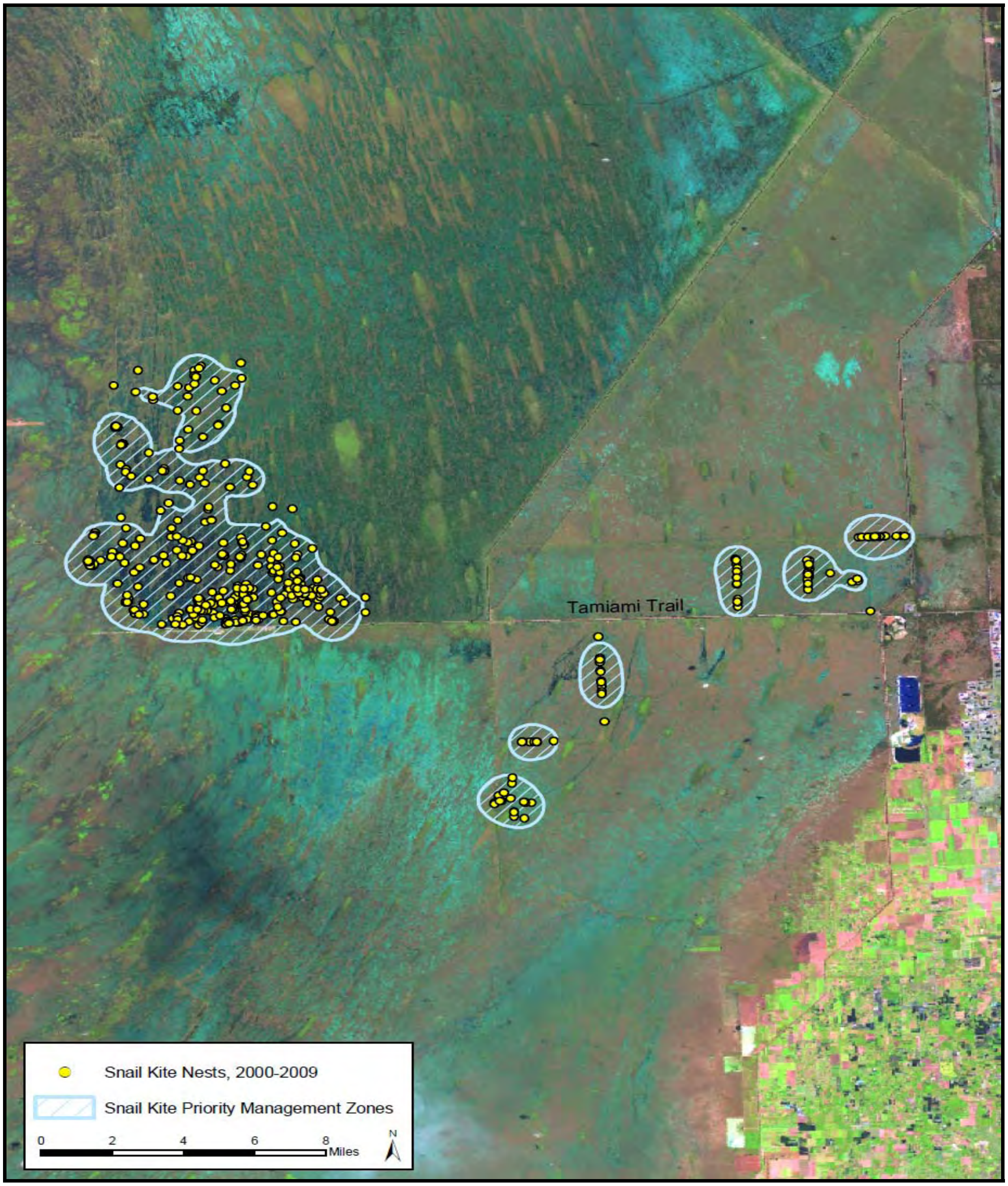


Figure 3-34 – Everglade snail kite priority management zones near Tamiami Trail based on data collected 2000-2009 (USFWS)

Since the mid-1990s, the geographic range of the Everglade snail kite has been reduced to the Everglades, Lake Okeechobee, Loxahatchee Slough, the Kissimmee River, and the Upper St. Johns River watersheds (Cattau et al., 2008). During 1992-2001 the majority of successful Everglade snail kite reproduction occurred in WCA-3A (Cattau et al., 2009). However, no Everglade snail kites were fledged out of WCA-3A in 2001, 2005, 2007, or 2008; only two Everglade snail kites from the same nest fledged out of WCA-3A in 2009 (Cattau et al, 2009). During 1985 – 1995 Lake Okeechobee once provided a productive breeding site for Everglade snail kite nesting but this area no longer constitutes productive breeding grounds (Cattau et al., 2009). Since the loss of the productive Everglade snail kite breeding grounds in Lake Okeechobee and WCA-3A, the majority of the Everglade snail kite nesting has most recently occurred in the Kissimmee Chain of Lakes, namely Lake Tohopekaligo (Toho); this area accounted for the majority of the successful nesting attempts from 2005-2009 (Cattau et al., 2009).

Reproductive declines throughout the geographic range of the Everglade snail kite have been attributed to natural disturbances such as droughts, anthropogenic water management practices, and long-term habitat degradation. Another contributing factor linked to the lack of successful nesting and fledgling success is the aging Everglade snail kite population that is known to be less reproductively viable and less capable of responding to poor environmental conditions such as drought (Cattau et al., 2009). The spread of the exotic apple snail may also limit juvenile Everglade snail kite survival and contribute to overall population declines (Cattau et al., 2009). Everglade snail kite recovery is thought to be dependent upon maintaining hydrologic conditions that support nesting and foraging conditions and provide suitable conditions for its primary prey, the native apple snail. The long-term recovery of this species will be dependent on reducing habitat fragmentation, and improving environmental and ultimately habitat conditions throughout the remaining range of its habitat from the Kissimmee Chain of Lakes to ENP.

The USFWS *Draft Snail Kite Management Guidelines* (2006) dictate that nest protection buffers be established around every active Everglade snail kite nest. These buffer zones would be in effect from when kites begin nest building through the time when breeding activity is no longer observed at the site. Because kites can re-nest, and may re-nest in the same area as previous attempts, buffer zones may remain in place past the time when fledglings leave the area if adult kites continue to show breeding activity, including courtship, in the general area (USFWS, 2006).

- No-entry Buffer Zone - A 500-foot (~150 meter) radius no-entry buffer zone would be established around all active nests that are discovered. The purpose of this buffer zone is to protect kites from direct disturbance that may affect the fate of nesting (USFWS, 2006).
- Limited Activity Buffer Zone - A 1,640-foot (500 meter) radius limited-activity buffer zone would be established around all active kite nests. This buffer zone is intended to maintain and protect foraging opportunities and habitat conditions around each nest to allow the nest to succeed. The goal is to maintain habitat conditions for the entire nesting period similar to those that were present when the birds selected the site (USFWS, 2006).

Eastern Indigo Snake

The Eastern Indigo snake is a large, non-poisonous snake that may reach up to eight feet in length. The snake gets its name from its shiny, blue-black color. Its diet consists mainly of other snakes, amphibians, small mammals, and occasionally birds and sea turtles. This species occurs throughout Florida and along the coastal plain of Georgia. The eastern indigo snake is found in a variety of habitats but prefer dry pineland habitat bordered by water. The project area consists of large expanses of wetland, which are not particularly attractive as habitat to this snake. The decline in populations is attributed to loss of habitat to agriculture, and also collecting for the pet trade. The species has also suffered from mortality during gassing of gopher tortoise burrows for rattlesnake collection. Little is known about the specific habits and niche of the Eastern indigo snake in the Park. This species is found in and near hardwood hammocks. Standard Protection Measures for the East Indigo Snake (USFWS, 2004) have been developed that provide protective mitigation measures for the eastern indigo snake during construction activities.

Other State-Listed Species

The state of Florida lists a variety of plant and animal species as endangered, threatened, species of special concern, or commercially exploited. The state defines these species under the Florida Endangered and Threatened Species Act as follows:

Animals

- A threatened species is any species of fish and wildlife naturally occurring in Florida which may not be in immediate danger of extinction, but which exists in such small populations as to become endangered if it is subjected to increased stress as a result of further modification of its environment.
- Endangered species are defined as any species of fish and wildlife naturally occurring in Florida, whose prospects of survival are in jeopardy due to modification or loss of habitat; over utilization for commercial, sporting, scientific, or educational purposes; disease; predation; inadequacy of regulatory mechanisms; or other natural or manmade factors affecting its continued existence.
- Species of special concern are those that in the foreseeable future may become a threatened species unless additional protective measures or management measures are implemented. Species of special concern may already meet some criteria for threatened species but there may not be enough data yet available to elevate them to a threatened status.

Plants

- "Threatened plants" means species native to the state that are in rapid decline in the number of plants within the state, but which have not so decreased in such number as to cause them to be endangered.
- "Endangered plants" means species of plants native to the state that are in imminent danger of extinction within the state, the survival of which is unlikely if the causes of a decline in the number of plants continue, and includes all species determined to be endangered or threatened pursuant to the federal ESA of 1973, as amended,

Table 3-10 – Other Listed Wildlife Species with Potential to Occur in the Tamiami Trail Project Area

Common Name	Scientific Name	State Status
Everglades mink	*Mustela vison*	Threatened
The Everglades mink is a medium size member of the weasel family with a long slender body, short legs, and a long tail. The fur is dark brown over the body and blackish brown at the tip of the tail. Some individuals have a white patch on the chin or chest. The mink utilizes a variety of wetland habitats including freshwater marsh, cypress swamp, and forested wetlands. The south Florida distribution includes Southern Collier County, mainland Monroe County, and Miami-Dade County. Recent camera monitoring efforts have not detected minks within Northeast Shark River Slough, ENP. However, it is possible that the camera monitoring methods used did not detect minks even though they are present in Northeast Shark River Slough. Therefore, minks still have the potential to occur in Northeast Shark River Slough.		
limpkin	*Aramus guarauna*	Species of Special Concern
The limpkin is a somewhat large bird, 66 cm (26 in) long, with a wingspan of about 102 cm (40 in) and a weight of about 1.1 kg (2.4 lb). Its plumage is drab—dark brown with an olive luster above. The feathers of the head, neck, wing coverts, and much of the back and underparts (except the rear) are marked with white, making the body look streaked and the head and neck light gray. The limpkin occurs from peninsular Florida (and formerly the Okefenokee Swamp in southern Georgia) and southern Mexico through the Caribbean and Central America to northern Argentina. In South America it occurs widely east of the Andes; west of them its range extends only to the Equator. It inhabits freshwater marshes and swamps, often with tall reeds, as well as mangroves. In the Caribbean, it also inhabits dry brush land. While considered relatively uncommon in ENP, this species has previously been observed within freshwater marshes of ENP and has also previously bred within ENP (Loughlin et al., 1990; NPS, 2006b). Therefore, limpkins have the potential to occur and potentially to breed and forage within Northeast Shark River Slough.		
marsh wren	*Cistothorus palustris*	Species of Special Concern
Two recognized subspecies of the marsh wren breed within coastal marshes of Florida and are listed as Species of Special Concern by the state, The Worthington's marsh wren (*C. palustris griseus*) breeds within cordgrass marshes of Duval and Nassau counties while the Marian's marsh wren subpopulation (*C. palustris marianae*) is located in black needlerush marshes on the Gulf coast (FFWCC, 2003). Marsh wrens have been observed within freshwater marshes of Florida but are not currently breeding in these areas (FFWCC, 2003). Marsh wrens have previously been observed within the freshwater marshes of ENP and therefore, have the potential to occur within Northeast Shark River Slough (Loughlin et al., 1990; NPS, 2006b).		
little blue heron	*Egretta caerula*	Species of Special Concern
The little blue heron is a wading bird found along the Atlantic coast from Massachusetts to Florida, and is most abundant along the Gulf of Mexico. This species ranges up to 30 inches in height and would have a wingspan of approximately 3 feet. Adults have a purple head and neck, with a slate-gray body. The long neck is held in an "S" curve at rest and in flight. Young are all white, with a blue bill and green legs. Little blue herons feed during the day on fish, reptiles, crustaceans, and insects. The long bill is used to jab and eat the prey. Little blue herons are common throughout the project area. This species nests within the Tamiami colonies and uses habitats within Northeast Shark River Slough for foraging and roosting.		

Common Name	Scientific Name	State Status
reddish egret	*Egretta rufescens*	Species of Special Concern
The reddish egret is approximately 30 inches in length with a wingspan of 46 inches. The dark morph breeding adult is characterized by a pink bill with a black tip and cobalt blue legs with shaggy plumes on the head while the white morph adult generally resembles a little blue heron or a snowy egret (Dunn and Alderfer, 2008). This species disperses along the Gulf coast in the post-breeding phase and is found casually inland to the Midwest, through the southwest and up the Atlantic coast to New England (Dunn and Alderfer, 2008). Although not reported as breeding within Northeast Shark River Slough, ENP, reddish egrets have previously been observed within the freshwater marshes of ENP and therefore, have the potential to occur within Northeast Shark River Slough (Loughlin et al., 1990; NPS, 2006b).		
snowy egret	*Egretta thula*	Species of Special Concern
The snowy egret is a small white heron, about 2 feet tall, with an approximate 3 foot wingspan. This species is distinguished by a black bill and legs, with yellow feet. Both male and female have the same coloring. Snowy egrets breed in shared colonies in salt marshes, ponds and shallow bays. Prey includes aquatic organisms and insects, such as shrimp, fish, frogs, and insects. They forage by walking slowly or standing motionless and striking at the prey. The species was reduced from common to rare by 20th century plume hunting. Snowy egrets are common throughout the project area. This species nests within the Tamiami colonies and uses habitats within Northeast Shark River Slough for foraging and roosting.		
tricolored heron	*Egretta tricolor*	Species of Special Concern
The tricolored heron is a wading bird found from Massachusetts to the Gulf Coast. Reaching 30 inches in height, its slate-gray plumage is complemented by a white belly and a white chin stripe. During most of the year, the bill is yellow with a black tip and its legs are yellow. During mating season the bill turns bright blue and the legs are bright pink. Its diet consists primarily of fish, but may include small reptiles, amphibians, insects, and crustaceans. This species usually breeds in brackish and saltwater coastal areas, in mixed colonies with other herons. Nests are close to the ground. Tricolored herons are common throughout the project area. This species nests within the Tamiami colonies and uses habitats within Northeast Shark River Slough for foraging and roosting.		
white ibis	*Eudocimus albus*	Species of Special Concern
The white ibis is a medium-sized wading bird approximately 25 inches in length with a wingspan of approximately 38 inches (Dunn and Alderfer, 2008). Its feathers are entirely white, except for dark wing tips. The face is bare and pink, blending into a long, curved bill. It has long pink legs and webbed toes. Barriers, marshes, coastal islands and inland lakes are the preferred habitat and nesting sites. White ibis probe for aquatic crustaceans and insects using their bill. White ibis are common in the project area. This species nests within the Tamiami colonies and uses habitats within Northeast Shark River Slough for foraging and roosting.		
American kestrel	*Falco sparverius paulus*	Endangered
The American kestrel is approximately 10.5 inches in length and has a wingspan of approximately 23 inches (Dunn and Alderfer, 2008). This subspecies inhabits open pine savannahs, sandhills, prairies, freshwater marshes, hammocks, mangrove forests, and pastures in Florida and the southeastern United States (Loughlin et al., 1990; FFWCC, 2009). Because this species has been previously observed in freshwater marshes of ENP (Loughlin et al., 1990), this subspecies has the potential to occur and forage within Northeast Shark River Slough.		

Common Name	Scientific Name	State Status
Florida sandhill crane	*Grus canadensis pratensis*	Threatened
The Florida sandhill crane stands approximately up to four feet tall and a wingspan of nearly 6.5 ft. This bird is characterized by its long-neck and feathers that clump at its rear (Brandt and Chafin, 2003). The Florida sandhill crane is distributed within peninsular Florida, although not as observed south of Lake Okeechobee and also found within southeastern Georgia (Okefenokee Swamp) (Brandt and Chafin, 2003). This subspecies inhabits prairies, freshwater marshes, and grassed areas including pastures, golf courses, and highway medians (Brandt and Chafin, 2003). While considered relatively uncommon in ENP, this species has previously been observed within freshwater marshes of ENP and has also previously bred within ENP (Loughlin et al., 1990; NPS, 2006b). Therefore, this species has the potential to occur, forage, and breed within Northeast Shark River Slough.		
white-crowned pigeon	*Patagioenas leucocephala*	Threatened
The white-crowned pigeon is approximately 13.5 inches in length and is characterized by is white-topped head and large, square tail (Dunn and Alderfer, 2008). This species is found within the Florida Everglades and the Florida Keys and generally overwinters on Caribbean Islands (Dunn and Alderfer, 2008). While this species is not breeding within the freshwater marshes of ENP, this species has been observed within the freshwater marshes of ENP (Loughlin et al., 1990; NPS, 2006b). Therefore, this species has the potential to occur within Northeast Shark River Slough.		
roseate spoonbill	*Ajaia ajaja*	Species of Special Concern
Roseate spoonbills are typically found in the coastal marshes, mudflats, and mangrove keys from Florida to coastal Texas. These large wading birds stand almost 3 feet tall and have a wingspan in excess of 4 feet. The term ‘roseate’ refers to the brilliant pink color of the adult bird. This species is often found in small groups with other wading birds. To feed, roseate spoonbills immerse their bill tips in water and swing their heads from side to side. Their diet consists of small fishes, crustaceans, mollusks, slugs and aquatic insects. Roseate spoonbills often nest in rookeries with herons, ibis, and other wading birds. They construct their nests of sticks, in trees or bushes, 5 - 15 feet off the ground. Northeast Shark River Slough provides foraging habitat for roseate spoonbills; however, this area is generally not used for nesting by roseate spoonbills.		
American alligator	*Alligator mississippiensis*	Threatened
The alligator is a large mostly black crocodilian with a broad round snout and no prominently visible tooth in the lower jaw when the mouth is closed. It is distinguished from the American crocodile which has a prominently displayed tooth on the lower jaw when the mouth is closed and is lighter in color with dark crossbands or spots on the back, tail and legs. The alligator is found in most permanent bodies of fresh water including lakes, ponds, canals, marshes, and rivers, and occasionally wanders into brackish water conditions. American alligators area known to breed and forage within Northeast Shark River Slough.		

(NPS, 2010; FFWCC, 2003; Hipes et al., 2001)

No federally listed plants are anticipated to occur in the project area. ***Table 3-11*** below shows the State-listed plant species with the potential to occur in the project area. According to the FDACS, statutory protection of State-listed plants is not applicable if the clearing of land is performed by a public agency when acting in the performance of its obligation to provide service to the public (Section 581.185(8) Florida Statutes).

Table 3-11 –State-Listed Plant Species with Potential to Occur in the Tamiami Trail Project Area

Common Name	Scientific Name	State Status	Species Information
Florida Butterfly Orchid	*Encyclia tampensis*	Commercially Exploited	Rockland hammocks and coastal buttonwood forests
Southern Fogfruit	*Phyla stoechadifolia*	Endangered	Marshes
Spicewood	*Calyptranthes pallens*	Threatened	Rockland hammocks, coastal berm
Satinleaf	*Chrysophyllum oliviforme*	Threatened	Pinelands and hammocks
Sword Fern	*Nephrolepis biserrata*	Threatened	Moist and shady hammocks
Reflexed wild-pine, northern needleleaf	*Tillandsia balbisiana*	Threatened	Moist forests, swamps, pinelands, hammocks
Cardinal Airplant; Common Wildpine	*Tillandsia fasciculata var. densispica*	Endangered	Cypress swamps, sloughs, and hammocks
Golden Leather fern	*Acrostichum aureum*	Threatened	Coastal hammocks, fresh and saltwater marshes
Royal fern	*Osmunda regalis*	Commercially Exploited	Hammocks and cypress swamps
Giant wild-pine, giant airplant	*Tillandsia utriculata*	Endangered	Pinelands, coastal hammocks, cypress swamps, coastal buttonwood forests
Leatherleaf Airplant	*Tillandsia variabilis*	Threatened	Hammocks and cypress swamps

(NPS, 2010; Coile and Garland, 2005)

3.6 Wilderness/Unique Ecosystems

Everglades National Park is one of the most unusual wilderness areas on the continent. It is the largest remaining subtropical wilderness in the United States, and its abundant wildlife includes rare and endangered species, such as Florida panthers, West Indian manatees, eastern indigo snakes, Cape Sable seaside sparrows, Everglade snail kites, and wood storks. The Everglades have also been designated as an International Biosphere Reserve, a World Heritage Site, and a Wetland of International Importance, in recognition of its significance to all the peoples of the world (NPS, 2006).

The wilderness of ENP offers an escape from human-made structures, crowds, artificial light, and noise, and allows visitors to experience solitude, natural quiet, and spectacular scenery. The vast wilderness also allows visitors to explore and discover the incredible natural beauty of the many natural features, and many species of plants and animals. The remote areas of the wilderness provide outstanding opportunities for solitude and a primitive and unconfined type of recreation. This is the basis of a wilderness experience.

Approximately 1,296,500 acres (524,686 hectares) of wilderness was designated at ENP by Congress on November 10, 1978. The park also contains approximately 81,900 acres (33,144 hectares) of potential wilderness; combined, these areas represent about 86 percent of the total park area (NPS, 2006). The East Everglades Expansion Area, a 107,600 acre addition to the northeast area of the park in 1989, is currently being evaluated for wilderness characteristics in the Park's GMP/EEWS/EIS . The Draft GMP/EEWS/EIS is expected to be released for public review and comment in January 2011 and would include a Draft NPS Preferred Alternative.

The Park manages its wilderness areas, including potential wilderness, in accordance with the Wilderness Act so that the areas retain their "primeval character and influence, without permanent improvements or human habitation" (16 USC § 1131). Development in the Park is limited to areas of existing services, utilities, and infrastructure. Management activities occurring in wilderness are associated with fire management, exotic plant management, and research and educational activities.

Visitor use and experience of the wilderness area surrounding the area is somewhat limited, due to the difficult access and/or inhospitable nature of the wilderness areas. However, visitors to the park are encouraged to follow "Leave No Trace" principles when recreating in wilderness to ensure its protection and to maximize the visitor's wilderness experience. These principles include traveling and camping on durable surfaces, disposing of waste properly, leaving wilderness resources as they are found, minimizing campfire impacts, respecting wildlife, and being considerate to other visitors (NPS, 2006).

3.7 Cultural Resources

The cultural environment includes those aspects of the physical environment that relate to human culture and society, along with the institutions that form and maintain communities and link them to their surroundings (King and Rafuse, 1994). Section 101(b)(4) of NEPA directs Federal agencies to preserve not only natural resources but also important historical and cultural aspects of our national heritage at Federal undertakings are planned and implemented. In response to that mandate and project scoping, potential impacts on archaeological, historical, and traditional cultural resources were addressed. The analysis also addressed other applicable Federal laws and regulations that protect cultural resources, especially Section 106 of the NHPA. That Act requires Federal agencies to consider the effects of their undertakings on properties that are listed in or eligible for the NRHP. Section 106 requirements were addressed pursuant to regulations for Protection of Historic Properties (Title 36, CFR, Part 800) and NPS policy (*Director's Order 28: Cultural Resource Management*).

To be eligible for the NRHP, properties must be 50 years old (unless they have special significance) and have national, state, or local significance in American history, architecture, archaeology, engineering, or culture. They also must possess integrity of location, design, setting, materials, workmanship, feeling, and association, and meet at least one of four criteria:

Criterion A: Be associated with significant historical events or trends

Criterion B: Be associated with historically significant people

Criterion C: Have distinctive characteristics of a style or type, or have artistic value, or represent a significant entity whose components may lack individual distinction

Criterion D: Have yielded or have potential to yield important information (Title 36, CFR, Part 60)

<u>Region of Influence (Area of Potential Effects)</u>

The region of influence is the geographic area within which a Federal action may cause effects on resources. The concept is analogous to the area of potential effects (APE) on NRHP-listed or eligible properties, as defined by regulations implementing Section 106 of the NHPA [Title 36, CFR, Part 800.16(d)]. Those regulations define the APE as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties. The scale and nature of the APE can vary for different types of potential impacts on the cultural environment.

The Tamiami Trail Modifications: Next Steps project has potential to affect cultural resources as a result of (1) direct disturbance due to construction activities, and (2) diminishment of historical integrity as a result of indirect effects such as visual changes and limiting access. The APE for direct construction impacts was defined as those areas that could be disturbed by construction of additional bridges and raising the height of the unbridged segments of the Tamiami Trail within the project area. Those areas were estimated on the basis of preliminary engineering data, and include a narrow strip of land along the south side of the Tamiami Trail for widening of the ROW or temporary use during construction. Construction staging areas are expected to be located at developed business sites along the corridor. Asphalt removed from sections of the road replaced by bridges might be reused or disposed of in an approved, developed facility. It is expected that other excess material would be deposited in other previously disturbed locations. The APE for visual and access impacts is defined as including the properties along the south side of the Tamiami Trail within the project area.

Cultural History

Archaeological evidence indicates that Florida has been occupied for approximately 12,000 years. Groups called Paleoindians occupied the regions from about 12,000 to 9,500 years ago, when the climate was cool and arid. Paleoindians hunted Pleistocene megafauna (including giant tortoises, giant ground sloths, saber-tooth cats, mammoths, mastodons, camelids, and horses) but probably relied more on smaller game and indigenous plant foods found within a mosaic of wetlands mixed with upland knolls, pine-oak islands, and cabbage palm hammocks. Paleoindian sites are rare and none have been found near the project area.

The subsequent Archaic period represents a continuation of a mobile hunting and gathering way of life that lasted approximately 7,000 years. An oak-savannah environment with a drier climate and rising sea levels characterized the Early Archaic period. During the Middle Archaic period (dated from about 7,000 to 5,000 years ago), the modern climate and Everglades environment developed. Increasing numbers of archaeological sites indicate that populations grew, with coastal groups relying on shellfish and marine resources, but hunting, fishing, and plant collecting also expanded in the Everglades. Pottery was first made during the Late Archaic period.

The population continued to increase during the Glades period, dated from about 2,500 to 500 years ago, and populations became more sedentary, occupying sites for considerable lengths of time. Virtually all tree islands and hardwood tree hammocks in the Everglades have potential for archaeological sites dating to this time period. The period is divided into more than a half dozen phases based primarily on changing types of pottery. Temple mounds and earthworks, particularly in the Okeechobee Basin, suggest that increasingly complex social structures had developed.

When European explorers arrived in 1513, they found people of the Glades culture in Florida (with an estimated population of about 20,000 organized into at least five tribal groups). The Spanish claim of hegemony lasted 250 years until Florida became a British colony for 20 years between 1763 and 1783. Spain again reclaimed ownership for another 38 years before Florida became part of the United States in 1821. Spanish missionaries and colonists, and the diseases they brought devastated aboriginal groups, which had largely disappeared from south Florida by the mid-1700s. Other aboriginal groups fleeing European settlement in Georgia, Alabama, and north Florida moved into south Florida and the amalgamation of these groups came to be known as the Seminoles. Almost 90 percent of the Seminoles were captured and transported to

Indian Territory between 1835 and 1842 during the Second Seminole War. The economy of the European colonists in Florida focused on farming and ranching, and in the last half of the 1800s the Seminoles who remained also followed agricultural pursuits. Florida seceded during the Civil War, and the loss of slave labor curtailed agricultural development after the war, although cattle ranching continued to prosper.

The modern era of south Florida began in the last decade of the nineteenth century, when the population of Dade County grew by five times from fewer than a thousand to almost 5,000. Entrepreneurs made the region a subtropical colony of the North rather than an extension of the south. The arrival of the Florida East Coast Railroad in Miami in 1896 fueled the growth. Development boomed in the 1920s until it was stalled by major hurricanes in 1926 and 1928. During the Great Depression of the 1930s, the region continued to attract tourists and New Deal programs bolstered the economy. The 1940s brought another development boom, and the Cuban exodus of the 1950s and 1960s continued the trend of population growth. Although the region has become a major international commercial and tourist center, much of the Everglades remains an undeveloped wilderness. Everglades National Park was established in 1947 to preserve part of the ecosystem. The Seminole Tribe and Miccosukee Tribe were officially recognized by the Federal government in 1957 and 1962, respectively. The Miccosukee Reservation is north of the Tamiami Trail at the western end of the project area. The Miccosukee Tigertail Camp is located along the north side of the highway, and the Osceola Camp is on the south side within ENP.

Cultural Resources within the Area of Potential Effects

Inventory surveys have identified three properties evaluated as eligible for the NRHP within the APE and a fourth property is considered potentially eligible (***Table 3-12***).

Table 3-12 – Historic Properties within the Area of Potential Effects

	Cultural Resource	Description	National Register of Historic Places Status
1	Tamiami Trail (8DA6510)	Highway constructed between 1915 and 1928	Eligible, Criteria A and C
2	Airboat Association of Florida (8DA6768)	Headquarters of a private organization formed to promote use and conservation of Everglades; clubhouse and kitchen built in 1954 and caretaker residence in 1962	Eligible, Criterion A
3	Coopertown Restaurant and Airboat Rides (8DA6767)	Commercial restaurant and residence built in 1947 as tourist attraction	Eligible, Criterion A
4	Miccosukee Osceola Camp	Tourist attraction and residential location established by William McKinley Osceola in the 1930s	Potentially Eligible, Criterion A and B

(Azzarello et al., 2006; Janus Research, 2001; Perlman et al., 2009; Price et al., 2010)

Construction of the Tamiami Trail highway (State Road 90/U.S. Highway 41) began in 1915 and was completed in 1928 to connect Tampa and Miami. The 245-mile-long highway is considered eligible for the NRHP because construction of the first east-west route across the southern Florida peninsula through the Everglades was a considerable engineering feat that led to substantial development. The highway, however, created a barrier for natural flows into the

Everglades and later drainage and flood control projects exacerbated the problem, which the current Next Steps project is now addressing.

The Airboat Association of Florida property is headquarters for a private organization founded in 1951 to promote use and conservation of the Everglades. The property is considered eligible for the NRHP for its association with development and use of airboats for hunting, fishing, and recreational use of the Everglades, which is considered a historically significant tradition. The three historic buildings on the property include a clubhouse and kitchen built in 1954 and a caretaker residence built in 1962. Those buildings are located about 150 to 170 feet south of the highway.

John Cooper, a founding member and first vice president of the Airboat Association of Florida, developed Coopertown Restaurant and Airboat Rides as a commercial tourist attraction when he built a restaurant and a house in 1947. The property is considered eligible for the NRHP for its association with the development of recreational tourism in the Everglades. The two historic buildings on the property are only about 55 to 85 feet south of the highway.

William McKinley Osceola and his wife, Alice, established a camp on Christmas Day, 1935. The camp served as a family residence and gift shop and later as a site for airboat rides. The camp is inside the northern boundary of ENP. Fill material was recently placed by the present residents, descendants of William McKinley Osceola, to elevate the camp and its buildings so they will not be flooded by rising water levels. There are no intact historic buildings at the camp (Fred Dayhoff, personal communication). Shovel testing has not been conducted to check for buried cultural resources since fill has been placed at the site. Aerial photography indicates there is a tree island on the north side of the highway, to the north of the camp, which is a candidate for having archeological resources. The Osceola Camp is on the south tail of this tree island and appears to have been developed in a low area that was raised with fill material. As such, the potential for buried archeological resources in the fill is low. If archeological deposits are present at the camp, they have been covered by the recently placed fill. The evaluation of the NRHP eligibility of the Osceola Camp remains in incomplete, but for purposes of this project, it was considered potentially eligible under Criterion A and Criterion B.

Other cultural resources have been recorded but they were evaluated as having no historic values that warrant preservation and are considered ineligible for the NRHP. Those resources include Gator Park (8DA10088), which was probably built as a gas station, subsequently used as a bar, and then converted to an airboat concession around 1989. The Tamiami Canal or L-29 Canal (8DA6453) is a borrow canal created by excavation of material for elevating the adjacent roadbed of the Tamiami Trail when it was built. The canal was subsequently upgraded to control and transport water released from WCA-3 on the north side of the Tamiami Trail. The Tamiami Canal has been evaluated as eligible for the NRHP for its association with the Tamiami Trail, but the segment of the canal in the project area has been modified so much that it has lost its historical integrity and no longer contributes to the historic values of the canal.

3.8 Visitor Use and Experience

The 10.7-mile section of Tamiami Trail that comprises the project area in Miami-Dade County is bordered to the north by WCA-3B and on the south by the northern edge of ENP. Tamiami Trail serves as a gateway not only to visitor recreational opportunities within these adjacent areas but also to the vast recreational opportunities in the South Florida region.

The State Comprehensive Outdoor Recreation Plan (SCORP) is the best source of information on recreation demand and supply at the state and regional level. It disaggregates the state into 11 regions composed of clusters of counties. The South Florida region (Region 11) is composed of Broward, Miami-Dade, and Monroe counties.

The South Florida region includes approximately 7,500 square miles at the southernmost tip of the state. This region includes the Everglades and the Florida Keys, areas with significant natural beauty and recreational value. The region also encompasses Biscayne Bay, and nearly 70 miles of Atlantic Ocean Beach.

Region 11 boasts over 3 million acres of land and water resources for outdoor recreation use. The federal government supplies nearly 70 percent of the available total. A vast portion of this acreage constitutes ENP. State government agencies supply nearly one million acres of outdoor land and water recreation resources. ***Table 3-13*** presents descriptive information on the recreation facilities in SCORP Region 11.

Table 3-13 – Regional Outdoor Recreation Facilities (Region 11)

Resource/Facility	Units	Region 11	% of State Total	State Total
Outdoor Recreation Areas	Areas	2,054	16%	13,325
Land	Acres	1,796,151	19%	9,624,923
Water	Acres	1,350,609	37%	3,667,645
Outdoor Recreation Areas	Acres	3,146,974	24%	13,313,762
Cabins	Cabins	382	9%	4,171
Tent Camp Sites	Sites	1,290	6%	20,044
RV Campsites	Sites	12,207	8%	162,041
Historic Sites	Sites	108	8%	1,328
Commemorative Structures	Structures	40	13%	318
Museums	Museums	71	14%	516
Picnic Tables	Tables	14,258	12%	116,086
Hunting Areas	Acres	698,451	13%	5,287,600
Bike Trail (Paved)	Miles	404	28%	1,425
Bike Trail (Unpaved)	Miles	74	3%	2,383
Canoe Trail	Miles	292	13%	2,295
Hiking Trail	Miles	420	8%	5,424
Equestrian Trail	Miles	139	6%	2,361
Jogging Trail	Miles	191	14%	1,326
Ohv Trail	Miles	0	0%	833
Nature Trail	Miles	254	10%	2,475
Freshwater Beach	Miles	3	4%	60
Freshwater Boat Ramps	Ramps	110	6%	1,739
Freshwater Boat Ramps	Lanes	144	7%	2,049
Freshwater Catwalks	Catwalks	45	1%	7,947
Freshwater Marinas	Marinas	7	2%	457
Freshwater Marinas	Slips	325	3%	11,762

Resource/Facility	Units	Region 11	% of State Total	State Total
Freshwater Piers	Piers	39	7%	569
Saltwater Beach	Miles	68	14%	501
Saltwater Boat Ramps	Ramps	202	22%	939
Saltwater Boat Ramps	Lanes	283	22%	1,268
Saltwater Catwalks	Catwalks	65	10%	631
Saltwater Marinas	Marinas	334	36%	937
Saltwater Marina Slips	Slips	13,965	31%	45,716
Saltwater Piers	Piers	72	17%	412

Recreational Opportunities

The South Florida region provides substantial opportunities for outdoor resource-based recreation. Among the numerous activities available are diving, snorkeling, camping, hiking, bicycling, boating and hunting. The Atlantic Ocean and numerous bays afford significant opportunities for saltwater beach recreating. Recreational opportunities accessed via Tamiami Trail within the vicinity of project area include biking, boating, fishing, hiking, camping, and wildlife viewing.

Approximately six miles west of the project area, the Shark Valley Information Center offers a 15-mile round-trip tram road (not open to private motorized vehicles) that extends into the marsh, offering one of the best opportunities for viewing wildlife. A two-hour narrated tram ride provides an overview of the freshwater Everglades, and bicycles are available to rent. An observation tower is located at the half-way point.

The Francis S. Taylor Wildlife Management Area, which includes WCA-3B, is managed by FFWCC. This area is managed for both consumptive (hunting, frogging, fishing) and non-consumptive (wildlife viewing, camping, boating, airboating, etc.) recreational use and environmental purposes. WCA-3B is accessed by crossing the L-29 Canal at either the S-333 or S-334 water control structures and launching at the boat and airboat ramps.

Four commercial airboat operators currently operate along the Tamiami Trail and provide guided education eco-tours of the Everglades. Visitors to the concessions range from drive-up visitors to tour groups from major American and European tour operators and cruise lines. The airboat concessions are a significant means by which the public experiences the Everglades. Three operators, Coopertown Airboat Rides and Restaurant, Everglades Safari Park and Gator Park operate from facilities located on the south side of Tamiami Trail and receive as many as 500,000 visitors each year, with a large proportion of the visits coming from international visitors. The other operator, Airboat USA launches from a public airboat ramp immediately east of Coopertown Airboat Rides.

The Airboat Association of Florida is a recreational association with facilities on the south side of the Tamiami Trail about three miles east of the western end of the project area. Facilities include a caretaker's residence, meeting room, workshop arenas for working on airboats, a cookhouse, several mobile RV sites including covered picnic areas, and a pistol shooting range.

The verge between the L-29 Canal and the L-29 Levee is used for passage along the canal, picnicking, or launching boats into the L-29 Canal. A road atop the L-29 Levee allows panoramic views to the north into WCA-3B.

Primary access to boat ramps on the north side of the L-29 Canal is at S-333 and S-334. Roads across these structures lead to several boat ramps and to bank fishing on the north bank of the L-29 Canal. S-334 provides access to a boat ramp (Boat Ramp 153) three miles to the east that allows boat launching into the L-29 Canal. A picnic area is associated with the boat ramp. Control structure S-333 provides access across the L-29 Canal to one airboat ramp and two boat ramps. There is a boat ramp on Canal 67-A and another on Canal 67-C. Both ramps are heavily used by boat fishermen. The airboat ramps provide access for deer and waterfowl hunters, as well as for recreational airboaters. Approximately 10.5 miles of the north bank of the L-29 Canal are available for bank fishing. Noncommercial airboats also launch south of the Tamiami Trail at two locations for sightseeing. The two locations are the ramp immediately east of Coopertown Airboat Rides and an undeveloped area at the L-67 Extension. The “Everglades National Park Protection and Expansion Act” allows those non-commercial airboat operators who were using the expansion area as of January 1, 1989, to continue to operate airboats inside the expansion area.

Bank fishing is also popular from the shoulders of the Tamiami Trail and L-67 Extension Levee. Fishermen frequent the 10.7 miles of the south bank of the L-29 Canal (north shoulder of the highway). The only places for bank fishing on the south side of the highway are where the culvert sets discharge water to the south. FFWCC personnel conducted angler counts along the Tamiami Trail from December 1998 to May 1999. The mean number of anglers per mile for weekdays and weekend days, respectively, was 0.95 and 2.28. Ninety-four percent were bank anglers (personal communication, FFWCC, September 28, 2000).

These numbers translate into an estimated ten fishermen per weekday and 23 per weekend day, totaling approximately 5,000 man-days of fishing per year within the 10.7-mile study area. Personal observation revealed 25 bank fishermen and two boats with two fishermen in the project study segment at approximately 10:00 A.M. on a Saturday in September 2000. Almost all the bank fishermen were fishing on either side of the highway ROW, with only a few on the north bank of the L-29 Canal.

It should be noted that at least some of the fishing is subsistence, not recreational. There is reportedly recreational fishing for oscars (*Astronotus ocellatus*), an aquarium fish native to South America that has become established in South Florida. Recreational anglers have also been observed fishing for bass by boat in the canal during the short period of time when dry conditions drive the bass out of the marshes (Dr. Joel Trexler, Florida International University, personal communication).

Everglades National Park Visitation

Everglades National Park receives approximately one million visitors each year. Visitor use patterns at the Everglades are, in part, influenced by the more than 5.7 million people living within 100 miles, and more than 15.2 million people living within 300 miles of the park (ERA, 2007). In addition to visitation from people living in the surrounding area, the Park also receives visitation from vacationers in nearby urbanized areas. For example, more than 8 million people vacation in Miami-Dade County alone (USGS, 2004), many of which could potentially include a trip to ENP as part of their vacation plans. Everglades National Park visitation statistics from 1979 to 2008 are shown in ***Table 3-14***. Approximately 50 percent of visitation occurs between January and April.

Table 3-14 – Everglades National Park Visitation

Fiscal Year	Recreational	Non-Recreational	Total Visits*	Percentage Change**
2008	822,118	5,521	827,639	-25.77%
2007	1,074,764	40,182	1,114,946	12.17%
2006	954,022	39,927	993,949	-22.42%
2005	1,233,837	47,406	1,281,243	3.38%
2004	1,181,355	57,996	1,239,351	12.61%
2003	1,040,648	59,949	1,100,597	6.04%
2002	968,909	68,973	1,037,882	-6.36%
2001	1,049,851	58,539	1,108,390	4.50%
2000	995,390	65,238	1,060,628	-7.08%
1999	1,073,982	67,461	1,141,443	-3.06%
1998	1,118,215	59,262	1,177,477	11.93%
1997	989,532	62,420	1,051,952	6.82%
1996	890,167	94,658	984,825	8.30%
1995	820,466	88,897	909,363	-7.39%
1994	886,455	95,489	981,944	-7.51%
1993	973,706	87,937	1,061,643	-0.25%
1992	1,025,686	38,671	1,064,357	-21.02%
1991	1,292,014	55,629	1,347,643	34.48%
1990	957,925	44,184	1,002,109	3.54%
1989	913,372	54,520	967,892	-9.66%
1988	1,026,188	45,184	1,071,372	31.34%
1987	787,493	28,261	815,754	7.01%
1986	739,072	23,211	762,283	8.79%
1985	697,646	3,040	700,686	10.89%
1984	628,658	3,233	631,891	8.96%
1983	577,439	2,505	579,944	-6.51%
1982	550,168	70,175	620,343	-0.42%
1981	564,721	58,222	622,943	-22.36%
1980	744,244	58,107	802,351	-4.32%
1979	718,102	120,511	838,613	N/A

(http://www.nature.nps.gov/stats/park.cfm?parkid=374)
"Total visits" is the total of recreational and non-recreational visits.
** Percentage change applies to total visits only.

In 2008, Papadogiannaki et al. conducted a visitor study at the Park that consisted of a winter survey (February 26 to March 3) that was distributed to 1,094 visitor groups (795 of which responded for a 72.2% response rate) and a spring survey (April 29 to May 5) that was distributed to 647 visitor groups (370 of which responded for a 57.2% response rate). The combined response rate for both surveys was 66.9%.

Based on the survey results, visitors to ENP ranged in age from 1 to 94 years in the winter survey and 1 to 90 years in the spring survey (***Figure 3-35***) (Papadogiannaki et al., 2008). In the winter survey, 57% of visitors were aged between 51 to 75 years and 7% were 15 years or younger with the remaining respondents falling in between these two age groups (***Figure 3-35***) (Papadogiannaki et al., 2008). In the spring survey, 41% of visitors were aged between 51 to 75 years and 12% were 15 years or younger with the remaining respondents falling in between these two age groups (***Figure 3-35***) (Papadgiannaki et al., 2008).

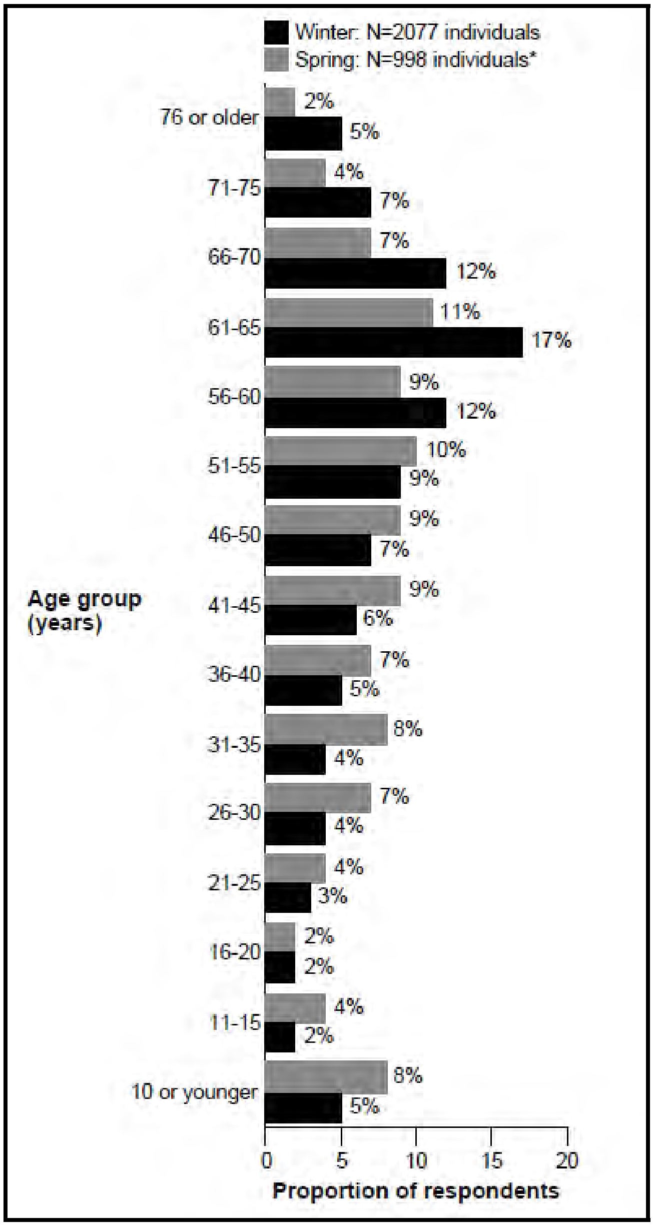


Figure 3-35 – Visitor Age (Papadogiannaki et al., 2008)

Based on the survey results, patrons visiting ENP consisted of groups of people of only one person to greater than four people, with the most common visitor group consisting of two people (***Figure 3-36***) (Papadogiannaki et al., 2008).

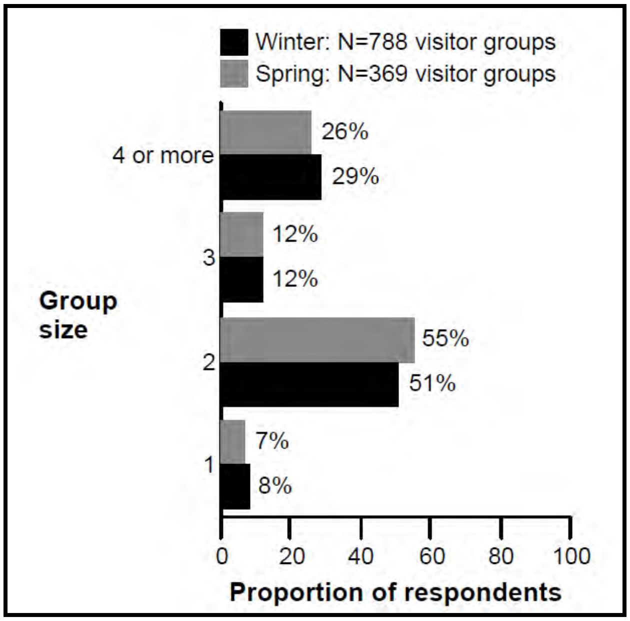


Figure 3-36 – Group Size (Papadogiannaki et al., 2008)

Based on the survey results, the visitor groups coming to ENP consisted mainly of friends and family, with a small proportion of visitor groups being categorized as "other" (i.e., church groups, business groups, clubs, etc.) (***Figure 3-37***) (Papadogiannaki et al., 2008). Of the visitors traveling with a group of people, a proportion of the visitors came to ENP as part of an organized group such as an educational/school group or a commercially guided tour (***Figure 3-38***) (Papadogiannaki et al., 2008).

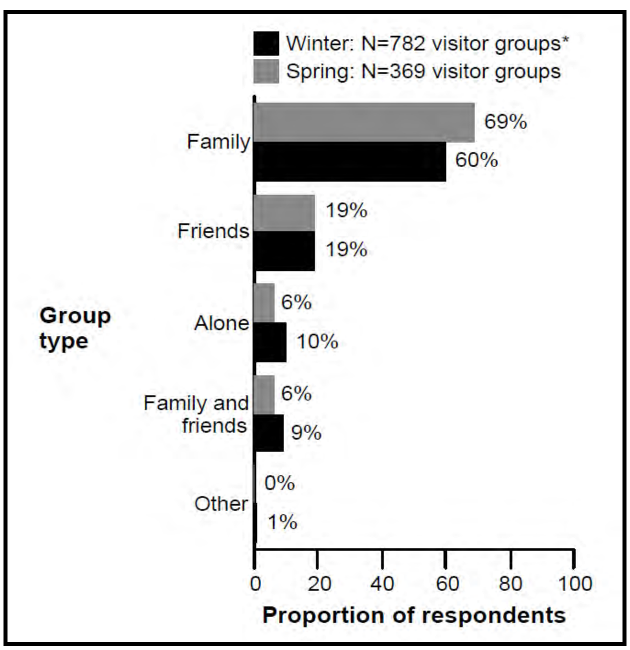


Figure 3-37 – Group Type (Papadogiannaki et al., 2008)

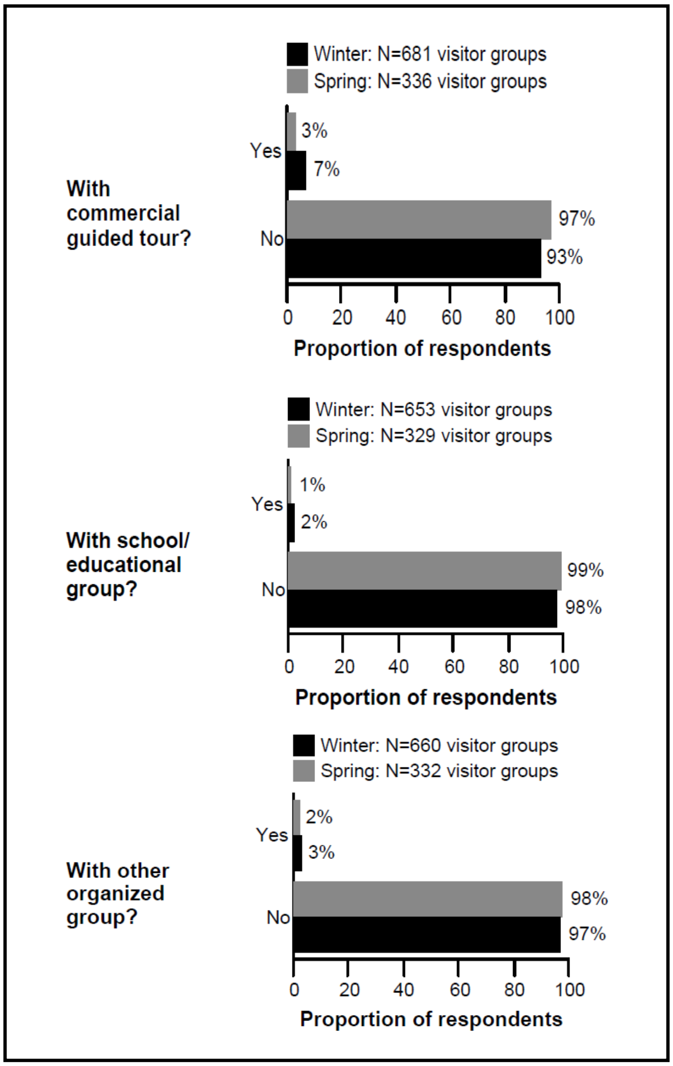


Figure 3-38 – Visitors with Organized Groups (Papadogiannaki et al., 2008)

U.S. visitors comprised 80% of total visitation to the park in the winter survey (***Table 3-15***). U.S. visitors to ENP in the winter survey came from 47 states and Washington, D.C., with the largest proportions from: Florida (32%), 7% Pennsylvania (7%), and Michigan (6%) (Papadogiannaki et al., 2008). U.S. visitors comprised 54% of total visitation in the spring survey (***Table 3-15***). U.S. visitors to ENP in the spring survey came from 34 states and Washington, D.C., with the largest proportions from: Florida (45%), California (8%), and Michigan (4%) (Papadogiannaki et al., 2008).

International visitors came from 19 countries and comprised 20% of total visitation to the Park during the winter survey period (***Table 3-16***). During the winter survey period, 21% of international visitors came from Canada, 20% came from Germany, 16% came from United Kingdom, 16% came from France, and smaller proportions came from 16 other countries (***Table 3-16***). International visitors came to visit ENP from 21 countries and comprised 46% of total visitation to the Park during the spring survey period (***Table 3-16***). During the spring survey, 36% of international visitors came from Netherlands, 23% came from Germany, 12% came from the United Kingdom, and smaller proportions came from 15 other countries (***Table 3-16***) (Papadogiannaki et al., 2008).

Table 3-15 – United States Visitors by State of Residence

Winter

State	Number of visitors	Percent of U.S. visitors N=1,529 individuals	Percent of total visitors N=1,902 individuals
Florida	483	32	25
Pennsylvania	100	7	5
Michigan	94	6	5
New York	72	4	4
Illinois	67	4	4
Ohio	56	4	3
Wisconsin	47	3	2
Massachusetts	44	3	2
Minnesota	43	3	2
Virginia	40	3	2
New Jersey	39	3	2
California	34	2	2
Maryland	31	2	2
Indiana	29	2	2
North Carolina	28	2	1
Vermont	28	2	1
Kentucky	25	2	1
Connecticut	23	2	1
Georgia	19	1	1
New Hampshire	19	1	1
27 other states and Washington, D.C.	208	14	11

Spring

State	Number of visitors	Percent of U.S. visitors N=499 individuals	Percent of total visitors N=917 individuals
Florida	226	45	25
California	40	8	4
Michigan	18	4	2
New York	17	3	2
Texas	15	3	2
Virginia	15	3	2
New Jersey	14	3	2
Washington	14	3	2
Massachusetts	12	2	1
Indiana	10	2	1
New Hampshire	10	2	1
North Carolina	10	2	1
22 other states and Washington, D.C.	98	20	11

(Papadogiannaki et al., 2008)

Table 3-16 – International Visitors by Country of Residence

Winter

Country	Number of visitors	Percent of international visitors N=373 individuals	Percent of total visitors N=1,902 individuals
Canada	80	21	4
Germany	76	20	4
United Kingdom	61	16	3
France	58	16	3
Netherlands	33	9	2
Sweden	26	7	1
Switzerland	6	2	<1
Italy	5	1	<1
Denmark	4	1	<1
Colombia	3	1	<1
Czech Republic	3	1	<1
Finland	3	1	<1
Ireland	3	1	<1
Israel	3	1	<1
Austria	2	1	<1
Belgium	2	1	<1
Norway	2	1	<1
Slovenia	2	1	<1
Australia	1	<1	<1

Spring

Country	Number of visitors	Percent of international visitors N=418 individuals	Percent of total visitors N=917 individuals
Netherlands	149	36	16
Germany	98	23	11
United Kingdom	49	12	5
Canada	36	9	4
France	31	7	3
Denmark	11	3	1
Switzerland	9	2	1
Belgium	6	1	1
Italy	5	1	1
Australia	4	1	<1
Czech Republic	4	1	<1
Sweden	3	1	<1
Iceland	2	<1	<1
Russia	2	<1	<1
South Africa	2	<1	<1
Spain	2	<1	<1
Austria	1	<1	<1
Estonia	1	<1	<1
Finland	1	<1	<1
New Zealand	1	<1	<1
Norway	1	<1	<1

(Papadogiannaki et al., 2008)

Aesthetics

The views along the project segment of the Tamiami Trail are somewhat limited and constrained. On the north side of the highway are the L-29 Canal and the L-29 Levee, which extend along the entire 10.7 miles of the project segment. The view of the north side of the canal and levee is broken up by several water control structures and the Tigertail Camp. A panoramic view of the sawgrass and occasional hammocks or tree islands is largely blocked by the height of the levee. On the south side, the view is often blocked by tall vegetation growing along the roadside. Occasional breaks allow some distance views.

Flight 592 Memorial

The ValuJet Flight 592 Memorial is located at the western end of the project area on the northern side of the L-29 Levee, about 250 feet from Tamiami Trail and about 11 miles west of Krome Avenue in Miami-Dade County. Access to the memorial is via the S-333 canal crossing. The site consists of a parking area and a sculpture/memorial consisting of 110 concrete pillars that symbolize each of the lives lost in the DC-9 crash on May 11, 1996. The pillars are arranged in a triangular pattern that points to the actual crash site eight miles away in the Everglades.

3.9 Park Management and Operations

Park management and operations at ENP is overseen by the superintendent, who is responsible for managing the staff, concessionaires and residents, and park programs (NPS, 2006). Park staff provides the full scope of functions and activities to accomplish management objectives, performing duties that include enforcement, resource protection and management, and interpretation and education. The discussion of park management and operations is broken down into the following program areas: education, maintenance, and enforcement.

Education and Interpretation

One of the primary functions of ENP, and all national parks, is to serve educational purposes (NPS, 2006). The NPS is committed to extending its leadership in education, building on what is in place, and pursuing new relationships and opportunities to make national parks even more meaningful in the life of the nation (NPS, 2006). Within the rich learning environments of ENP and facilitation by NPS interpreters, visitors would be offered authentic experiences and opportunities to enjoy one of the most beautiful and historic places in America (NPS, 2006).

The park's interpretive program is in place to encourage dialogue and accept that visitors have their own individual points of view. Factual information presented is current, accurate, based on current scholarship and science, and delivered to convey park meanings, with the understanding that visitors would draw their own conclusions. The education and interpretive program is also designed to reach out to park neighbors, segments of the population that do not visit the park, and community decision-makers to stimulate discussions about the park and its meanings in local, regional, and national contexts. In addition, interpretive services of the park are designed to help employees better understand the park's history, resources, processes, and visitors.

Maintenance

Everglades National Park currently has staff in the Maintenance Division. However, responsibility for the Park's natural resources and accompanying features also falls on the park's many scientists, planners, and managers.

There is a maintenance responsibility and cost for every asset that is administered by the NPS. The costs and the useful life associated with park features are directly related to the type and level of maintenance provided. Therefore, as outlined in the NPS *Management Policies 2006* for all park facilities, the NPS is committed to conducting a program of preventive and rehabilitative maintenance and preservation, including sustainable design.

Although originally constructed in the 1920s, Tamiami Trail has had modifications to the roadway to impact the maintenance history. In the 1960s parts of the roadway were widened to the east to accommodate larger vehicles; however, Tamiami Trail continued to remain only a one lane east-west roadway. Further modifications, including adding more lanes and significantly widening the road, planned in the 1960s and 1970s were discarded in favor of the construction of Alligator Alley (I-75) to the north.

Enforcement

The law enforcement program is an important tool in carrying out the NPS mission. The objectives of the NPS law enforcement program are (1) the prevention of criminal activities through resource education, public safety efforts, and deterrence; and (2) the detection and investigation of criminal activity and the apprehension and successful prosecution of criminal violators (NPS, 2006). In carrying out the law enforcement program, the Service would make reasonable efforts to protect the natural and cultural resources entrusted to its care and to provide for the protection, safety, and security of park visitors, employees, concessionaires, and public and private property (NPS, 2006).

Illegal activities that have occurred or may occur along the proposed improvements to Tamiami Trail which may require enforcement consist of:

- Littering and improper disposal of waste along the roadway.
- Illegal fishing activities in the surrounding waterways.
- Tampering with or harassing threatened and endangered wildlife.
- Trespassing on private or government property.

3.10 Noise/Soundscapes

All noise levels in this document are reported in decibels using the "A" weighting scale referred to as "dBA". This weighting scale correlates well with human response to traffic noise. Also, unless otherwise noted, all noise levels are reported as the one-hour equivalent noise level (LAeq1h). The LAeq1h represents the A-weighted steady-state noise level that contains the same acoustic energy over a one hour period as a fluctuating noise level due to a time varying source(s) over that same period.

Noise sensitive sites along the project corridor are found in three areas: the Flight 592 Memorial, Osceola Camp, and Tigertail Camp. These sites are described in ***Table 3-17***.

Table 3-17 –Noise Receiver Locations

Location	Receiver Number	Type	Building Row	Land Use Activity Category	Distance from Roadway Centerline [Existing/Build] (Feet)	Number of Noise Sensitive Sites
Flight 592 Memorial	Flt592	Park	N/A	B	300/312	N/A
Osceola Camp	OC-1	Residential	1ST	B	90/78	1
	OC-2	Residential	2ND	B	155/143	3
	OC-3	Residential	3RD	B	210/197	6
	OC-4	Residential	2ND	B	165/153	1
	OC-5	Residential	1ST	B	110/98	3
Tiger Tail Camp	TTC-1	Residential	1ST	B	195/207	5
	TTC-2	Residential	1ST	B	195/207	5

Measurements of existing ambient noise levels along the project corridor were performed at two locations using procedures defined in the FHWA report *Measurement of Highway-Related Noise* (FHWA-PD-96-046). The field measurements were conducted over 16.5 hour periods during September and October 2000 at the Osceola Camp and at the Tiger Tail Camp. The average LAeq (1hr) noise levels were 65.8 dBA at the Osceola Camp and 58.4 dBA at the Tiger Tail Camp and the peak hour noise levels were 68.0 dBA and 61.0 dBA, respectively. Noise level, site and traffic data gathered during the field measurements were used to develop inputs to the FHWA's Traffic Noise Model (TNM) for computer models representative of the existing conditions. These data were used to verify that representative models of the existing conditions could be developed. The average error for all of the field measurement sites fell within the ±3.0 dBA verification limit using TNM in accordance with Chapter 17 of the FDOT Project Development and Environment (PD&E) Manual, and further use of the TNM model on this project was supported.

This study evaluated predicted noise levels for the existing conditions, future without project conditions, and the proposed project alternatives. Existing peak-hour traffic noise levels were predicted for all of the nearby noise sensitive sites using TNM. Locations selected for modeling were based on site characteristics including topography, number of buildings, building arrangement, recreation or other outdoor use areas, building location with respect to the highway, and site features such as fences and walls. ***Table 3-18*** presents project area traffic data used to evaluate worst-case traffic noise levels for each of these conditions. A peak-season factor of 160 percent was applied to the project design hour volumes to account for heavier tourist-season traffic and for consistency with previous phases of the noise analysis for this project. The purpose of using this factor was to estimate the expected worst-case traffic noise levels at the nearby noise sensitive sites and to provide a conservative estimate of traffic noise impacts along the entire project corridor.

Table 3-18 – Project Area Traffic Data

Year	AADT (vehicles/day)	Peak Hour Factor (K_{30})	Design Hour (vehicles/hour)	Peak Season Design Hour (vehicles/hour)	Truck Factor	Average Speed (mph)
2018	5,800	8.07%	468	749	11.5%	55
2038	7,200	8.07%	581	930	11.5%	55

(USACE, 2009)

Table 3-19 presents the peak-hour traffic noise levels for the existing conditions at the Flight 592 Memorial and the two camps. Worst-case existing noise levels at the Flight 592 Memorial are predicted to be 57.3 dBA. At the Osceola Camp, worst-case existing noise levels are predicted to range from 54.8 dBA in the third row of homes to 67.3 dBA at a home directly adjacent to Tamiami Trail. Worst-case existing noise levels at the Tiger-Tail Camp are predicted to range from 57.2 to 58.3 dBA.

Table 3-19 – Existing Peak Hour Noise Levels

Location	Receiver	Predicted Existing (2009) Traffic Noise Levels (dBA)
Flight 592 Memorial	Flt592	57.3
Osceola Camp	OC-1	67.3
	OC-2	58.3
	OC-3	54.8
	OC-4	59.1
	OC-5	60.7
Tiger Tail Camp	TTC-1	57.2
	TTC-2	58.3

3.11 Socioeconomics

This section includes a description of the local economy and demographics of the study area. This descriptive information provides insight into the study area's socioeconomic characteristics, and provides part of the basis for different facets of the economic impact evaluation work in the remainder of the EIS.

The people who live in the study area, and the economic activity, in which they are engaged, comprise important components of the area's total environment. In addition to the direct use of this data for the water use projections and other social effects (OSE) mentioned above, residents of the study area represent the socioeconomic environment for the other impact topics of flooding, water use shortages, fishing, recreation, and navigation.

Adverse changes in the health and condition of the natural system can cause severe negative impacts on the economic system, particularly in the study area for this feasibility study. Conversely, in this study area, beneficial changes to the natural system are expected to have a strong positive effect on the economic system. It is significant, therefore, to describe and understand the general economic and social environment within which such changes could take place. Although the main focus of economic impact evaluation efforts undertaken for this study has been to describe the economic impacts and benefits of alternatives being considered for implementation, describing the broader context for these evaluation efforts is also necessary and important.

For the purposes of this study the project area is divided into a three proximity zones based on incremental distance relative to the project area. The zones are defined as follows:

- Zone 1: Area within 3 miles of the project area.
- Zone 2: Area within 5 miles of the project area.
- Zone 3: Area within 7 miles of the project area.

These zones are further broken down into census tracts. As of this writing, the 2000 census data is most current available at the census tract level with the exception of 2007 population figures.

Much of the socioeconomic data for the study area is derived from census tract, parcel, and land use GIS data. The proximity zones are a method for aggregating this data based on distance relative to the study area. A zone may incorporate a particular tract and all the data associated with it even though there is area outside the proximity of the zone in question due to overlapping.

Miami-Dade County is located in Southeastern Florida bordered by Broward County to the north, the Atlantic Ocean to the east and south, and Monroe County to the west, and Collier County to the northwest. The county encompasses 1,946 square miles of land, and 485 square miles of water. The county's interior makeup is characterized by: substantial urban development to the east along the coastline; WCAs in the northwest corner; agricultural land concentrated in the center of the county; and ENP comprising vast portions of Miami-Dade, from the center of the county to its western and southern extents.

3.11.1 Demographics

3.11.1.1 Population

Miami-Dade County has a population of 2,462,292 persons, and a population density of 1,265 persons per square mile (UF BEBR, 2008). It is the most populous county in Florida, and the eighth most populous county in United States, comprising half of the total South Florida metropolitan area population(Miami-Dade, Fort Lauderdale, and Palm Beach counties).

All counties within District 11 have slower growth rates than the state as a whole. Current trends indicate Monroe County is expected to lose population between 2007 and 2035, while Broward County is projected to grow faster than Miami-Dade. Though Miami-Dade remains Florida's most populous county, current statistics indicate the percentage of Floridians residing in Miami-Dade have declined 3.5 percent between 1980 and 2000. Furthermore, projections out to 2035 suggest that this trend would continue. See ***Table 3-20*** for greater detail.

Table 3-20 – Projected Population Totals (2007 – 2035)

Population Projections 2007-2035 (1,000)								
	Year							% Change (2007-2035)
	2007	2010	2015	2020	2025	2030	2035	
Florida	18,680.4	19,308.1	20,955.9	22,477.9	23,955.1	25,340.7	26,616.6	42%
Broward	1,765.7	1,806.3	1,915.8	2,016.4	2,113.4	2,203.9	2,286.7	30%
Miami-Dade	2,462.3	2,512.3	2,645.5	2,768.3	2,886.8	2,997.2	3,098.3	26%
Monroe	79.0	78.7	77.8	77.0	76.3	75.5	74.9	-5%
% of Floridians Residing in Miami-Dade	13.18%	13.01%	12.62%	12.32%	12.05%	11.83%	11.64%	-1.54%

(UF BEBR, 2008)

Although Florida's population growth rates are declining, Miami-Dade's historic and projected growth rate is significantly lower than that of the state. Population in Florida and Miami-Dade is expected to grow by almost 8 million and 636,000 respectively from 2007 to 2035. Miami-Dade is expected to remain the States most populous county even with declining population growth rates. ***Table 3-21*** is illustrative of the trend of declining rates of population growth for Miami Dade County.

Table 3-21 – Projected Population Growth Rates (2007 – 2035)

Average Annual Projected Population Growth Rates 2007-2035							
	Year						Avg. Annual Growth Rate (2007-2035)
	2007-2010	2010-2015	2015-2020	2020-2025	2025-2030	2030-2035	
Florida	1.1%	1.7%	1.5%	1.3%	1.2%	1.0%	1.3%
Broward	0.8%	1.2%	1.1%	1.0%	0.9%	0.8%	0.9%
Miami-Dade	0.7%	1.1%	0.9%	0.9%	0.8%	0.7%	0.8%
Monroe	-0.1%	-0.4%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%
% of Floridians Residing in Miami-Dade	-0.4%	-0.6%	-0.5%	-0.4%	-0.4%	-0.3%	-0.4%

(UF BEBR, 2008)

Southeastern Florida's densely populated urban areas and growing population have fueled the westward development of agricultural and unimproved lands, closer to ENP and Tamiami Trail. According to 2007 Census tract data, there are approximately 179,715 persons within 7 miles of the Tamiami Trail project area, 16 percent more than 2000 Census estimates.

Zone 1 encompasses 94 square miles and incorporates one census tract with an estimated 2007 population of 30,504 persons, up 107 percent from 2000. Tract 101.46, and is located on the eastern tip of the project area.

Zone 2 overlaps three census tracts including 101.46, accounted for in zone 1. It comprises 188 square miles and has a combined 2007 population of 61,049 persons, up 79 percent from 2000. All three tracts are located in the eastern section of the zone.

Zone 3 has an area of 307 square miles and defines the extent of the study area. It groups 22 census tracts including the aforementioned, and has a combined 2007 population of 179,715 persons, up 16 percent from 2000 figures. The combined area of the tracts exceeds the area of the proximity zone in this case, due to the inclusion of tract 115. Census tract 115 is the largest and least populous tract in the study area with a population density of 7 persons per square mile. With an estimated population of 6,446, its numbers have grown by over 24 percent between 2000 and 2007. While this tract overlaps all three proximity zones, its data is only associated with zone 3 due to the location of its geometric centroid. This tract comprises large sections of ENP and the WCAs in the northwest section of Miami-Dade County. See ***Table 3-22*** for a breakdown of proximity zone population data.

Table 3-22 – Population Data for Each Proximity Zone (2007)

	Zone 1	Zone 2	Zone 3
Zone Area (sqmi)	94	188	307
Census Tract Area (sqmi)	11	19	1,056
Population 2000	14,710	34,148	179,715
Population 2007	30,504	61,049	215,214
% Change 2000-2007	107.4%	79%	16%
Population Density 2007 (p/sqmi)	2,733	541	168

(U.S. Census Bureau, 2000)

3.11.1.2 Households

Miami-Dade County's household numbers are the largest in the planning district with the highest rate of growth between 2000 and 2007. However, household growth is less than that of the state as a whole during the same period. See ***Table 3-23*** for more detail.

Table 3-23 – Households (2007)

	Total	% Change (2000-2007)	Avg. Household Size
Florida	7,443,963	17%	2.45
Broward	702,139	7%	2.48
Miami-Dade	862,750	11%	2.8
Monroe	35,610	2%	2.18

(UF BEBR, 2008)

<u>Race and Ethnicity</u>

Florida's racial and ethnic make-up is essentially 80 percent white and 17 percent black as of 2007. Individuals of Hispanic origin have seen large numerical increases in recent years, and constitute a majority of the population in Miami-Dade County. See ***Table 3-24*** for greater detail.

As of 2000, the individuals in this area were overwhelmingly of Hispanic origin. The percentages of blacks in the study area are significantly lower than for Miami-Dade County as a whole.

Table 3-24 – Racial and Ethnic Make-up

Race and Ethnicity				
	Florida	**Broward**	**Miami-Dade**	**Monroe**
Population, 2007	18,680,367	1,765,707	2,462,292	78,987
Population Change (2000-2007)	16.9%	8.8%	9.3%	-0.8%
White, 2007	80.6%	65.8%	71.9%	89.4%
Black, 2007	16.6%	24.2%	19.7%	5.5%
Other, 2007	2.8%	10.0%	8.4%	5.1%
Hispanic Origin	20.8%	22.7%	61.9%	19.3%

(U.S. Census Bureau, 2005-2007; UF BEBR, 2008)

Age

Current statistics illustrate an aging trend for Miami-Dade County and the state of Florida as a whole. The median age for the state of Florida and Miami-Dade County increased by 2 percent and 7 percent respectively from 2000 to 2007. Miami-Dade's median ages is the lowest in the planning district, and lower than the state as a whole. However the percentage change in its median age from 2000 to 2007 is greater than that of the state. Monroe County has the highest median age and the greatest acceleration in percentage terms during the same time period. See ***Table 3-25*** for greater detail.

The median age averaged for each proximity zone is between 35 and 36, similar to that of Miami-Dade County. The median age range for the 22 census tracts that constitute zone 3 are between 30 and 40.

Table 3-25 – Median Age

Median Age	2000	2007	% Change
Florida	38.7	39.9	3.10%
Broward	37.8	38.4	1.59%
Miami-Dade	35.6	37	3.93%
Monroe	42.6	45.3	6.34%

(U.S. Census Bureau, 2005-2007)

Table 3-26 compares the aging trend of the three state planning district with that of Florida as a whole. While Miami-Dade shows percentage increases in each category, the two eldest categories are significantly higher than the state as a whole and Broward County. Of individuals 65 years or older, Miami-Dade had the highest percentage increase in the planning district, and greater than the state as a whole. Only Monroe County's surpassed Miami-Dade in percentage increase in individuals of 62 years or older.

Table 3-26 – Aging Trends

	Florida	Broward	Miami-Dade	Monroe
	2000-2007	2000-2007	2000-2007	2000-2007
18 years and over	0.65%	-0.26%	2.13%	0.97%
21 years and over	0.68%	-0.55%	1.97%	1.74%
62 years and over	-1.97%	-7.14%	8.18%	10.67%
65 years and over	-3.98%	-11.80%	8.27%	4.11%

(U.S. Census Bureau, 2005-2007)

Table 3-27 – Proximity Zone Demographics

	Zone 1	Zone 2	Zone 3
Households	3,558	9,115	52,924
White	12,486	29,577	153,660
Black	1,246	1,726	7,463
Hispanic Origin	11,536	27,027	140,965
Median Age	36	35	35

(U.S. Census Bureau, 2000)

3.11.2 Economy

Generally, a strong wholesale and retail trade, government and service sector characterize Florida's economy. Florida's warm weather and extensive coastline attract vacationers and other visitors, making the state a significant retirement destination for people all over the country. Agriculture is an important sector of the state's economy, and is significant to portions of the study area. Manufacturing has played less of a role in Florida in comparison to the national economy, but a high technology manufacturing has begun to emerge as a significant sector in the state over the last 15 years.

Table 3-28 illustrates some basic economic indicators for the state of Florida as a whole, and the counties that make up Planning District 11 based on the 2005 – 2007 American Community Survey. ***Table 3-29*** illustrates similar data for at the state, county, and study area level based on the 2000 decennial census. While Monroe County has a smaller and older population, it also consistently has the lowest unemployment, and highest personal per capita and median household income of the three counties.

The 2000 decennial census data collected for the study area show significant differentiation from Miami-Dade County as a whole. The area within seven miles of the Tamiami Trail project tended to have lower unemployment, lower percentages of blacks, higher percentages of whites, and higher median household income than Miami-Dade County as a whole. The number of persons of Hispanic origin, tended to be substantially larger than the county average. Individuals living in this area are much less likely to be below the poverty level in comparison to the rest of Miami-Dade. While average median household income for the study area was larger, per capita income for the study area was less than that of than that of the State of Florida and Miami-Dade County. See ***Table 3-29*** for greater detail.

Table 3-28 – Regional Economic Indicators (2005-2007)

	Florida	**Broward**	**Miami-Dade**	**Monroe**
Population-2007 (1,000)	18,680.4	1,765.7	2,462.3	79.0
Unemployment (ACS 2005-2007)	6.0%	6.0%	6.3%	2.8%
Per Capita Income (ACS 2005-2007)	26,125	27,950	22,479	39,254
Median Household Income (ACS 2005-2007)	46,602	51,221	41,943	55,550
% Below Poverty Level (ACS 2005-2007)	12.6%	11.3%	13.2%	6.1%
White	80.6%	65.8%	71.9%	89.4%
Black	16.6%	24.2%	19.7%	5.5%
Hispanic Origin	20.1%	22.7%	61.9%	18.0%

(U.S. Census Bureau, 2005-2007; UF BEBR, 2008)

Table 3-29 – Population and Economic Indicators (1999-2000)

	Florida	**Broward**	**Monroe**	**Miami-Dade**	**ZONE-1**	**ZONE-2**	**ZONE-3**
2000 Population	**15,982,378**	**1,623,018**	**79,589**	**2,253,362**	**14,710**	**34,148**	**179,715**
% Unemployment	**3.2%**	3.3%	2.0%	**5.0%**	2.5%	3.3%	**4.1%**
Per Capita Income	**21,557**	23,170	26,102	**18,497**	17,580	18,299	**17,025**
Median Household Income	**38,819**	41,691	42,283	**35,966**	60,679	58,602	**48,788**
% Below Poverty	**12.5%**	11.5%	10.2%	**18.0%**	3.4%	4.8%	**8.3%**
Total Housing Units	**7,302,947**	741,043	51,617	**852,278**	3,665	9,374	**54,759**
Households	**6,337,929**	654,445	35,086	**776,774**	3,558	9,115	**52,924**
White	**78.0%**	70.6%	90.7%	**69.7%**	84.9%	86.6%	**85.5%**
Black	**14.6%**	20.5%	4.8%	**20.3%**	8.5%	5.1%	**4.2%**
Hispanic Origin	**16.8%**	16.7%	15.8%	**57.3%**	78.4%	79.1%	**78.4%**

Industry Employment

According to the 2005-20007 American Community Survey estimates, the three most significant industrial employment sectors in the Miami-Dade economy are: educational services and health care and social assistance (~19%); retail trade (~12%); and professional, scientific, and management and administrative and waste management services (~12%). In terms of industrial employment percentages, Miami-Dade's economy is quite similar to the state of Florida as a whole. ***Table 3-30*** illustrates Miami-Dade County's industrial employment numbers in comparison with the state of Florida and the other counties in Planning District 11.

Table 3-30 – Industrial Employment ACS (2005-2007)

	Florida	Broward	Monroe	Miami-Dade
Civilian employed population 16 years and over	**8,204,726**	**863,562**	**39,318**	**1,083,842**
Educational services, and health care and social assistance	18.5%	17.80%	10.20%	18.90%
Retail trade	12.8%	13.10%	13.30%	11.40%
Professional, scientific, and management, and administrative and waste management services	11.5%	12.50%	10.00%	11.80%
Arts, entertainment, and recreation, and accommodation, and food services	10.4%	9.50%	21.40%	9.10%
Construction	10.3%	8.40%	9.40%	9.20%
Finance and insurance, and real estate and rental and leasing	8.5%	9.40%	8.80%	8.50%
Manufacturing	5.9%	5.50%	2.00%	5.70%
Transportation and warehousing, and utilities	5.1%	5.70%	7.60%	7.60%
Other services, except public administration	5.1%	5.60%	3.70%	6.00%
Public administration	4.8%	4.50%	9.00%	3.80%
Wholesale trade	3.6%	4.80%	2.20%	5.20%
Information	2.4%	3.10%	1.00%	2.30%
Agriculture, forestry, fishing and hunting, and mining	1.0%	0.20%	1.60%	0.50%

(U.S. Census Bureau, 2005-2007)

Statistics on industry employment at the census tract level is available only on a decennial basis. In order to compare the study area industrial employment with state and regional, it was necessary to use the 2000 figures. The study area is fairly representative of Miami-Dade and the state as a whole in terms percentages of industrial employment.

According to 2000 census tract data there is little variation between the industrial employment make-up of the study area and Miami-Dade County. The only relatively significant difference in industrial employment between Miami-Dade and the study area is in the arts, entertainment, recreation and food services sector. Miami-Dade as a whole surpasses the study area by almost 3 percentage points in this area of industrial employment. ***Table 3-31*** provides greater detail on the comparison between study area, county, and state industrial sector employment.

Table 3-31 – Industrial Sector Employment by State, County, and Study Area

	Florida	Broward	Monroe	Miami-Dade	ZONE-1	ZONE-2	ZONE-3
Employed civilian population 16 years and over; Number	**6,995,047**	**758,939**	**41,181**	**921,208**	**6,005**	**14,824**	**78,147**
% Educational, health and social services	**18.1%**	17.8%	11.9%	**18.0%**	14.9%	17.4%	**17.1%**
% Retail trade	**13.5%**	14.1%	12.9%	**12.3%**	14.5%	12.8%	**14.0%**
% Professional, scientific, management, administrative, and waste management services	**10.6%**	11.7%	8.3%	**11.6%**	10.7%	11.9%	**11.3%**
% Arts, entertainment, recreation, accommodation and food services	**10.5%**	9.2%	22.3%	**9.1%**	4.0%	5.6%	**6.7%**
% Finance, insurance, real estate, and rental and leasing	**8.1%**	9.1%	6.8%	**8.0%**	15.2%	12.8%	**9.9%**
% Transportation and warehousing, and utilities	**5.3%**	5.7%	5.9%	**7.5%**	10.6%	9.5%	**8.7%**
% Manufacturing	**7.3%**	6.7%	2.0%	**7.1%**	5.9%	5.0%	**5.9%**
% Construction	**8.0%**	7.4%	9.3%	**6.9%**	7.3%	5.9%	**6.6%**
% Wholesale trade	**4.0%**	4.6%	2.3%	**6.0%**	6.3%	7.3%	**6.7%**
% Other services (except public administration)	**5.1%**	5.4%	5.0%	**5.6%**	3.0%	4.4%	**5.1%**
% Public administration	**5.2%**	4.5%	7.9%	**4.1%**	4.7%	3.7%	**3.9%**
% Information	**3.1%**	3.7%	2.1%	**3.1%**	2.8%	3.5%	**3.4%**
% Agriculture, forestry, fishing and hunting, and mining	**1.3%**	0.3%	3.5%	**0.7%**	0.1%	0.1%	**0.8%**

(U.S. Census Bureau, 2005-2007)

<u>Unemployment</u>

The unemployment rate for Florida and Miami-Dade was 6 percent, and 6.3 percent respectively according to American Community Survey 2005 to 2007 three year estimates. Monroe County had the lowest unemployment for Planning District 11 at 2.8 percent. See ***Table 3-27*** for greater detail.

Unemployment rates for the proximity zones tended to be lower than Miami-Dade County and the State of Florida for 2000 ranging between 2 and 4 percent for the year 2000.

<u>Per Capita Income</u>

Personal per capita income in Florida is $26,125 but somewhat lower for Miami-Dade County at $22,479. Monroe and Broward County had higher personal per capita income than the state of

Florida and Miami-Dade at $39,254, and 27,950 respectively. ***Table 3-31*** displays some key economic indicators for District 11.

According to 2000 census figures, personal per capita incomes averaged for the census tracts that constitute zones 1, 2, and 3 was 17,580, 18299, and 17,025 respectively. Per capita income for the study area was less than Miami-Dade, and the state of Florida as a whole.

<u>Median Household Income and Poverty</u>

Of the three counties, Monroe County had the highest median household income at $55,550 with Broward coming in next at $51,221. Miami-Dade was alone in having lower median household income than the state average of $46,602 as a whole, at $41,943. Monroe's percentage of residents living below the poverty level was 6 percent, the lowest in the region. Miami-Dade had the largest percentage of residents living below the poverty level in the region at 13.2 percent.

The average median household income for the census tracts constituting the study area was larger than that of Miami-Dade County by almost $13,000 according to 2000 census tract data. While the percentage of people below the poverty level was 18 percent for Miami-Dade, it was 8.3 percent for the census tracts constituting the study area. See ***Table 3-28*** for greater detail.

3.12 Transportation

The original Tamiami Trail was constructed in the late 1920s and early 1930s primarily by digging the canal by steam shovel and placing the spoil ahead to create the roadbed. In the mid-1940s, about 38 bridges were added at various locations on the Tamiami Trail, 19 of which were within the project area. In the early 1950s, the bridges were removed and replaced with the culvert sets that are currently in place. In 1968, the shoulders were widened and the pavement was overlaid. In 1970, a guardrail was added on the north side. At some time in the 1980s or 1990s, another guardrail was added on the south side of the road. Finally, in 1993, the shoulders were widened, and the mainline pavement was resurfaced. (USACE, 2008)

The Tamiami Trail serves as a major part of South Florida's transportation infrastructure. Using State Road 60 near Tampa as an initial reference point, Tamiami Trail is the final 275 miles of US Highway 41. Starting from Tampa, it passes through Gibsonton, Ruskin, Bradenton, Sarasota, Naples, and terminates in Miami. As the trail bisects Miami-Dade County, it forms the northern boundary of ENP, and the southern boundary of WCA-3.

The segment of highway in Miami-Dade County is located approximately 26 miles south of Interstate-75, another major east-west route across South Florida. Since Tamiami Trail parallels Interstate-75 across South Florida, the highway serves as an alternate hurricane evacuation route for residents of both coasts. To the south is US Highway-1, which intersects the Tamiami Trail in eastern Miami-Dade County and provides thoroughfare to the Florida Keys.

In addition to providing a major transportation link between South Florida's east and west coast population centers, the highway provides passage through Big Cypress National Preserve and a Miccosukee Indian Tribe reservation. Tamiami Trail also serves as the sole overland access route to two Miccosukee Indian tribal camps (Osceola and Tiger Tail) and several commercial airboat concessions. As a scenic byway, Tamiami Trail provides motorized and non-motorized travelers with 50 miles of picturesque landscape and wildlife viewing opportunities.

Traffic volume along Tamiami Trail within the proposed project area was estimated to be 5,375 vpd in 2000 (USACE, 2005) with the latest (2008) traffic estimate at 5,200 vpd (USACE, 2009), therefore traffic volume has shown no net increase in almost a decade. By 2018 traffic volume is anticipated to increase to 5,800 vehicles or by only 600 vpd (USACE, 2009). All projected traffic volume increases are anticipated to be due to increases in South Florida population and not as a result of the construction of the proposed project.

The road is currently in need of maintenance. The asphalt surface of the road has surface environmental stress cracks and subsurface fatigue cracks. Based on FDOT's *Flexible Pavement Survey Handbook* in 2000 the Pavement Condition Rating, by which road surfaces are rated on a scale of 1 to 10, the Tamiami Trail would receive an FDOT rating of 6. Whenever a road is rated at 6 or below, repair actions are typically required. Because of pavement deterioration in terms of cracking, rutting, and ride, FDOT determined that the portion of the Tamiami Trail within the project area is in need of rehabilitation.

3.13 Hazardous, Toxic, and Radioactive Waste

A Phase I HTRW Assessment for the Tamiami Trail Modifications: Next Steps project in Miami-Dade County, Florida was completed in September 2009.

According to the HTRW Assessment, Four (4) contaminated sites were identified as Recognized Environmental Concerns (RECs) within the project corridor. Two (2) contaminated sites were also identified outside but adjacent to the project corridor. The two sites outside of the project corridor were classified as being cross hydrologic gradient to the project corridor and therefore do not create any concerns for the proposed Tamiami Trail Bridge Project construction activities. The four (4) RECs identified in the Phase I HTRW Assessment report are discussed below.

1. Salem Radio Facility Roadside Ditches (N 25º45.658', W 80º32.837'): The HTRW Assessment reported that a previous environmental assessment had discovered concentrations of cis- and trans- 1,2-Dichloroethene, Trichloroethene, 4-Isopropyltoluene, and vinyl chloride in the surface water observed in the ditches along the access roads (dirt roads) leading to the Salem Radio facility. The HTRW Assessment (2009) indicated that solid waste currently fills the ditches and classifies this site as a Low risk REC for the proposed Tamiami Trail Bridge project.

   Based on the available information, it is likely that this facility poses a High risk REC to the proposed project corridor as filling the surface water ditches with solid waste could have caused migration (both vertically and horizontally) of the contaminants found in the surface water.

2. Coopertown (N 25º45.658', W 80º33.668'): The HTRW Assessment reported that Arsenic was discovered in soil samples collected adjacent to septic tank at the site, and that the Arsenic concentrations exceeded the FDEP's Soil Cleanup Target Levels (SCTLs). The OHC HTRW Assessment Report stated that the land owner had recently contracted a consultant to remediate the site; however no cleanup efforts have been initiated at the site as of the writing of this EIS. The HTRW Assessment Report gave this REC a ranking of "Low".

   A review of current regulatory files at Miami Dade Department of Environmental Resources Management (DERM) indicated a correspondence from MACTEC dated October 13, 2009 referred to the completion of the Arsenic source removal project at Coopertown by October 15, 2009. A URS representative contacted the Project Engineer Mr. Jonathan Bulley at MACTEC on November 6, 2009 to confirm the project status. Mr. Bulley indicated that MACTEC completed a small source removal excavation around a monitoring well per DERM's request and a report had just recently been submitted for DERM's review. Mr. Bulley also indicated that it was a small excavation that did not exceed more that one foot below land surface and the arsenic concentrations were only just above back ground levels and were confined to the soils. Per Mr. Bulley, arsenic did not exist in the groundwater at the site. Based on this information Coopertown does create a REC for the proposed project corridor, and that the site be ranked as “Low”, pending DERMs comments on the source removal conducted by MACTEC.

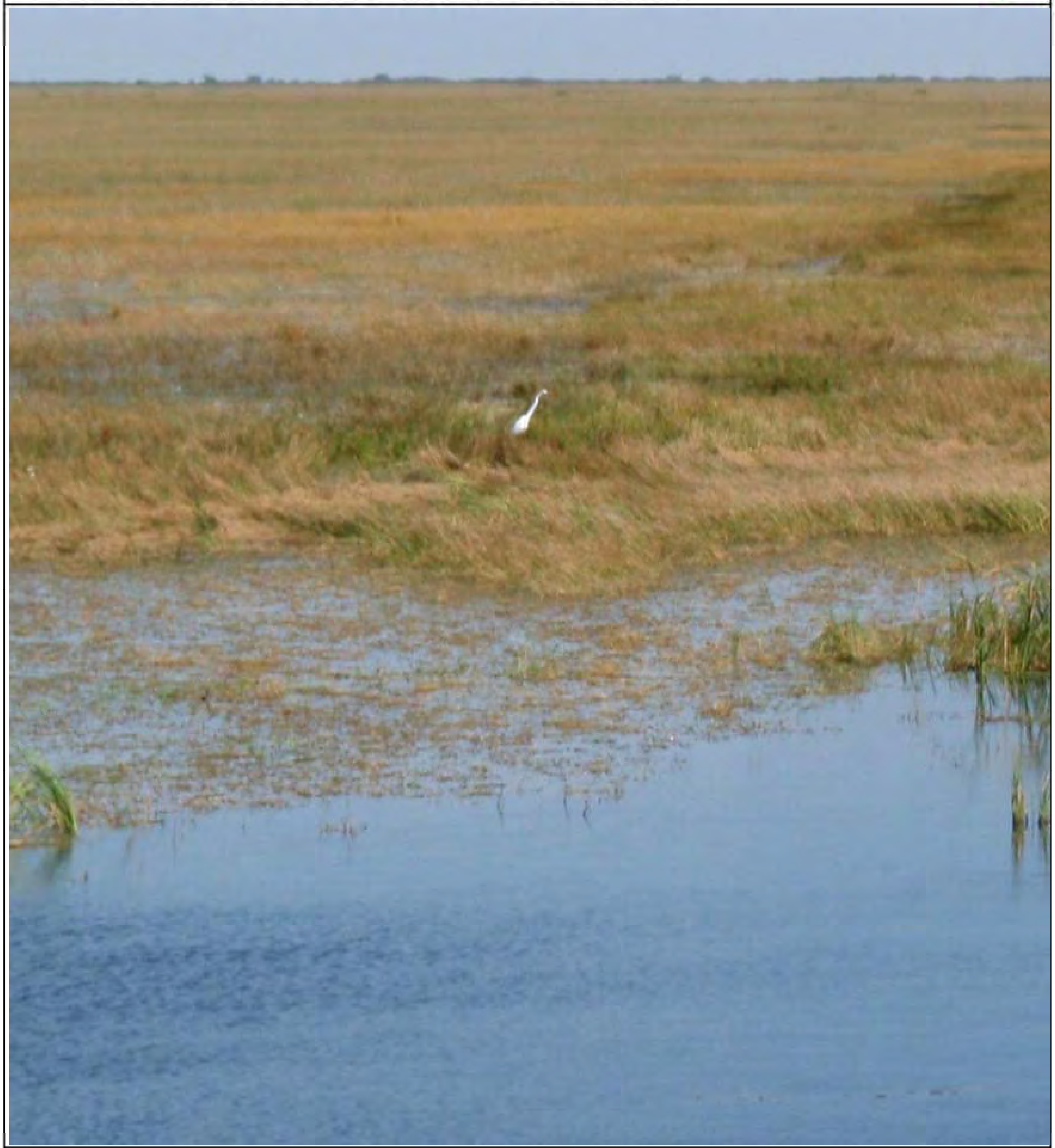
3. Gator Park (N 25º45.658’, W 80º34.867’): The HTRW Assessment reported that a previous report from Law Engineering from 2001-2002 stated that groundwater quality had been impacted by petroleum discharge(s) at the site from a former Leaking Underground Storage Tank (LUST) that has since been removed from the site. The report preparers were unable to obtain more recent data for the site. The HTRW Assessment Report gave this REC a ranking of “Low”.

   The HTRW indicated that the previous consultant recommended notifying the regulatory agency that the elevated levels of organic compounds were found in the vicinity of the tank farm. However, no documentation with regards to either a notification of discharge or any assessment/remedial action was found in the regulatory files. Based on the available information it is likely that this site poses High risk REC to the proposed project corridor.

4. Everglades Safari (N 25º45.658’, W 80º37.548’): The HTRW Assessment reported that groundwater sampling conducted in 2005 showed that six onsite monitoring wells yielded detectable concentrations of Volatile Organic Aromatics (VOAs) and PAHs. Additionally, concentrations in two of the six wells exceeded the FDEP’s Groundwater Cleanup Target Levels (GCTLs) for benzene, Methyl Tertiary Butyl Ether (MTBE), naphthalene, 1-methylnapthalene, and 2-methylnapthalene. The contamination is attributed to an older LUST that has since been removed, and fluids leaking from tourist busses over the years. Additionally, three (3) three thousand (3,000) gallon ASTs exist at the site on a concrete pad, however no secondary spill containment was visible in the photograph. The HTRW Assessment Report gave this REC a ranking of “High”.

   A Site Assessment Report Addendum completed by MACTEC in December 2008 for Everglades Safari revealed that only one well having compounds exceeding the FDEP GCTLs. Well MW-5 had concentrations of Benzene at 67µg/L and 49.3µg/L on 9/16/06 and 5/18/07 respectively. These concentrations exceeded the FDEP GCTLs of 1µg/L, but were below the FDEP Natural Attenuation levels of 100 µg/L. All other compounds were below GCTLs. In the December 2008 Site Assessment Report Addendum, MACTEC proposed a source removal around MW-5 that was estimated to cost $71,300. No additional information was available for the site. A phone call to Everglades Safari on November 4, 2009 revealed that no remediation has occurred at the site this calendar year. It is likely that Everglades Safari does create a REC for the Tamiami Bridge Project, and that the site be ranked as “High” based on the documented concentrations of Benzene in MW-5 from 2006 and 2007.

EVERGLADES NATIONAL PARK
TAMIAMI TRAIL MODIFICATIONS: NEXT STEPS
FINAL ENVIRONMENTAL IMPACT STATEMENT



CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

For each impact topic discussed in Chapter 3, Affected Environment, the "environmental consequences", or potential impacts, of each of the alternatives (or groupings of alternatives if impacts are similar in nature) to each of the resources or values (i.e., impact topics) is analyzed. This section analyzes both beneficial and anticipated adverse impacts that would likely result from the implementation of any of the alternatives considered. This section also summarizes the laws and policies relevant to each impact topic and explains the general methodology used to analyze impacts, including definitions of impact thresholds for measuring the intensity of impacts. An assessment of whether or not impairment of a resource would occur is also provided for natural and cultural resources.

4.1 Methodology for Establishing Impact Thresholds and Measuring Effects by Resource

The general approach for measuring the effects of the alternatives on each resource category includes general analysis methods as described in guiding regulations, basic assumptions, thresholds used to define the level of impact resulting from each alternative, methods used to evaluate the cumulative effects, and the methods and thresholds used to determine if impairment would occur for those applicable impact topics. The analysis of impacts follows CEQ guidelines and *Director's Order 12* procedures (NPS, 2001).

4.1.1 General Analysis Methods

Potential impacts of all alternatives are described in terms of type (Are the effects beneficial or adverse?); context (Are the effects site-specific, local, or regional?); duration (Are the effects short-term or long-term?); and intensity (Are the effects negligible, minor, moderate, or major?). Because definitions of intensity vary by impact topic, intensity definitions are provided separately for each impact topic analyzed in this document. In some cases, alternatives were grouped together in the analysis when impacts were determined to be similar in order to minimize redundancy.

Each alternative is compared to a baseline to determine the context, duration, and intensity of the resource impacts. For purposes of the impact analysis, the baseline is the No-Action Alternative. In the absence of quantitative data, best professional judgment was used to determine impacts. In general, impacts were determined using existing literature, federal and state standards, and consultation with subject matter experts and park staff and other agencies.

For the purposes of analysis the following assumptions are used for all impact topics:

Beneficial**:** A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.

Adverse**:** A change that declines, degrades, and/or moves the resource away from a desired condition or detracts from its appearance or condition.

Context**:** Context is the affected environment within which an impact would occur, such as local, park-wide, regional, global, affected interests, society as whole, or any combination of these. Context is variable and depends on the circumstances involved with each impact topic.

Duration**:** The duration of the impact varies according to the impact topic evaluated. However, for the purposes of this analysis, the following assumptions are used for all impact topics except cultural resources:

Short-term impacts: Those impacts occurring in the immediate future or during plan implementation (usually from one to six months, or up to one year). For natural systems (vegetation, wildlife, wetlands), recovery would take less than one year.

Long-term impacts: Those impacts occurring after plan implementation, through the next 10 years; for natural systems (vegetation, wildlife, wetlands), recovery would take more than one year.

Because most cultural resources are non-renewable, impacts to most cultural resources are considered long-term, except those for the natural elements of cultural landscapes that would renew such as vegetation; effects would be short-term (three to five years) until natural components are replaced (e.g., new vegetation grows).

Intensity**:** Because definitions of impact intensity (negligible, minor, moderate, and major) vary by impact topic, intensity definitions are provided separately for each impact topic analyzed.

A summary table of the environmental consequences for the Tamiami Trail Modifications: Next Steps project have been provided at the end of Chapter 2 of this EIS.

4.1.2 Analysis Area

The area of analysis for all topics is described under each topic and may include either the primary area along the Tamiami Trail roadway corridor (including a 50 foot easement) or the expanded study area, including indirect impacts to Northeast Shark River Slough and the entirety of ENP.

4.1.3 Cumulative Impacts Analysis

Cumulative impacts are defined in 40 CFR 1508.7 as those impacts that result from:

> *...the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.*

The Cumulative Impact Analysis section is organized to aid the reader in understanding the synergistic relationship between the CERP and non-CERP restoration efforts and how the cumulative benefits of completing the Tamiami Trail Modifications: Next Steps project is both integral to and dependent on the prioritization and sequencing of these efforts. First, the reader is introduced to past and current projects (***Table 4-1***) with an explanation of how these projects form the foundation for future CERP and non-CERP planning efforts. The reader is then provided a detailed explanation of how the Tamiami Trail Modifications: Next Steps project fits into the current (short-term) and potential future (long-term) plans for Everglades restoration, based on new scientific information and recent sequencing and prioritization decisions that will require substantial increases in water quality treatment and water storage south of Lake Okeechobee (***Table 4-2***). Recognizing that there is some uncertainty with future plans, these new water quality treatment and water storage efforts should provide the ability in the next several years to move substantially larger volumes of flows to WCA-3 and ENP. The grouping of CERP and non-CERP projects into phases provides the reader a more comprehensive explanation of the interdependencies of current and future projects and how the cumulative benefits of restoration of the southern and central Everglades are indelibly linked to implementation of the Tamiami Trail Modifications: Next Steps project.

Table 4-1 – Projects with Cumulative Effects on Southeastern Florida/ Southern Everglades Regional Environment

Project	Responsible Agency
Past Actions	
Modified Water Deliveries to Everglades National Park – Raising Tigertail Camp, construction of structures S-356, S-355A & B, and partial backfilling 4-miles of the L-67E Canal	USACE/ENP
Experimental Program of Water Deliveries to Everglades National Park – Test Iterations 1-5 (Shark River Slough)	USACE
Experimental Program of Water Deliveries to Everglades National Park – Test Iteration 6 (Taylor Slough)	USACE
Experimental Program of Water Deliveries to Everglades National Park – Test Iteration 7 (modified Taylor Slough)	USACE
Interim Structural and Operational Plan (ISOP) for the Hydrologic Compliance with the Cape Sable Seaside Sparrow Biological Opinion	USACE
Interim Operational Plan (IOP) for Protection of the Cape Sable Seaside Sparrow	USACE
Current Actions	
Tamiami Trail Limited Reevaluation Report: 1-mile bridge/elevated highway	USACE/NPS
Modified Water Deliveries to Everglades National Park: 8.5 SMA	USACE/NPS
South Dade Canal 111 (C-111) Project	USACE/SFWMD
Modified Water Deliveries to Everglades National Park: Combined Operational Plan	USACE/NPS/SFWMD
Willing Seller Land Acquisition Program in 8.5 SMA	FDEP
East Coast Buffer/Water Preserve Areas Project	SFWMD
Water Quality Treatment: STA Expansion (Compartments B & C)	
Lower East Coast Regional Water Supply Interim Plan	SFWMD
Everglades Restoration Transition Plan: Deviation from Interim Operational Plan	USACE/USFWS
Future Actions (Proposed and Subject to Future Decisions)	
Tamiami Trail Modifications: Next Steps Feasibility Report/EIS	NPS[33]
Comprehensive Everglades Restoration Plan; WCA-3 Decompartmentalization (DECOMP) and Hydropattern Restoration feature, ENP Seepage Management, C-111 Spreader Canal, River of Grass Initiative	USACE/SFWMD

33 The NPS is only responsible for the content of the information contained in this EIS. All responsibility for future actions associated with the implementation of the Tamiami Trail Modifications: Next Steps project subsequent to the release of this document will be determined at a later date.

Project	Responsible Agency
Everglades National Park General Management Plan	ENP
Lower East Coast Regional Water Supply Plan – South Florida Ecosystem Restoration Plan	SFWMD
Water Quality Treatment: Conversion of Talisman A1 Lands into Shallow Reservoir	SFWMD
Water Quality Treatment: Conversion of Talisman A1 Shallow Reservoir into STA	SFWMD
Water Quality Treatment: Conversion of Talisman A2 Lands into Shallow Reservoir	SFWMD
Water Quality Treatment: Conversion of a portion of the Talisman A2 Shallow Reservoir into STA	SFWMD
Water Quality Treatment: STA Expansion Upstream of STA 1W	SFWMD
Water Quality Treatment: Storage and Treatment in the C-139 Basin	SFWMD
Construction of EAA Regional Storage Reservoir	SFWMD

To assist the reader, reference is made to regional modeling (CERP and non-CERP) used to predict future water flow volumes, water stages, and ecological conditions. Collectively, all the current and future actions listed in ***Table 4-1*** are needed to achieve the greatest possible hydrologic restoration of the southern Everglades. Many of these actions have been incorporated into the CERP modeling and planning process—authorized by the WRDA and designed to consider the entire South Florida ecosystem. In the hydrologic modeling analysis, a set of performance measures are applied to ecological targets to predict the restoration benefits associated with hydrologic improvements. The CERP analysis includes fundamental assumptions about the future status of CERP and pre-CERP projects, including the MWD project and other on-going projects. The CERP future conditions assume the MWD Project, including additional modifications, such as those for the Tamiami Trail Modifications: Next Steps project, are fully implemented as formulated and provide the capacity to allow for unconstrained flows to Northeast Shark River Slough.

The WRDA provided the approval of CERP as a framework and guide for modifications to the C&SF Project needed to restore the South Florida ecosystem and to provide for the other water-related needs of the region. Implementation of the Tamiami Trail Modifications: Next Steps project as a predecessor of the larger CERP action provides the infrastructure to allow for the future water volumes, water stages, water quality, and seepage management needed for full restoration of environmental conditions in the central and southern Everglades. Therefore, this project is expected to contribute to a net beneficial cumulative impact.

Past Projects – Foundation Projects

The MWD project (***Figure 4-1***) was authorized over 20 years ago (1989) to restore more natural water flows into ENP. Roads and canals have long affected water flow into the park, but the construction of the WCAs in 1963 dramatically reduced flow to what is now Northeast Shark River Slough. The MWD project was authorized as part of the Everglades Expansion Act of 1989 after a series of measures implemented in the 1970s and 1980s to alleviate/reverse the effects of an extended, historic drought on the ecosystem in ENP proved to be inadequate. These series of measures, called the Experimental Water Deliveries Program (***Table 4-1***), included several ineffective attempts to adjust water delivery schedules to restore more normal flow to ENP. In 1999, the USFWS issued a jeopardy BO on the Cape Sable seaside sparrow, marking the end of the Experimental Water Deliveries Program at Iteration #7 and requiring Emergency Deviation in water deliveries to ENP to protect the Cape Sable Seaside Sparrow. In 2002, the IOP (***Table 4-1***) EIS ROD was signed in an effort to address Endangered Species Act requirements concerning water deliveries to ENP.

Current Projects

Modified Water Deliveries to Everglades National Park and C-111 Projects

The purpose of the MWD project (***Table 4-1***) was to construct modifications to the C&SF Project to improve water deliveries into ENP and, to the extent practicable, take steps to restore the natural hydrologic conditions in the Park. The MWD Project consists of four components and all are closely aligned with purposes of the initial CERP projects and with future CERP projects. The components include:

1. Conveyance and seepage control: hydraulically reconnect WCA-3A to WCA-3B and then Northeast Shark River Slough while maintaining approved levels of flood protection along the eastern boundary of Northeast Shark River Slough.
2. Tamiami Trail: modify the roadway to provide substantial increases in flows to Northeast Shark River Slough from WCA-3.
3. 8.5 SMA: provide flood mitigation to offset the adverse effects of increased water levels associated with the other project components.
4. Project Implementation Support: development of operational plans, hydrologic and ecologic monitoring, and project management support activities.

Funding has been provided and contracts awarded to complete the modifications to the Tamiami Trail component—2008 LRR/EA—which is currently constructing a 1-mile bridge and raising the remainder of the road to allow for increased flows to Northeast Shark River Slough.

The purpose of the C-111 project (***Table 4-1***) is restoration of the ecosystem in Taylor Slough and the eastern panhandle of ENP, while providing flood damage reduction within the C-111 basin consistent with the authorities provided to the USACE. Benefits to Taylor Slough and the eastern panhandle are dependent on modifications to the Tamiami Trail to allow for larger volumes of flows to Northeast Shark River Slough.

Water Management Changes in WCA-3A and ENP – Operations Associated with the Everglades Restoration Transition Plan (ERTP)

The construction and subsequent closure of the levee system (L-29 and L-67A/C) enclosed WCA-3A and WCA-3B, creating dramatically altered water management regimes in the central and southern Everglades. Rainfall and inflows from the north are now retained in WCA-3A, or passed southward into the historically drier marl prairies along Western Shark River Slough, while the wetlands of WCA-3B and Northeast Shark River Slough have been isolated from natural overland flows and drained. Efforts to re-establish flows into the historic eastern flow-way through WCA-3B and Northeast Shark River Slough have been underway for nearly three decades, but the progress has been very slow.

A series of operational (short-term) and structural (longer-term) modifications are currently being evaluated as part of the ERTP (***Table 4-1***). The short-term operational changes will involve modifications to the WCA-3A regulation schedule beginning with the planned modifications in the ERTP that will replace the IOP.

<u>Combined Operating Plan</u>

The COP for the MWD project is the MWD component that will combine MWD structural and conveyance features with C-111 features to modify the IOP based on the ERTP project.

Future Projects

Prioritization and sequencing of future CERP and non-CERP projects (***Table 4-2***) is critical to the success of Everglades restoration. The purpose of the DOI Vision, described below, is to identify a strategy for integration of new scientific information, system-wide hydrological objectives (flow volumes, water quality, seepage management, and associated operational plans) and individual project objectives both to optimize the use of state and federal resources and to achieve earlier environmental benefits. It should be noted that the schedules presented in this section, including the projects grouped in phases, are based on the current information available from the USACE and SFWMD, and, at this point, are recommendations for how future projects may be sequenced. The NPS used these schedules to provide the reader additional information on how these reasonable and foreseeable projects could be implemented in a manner consistent with the additional modifications to Tamiami Trail proposed in this document. Obviously, the cumulative impacts (and benefits) of the Tamiami Trail Modifications: Next Steps project can only be attained when these projects are completed and functional based on future decisions consistent with DOI's recommendations. While the genesis for these revised schedules are new water quality treatment requirements and new scientific findings that are included in this subsection, the new schedules are consistent with the DOI vision for Everglades restoration.

<u>Department of the Interior Restoration Vision</u>

The DOI completed a Vision and Plan for Successful Everglades Restoration in December 2008 and a revision in draft form in September 2010 recommending how future projects may be implemented to maximize restoration benefits. The Vision has not been vetted by other Federal agencies or stakeholders, and does not constitute an Administration policy. Implementing the following tasks would be contingent on obtaining new authorities, the availability of appropriations, and other Federal priorities. Concisely stated, the vision "is to recover, given modern constraints, a natural system with ecological functions and hydrological connectivity, spatial and temporal patterns, and diversity and abundance of species that characterized the historical greater Everglades wetland basin." The Vision goes on to state that "The restored ecosystem will be altered from and smaller than the pre-drainage system, yet will still retain the essential characteristics of the historic ROG. Successful restoration will be achieved when the new system no longer acts like a set of managed, disconnected wetlands but rather reestablishes the defining characteristics and connectivity of a natural Everglades system."

Among the project requirements needed to achieve the DOI vision, the following tasks were identified as paramount (from the 2010 draft revised DOI Vision):

1. Authorization and funding to initiate construction of the Tamiami Trail Next Steps project;
2. Funding to support additional land acquisition needed for storage and treatment of new flows to the Everglades via the State's ROG acquisition;
3. Initiation of an integrated planning process that encompasses those projects and components needed to support increased flows from Lake Okeechobee south to Florida Bay and Biscayne Bay in terms of quality, quantity, timing, and distribution while

addressing seepage, flood control, water supply, and other system needs and project purposes; and

4. Restructuring the Integrated Delivery Schedule to ensure appropriate and timely crediting of State expenditures in support of the overall CERP program in order to maintain momentum for construction and operation of other restoration plan components beyond those needed to comply with court-ordered deadlines for meeting Everglades water quality standards.

The vision document also identifies the "successful and timely implementation of projects to remove barriers and restore a more natural flow" as the highest priority for action and specifically identified additional bridging of the Tamiami Trail as an integral step in complying with that priority. Removal of barriers to flow, in the opinion of the DOI, is vital to the attainment of one of the more important objectives of restoration − the recovery of a sustainable ridge-slough-tree island landscape. However, the NPS acknowledges that the Tamiami Trail Modifications: Next Steps project, unto itself, is not capable of accomplishing restoration. The project must be implemented in a manner that relies heavily on the completion of other projects that will provide the restoration volumes of water, the facilities needed to treat the water in a manner consistent with state and federal requirements, and to provide sufficient seepage management for the protection of the adjacent developed areas.

<u>New Water Quality Treatment Requirements and Scientific Findings</u>

New scientific information and recent sequencing and prioritization decisions have led to plans to substantially increase water quality treatment and water storage south of Lake Okeechobee, providing the ability in the next several years to move greater volumes of flows to WCA-3 and ENP. The completion of the Tamiami Trail Modifications: Next Steps project will provide the infrastructure to move these larger volume flows into Northeast Shark River Slough, restoring ecological conditions in over 107,000 acres in Northeast Shark River Slough, while preventing adverse impacts to threatened or endangered species in WCA-3 and Western Shark River Slough. Everglades restoration goals are based on an understanding of the pre-drainage hydrologic characteristics of the Everglades, because the historical patterns of sheetflow and inter-annual floods and droughts shaped the life histories of many native plant and animal communities. As an example, high-flow events played a key role in establishing and maintaining unique Everglades landscapes (such as the ridge-slough-tree island mosaic). Similarly, in the pre-drainage Everglades large volumes of freshwater flowed into the downstream estuaries, which supported their biological productivity, by buffering them from prolonged hyper-saline events.

<u>The Role of Water Flow Directions and Velocities</u>: The ridge-slough-tree island mosaic is a defining characteristic of the Everglades ecosystem and is similar to patterned peatlands found elsewhere in the world. Recent studies suggest that the interaction between Everglades plant communities, marsh water depths, and flow velocities created this unique landscape patterning (Zweig and Kitchens, 2008). High flow pulses are thought to be the key process that created and maintained the ridge and slough micro-topography (Larson et. al., 2009). Wet season flow pulses would entrain fine organic sediment that would pass through the deeper sloughs and then settle on the shallower sawgrass ridges. Restoring these seasonal flow patterns is critical to reshaping the Everglades wetlands into the flow sculpted ridge-slough-tree island mosaic that supported the abundant and diverse fish and wildlife populations that characterized the pre-drainage system.

<u>The Everglades were Wetter and the Estuaries were Fresher</u>: Recent paleo-ecological evidence from the freshwater wetlands of the central/southern Everglades and downstream estuaries

(Florida Bay and Biscayne Bay) indicate that the pre-drainage Everglades were wetter and the estuaries were fresher than previously understood. Sites throughout the freshwater Everglades provide evidence for a greater extent of deep open water sloughs prior to the implementation of water management practices of the 20th century, followed by a shift to shallower sawgrass marshes (Bernhardt and Willard, 2009; Willard et al., 2001). Similar studies of estuarine animal communities that existed at the beginning of the 20th century were typical of a lower, more stable salinity pattern than is associated with the managed system today, and these differences are not fully explained by rising sea level (Marshall et al., 2009; Wingard, 2007).

More Water is Needed for Everglades Restoration: The above paleo-ecological studies have provided new evidence that the volumes of water needed to reproduce conditions that mimic the historic Everglades water depths/flooding durations and southern estuarine salinities are substantially larger than the pre-drainage estimates previously used to set our restoration targets. As an example, during the C&SF Restudy pre-drainage inflows to the northern/central Everglades were estimated at approximately 1.4 million acre-feet during an average year based on the hydrologic simulation model that was used in the CERP (NSM 4.6.2). Today, pre-drainage inflows to the northern/central Everglades are now estimated at approximately 2.1 million acre-feet during an average year based on the hydrologic simulation model used in the ROG initiative.

New Water Quality Treatment Requirements: Water quantity and water quality are tightly linked in the Everglades; water flow improvements cannot move forward unless the water meets established water quality criteria. Following the 1988 federal water quality lawsuit and 1991 settlement agreement, the State of Florida enacted the EFA in 1994. This Act prompted construction of approximately 45,000 acres of STAs and a regulatory program of BMPs to improve the quality of stormwater runoff from the EAA. While the combination of STAs and BMPs have been effective at removing, on average, 60 to 70 percent of the TP loading that would have entered the Everglades, outflow TP concentrations from the STAs are still high (averaging 25 ppb, but ranging from 13 ppb at STA-3/4 to 94 ppb at STA-6). These TP concentrations are well above the 10 ppb long-term geometric mean TP concentrations established for Everglades Protection Area inflows by the state in the 2003 amended EFA, and have led to Consent Decree violations at the Loxahatchee NWR and concentrations that are right at the limit for Shark River Slough in ENP.

In 2008, a federal court ruled that the USEPA's review and approval of State law changes to the EFA violated the Clean Water Act. In April 2010 the court reaffirmed this ruling and ordered the USEPA to issue a new or amended determination that would direct the State to implement additional water quality measures to ensure discharges are in compliance with the Clean Water Act. In September 2010, the USEPA submitted an amended determination to assure that STA discharges will be in compliance and determined that additional STAs will be required. The planned SFWMD ROG purchase of 26,800 acres of U.S. Sugar land and the existing State owned Talisman lands will likely become the focus of new EAA expanded STAs. One option that would divert West Palm Beach Canal (C-51) into an expanded STA-1W would bring approximately 200,000 acre-feet of new water into the central flow path to Northeast Shark River Slough. This would likely be implemented under the State's Long-Term Plan for Achieving Water Quality Goals (LTP). There is some level of uncertainty with the exact schedule, acreage requirements, and sequencing of water quality requirements as the State is granted an opportunity to submit alternatives and decisions must still be made on future projects.

Prioritization and Sequencing of Everglades Projects—New Path and Vision for Future Project Implementation

The following subsection uses the most recent state and federal draft project schedules (***Table 4-2***), which are illustrative and based on various assumptions and projections, as well as projects responding to the 2010 USEPA amended determination and regional modeling data to demonstrate the types of projects that may be completed in different periods of time and how these projects (including CERP and non-CERP efforts) could contribute to future hydrological changes in the Everglades.

<u>Long-term Regional Restoration Benefits</u>

As stated earlier, it is anticipated that the benefits of the implementation of the Tamiami Trail Modifications: Next Steps project will improve the ecological and hydrological conditions within the immediate vicinity of the project area. However, the NPS also maintains that the benefits of the project will be more expansive, allowing improvements on a regional scale when implemented in conjunction with other planned restoration projects and their associated operational plans. The interdependency of these future restoration projects and the Tamiami Trail Modifications: Next Steps project is detailed below. Three successive phases for restoration of the central and southern Everglades is proposed. Each phase consists of projects that will address storage, conveyance, water quality treatment, seepage management, and operations; this approach recognizes that restoration must fully integrate all these functions. The projects associated with the three phases are summarized in ***Table 4-2*** and graphically in ***Figure 4-3***.

The first phase is associated with the completion of the projects either currently under construction, such as the MWD and C-111 projects, or projects that will soon be initiated. The intent of this first phase is to provide some modest level of restoration benefits but also provide scientific insights into the response of the ecosystem to better implement the features and operations associated with the subsequent phases. In this way, the projects will benefit from a more adaptive management approach to final design of the structural features implemented but more importantly allow for a greater degree of flexibility in the operations of the water management system to benefit the restoration of the ecosystem.

The second phase of the proposed restoration sequencing will allow for more significant regional restoration benefits since the projects associated with this phase include the ability to convey, treat, and store additional water while also maintaining the required levels of flood protection through appropriate levels of seepage management. Implicit to providing the levels of regional benefits associated with Phase 2 is the need to have sufficient infrastructure in place to allow for the restoration to occur. Prior to providing any increased conveyance in Phase 2, the projects needed to treat this water as well as the modifications to the existing barriers to restoration flow, for example, must be completed first. For this reason, the NPS recommends the completion of the Tamiami Trail Modifications: Next Steps and ENP Seepage Management projects in advance or concurrent with the implementation of the Miami Canal portion of the WCA3 Decompartmentalization as well as the projects designed to provide additional conveyance to the central and southern Everglades. Further, it is anticipated that the operations of the Phase 1 will provide critical information needed in the development of the new operational plan of Phase 2. The plan should be based on an evaluation of hydrologic and ecologic data from the existing long-term ecosystem monitoring network and the use of an adaptive management approach to identification of the final Phase 2 operational plan.

The third and final proposed phase of restoration will not be attained until completion of the structural modifications and operational plan implemented in Phase 3. The Phase 3 features include many of the storage, conveyance, water quality, and seepage management components in the CERP. However, the NPS also recommends that the implementation of these CERP components be optimized through consideration of improvements to the functions of the plan components such as the River of Grass initiative in the EAA in order to make more clean water available to the restoration of the central and southern Everglades. The regional restoration benefits of this adaptive management approach would likely produce a more economically sound plan for restoration with enhanced benefits to the ecosystem.

Table 4-2 – NPS Proposed Prioritization and Sequencing of Restoration Projects

Restoration Purpose	Phase 1	Phase 2	Phase 3
Storage Projects		C-139 Annex (7,600 acres)	EAA Reservoir (26,000 acres)
Conveyance Projects	MWD: LRR/EA 1-Mile Bridge	TTM: Next Steps: (“Additional road Modifications and Bridging” in ***Figure 4-3***)	WCA3 Decompartmentalization (Phases II & III) (“Conveyance features” in ***Figure 4-3***)
	Decompartmentalization Physical Model (DPM)	WCA-3 Decompartmentalization Phase I: Hydropattern restoration features, backfill Miami Canal, and augmentation of S-333	
		C-51 East Diversion	
Water Quality Projects	Construction of Talisman Compartments B&C	Broward County Water Preserve Area, C-11 impoundment	Conversion of a portion of Talisman A2 to STA
	Conversion of Talisman A1 to shallow reservoir	Conversion of Talisman A1 shallow reservoir to STA	Additional treatment in C-139 basin (”New water from Lake O” in ***Figure 4-3)***
		Use of Talisman A2 for Storage and/or Treatment	
		Expansion of STA1W	
Seepage Management Projects	MWD: 8.5 SMA	ENP Seepage Management	WCA-3 Seepage Management
	C-111 Spreader canal Phase 1 (“C-111 Project” in ***Figure 4-3***)		
Operational Projects	Everglades Restoration Transition Plan	Combined Operational Plan	Final Operational Plan
	MWD/C-111: Combined Operational Plan		

Phase 1 and 2 water quality treatment and water storage projects south of Lake Okeechobee are likely to deliver higher volume flows to WCA-3 and ENP, requiring modifications to the Tamiami Trail to allow mean October stages of approximately 8.0 feet (***Figure 4-1***) and annual average flow volumes of over 800,000 acre-feet to Northeast Shark River Slough (***Figure 4-2***). The water stages achievable adjacent to the Tamiami Trail as depicted in Phase 3 (***Figure 4-1***), which represents full restoration benefits to the Everglades, will be approximately 8.5 feet (mean October stage) with average annual flow volumes of approximately 1.1 million acre-feet a year (***Figure 4-2***), which is well below the design capacity for the Tamiami Trail Modifications: Next Steps project. While the CERP modeling demonstrates that the design criteria for the Tamiami Trail Modifications: Next Steps project is very conservative, it also demonstrates that future ecological benefits to WCA-3 and ENP are directly linked to the completion of the Tamiami Trail Modifications: Next Steps project to allow for the increase in flow volumes associated with completion of the water quality treatment and water storage projects. ***Figure 4-3*** graphically depicts how incremental increases in water quality treatment and storage should be closely linked to structural changes to the south (modifications to the Tamiami Trail and WCA-3 levees) in order to maximize flows and ecological benefits to the central and southern Everglades, while meeting the other water-related needs of the region.

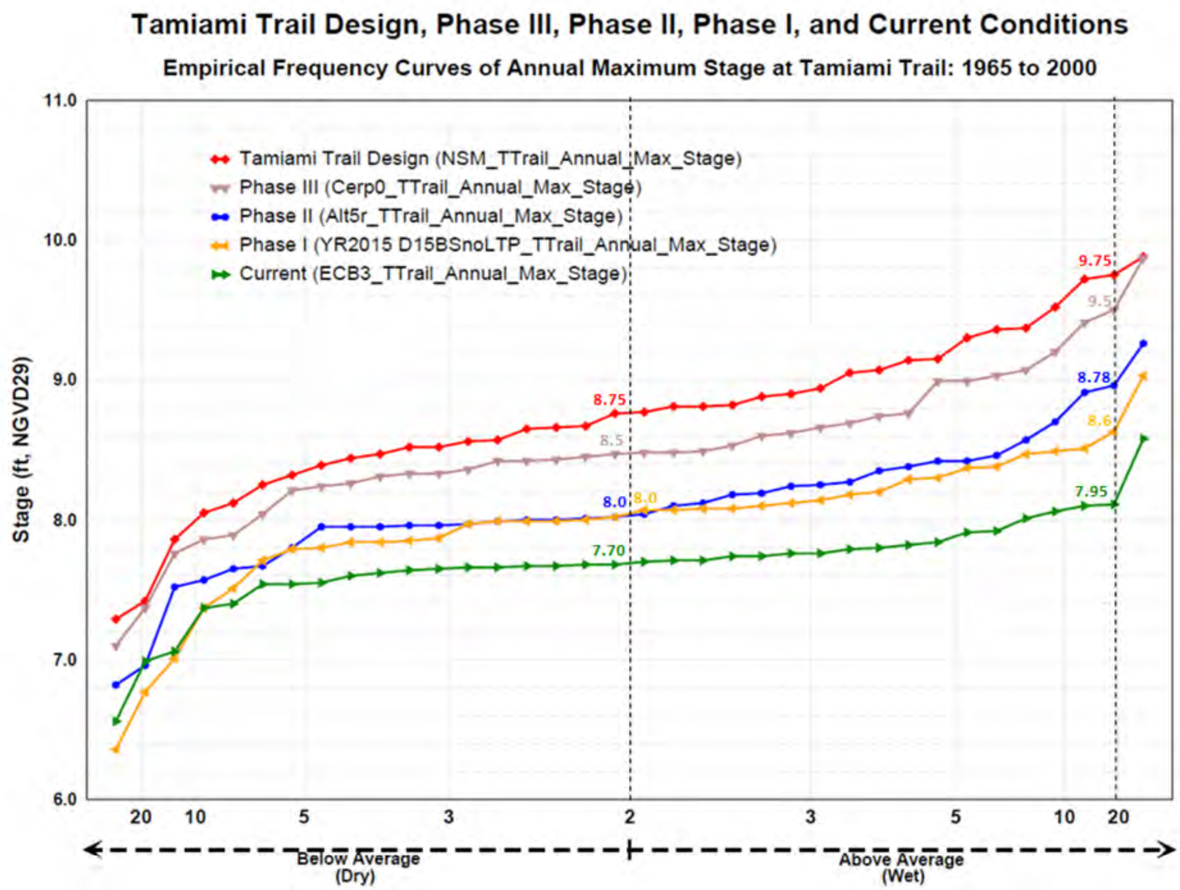


Figure 4-1 – Empirical Frequency Curves of Annual Maximum Stages for the Phased Projects in Table 4-2

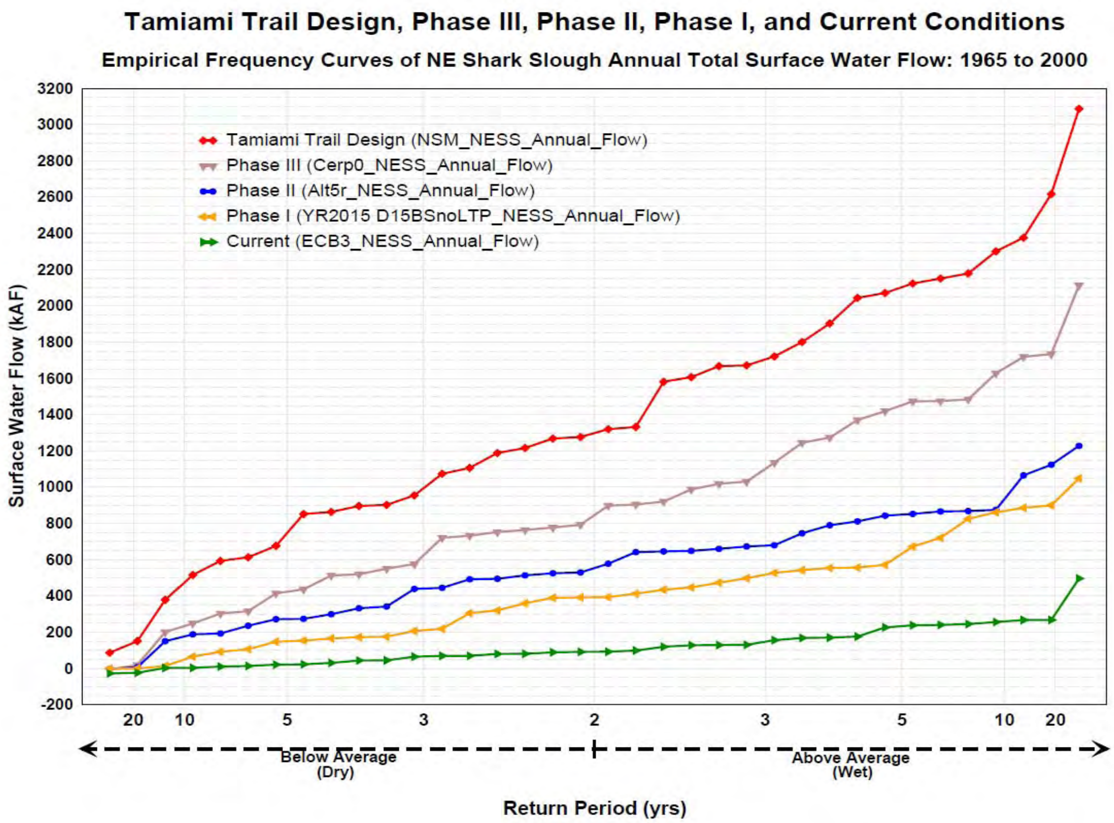


Figure 4-2 – Empirical Frequency Curves of Annual Surface Water Flows for the Phased Projects in Table 4-2

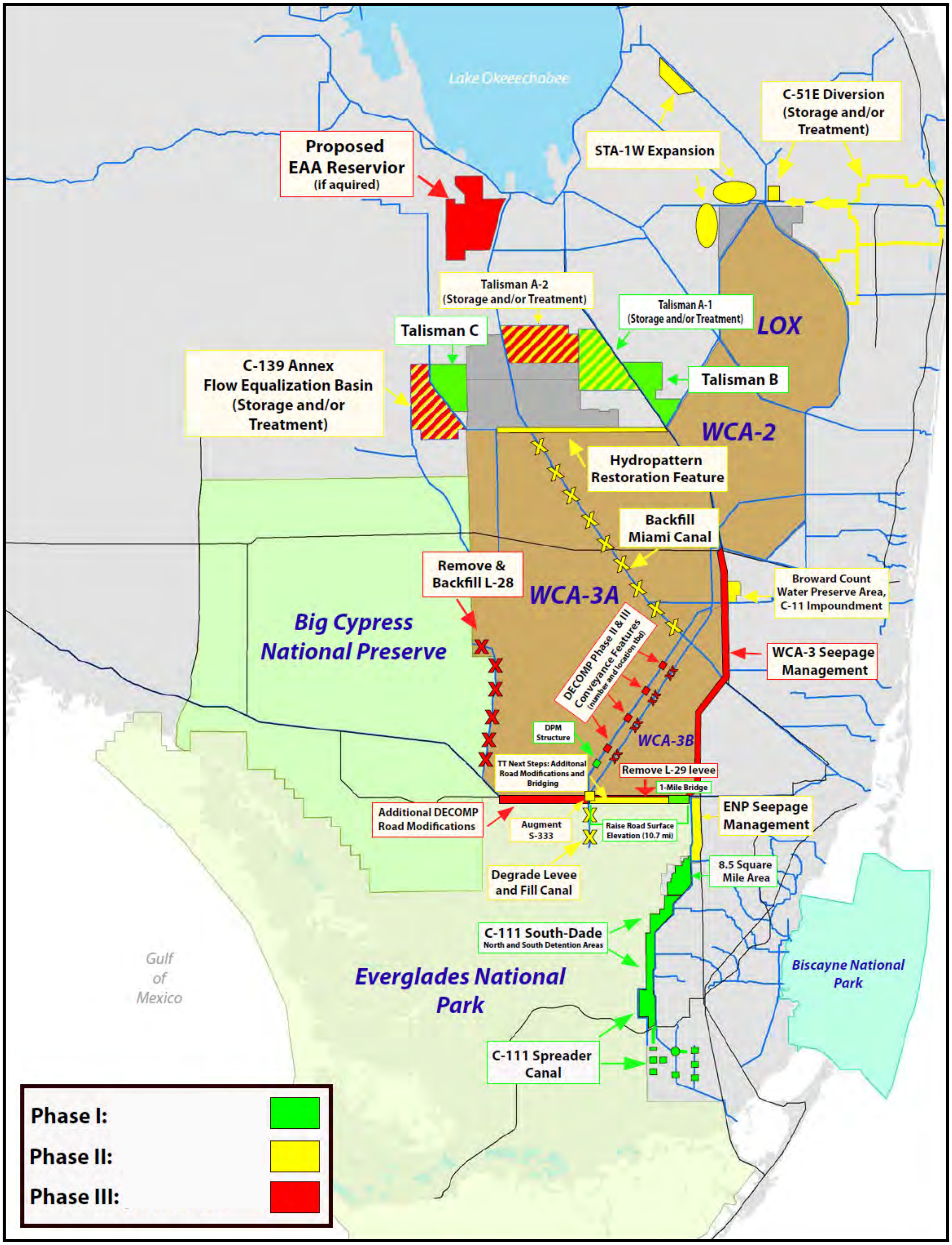


Figure 4-3 – NPS Proposed Sequencing of Projects to Maximize Restoration Benefits

Current Hydrologic Conditions

For comparative purposes all of the flow characteristics contained in this section are based on hydrologic simulation modeling results using the SFWMD or 2X2 model. Under current conditions (Alternative 7R is used as the base or existing condition) Shark River Slough inflows average approximately 870,000 acre-feet per year (***Figure 4-2***). Inflows into Northeast Shark River Slough account for just less than 240,000 acre-feet or approximately 27 percent of the total inflows (***Figure 4-2***), while Western Shark River Slough inflows are just below 630,000 acre-feet, or 72 percent of the total. The Northeast Shark River Slough inflows are held substantially lower than their historic volumes to limit L-29 canal stages from damaging the 1920s era Tamiami Trail roadway, while reducing high water conditions in the 8.5 SMA. L-29 canal stages are managed to remain at or below 7.5 feet, while 1-in-20 year wet condition is approximately 7.95 feet (***Figure 4-1***). These highly managed stages have reduced the flow capacity of the 19 sets of culverts under the roadway to approximately 1,250 cfs.

Phase 1 Projected Flow Benefits

Two important foundation projects, one southern Everglades CERP project, and the first phase of proposed improvements in EAA water quality treatment are expected to be completed over the next four years. These projects and their key components for this initial phase of restoration are color-coded green in ***Figure 4-3*** and include:

1. STA expansion via completion of Compartments B/C and conversion of the Talisman A1 lands into a shallow storage reservoir (flow equalization basin) to regulate flows into STA 3/4 along the central EAA flow path (see EPA's 9/2010 Amended Determination).
2. Modified Water Deliveries Project with the Tamiami Trail LRR/EA improvements, completed 8.5 SMA, and limited conveyance features (see USACE 4/2008 LRR).
3. Canal 111 South Dade Project and linkage with the 8.5 SMA features via full build-out of the north/south detention areas (see USACE 6/2007 Draft EA).
4. Canal 111 Spreader Canal Western Component with the Frog Pond detention area and Aeroject seepage management features.
5. WCA-3 Decompartmentalization and Sheetflow Enhancement Physical Model (DPM).

Completion of the eastern Tamiami Trail 1-mile bridge and roadway improvements authorized under the MWD project (LRR/EA) under Phase 1 will allow higher inflows into Northeast Shark River Slough (***Figure 4-2***). Total Shark River Slough inflows, however, are not expected to increase as a result of implementing the MWD and C-111 projects. Instead, the distribution will shift to the east (approximately 50 percent of the inflows would pass into Northeast Shark River Slough). Average eastern L-29 canal stages in the wet season would increase to approximately 7.7 feet and 1-in-20 year high water conditions would increase to approximately 8.6 feet (***Figure 4-1***). Following these changes, the flow capacity into Northeast Shark River Slough is expected to increase to approximately 1,850 cfs and average annual inflows should reach approximately 340,000 acre-feet (***Figure 4-2***). The increase in flow volumes above the 1350 cfs at the S-333 structure will be achieved by approximately 500 cfs flows through WCA-3B via the S-355 (A & B) structures (***Figure 4-1***).

Phase 2 Projected Flow Benefits

The Tamiami Trail Modifications: Next Steps project, a first phase of a central Everglades CERP conveyance project, and two proposed improvements in EAA water quality treatment and storage are expected to be completed in Phase 2. These projects and their key components for this second phase of restoration are color-coded yellow in ***Figure 4-3*** and include:

1. STA expansion via conversion of the A1 shallow reservoir to an STA and construction of a flow equalization basin at the location of Talisman A2 (see EPA's 9/2010 Amended Determination).
2. STA expansion and a possible new flow equalization basin upstream of STA 1W, that will likely include westward diversion of C-51basin flows, with a resulting increase of flows into the central EAA flow path (see EPA's 9/2010 Amended Determination).
3. The Tamaimi Trail Next Steps project's additional bridging and roadway improvements will be completed and associated conveyance and seepage management features will be needed (ENP Seepage Management project) to route water into Northeast Shark River Slough.
4. Phase 1 of the WCA-3 Decompartmentalization and Sheetflow Enhancement Project will include plugs to backfill the Miami Canal within northern WCA-3A and a spreader canal ("hydrologic restoration feature" in ***Figure 4-3***) to route STA 3/4 flows into WCA-3A along the L-4/L-5 levees. In addition, Phase 1 will include expansion of the S-333 structure to allow for an increase of approximately 4,000 cfs flows to Northeast Shark River Slough.

Completion of proposed STA expansions and the C-51 diversion would route approximately 185,000 acre-feet of additional flows into the Everglades. Construction of the DECOMP project Phase 1 features would improve the seasonal distribution and timing of these new inflows (***Figure 4-2***). Finally construction of the additional Tamiami Trail bridging and roadway improvements proposed by the Tamiami Trail Modifications: Next Steps project will accommodate these additional flows, while reducing WCA-3A high water conditions (***Figure 4-2***). Total Shark River Slough inflows would be expected to increase by 10 to 20 percent as a result of implementing these upstream water quality and conveyance projects, and the distribution of Shark River Slough inflows would be expected to shift more to the east. Average eastern L-29 canal stages in the wet season would increase to slightly over 8.0 feet, while 1-in-20 year high water conditions would increase to approximately 8.78 feet (***Figure 4-1***). Following these changes the flow capacity into Northeast Shark River Slough is expected to increase to approximately 4,000 cfs, and average annual inflows would reach approximately 550,000 acre-feet, an additional 210,000 acre-feet in this phase (***Figure 4-2***).

<u>Phase 3 Projected Flow Benefits</u>

The remaining central Everglades CERP conveyance and seepage management projects, a new EAA regional storage reservoir, and associated EAA water quality treatment are expected to be completed in Phase 3. These projects and their key components for this final phase of restoration are color-coded red in ***Figure 4-3*** and include:

1. Completion of a new EAA regional storage reservoir to retain Lake Okeechobee flows that would be sent southward, and replacement of the A1/A2 reservoirs planned for CERP (proposed location is the 26,000 acre parcel of central sugarcane lands as a first acquisition in the ROG acquisition initiative).
2. STA expansion via conversion of the Talisman A2 shallow reservoir to an STA and possible additional storage/treatment in the C-139 basin to treat Lake Okeechobee flows redirected to the Everglades.
3. Phases 2 and 3 of the WCA-3 Decompartmentalization and Sheetflow Enhancement project that will include backfilling the southern portion of the L-67A Canal, and creating gaps in significant portions of the L-76A and L-28 levees.

4. Completion of the WCA-3A/3B seepage management project to control groundwater losses into the L-30 canal.

Completion of the proposed EAA regional storage reservoir would retain and store approximately 300,000 acre-feet of new water routed southward from Lake Okeechobee and include expanded STAs for water quality treatment. The completion of the project features for DECOMP would allow for some of these new inflows to sheetflow through the central Everglades. Finally WCA-3A/3B seepage management would allow for substantial flows through WCA-3B, without increasing flooding concerns to the east. Under these conditions, total Shark River Slough inflows would be expected to more than double versus current conditions, reaching approximately 1.8 million acre-feet with up to 60 to 70 percent passing into Northeast Shark River Slough (***Figure 4-2***). Average eastern L-29 canal stages in the wet season would increase to approximately 8.5 feet, while 1-in-20 year high water conditions would increase to approximately 9.5 feet (***Figure 4-1***). Following these changes the flow capacity into Northeast Shark River Slough is expected to increase to approximately 5,500 cfs, and average annual inflows would reach approximately 900,000 acre-feet, an additional 350,000 acre-feet in this final phase (***Figure 4-2***).

Summary

The common thread connecting the past, current, and future restoration efforts is the need to elevate the Tamiami Trail roadway to allow for greater volumes of flows to Northeast Shark River Slough in ENP. The completion of the Tamiami Trail Modifications: Next Steps project will provide the infrastructure to move larger volume flows to Northeast Shark River Slough associated with new water quality initiatives south of Lake Okeechobee. Past actions attempted to manage the movement of water more naturally from the WCAs to ENP without major modifications to the Tamiami Trail and with few measurable benefits. Current actions will provide only minimal ecological improvements, as the L-29 Canal water stages (***Figure 4-1***) will have to be controlled well below levels where substantial flow volumes and associated ecological benefits are attainable (***Figure 4-2***). New scientific information and new water quality treatment and storage initiatives underscore the realization that restoration of the central and southern Everglades depends on raising the Tamiami Trail to allow for the natural, unconstrained flow patterns (volumes, distributions, velocities, and timing of flows) critical to reshaping the Everglades wetlands into the flow sculpted ridge-slough-tree island mosaic that once supported the abundant and diverse fish and wildlife populations characterized in the pre-drainage Everglades ecosystem.

Regional modeling is used in this section to illustrate how “reasonably foreseeable future actions” will cumulatively contribute to the restoration of more natural and historic flow volumes, water stages, and ecological conditions in the Everglades. This modeling depicts how water stage constraints at the Tamiami Trail flatten the normal seasonal flow patterns (dry and wet season rainfall patterns), preventing the natural water recession rates critical to the survival of many Everglades species (***Figure 4-2***). As depicted by the NSM model run (***Figure 4-2***), the flow velocities should be much higher during the rainy season providing a longer, wetter wet season and a slower dry-down (recession) during the dry season. The slower recession rate increases the abundance of prey species (fish and invertebrates) needed for the survival of fledgling avian species during the early dry season. Current and Phase 1 projects (***Figure 4-2***) do not allow for these high flow volumes and seasonal pulses that create and maintain the ridge and slough micro-topography (Larsen et. al., 2009). Recent paleo-ecological studies provide new evidence that the volumes of water needed to reproduce conditions that mimic the historic Everglades water depths/flooding durations, and southern estuarine salinities need to be substantially larger than the pre-drainage estimates previously used to set our restoration targets. This new science coupled with the DOI Vision and new prioritization and sequencing of restoration initiatives provides a better understanding of the importance of substantially elevating the Tamiami Trail to provide the near-term and long-term cumulative benefits essential to restoration of the South Florida ecosystem. Finally, the modeling also illustrates that even with achievement of the water stages associated with full implementation of the CERP projects (***Figure 4-1***), the 1-in-20 year maximum high water conditions would increase only to approximately 9.5 feet, still below the design criteria for the Tamiami Trail Modifications: Next Steps project (NSM of 9.7 DHW), providing assurances that the Tamiami Trail Modifications: Next Steps project is designed not only to maximize future restoration benefits, but to ensure the future integrity of the roadway and protect the general public that live and drive along this important transportation corridor.

Cumulative impacts for each impact topic for this project have been incorporated into this chapter of the EIS.

4.1.4 Impairment Analysis

The NPS *Management Policies 2006* requires an analysis of potential effects to determine whether or not actions would impact park resources, but it also must determine whether those actions would impair park resources. The fundamental purpose of the national park system, as established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. These laws give the NPS the managerial discretion to allow park resources and values to be impacted when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Park managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values.

The impairment that is prohibited by the Organic Act and the General Authorities Act is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. Whether an impact meets this definition depends on the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question, and other impacts. An impact to any park resource or value may constitute impairment, but an impact would be more likely to constitute impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- Identified as a goal in the park's GMP or other relevant NPS planning documents as being of significance.

Impairment may result from NPS activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park.

An impairment determination is included in the conclusion statement for all impact topics related to ENP natural and cultural resources. Impairment determinations are not made for visitor use, park operations and management, socioeconomics, transportation, or hazardous, toxic, and radioactive waste because impairment findings relate back to park resources and values, and these impact areas are not generally considered to be park resources or values. Impairment determinations are not made for visitor use and experience because, according to the Organic Act, enjoyment cannot be impaired in the same way an action would impair park resources and values.

4.1.5 Climate Change and Sea Level Rise

Guiding Regulations and Policies

Executive Order 13514, "*Federal Leadership in Environmental, Energy, and Economic Performance*" and DOI Secretarial Order 3285 both provide guidance on how federal agencies should address greenhouse gas emissions and climate change.

NPS *Management Policies 2006* (Section 4.7.2) states that "Parks containing significant natural resources will gather and maintain baseline climatological data for reference." Management Policies also state that "The Service will use all available authorities to protect park resources and values from potentially harmful activities…NPS managers must always seek ways to avoid, or minimize to the greatest degree possible, adverse impacts on park resources and values" (NPS, 2006). Section 9.1.1.6 discusses sustainable energy design, requiring any facility development to include improvements in energy efficiency and reduction in greenhouse gas emissions for both the building envelope and the mechanical systems that support the facility. Additionally, projects that include visitor centers or major visitor services facilities must incorporate Leadership in Energy and Environmental Design (LEED) standards to achieve a silver rating (NPS, 2006). Finally, Section 9.1.7 requires the NPS to interpret for the public the overall resource protection benefits from the efficient use of energy, and to actively educate and motivate park personnel and visitors to use sustainable practices in conserving energy (NPS, 2006). The NPS has also prepared draft interim guidance for considering climate change in NPS NEPA analyses.

Climate Change/Sea Level Rise

Climate change and the resulting sea level rise are affecting all of South Florida, especially low-lying areas such as ENP, and therefore will be addressed as part of this EIS. The Miami-Dade County Climate Change Advisory Task Force (CCATF) was established in 2006 with the charge of identifying potential future climate change impacts to Miami-Dade County and providing ongoing recommendations regarding mitigation and adaptation measures to respond to climate change (Miami-Dade, 2008). The CCATF's 25 appointed members represent a diverse, multidisciplinary and highly knowledgeable group of individuals, including the Superintendent of ENP (Miami-Dade, 2008). Since ENP is located largely within Miami-Dade County, the advice of the CCATF applies to the Park's resources.

The 2001 report of the United Nations sponsored Intergovernmental Panel on Climate Change (IPCC) projected a sea level rise over the coming century of one to three feet (median sea level rise of two feet) (Miami-Dade, 2008). The *Second Report and Initial Recommendations* published by the Miami-Dade CCATF states that global warming would result in many changes to the natural environment, "including changing atmospheric circulation and temperature patterns, changes in rainfall and severe weather, changes in biologic community distribution, increased extinction rates, changes in disease and pest distribution, and changes in sea level" (Miami-Dade, 2008). While all these environmental impacts would affect South Florida and ENP within the next century, the key concern for the low-lying areas of ENP would be rising sea level, "with a very high likelihood" that the sea level would rise an additional 1.5 feet in the next 50 years and a cumulative total of three to five feet within a century (Miami-Dade, 2008).

The 2007 IPCC report projected a somewhat lower sea level rise than the 2001 IPCC report, but it did not incorporate the substantially accelerated melting being observed in the Greenland Ice

Sheet (Miami-Dade, 2008). The recent changes occurring in the Arctic and Greenland mean that global warming and sea level rise would happen much more rapidly than had been only recently projected (Miami-Dade, 2008). Even recent model projections of future ice melt for Greenland by 2040 have already occurred (Miami-Dade, 2008). In the Antarctic, there is no inherent reason why the impacts of global warming should follow the pattern of the Arctic Ocean (Miami-Dade, 2008). Nevertheless, there has been a gradual loss of pack ice through the last half of the twentieth century, but a slight expansion in the past decade (as anticipated by climate models); about a 12% increase in the flow rate of 300 glaciers around the margin of Antarctica between 1993 and 2003; and a substantial increase in summer snow melt in both marginal and interior areas of the ice sheet since 2005 (Miami-Dade, 2008). Antarctica is a critical unknown to future projections; however, it is showing distinctive early signatures of accelerated ice release (Miami-Dade, 2008). As a result of these uncertainties, the IPCC reports underestimate the amount of sea level rise that is likely to occur in this century (Miami-Dade, 2008); therefore, the Miami-Dade County CCATF findings are used as the basis for impact analysis for this project.

Only a two-foot sea level rise by the end of the century, as projected in the 2001 IPCC report, would drastically change the landscape of South Florida and ENP (Miami-Dade, 2008). Spring high tides would be +4.5 to 5 feet above present mean sea level; storm surges would be higher; barrier islands, fill islands, and low-lying mainland areas would be frequently flooded; salt water intrusion would restrict available freshwater resources; and drainage would be more sluggish (Miami-Dade, 2008). Based on the Miami-Dade County CCATF 2008 report, it is anticipated that sea level within the next century would rise substantially more than the IPCC's projected two feet. Many respected scientists, as documented in the CCATF's 2008 report, now see a likely sea level rise of at least 1.5 feet in the next 50 years and a total of at least three to five feet by the end of the century, with the potential for a larger rise. With this scenario, spring high tides would be at +6 to +8 feet (Miami-Dade, 2008). This estimate also does not take into account the possibility of a catastrophically rapid melt of land-bound ice from Greenland, and it makes no assumptions about Antarctica (Miami-Dade, 2008). The IPCC is not expected to revisit these estimates until 2012; therefore, the current estimates must be taken into account in the analysis of project alternatives.

NPS *Management Policies 2006* (Section 4.7.2) regarding weather and climate states that the NPS would "gather and maintain baseline climatological data for reference" for parks containing "significant natural resources." The NPS further states that "the Service would not conduct weather-modification activities" in an attempt to alter naturally occurring conditions in the Park (NPS, 2006). While slowing the rate of sea level rise is beyond the resources of the Park, monitoring sea level change and evaluating and predicting impacts on the park's landscape is a valid management issue.

4.2 Geology, Topography, and Soils

4.2.1 Guiding Regulations and Policies

NPS *Management Policies 2006* (Section 4.8) states that the NPS would protect geologic features from the unacceptable impacts of human activity, while allowing natural processes to continue. The term "geologic features" describes the products and physical components of geologic processes. Examples of geologic features include rocks, soils, and minerals; geysers and hot springs in geothermal systems; cave and karst systems; canyons and arches in erosional landscapes; sand dunes, moraines, and terraces in depositional landscapes; dramatic or unusual rock outcrops and formations; and paleontological and paleoecological resources such as fossilized plants or animals, or their traces.

4.2.2 Assumptions, Methodology and Impact Thresholds

Potential impacts to soils are assessed based on the extent of disturbance to natural undisturbed soils, the potential for soil erosion resulting from disturbance, and limitations associated with the soils. Analysis of possible impacts to soil resources was based on review of existing literature and maps, and information provided by the NPS and other agencies.

The following thresholds were used to determine the magnitude of impacts on soils and geologic features:

Negligible: Soils and geologic features would not be affected, or effects would not be measurable. Any soil erosion, effects on soil productivity, or the ability of the soil to support native vegetation would be slight, and would occur in a localized area.

Minor: Effects on soils or geologic features (soil erosion, effects on soil productivity or the ability of the soil to support native vegetation) would be detectable, but only a localized area would be affected. If mitigation was needed to compensate for adverse effects, it would be relatively simple to implement and would likely be successful.

Moderate: Effects on soils or geologic features (soil erosion, effects on soil productivity or the ability of the soil to support native vegetation) would be readily apparent, and would occur over a regional area. Mitigation would probably be necessary to compensate for adverse effects and would likely be successful.

Major: Effects on soils or geologic features (soil erosion, effects on soil productivity or the ability of the soil to support native vegetation) would be readily apparent, and would substantially change the soil or geologic characteristics over a regional area. Extensive mitigation would be needed to compensate for adverse effects, and its success would not be assured.

Duration: Short-term impacts occur during all or part of alternative implementation; long-term impacts extend beyond implementation of the alternative.

Analysis area: The focus of this analysis is the area that would be directly affected by the proposed actions, primarily the project footprint plus 50 foot easements; however, impacts to geology, topography and soils in the greater project area (Everglades) are also discussed.

4.2.3 Impacts of the Alternatives

<u>No-Action Alternative</u>

Analysis. If the No-Action Alternative is selected as the preferred alternative, there would be no additional direct or indirect short- or long-term impacts on geology, topography, or soils other than those already realized from construction of the 2008 LRR/EA preferred alternative (1-mile eastern bridge). The geology, topography, and soils within the vicinity of the project area would continue to be adversely impacted in the short- and long-term due to peat loss.

Cumulative Impacts Cumulative effects to geology, soils and topography are based on the analysis of past, present and reasonably foreseeable future actions in the Everglades region in combination with the No-Action Alternative. Implementation of current projects such as the MWD and the CERP and reasonably foreseeable projects such as WCA-3A Decompartmentalization and the ROG initiative are anticipated to provide longer hydroperiods and increased water depths that will provide more favorable conditions for peat accretion. The implementation of MWD and CERP projects planned for the Everglades area is anticipated to result overall in a cumulative long-term beneficial effect on soils.

Conclusion. No short- or long-term adverse or beneficial effects to geology, topography, and soils would result from the selection of the No-Action Alternative. Consequently, there would be no impairment to geology, topography, or soils as a result of the No-Action Alternative.

<u>Action Alternatives</u>

Analysis. Short-term effects to soils in Northeast Shark River Slough would occur during project implementation. Access routes for removal of excavated material may need to be created and disturbance and compaction of soils is anticipated from temporary construction-related activities. Soil impacts resulting from temporary construction-related activities for any of the bridging alternatives are expected to be adverse, local, minor, and short-term. The estimated permanent and temporary acreage of soil impacts associated with each of the bridging alternatives is provided in ***Table 4-3***. The impacts to wetland soils were estimated by summing the acreage of impacts from the freshwater marsh, mixed wetland hardwood/shrub, sawgrass marsh, water/canal/pond, and grass/bare 2005 FLUCFCS categories.

Table 4-3 – Estimated soil impacts resulting from construction-related activities of bridging project alternatives

Bridging Project Alternative	Estimated Permanent Soil Impacts (acres)	Estimated Temporary Soil Impacts (acres)	Total Permanent and Temporary Soil Impacts (acres)
Alternative 1	50.7	21.9	72.6
Alternative 2a	56.5	28.2	84.7
Alternative 4	41.4	16.1	57.5
Alternative 5	44.5	18.6	63.2
Alternative 6e	49.2	40.0	89.2

Note: This acreage does not include the soil acreage impacts of the LRR No-Action 1-mile eastern bridge.

Best management practices would be implemented to minimize impacts to soils resulting from construction and maintenance-related activities. Long-term effects to soils would result from construction and maintenance-related activities and implementation of an operational plan in association with the project alternative. For all bridging alternatives (Alternatives 1-6e), soils would be excavated in the bridging footprint during construction and long-term maintenance procedures would be implemented to permanently maintain the bridging footprint devoid of soils and vegetation. It is anticipated that excavation of the soils and the vegetation layer within the bridge footprint may cause phosphorus assimilation processes to occur further downstream into ENP. Best management practices would be implemented to minimize impacts to soils resulting from long-term maintenance-related activities. It is expected the impacts resulting from this soil excavation and disturbance would be adverse, local, minor and long-term because soils would be permanently removed from the project area. Other long-term effects on soils would result from implementation of an operational plan in association with the bridging project alternatives.

The *Second Report and Initial Recommendations* published by the Miami-Dade CCATF states that global warming would result in many changes to the natural environment, "including changing atmospheric circulation and temperature patterns, changes in rainfall and severe weather, changes in biologic community distribution, increased extinction rates, changes in disease and pest distribution, and changes in sea level" (Miami-Dade, 2008). All these environmental impacts would affect South Florida, ENP, and the project area within the next century, with the key concern for the low topography project area being rising sea level, "with a very high likelihood" that the sea level may rise an additional 1.5 feet in the next 50 years and a cumulative total of three to five feet within a century (Miami-Dade, 2008). Geology, topography and soils may be impacted by saltwater infiltration of surficial aquifers and saltwater intrusion into freshwater marshes of the Northeast Shark River Slough and southern ENP.

Cumulative Impacts Implementation of current projects such as the MWD and the CERP and reasonably foreseeable projects such as WCA-3A Decompartmentalization and the ROG initiative are anticipated to provide longer hydroperiods and increased water depths that will provide more favorable conditions for peat accretion. The occurrence of unnatural peat fires is also expected to decline. Construction activities and bridge maintenance activities associated with the all the action alternatives (1-6e) would create short- and long-term adverse impacts by disturbance and removal of peat and muck. The expected benefits to soils from other projects and plans are expected to outweigh the minor adverse effects to soils of the any of the action alternatives of the proposed project. The current project in combination with related actions in other locations such as MWD and CERP projects planned for Everglades area is anticipated to result overall in a cumulative long-term beneficial effect on soils.

Conclusion. Effects to soils would be directly related to the short-term and long-term effects caused by construction, operations, and maintenance associated with any of the bridging alternatives. It is anticipated that the soil impacts resulting from temporary construction-related activities would be adverse, local, minor, and short-term. Long-term impacts resulting from implementing any of the project alternatives are anticipated to be adverse, local, and minor. No impairment of or unacceptable impacts to soils are anticipated from construction and maintenance-related activities associated with the bridging project. An overall long-term benefit to soils is anticipated with implementation of the project alternative in combination with related actions such as the MWD and CERP projects.

4.3 Water Resources

4.3.1 Hydrology

4.3.1.1 Guiding Regulations and Policies

The 1989 ENP Protection and Expansion Act authorized improvements in the delivery of water from WCA-3B to the ENP expansion area in Northeast Shark River Slough (Northeast Shark River Slough immediately south of Tamiami Trail.

NPS *Management Policies 2006* specifically addresses the management of Watershed and Stream Processes in Section 4.6.6. The policy states:

> *The Service will manage watersheds as complete hydrologic systems and minimize human- caused disturbance to the natural upland processes that deliver water, sediment, and woody debris to streams.*
>
> *The Service will manage streams to protect stream processes that create habitat features such as floodplains, riparian systems, woody debris accumulations, terraces, gravel bars, riffles, and pools. Stream processes include flooding, stream migration, and associated erosion and deposition.*
>
> *The Service will protect watershed and stream features primarily by avoiding impacts on watershed and riparian vegetation and by allowing natural fluvial processes to proceed unimpeded…*

4.3.1.2 Assumptions, Methodology and Impact Thresholds

Potential impact to hydrology is based on cumulative impacts to potential flows into Northeast Shark River Slough and water velocity in the vicinity of the bridges into the Northeast Shark River Slough in ENP. The level of benefit for each alternative is ranked according to comparison of the expected system response to either target values or to the best response. The level of impact for velocity is scored and ranked relative to the target velocity of the natural flow condition. The level of impact for the potential flows into Northeast Shark River Slough is related to bridge length and location, and is expressed as a percentage of total available marsh capacity. The rankings for the impact evaluation topics are direct impacts grouped into three categories based on the evaluations. The categories are:

Negligible: Hydrology would not be affected, or changes would be at low levels; any detected effects to hydrology would be slight and localized.

Minor: Changes in hydrology would be measurable, although the changes would be small and localized.

Moderate: Changes in hydrology would be measurable and regional.

Major: Changes in hydrology would be readily measurable, and would have observable consequences on a regional scale.

Duration: Short-term – Recovers in less than 1 year following completion of construction. Long-term - Takes more than 1 year to recover following completion of construction.

Analysis Area: The area of analysis for this project includes the Tamiami Trail project area and areas immediately upstream and downstream of the project area.

4.3.1.3 Impacts of the Alternatives

<u>No-Action Alternative</u>

Analysis If the No-Action Alternative is selected as the preferred alternative, there would be no additional direct or indirect short- or long-term impacts on hydrology other than those already realized from construction of the 2008 LRR/SEIS preferred alternative (1-mile eastern bridge).

Cumulative Impacts The intent of past, on-going and foreseeable future projects are to restore the natural hydrology of the Everglades ecosystem and increase surface water deliveries to Northeast Shark River Slough and ENP. Implementation of past, and present projects is leading to incrementally better hydrologic conditions within the Everglades ecosystem and future projects will further enhance hydrologic flows. Therefore, an analysis of future projects in conjunction with the No-Action Alternative concludes that related actions in other areas are expected to have a long-term beneficial cumulative effect on hydrology. However, most potential future benefits cannot be realized without increasing the flow capacity of the structures under Tamiami Trail.

Conclusion. No short- or long-term adverse or beneficial effects to hydrology would result from the selection of the No-Action Alternative. Consequently, there would be no additional impairment to hydrology as a result of the No-Action Alternative.

<u>Action Alternatives</u>

Analysis. Activities associated with the construction of all action alternatives (1-6e) have the potential to negatively affect hydrology. Dewatering and the temporary diversion of water flow during construction would cause adverse, short-term, localized impacts to hydrology.

While the existing culverts do provide a hydraulic connection to the deeper sloughs within Northeast Shark River Slough, the no-action alternative only distributes water to 9% of the 10.7-mile project footprint. The culverts create a point source discharge into ENP, rather than sheetflow. The action alternatives improve the distribution of flows to between 19% and 61% of the project footprint (***Table 4-4***). Alternatives 2a and 6e provide a significantly greater percentage than the other alternatives, at 40% and 61%, respectively. Given the area of marsh receiving benefits, however, the long term benefits to hydrology based on direct impacts are minor and localized for Alternatives 2a and 6e, and negligible for Alternatives 1, 4 and 5.

Table 4-4 – Water Deliveries to Everglades National Park

Alternative	Distribution of Flows as Percent of 10.7-mile Reach	Potential Flows as Percentage of Available Capacity	Average Velocity 200 feet Below Bridge (ft/sec)
No-Action	9	10	0.34
1	30	35	0.14
2a	40	50	0.10
4	19	26	0.20
5	23	29	0.16
6e	61	64	0.08

Cumulative Impacts. The intent of past, on-going and foreseeable future projects is to improve the natural hydrology of the Everglades ecosystem and increase surface water deliveries to Northeast Shark River Slough and ENP. Implementation of past, and present projects is leading to incrementally better hydrologic conditions within the Everglades ecosystem and future projects will further enhance hydrologic flows. While all action alternatives (1-6e) of the proposed project are associated with a short-term, localized, adverse impact to hydrology related to construction activities, the action alternatives have incremental long-term, beneficial effects on hydrology based on bridge opening length. Therefore, the action alternatives of the proposed project in combination with related actions in other areas are expected to have long-term beneficial cumulative effects on hydrology.

The ability of the action alternatives to convey potential flows is an important factor in determining a benefit to hydrology. The wider (longer) the bridge opening provided by an alternative the more potential there is to pass expected flows. Alternatives 6e and 2a provide the best potential to pass surface water flows as a percentage of available capacity with Alternative 6e able to pass 64% of available capacity and 2e able to pass 50% of available capacity along the 10.7 mile project corridor (***Table 4-4***). The shortest bridge length, Alternative 4, can only pass 26% of the available capacity.

Flow velocity is also important for creating and maintaining the ridge and slough landscape. With the potential higher flows from future projects, and improved operations, all of the action alternatives provide greatly improved (reduced) velocities relative to the no-action alternative. However, only alternatives 2a and 6e have velocities approaching the natural condition of 0.5 ft/sec under future anticipated flow volumes.

Conclusion. All action alternatives (Alternative 1 - 6e) will have a short-term, adverse, minor localized affect on hydrology associated with project construction. Additionally, all action alternatives will have a long-term beneficial effect on hydrology based on their capacity to convey flows and relative low velocities. Consequently, there would be no impairment to hydrology as a result of any of the action alternatives, relative to existing conditions.

4.3.2 Water Quality

4.3.2.1 Guiding Regulations and Policies

NPS *Management Policies 2006* specifically addresses water quality in Section 4.6.3. The policy states:

> *The pollution of surface waters and groundwater by both point and nonpoint sources can impair the natural functioning of aquatic and terrestrial ecosystems and diminish the utility of park waters for visitor use and enjoyment. The Service will determine the quality of park surface and groundwater resources and avoid, whenever possible, the pollution of park waters by human activities occurring within and outside the parks. The Service will*
>
> - *Work with appropriate governmental bodies to obtain the highest possible standards available under the Clean Water Act for the protection for park waters;*
> - *Take all necessary actions to maintain or restore the quality of surface waters and groundwater within the parks consistent with the Clean Water Act and all other applicable federal, state, and local laws and regulations; and*
> - *Enter into agreements with other agencies and governing bodies, as appropriate, to secure their cooperation in maintaining or restoring the quality of park water resources.*

4.3.2.2 Assumptions, Methodology and Impact Thresholds

Potential impacts to water quality are based on impacts to the chemical, physical, or biological constituents of the water column. The following thresholds were used to determine potential impacts to water quality:

Negligible: Water quality would not be affected, or changes would be at low levels of detection. Any detected effects to water quality would be slight and localized.

Minor: Changes in water quality would be measurable, although the changes would be small and localized.

Moderate: Changes in water quality would be measurable and regional.

Major: Changes in water quality would be readily measurable, and would have observable consequences on a regional scale.

Analysis area: The area of analysis for water quality is the Tamiami Trail project area and areas immediately downstream of the project area.

4.3.2.3 Impacts of the Alternatives

No-Action Alternative

Analysis. If the No-Action Alternative is selected as the preferred alternative, there would be no additional direct or indirect short- or long-term impacts on water quality other than those already realized from construction of the 2008 LRR/EA preferred alternative (1-mile eastern bridge). The water quality within the vicinity of the project area would remain unchanged.

Cumulative Impacts. Current and future projects associated with MWD, CERP, and other Everglades restoration and/or water quality improvements, such as the DECOMP project and construction of additional storm water treatment areas, is anticipated to improve water quality. The CERP and MWD projects, such as the DECOMP project, are anticipated to improve sheetflow from WCA-3B to ENP. These improvements are meant to enable the reestablishment of the historic Shark River Slough flow-way from WCA-3A through WCA-3B to ENP. Under these improvements source waters will have greater residence time moving slowly as sheetflow to undergo biological, physical and chemical reactions that will improve water filtration and reduce pollutant loadings to ENP. Additional upstream storm water treatment areas will help to improve the quality of water prior to it reaching Everglades' wetlands such as those within Northeast Shark River Slough.

Even if the No-Action Alternative is implemented, it is expected that the total cumulative impacts to water quality given related projects would be beneficial and long-term.

Conclusion. No short- or long-term adverse or beneficial effects to water quality would result from the selection of the No-Action Alternative. Consequently, there would be no impairment of water quality as a result of the No-Action Alternative.

Action Alternatives

Analysis. Short-term effects on water quality in Northeast Shark River Slough would occur during project implementation. Excavation of the project area and other construction-related disturbance activities is anticipated to cause temporary impacts to water quality in Northeast Shark River Slough such as increased TP, TSS and turbidity in the surface water in all of the bridging alternatives (Alternatives 1-6e). For all bridging alternatives (Alternatives 1-6e), soils and vegetation would be excavated in the bridging footprint during construction and long-term maintenance procedures would be implemented to permanently maintain the bridging footprint devoid of soils and vegetation. Best management practices would be implemented to minimize impacts to water quality resulting from construction and maintenance-related activities. Based on the results of the S-12D Flow-way Maintenance Plan water quality monitoring and the scope of the bridging projects, it is anticipated that the water quality impacts resulting from construction-related activities for all bridging alternatives would be adverse, local, minor, and short-term.

Long-term effects on water quality would result from implementation of an operational plan in association with this project alternative. Long-term effects to water quality resulting from operations remain unknown since an operational plan has not yet been developed for this project alternative. Since a water operations plan has not yet been developed and is not being analyzed as part of this EIS, long-term effects to water quality would need to be assessed as part of any future project that implements an operational plan.

To minimize water quality and wetland resource impacts, BMP's would be implemented during construction. These practices would include employment of staked silt fence and turbidity barriers. Silt fence would be employed prior to commencement of construction around the outer perimeter of each work zone to minimize the potential for impacts to adjacent undisturbed wetlands. Turbidity barriers would be employed in canals and deep water sites prior to commencement of construction at a sufficient distance (approximately 500 feet if conditions allow) from the work zone to create a temporary mixing zone upstream and downstream of the project area to allow for settling of any turbidity generated during construction. Because the project is located in an OFW, which has restrictive water quality requirements including no degradation of water quality including turbidity above ambient levels, all turbidity barriers would remain in place and be inspected daily throughout the construction phase of the project.

Additionally, a turbidity monitoring plan would be employed during construction. If monitoring reveals that turbidity levels exceed the standards, construction activities would be immediately halted and shall not resume until corrective actions are employed (e.g. the use of additional turbidity barriers, waiting for rain events to pass, modifications of equipment, etc.). After construction, temporarily disturbed areas would be restored to pre-existing conditions (e.g. regraded, soil uncompacted, etc) with upland areas stabilized per DOT specifications and wetlands allowed to reestablish naturally. The turbidity barriers and silt fence would be removed at the work areas once turbidity has subsided and all exposed soils are stabilized upon completion of construction.

The *Second Report and Initial Recommendations* published by the Miami-Dade CCATF states that global warming would result in many changes to the natural environment, "including changing atmospheric circulation and temperature patterns, changes in rainfall and severe weather, changes in biologic community distribution, increased extinction rates, changes in disease and pest distribution, and changes in sea level" (Miami-Dade, 2008). All these environmental impacts would affect South Florida, ENP, and the project area within the next century, with the key concern for the low topography project area being rising sea level, "with a very high likelihood" that the sea level would rise an additional 1.5 feet in the next 50 years and a cumulative total of three to five feet within a century (Miami-Dade, 2008). Water quality would be potentially impacted by increasing the amount and duration of saltwater in interior marshes of the southern ENP.

Cumulative Impacts. The localized, minor adverse impacts for all project action alternatives (1-6e) would not detract measurably from the water quality benefits anticipated from current and future projects associated with MWD and CERP. The DECOMP project is anticipated to improve flow patterns within the area necessary for the recovery of the native flora and fauna. The CERP and MWD projects, such as the DECOMP project, are anticipated to improve sheetflow from WCA-3B to ENP. These improvements are meant to enable the reestablishment of the historic Shark River Slough flow-way from WCA-3A through WCA-3B to ENP. Under these improvements source waters will have greater residence time moving slowly as sheetflow to undergo biological, physical and chemical reactions that will improve water filtration and reduce pollutant loadings to ENP.

It is expected that the total cumulative impacts to water quality given the action alternatives of the proposed project combined with related projects would be beneficial and long-term.

Conclusion. Water quality effects would be directly related to the short-term and long-term effects caused by construction, operations, and maintenance associated with the of the Tamiami Trail bridging project alternatives. It is anticipated that the water quality impacts resulting from construction-related activities would be adverse, local, minor, and short-term. No long-term effects to water quality associated with the construction of the project alternatives are anticipated. No impairment of or unacceptable impacts to water quality resources or values is anticipated from construction and maintenance-related activities associated with the bridging project. Since a water operations plan has not yet been developed and is not being analyzed as part of this EIS, long-term effects to water quality would need to be assessed as part of any future project that implements an operational plan in association with the Tamiami Trail Modifications: Next Steps project features.

4.3.3 Wetlands

4.3.3.1 Guiding Regulations and Policies

As described in the Purpose and Need chapter a federal executive orders, EO 11990 (Protection of Wetlands) direct federal agencies to avoid adverse impacts to wetlands. *Director's*

Order 77-1 establishes policies, requirements, and standards for implementing Executive Order 11990.

Director's Order 77-1 states the NPS would employ a sequence of avoiding adverse wetland impacts to the extent practicable, minimizing impacts that would not be avoided, and compensating for remaining unavoidable adverse wetland impacts by restoring degraded wetlands. If the preferred alternative would result in adverse impacts to wetlands, the NPS would prepare and approve a SOF in accordance with procedures described in *Procedural Manual 77-1: Wetland Protection*. Since wetland resources are located within the study area and would be adversely affected by the construction of the proposed project, a SOF has been prepared in accordance with procedures described in *Procedural Manual 77-1* (see ***Appendix D***).

NPS *Management Policies 2006* specifically address water quality, wetlands, and floodplains in Sections 4.6.3, 4.6.4, and 4.6.5, respectively. The policies state that NPS would "take all necessary actions to maintain or restore the quality of surface waters and ground waters within parks consistent with the Clean Water Act and all other applicable and federal, state, and local laws and regulations" and provide similar protective provisions for wetlands and floodplains that reiterate the language in the director's orders discussed above (NPS, 2006).

4.3.3.2 Assumptions, Methodology and Impact Thresholds

The impact thresholds for wetlands are based on the wetlands acreage permanently filled or restored, and the size, integrity, and connectivity of the wetlands affected. These indicators are defined as follows:

- Size – The severity of impacts to wetlands depends on the size of the wetland impacted. A small area of impact in a large wetland would be likely to have less of an effect than a large area of impact in a small wetland. The change in size of a wetland, as a result of an impact, would also influence the integrity and connectivity of the wetland and vice versa.
- Integrity – Highly intact wetland areas with little prior disturbance would be more susceptible to impacts from direct development than a wetland previously degraded by development or other activities. The loss of function and productivity of the higher quality wetland would be a greater loss than that of a lower quality wetland. Additionally, indirect impacts due to soil compaction or a change in vegetation or hydrology would also impact the integrity of the wetland.
- Connectivity – The relationship of wetlands to other wetlands or other valuable natural resources is also important in determining the degree of impact or project benefits. Narrow, previous trail corridors that are infrequently or seasonally used would have less fragmenting effect than would a wide hard-surface roadway with high volumes of vehicular or pedestrian traffic. Establishment of buildings or other structures in wetlands areas would also create barriers to the natural dispersal of plants and animals and impact the connectivity of wetlands.

Negligible: No measurable or perceptible effects on size, integrity or connectivity of wetlands would occur. No USACE 404 permit would be necessary.

Minor: The effect on wetlands would be measurable or perceptible, but localized in terms of area and the nature of the impact. A small effect on size, integrity, or connectivity would occur; however, the overall viability would not be affected. If left alone, an adversely affected wetland would recover, and the impact would be reversed. A USACE 404 permit would not be required.

Moderate: The impact would be sufficient to cause a measurable effect on one of the three parameters (size, integrity, connectivity) or would result in a permanent loss or gain in wetland acreage, but not to large areas. Wetland functions would not be affected in the long-term. A USACE 404 permit would be required.

Major: The impact would result in a measurable effect on all three parameters (size, integrity, connectivity) or a permanent loss or gain of large wetland areas. The impact would be substantial and highly noticeable. The character of the wetland would be changed so that the functions typically provided by the wetland would be substantially altered. A USACE 404 permit would be required.

Analysis area: The area of analysis for wetlands is the Tamiami Trail project area and wetland directly adjacent to the project area.

4.3.3.3 Impacts of the Alternatives

No-Action Alternative

Analysis. If the No-Action Alternative is selected as the preferred alternative, there would be no additional direct or indirect short- or long-term impacts on wetlands other than those already realized from construction of the 2008 LRR/EA preferred alternative (1-mile eastern bridge). The current unnatural altered hydrologic conditions within the vicinity of the project area would continue to have a negative impact on wetland values and functions within the WCAs, ENP, and Northeast Shark River Slough.

Cumulative Impacts. The intent of past, present, and future actions has been to restore the hydrology of the Everglades ecosystem so that degraded wetlands could recover. The MWD and the CERP projects are being implemented as an incremental part of total Everglades restoration plan that has wetland restoration as a main goal. The implementation of the No-Action Alternative in conjunction with other related actions in other areas is expected to have overall long-term beneficial cumulative effects on wetlands.

Conclusion. No short- or long-term adverse or beneficial effects to wetlands would result from the selection of the No-Action Alternative. Consequently, there would be no impairment of wetlands as a result of the No-Action Alternative.

Action Alternatives

Analysis. Specific construction methodologies and details for the action alternatives are not available at present, however all action alternatives involve a combination of different length of bridging and lengths of road reconstruction that involve varying levels of wetland impacts. Under the action alternatives the bridges and ConSpan (where required) would create a conveyance opening through Tamiami Trail by removing the sections of the existing highway. The bridges would be constructed approximately 50 south of the roadway ROW areas. The remaining highway embankment would be reconstructed to raise the crown elevation to 13.13 feet. Wetland and surface water impacts will be associated with the removal of portions existing roadway, construction of the bridges, the widening of the existing roadway to accommodate the new higher crown elevation, and construction of temporary work spaces that allow for access of construction equipment to the project site. Avoidance and minimization of wetland impacts is an important consideration; therefore, impact minimization efforts should be considered during project design and permitting to reduce impacts to adjacent wetlands and surface waters to the maximum extent possible while maintaining safe and sound engineering and construction practices.

The estimated project features engineering design GIS layers were intersected with the 2005 FLUCFCS GIS layer in ArcMap (v. 9.3) to estimate the types and quantities of wetland plant communities that would be temporarily and permanently impacted by construction of the Tamiami Trail Modifications: Next Steps project alternatives. The results of this analysis are provided in ***Table 4-5*** (Detailed maps depicting plant community types impacted by construction of Alternative 6e are provided in the Wetland Statement of Findings in ***Appendix D***). Unavoidable direct wetland impacts resulting from the proposed action alternatives range from an estimated low of 57.5 acres (41.4 acres permanent, 16.1 acres temporary) with Alternative 4 to an estimated high of 89.2 acres (49.2 acres permanent, 40.0 acres temporary) with Alternative 6e, the preferred alternative. While the alternatives with the most bridging are associated with the largest acreage of wetland impacts, they also allow for the most on-site wetland restoration associated with the road removal activities. For example, Alternative 6e allows for approximately 41.9 acres of road removal/wetland restoration (nearly a one to one ratio of restoration area to permanent impact area) while road removal/wetland restoration associated with implementation of Alternative 4 is only approximately 7.6 acres (the road removal/wetland restoration area is over five times less than the permanent impact area). Compared to the other action alternatives, Alternative 6e provides the maximum amount of road removal/wetland restoration. A summary of the estimated impacts to wetlands from implementation of the action alternatives is provided in ***Table 4-5****.*

Table 4-5 – Estimated Permanent and Temporary Wetland Impacts

2005 FLUCFCS Wetland Category		**Permanent Impact (acres)**	**Temporary Impact (acres)**
Alternative 1	Freshwater Marsh	15.8	6.8
	Mixed Wetland Hardwood/Shrub	20.9	10.6
	Sawgrass Marsh	10.8	4.1
	Water/Canal/Pond	0.7	0.2
	Grass/Bare	2.6	0.4
	Totals	**50.7**	**21.9**
Alternative 2a	Freshwater Marsh	17.9	8.3
	Mixed Wetland Hardwood/Shrub	24.4	15.3
	Sawgrass Marsh	10.8	4.1
	Water/Canal/Pond	0.7	0.2
	Grass/Bare	2.7	0.4
	Totals	**56.5**	**28.2**
Alternative 4	Freshwater Marsh	12.9	5.7
	Mixed Wetland Hardwood/Shrub	17.3	7.1
	Sawgrass Marsh	7.9	2.5
	Water/Canal/Pond	0.6	0.2
	Grass/Bare	2.6	0.6
	Totals	**41.4**	**16.1**

2005 FLUCFCS Wetland Category		Permanent Impact (acres)	Temporary Impact (acres)
Alternative 5	Freshwater Marsh	13.7	5.9
	Mixed Wetland Hardwood/Shrub	18.7	8.1
	Sawgrass Marsh	8.9	4.2
	Water/Canal/Pond	0.6	0.2
	Grass/Bare	2.7	0.3
	Totals	**44.5**	**18.6**
Alternative 6e	Freshwater Marsh	14.2	16.3
	Mixed Wetland Hardwood/Shrub	22.0	16.7
	Sawgrass Marsh	9.9	5.8
	Water/Canal/Pond	0.8	0.6
	Grass/Bare	2.4	0.6
	Totals	**49.2**	**40.0**

Permanent impacts would result from dredging and filling of wetlands associated with widening of Tamiami Trail to support the new crown elevation, dredging and filling for bridge supports and pilings, and from shading of wetlands associated with the construction of the new bridges. Temporary wetland/surface water impacts are associated with the construction of temporary work spaces so that construction equipment can accesses all areas within the construction zone.

Full realization of project benefits is dependent upon a future operational plan that utilizes the structural capacity of the alternatives. Potential benefits that would occur once an operational plan is defined and executed include enhancement of degraded wetland habitats within the Northeast Shark River Slough system. It is highly likely that implementation of the bridging alternatives in conjunction with the operational plan is self-mitigating, and that permanent and temporary wetland impacts associated with the construction of the proposed project would be offset by the enhancement to wetlands attributed to operation of the completed Tamiami Trail Modification: Next Steps project. However, long-term effects to wetlands resulting from operations remain unknown since an operational plan has not yet been developed for this project alternative. Since there is uncertainty as to the degree future benefits associated with the operation of the project, mitigation would be conducted at the Hole-in-the-Donut site at ENP if anticipated project benefits do not offset the project's impacts to wetland value and functions.

The *Second Report and Initial Recommendations* published by the Miami-Dade CCATF states that global warming would result in many changes to the natural environment, "including changing atmospheric circulation and temperature patterns, changes in rainfall and severe weather, changes in biologic community distribution, increased extinction rates, changes in disease and pest distribution, and changes in sea level" (Miami-Dade, 2008). All these environmental impacts may affect South Florida, ENP, and the project area within the next century, with the key concern for the low topography project area being rising sea level, "with a very high likelihood" that the sea level would rise an additional 1.5 feet in the next 50 years and a cumulative total of three to five feet within a century (Miami-Dade, 2008). Wetlands may be impacted by saltwater intrusion into freshwater marsh areas which would lead to conversion of the areas to brackish water systems. Additionally, freshwater wetlands may be impacted by increasing water levels and longer duration hydroperiods as freshwater flows to Florida Bay are obstructed by increased tidal gradients in southern portions of ENP.

Since the preferred alternative would result in adverse impacts to existing wetlands, a SOF in accordance with procedures described in *Procedural Manual 77-1: Wetland Protection*, has been prepared (see ***Appendix D***).

Cumulative Impacts. Direct effects of the project alternatives (1-6e) on wetlands consist of dredging, filling, shading, and compaction of wetlands from construction activities. Based on the UMAM tabletop analysis (described in Section 2.3.8, PM-8-Impacts to Wetlands), Alternative 6e had the least amount of permanent impacts to functional wetland values as compared to the other action alternatives. Alternative 6e has an estimated four times less impacts to functional wetland values than any of the other action alternatives. While Alternative 6e has the largest construction footprint area, it also provides the most restoration benefit for partial restoration of wetland functional values in the existing roadway sections that will be removed. The impacts from implementation of the action alternatives will result in moderate, adverse, long and short-term effects on wetlands. However, construction of any of the action alternatives and implementation of an operation plan for water flows creates the potential for increased flows to the ENP, and provides an opportunity for the improvement of the wetland communities within Shark River Slough located to the south of Tamiami Trail. Though the action alternatives of the proposed project has localized adverse effects on wetlands, the proposed project in conjunction with other related Everglades restoration projects such as the CERP and the MWD is anticipated to provide overall long-term beneficial cumulative effects on wetlands.

Conclusion. The implementation of the action alternatives (1-6e) would result in moderate, adverse, short-term, localized effects to wetlands associated with construction of temporary work areas. Additionally, implementation of the action alternatives would result in moderate, adverse, long-term, localized effects to wetlands associated with permanent filling of wetlands in conjunction with raising the crown of Tamiami Trail and construction of bridges. An operational plan has not yet been developed in association with the proposed project's infrastructure[34]. Full realization of project benefits is dependent upon an operational plan that utilizes the structural capacity of the preferred alternative. Potential benefits that would occur once an operational plan is defined and executed include enhancement of degraded wetland habitats within the Northeast Shark River Slough system. It is highly likely that implementation of the preferred bridging alternative in conjunction with the operational plan is self-mitigating, and that permanent and temporary wetland impacts associated with the construction of the proposed project would be offset by the enhancement to wetlands attributed to operation of the completed Tamiami Trail Modification: Next Steps project. However, long-term effects to wetlands resulting from operations remain unknown, since an operational plan has not yet been developed for the project alternatives.

Since there is uncertainty as to the level of wetland improvements that would be achieved with the operation of the project, mitigation would be conducted at the Hole-in-the-Donut site at ENP if anticipated project benefits do not adequately offset the project's impacts to wetland value and functions. Wetland impacts would be mitigated, thus, there would be no impairment of wetland values and functions as a result of implementation of any of the action alternatives.

34 Additional explanation of the development of a water operations plan can be found in the cumulative impacts analysis discussion in Section 4.1.3.

4.3.4 Floodplains

4.3.4.1 Guiding Regulations and Policies

Procedural Manual 77-2: Floodplain Management establishes the NPS procedures for implementing floodplain protection and management actions in units of the National Park System as required by Executive Order 11988, “Floodplain Management,” and *Director’s Order 77-2, Floodplain Management.* It is NPS policy to preserve floodplain values and minimize potentially hazardous conditions associated with flooding. To implement NPS floodplain policy, proposed actions are classified into one of three action classes. Depending upon the action class, one of three “regulatory floodplains” applies (100-year, 500-year, or Extreme). If a proposed action is found to be in an applicable regulatory floodplain and relocating the action to a non-floodplain site is considered not to be a viable alternative, then flood conditions and associated hazards must be quantified as a basis for management decision making and a formal SOF must be prepared, which describes the rationale for selection of a floodplain site, discloses the amount of risk associated with the chosen site, and explains flood mitigation plans. Since the project is located within a mapped floodplain, a SOF in accordance with procedures described in *Procedural Manual 77-2: Floodplain Management*, has been prepared (see ***Appendix E***).

NPS *Management Policies 2006* specifically addresses floodplains in Section 4.6.4. The policy states:

> *In managing floodplains on park lands, the National Park Service will (1) manage for the preservation of floodplain values; (2) minimize potentially hazardous conditions associated with flooding; and (3) comply with the NPS Organic Act and all other federal laws and executive orders related to the management of activities in flood-prone areas, including Executive Order 11988 (Floodplain Management), the National Environmental Policy Act, applicable provisions of the Clean Water Act, and the Rivers and Harbors Appropriation Act of 1899. Specifically, the Service will*
>
> - *Protect, preserve, and restore the natural resources and functions of floodplains;*
> - *Avoid the long- and short-term environmental effects associated with the occupancy and modification of floodplains; and*
> - *Avoid direct and indirect support of floodplain development and actions that could adversely affect the natural resources and functions of floodplains or increase flood risks.*
>
> *When it is not practicable to locate or relocate development or inappropriate human activities to a site outside and not affecting the floodplain, the Service will*
>
> - *Prepare and approve a Statement of Findings, in accordance with procedures described in Director’s Order 77-2 (Floodplain Management);*
> - *Use nonstructural measures as much as practicable to reduce hazards to human life and property while minimizing the impact to the natural resources of floodplains;*
> - *Ensure that structures and facilities are designed to be consistent with the intent of the standards and criteria of the National Flood Insurance Program (44 CFR Part 60).*

4.3.4.2 Assumptions, Methodology and Impact Thresholds

Impact thresholds for floodplain impacts are based on size of impact, length of effect, and area affected.

Negligible: Floodplains would not be affected; effects would either be non-detectable, or, if detected, would be considered slight, local, and would likely be short-term. A USACE 404 permit would not be necessary.

Minor: Effects on floodplains would be measurable, although the effects would likely be small, short-term, and localized. No mitigation measures associated with water quality or hydrology would be necessary. A USACE 404 permit would not be necessary.

Moderate: Effects on floodplains would be measurable and long-term but would be relatively localized. Mitigation could be required and if implemented, would likely be successful. A USACE 404 permit could be required.

Major: Effects on floodplains would be readily measurable, would have substantial consequences, and would be observable over a relatively large area and likely long-term. The character of the floodplain would be changed so that the functions typically provided by the floodplain would be substantially changed. Mitigation would be required and its success could not be assured. A USACE 404 permit would be required.

Analysis area: The area of analysis for floodplains is the 10.7- mile project corridor including the 50-foot ROW.

4.3.4.3 Impacts of the Alternatives

No-Action Alternative

Analysis. If the No-Action Alternative is selected as the preferred alternative, there would be no additional direct or indirect short- or long-term impacts on floodplains other than those already realized from construction of the 2008 LRR/EA preferred alternative (1-mile eastern bridge). The current unnatural altered hydrologic conditions within the vicinity of the project area would continue to have a negative impact on floodplain functions and values within the WCAs, ENP, and Northeast Shark River Slough.

Cumulative Impacts. Related actions such as the decompartmentalization of WCA-3 will lead to removal of impediments to flow which will benefit floodplain value and functions. The No-Action Alternative will have no effect on floodplains, however other past, present, and foreseeable future actions in the Everglades region will have a long-term beneficial cumulative effect on floodplains.

Conclusion. No short- or long-term adverse or beneficial effects to floodplains would result from the selection of the No-Action Alternative. Consequently, there would be no impairment to floodplain functions and values as a result of the No-Action Alternative.

Action Alternatives

Analysis. Action Alternatives 1, 4, and 5 provide for additional restoration of floodplain values and functions by bridging an additional 1 to 2.2 miles of floodplain when compared to the No-Action Alternative. The additional capacity to convey storm and flood events allowed by these bridging options would allow for enhanced hydrology and improved function of floodplain values and functions. Implementation of these alternatives is expected to have long-term beneficial effects to the values and functions of the floodplain.

Action Alternatives 2a and 6e would provide for the highest restoration of floodplain values and functions compared to the other alternatives based on the amount of bridging associated with these two alternatives. The preferred alternative, 6e, provides for most bridging of all alternatives, 5.5 miles of additional bridging compared to the No-Action Alternative. Implementation of alternatives 2a and 6e can be expected to provide long-term beneficial effects to the values and functions of floodplains. Under current conditions water flows from large storm events are prevented from quickly flowing to tide by the damming effect of Tamiami Trail. This situation causes regional high water conditions in the upstream WCAs until flows can bleed down through the Tamiami Trail culvert sets. Openings created by bridge crossings, in association with an adequate operational plan, will allow flows to be released more readily allowing regional water levels to recover following storm events.

It is anticipated that construction of all alternatives will have short-term, negative moderate impacts associated with project construction, due to placement of temporary fill, and changes in the existing duration, timing, and delivery of storm and flood events because of temporary rerouting of water flows. However, bridging of floodplain/wetlands will have a beneficial effect on floodplain values and functions in the long term.

The *Second Report and Initial Recommendations* published by the Miami-Dade CCATF states that global warming would result in many changes to the natural environment, "including changing atmospheric circulation and temperature patterns, changes in rainfall and severe weather, changes in biologic community distribution, increased extinction rates, changes in disease and pest distribution, and changes in sea level" (Miami-Dade, 2008). All these environmental impacts may affect South Florida, ENP, and the project area within the next century, with the key concern for the low topography project area being rising sea level, "with a very high likelihood" that the sea level would rise an additional 1.5 feet in the next 50 years and a cumulative total of three to five feet within a century (Miami-Dade, 2008). Floodplains may be impacted by the intrusion of saltwater into interior freshwater marshes as conveyance of storm and flood events to tide would be reduced as freshwater flow is impeded by increasing tidal gradients in southern portions of ENP.

Finally, since the project is located within a mapped floodplain, a SOF in accordance with procedures described in *Procedural Manual 77-2: Floodplain Management*, has been prepared (see ***Appendix E***).

Cumulative Impacts. The intent of future projects such as the Decompartmentalization of WCA-3 will be to remove impediments to flow which will benefit floodplain values and functions. While the implementation of the action alternatives (1-6e) will have short-term adverse impacts associated with project construction, it is offset by the long term benefit realized by the removal of portions of the roadway which were major restrictions to floodplain function. The action alternatives in combination with present and foreseeable future actions will have long-term beneficial cumulative effects on floodplains.

Conclusion. All action alternatives (1-6e) would have a short-term, adverse, moderate, localized effect on floodplain values and functions associated with project construction including diminished ability of the floodplain to convey storm and flood events due to temporary fill and rerouting of water flow. However, action alternatives 2a and 6e would have a long-term beneficial effects associated with restoration of water flow while action alternatives 1, 4, and 5 would have a long-term beneficial effect based on the additional capacity the floodplain would have to convey storm and flood events, therefore no impairment of floodplain functions is anticipated by implementation of any of the action alternatives.

4.4 Wildlife and Vegetation / Habitat

4.4.1 Guiding Regulations and Policies

The NPS Organic Act of 1916 and the NPS *Management Policies 2006* (NPS, 2006) direct parks to provide for the protection of park resources. The NPS *Management Policies 2006* state that "the Service would not attempt to solely preserve individual species (except threatened or endangered species) or individual natural processes; rather, it would try to maintain all the components and processes of naturally evolving park ecosystems, including the natural abundance, diversity, and genetic and ecological integrity of the plant and animal species native to those ecosystems. Just as all components of a natural system would be recognized as important, natural change would also be recognized as an integral part of the functioning of natural systems."

4.4.2 Assumptions, Methodology and Impact Thresholds

Maps showing vegetation cover in the Tamiami Trail project area and communications with NPS staff were used to identify baseline conditions for wildlife, wildlife habitat, and vegetation. Available information was also taken from other NPS and non-NPS resources to describe these resources in more detail.

In general, it was assumed that there would be impacts to wildlife and wildlife habitat that occur from the construction phase of the action alternatives, as well as post-construction effects. The primary steps taken in assessing impacts on wildlife and wildlife habitat (including vegetation) included determining:

1. Which species are found in areas likely to be affected by management actions described in the alternatives;
2. Habitat/vegetation loss or alteration caused by the alternatives; and
3. Displacement and disturbance potential of the actions and the species' potential to be affected by construction or future use and management activities.

The thresholds for the intensity of an impact are defined as follows:

Negligible: There would be no observable or measurable impacts to native species, their habitats, or the natural processes sustaining them. Impacts would be well within natural fluctuations.

Minor: A change in effects on wildlife and habitats would be localized within a small area. The change would be measurable or perceptible in terms of abundance, distribution, quantity, or quality of populations. While the mortality of individual animals might occur, the viability of wildlife populations would not be affected and the community, if left alone, would recover. Impacts would be detectable and are expected to be outside the natural range of variability.

Moderate: A change in effects on wildlife and habitats would occur over a relatively large area. The change would be readily measurable in terms of abundance, distribution, quantity, or quality of populations. Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and would be outside the natural range of variability. Disruptions to key ecosystem processes that would be outside natural variation might occur, but the ecosystem would soon return to natural conditions. Mitigation measures would probably be necessary to compensate for adverse effects and would likely be successful.

Major: A change in effects on wildlife and habitats would be readily apparent, and would substantially change wildlife populations over a large area in and out of the park. Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and would be expected to be outside the natural range of variability or be permanent. Key ecosystem processes might be disrupted. Loss of habitat might affect the viability of at least some native species. Extensive mitigation would be needed to compensate for adverse effects, and its success would not be assured.

Analysis area: The focus of this analysis is the area that would be directly affected by the proposed actions, primarily the project footprint plus 50 foot easements; however, impacts to wildlife in the greater project area (Everglades) are also discussed.

4.4.3 Impacts of the Alternatives

No-Action Alternative

Analysis. If the No-Action Alternative is selected as the preferred alternative, there would be no additional direct or indirect short- or long-term impacts on wildlife or vegetation/habitats other than those already realized from construction of the 2008 LRR/EA preferred alternative (1-mile eastern bridge). The current unnatural altered hydrologic conditions within the vicinity of the project area would continue to have a negative impact on wildlife habitat and vegetation in ENP, and Northeast Shark River Slough and movement of wildlife between Northeast Shark River Slough and the WCAs would continue to be hindered by the presence of Tamiami Trail.

Cumulative Impacts. Related actions in the vicinity of the proposed project would lead to improved wildlife habitat and increased ecological connectivity. The Decompartmentalization of WCA-3 will remove the L-29 levee and allow the return of the ridge and slough ecosystem to areas north of Tamiami Trail while increasing connectivity to areas to the south. While the No-Action Alternative offers no significant improvement to wildlife habitat, the cumulative effects to wildlife associated with the related projects in region is long-term and beneficial.

Conclusion. No short- or long-term adverse or beneficial effects to wildlife and vegetation/habitats would result from the selection of the No-Action Alternative. Consequently, there would be no impairment to wildlife and vegetation/habitats as a result of the No-Action Alternative.

Action Alternatives

Analysis. In the areas directly adjacent to the proposed project area, the noise associated with construction, and the presence of construction personnel would temporarily disperse wildlife to adjacent habitats although it is unlikely that changes to community or population dynamics would occur.

Erosion, sedimentation, and potential petroleum spills from equipment have the potential to cause pollution in surface waters that could adversely affect wildlife that utilize surface waters in the project area. However, pre and post construction erosion control BMPs would minimize impacts, including the installation and inspection of silt fences, hay bale barriers, sediment traps, or other equivalent measures.

Construction of any of the action alternatives would result in temporary and permanent loss of useable habitat by wildlife with effects that are anticipated to range from short to long term, and range from minor to moderate, dependent on the species. Dependent on the species this could result in a loss of breeding, foraging, roosting, loafing, shelter, and/or ranging habitat.

Based on availability of other useable habitat in the vicinity of the project area, the scale of the project, and the ability of some wildlife to move away from disturbance activities, it is estimated that habitat losses resulting from implementation of any action alternative (1-6e) is minor for most fish, invertebrates, mammals, amphibians, and reptiles (please note effects to Special Status species are described in Section 4.6, Special Status Species). Mortality of some individual animals, such as burrowing invertebrates that cannot move away from disturbance activities would be anticipated. However, no significant impact to mammal, amphibian, or reptile populations would be anticipated to occur from construction activities.

Because the area beneath the bridges would likely be scraped to bedrock, this area is anticipated to provide a type of artificial habitat similar to the culvert pools. It is anticipated the deeper habitat beneath the bridges would increase suitable conditions for larger native fish, such as the Florida gar, and for exotic fish species not adapted to the cyclical drying of the Everglades freshwater marsh. Smaller native fish beneath the bridges would likely be subject to increased predation. Overall, the deeper water habitat beneath the bridges would serve as refuge during the dry season, which may alter downstream marsh dynamics for species such as wading birds that use natural alligator holes and shallower ponds for foraging. While it is anticipated the deeper water habitat beneath the bridges may provide refuge for exotic fish and the exotic apple snail, the potential spread and effects on native species remains unknown.

Because there are three active wading bird colonies within the vicinity of the project area, effects to wading bird species and anhingas nesting within these colonies are anticipated to range from short to long-term and be at the moderate impact level. Permanent loss of wading bird nesting, loafing, roosting, and foraging habitat would result from construction activities. We would expect a similar level of impacts for other avian species that may be nesting within the project area. Because of the location of the project features and colony locations, wetland impacts from construction activities to the Tamiami wading bird nesting colonies are not directly related to bridge length. For example, Alternative 2a (as compared to the other action alternatives) has the highest estimated acreage of wetland impacts to the Tamiami wading bird colonies and is the only alternative that impacts the Tamiami East 2 Wading Bird Colony Habitat. Please refer to Section 4.6, Special Status Species for additional information regarding anticipated impacts to habitat at the Tamiami wading bird colonies.

Based on the results of our wildlife mortality performance measure evaluation (Section 2.3.5 of this EIS provides greater detail on procedures for calculating reduction in wildlife mortality.), all action alternatives would result in an increase in ecological connectivity, with benefits being directly related to bridging length. Thus, in comparison of the action alternatives, Alternative 6e would provide the greatest benefit to prevent vehicle collisions and prevent wildlife mortality. Alternatives 1 and 2a provide a moderate improvement over the No-Action alternative, while Alternatives 4 and 5 provide only a minimal improvement. The ability for wildlife to move between habitat components is crucial for maintaining wildlife population health and diversity. Tamiami Trail has long represented a barrier to wildlife movement to the north and south and the construction of bridges would provide much improved access for species to move between habitats in the WCAs and Northeast Shark River Slough. The deaths of small animals from collision with vehicles would continue to occur in the unbridged sections of Tamiami Trail. The mortality of wetland dependent amphibians and reptiles and potentially some mammals would not occur in the bridged sections because there would be no connection between the road surface and the marsh and canal habitat of the animals. However, because the L-29 canal and levee are not eliminated and because conditions may be artificially deep under the bridge, limited bridging (as in Alternatives 4 and 5) may simply redirect some animals to cross at other sections of the unbridged Tamiami Trail.

Steps would be taken to minimize the introduction of non-native plant species, which would affect the makeup of wildlife habitat, during and after construction. This would include limiting the amount of topsoil imported for revegetation, using seeds from native species for revegetation, and implementing exotic species control as necessary.

Full realization of project benefits is dependent upon an operational plan for water management that utilizes the structural capacity of the alternatives[35]. Potential benefits that would occur once an operational plan is defined and executed include enhancement of degraded wetland habitats within Northeast Shark River Slough that would lead to overall improvements in the quality of wildlife habitats in the vicinity of the project area. However, since an operational plan has not been developed for the project alternatives, anticipated benefits to wildlife habitats as a result of full implementation of an operational plan and structural improvements (the action alternatives) cannot be analyzed at this time.

The *Second Report and Initial Recommendations* published by the Miami-Dade CCATF states that global warming would result in many changes to the natural environment, “including changing atmospheric circulation and temperature patterns, changes in rainfall and severe weather, changes in biologic community distribution, increased extinction rates, changes in disease and pest distribution, and changes in sea level” (Miami-Dade, 2008). All these environmental impacts may affect South Florida, ENP, and the project area within the next century, with the key concern for the low topography project area being rising sea level, “with a very high likelihood” that the sea level may rise an additional 1.5 feet in the next 50 years and a cumulative total of three to five feet within a century (Miami-Dade, 2008). Wildlife and vegetation may be impacted by increasing saltwater intrusion into interior freshwater wetlands. This impact may cause dramatic changes in vegetation type and may lead to shifts in wildlife habitat forcing wildlife to seek areas with appropriate habitat.

Cumulative Impacts. Related actions in the vicinity of the proposed project would lead to improved wildlife habitat and increased ecological connectivity. Everglades’ restoration projects such as the CERP and the MWD are anticipated to improve hydropatterns and hydroperiods within Northeast Shark River Slough, improving habitats for most native wildlife species. The Decompartmentalization of WCA-3 will is anticipated to remove the L-29 levee and allow improved connectivity of ridge and slough habitats north and south of the Tamiami Trail. While all action alternatives (1-6e) result in short to long-term adverse effects to wildlife as a result of construction activities and loss of habitat, this is not anticipated to measurably detract from the long-term cumulative benefits anticipated with implementation of the Tamiami Trail Modifications: Next Steps project in association with the CERP and the MWD projects. Cumulative effects to wildlife associated with the action alternatives of the proposed project in conjunction with other Everglades related projects in other areas is anticipated to be long-term and beneficial.

Conclusion. Short-term to long-term, minor to moderate, adverse, effects to wildlife and vegetation/habitats would result from the construction of the action alternatives (Alternatives 1-6e). Long-term beneficial effects to wildlife and habitat would result from the increased ecological connectivity provided through the implementation of all action alternatives. Consequently, there would be no impairment of wildlife and habitat as a result of the action alternatives.

4.5 Land Use

4.5.1 Guiding Regulations and Policies

NPS *Management Policies 2006* (Section 3, Land Protection) states that “the National Park Service would use all available authorities to protect lands and resources within units of the national park system, and the Park Service would seek to acquire nonfederal lands and

35 Additional explanation of the development of a water operations plan can be found in the cumulative impacts analysis discussion in Section 4.1.3.

interests in land that have been identified for acquisition as promptly as possible. For lands not in federal ownership, both those that have been identified for acquisition and other non federally owned lands within a park unit's authorized boundaries, the Service would cooperate with federal agencies; tribal, state, and local governments; nonprofit organizations; and property owners to provide appropriate protection measures. Cooperation with these entities would also be pursued, and other available land protection tools would be employed when threats to resources originate outside boundaries".

4.5.2 Assumptions, Methodology and Impact Thresholds

Maps showing land use in the Tamiami Trail project area and communications with NPS staff were used to identify land use in the project area. Available information was also taken from other NPS and non-NPS resources to describe these resources in more detail.

The thresholds for the intensity of an impact are defined as follows:

Negligible: Land use in the form of construction of facilities and/or location or introduction of recreational or other activities in all cases conforms to the existing area land uses, any existing city or county zoning, and existing easements, licenses, rights-of-way, and leases.

Minor: Land use in the form of construction of facilities and/or location or introduction of recreational or other activities generally conforms to the existing area land uses, any existing city or county zoning, and generally honors existing easements, licenses, rights-of-way, and leases. Nonconforming uses or activities can be easily mitigated to bring them into conformance.

Moderate: Land use in the form of construction of facilities and/or location or introduction of recreational or other activities generally conforms to the existing area land uses, any existing city or county zoning, and generally honors existing easements, licenses, rights-of-way, and leases. Nonconforming uses or activities can be mitigated to bring them into conformance; however, such mitigation is difficult and expensive and may result in substantial changes to the proposal.

Major: Land use in the form of construction of facilities and/or location or introduction of recreational or other activities does not conform to the existing area land uses, any existing city or county zoning, and/or honors all existing easements, licenses, rights-of-way, and leases, and constitutes a conflicting use. Mitigation measures cannot be implemented to change the level of conformance.

Analysis area: The focus of this analysis is the area that would be directly affected by the proposed actions, primarily the project footprint plus 50 foot easements.

4.5.3 Impacts of the Alternatives

No-Action Alternative

Analysis. If the No-Action Alternative is selected as the preferred alternative, there would be no additional direct or indirect short- or long-term impacts on land use other than those already realized from construction of the 2008 LRR/EA preferred alternative (1-mile eastern bridge). The current land uses along the project corridor consisting of a mix of commercial, communication, development, and wetland uses would remain unchanged.

Cumulative Impacts. The consequence of certain CERP and ROG related actions is to change land use from agricultural related activities to surface waters for water treatment or wetland habitats. While this change of land use has negative connotation in terms of lost jobs and tax base, the change of use is consistent with general land use of the area, which is former wetlands, and consistent with local policies and plans. The No-Action Alternative maintains a status quo in the project area and in combination with other related actions in the vicinity of the project area will have a negligible long-term cumulative effect on land use.

Conclusion. No short- or long-term adverse or beneficial effects to land use would result from the selection of the No-Action Alternative. Consequently, there would be no impairment of land use as a result of the No-Action Alternative.

Action Alternatives

Analysis. Existing land use along the project area includes transportation corridor, commercial/services, communication, general development, grass/bare ground, and wetlands. ***Table 4-6*** shows the acres of each land use that would be impacted by implementation of each action alternative.

Table 4-6 – Land Use Impacts

Land Use	Alternative 1		Alternative 2a		Alternative 4		Alternative 5		Alternative 6e	
	Impacts (acres)									
	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.
Commercial/Services	0.21	0.05	0.21	0.05	0.21	0.05	0.21	0.05	0.19	0.06
Communications	0.76	0.11	0.76	0.11	0.3	0.11	0.76	0.11	0.44	0.53
Development	0.33	0.1	0.33	0.1	0.33	0.1	0.33	0.1	0.39	0.17
Freshwater Marsh	19.4	10.57	21.52	12.06	16.59	9.55	17.35	9.67	16.9	16.26
Grass/Bare Ground	2.79	0.36	2.82	0.37	2.76	0.57	2.78	0.34	2.5	0.64
Mixed Wetland Hardwood/Shrub	23.38	12.98	26.93	17.73	19.85	9.53	21.22	10.54	24.22	16.66
Road	0.66	0.14	0.67	0.14	0.61	0.12	0.62	0.12	0.7	0.23
Sawgrass Marsh	10.83	4.1	10.83	4.1	7.89	2.5	8.86	4.17	9.85	5.8
Water/Canal/Pond	0.71	0.2	0.76	0.2	0.62	0.22	0.66	0.19	0.79	0.63
Total	***59.07***	***28.61***	***64.83***	***34.86***	***49.16***	***22.75***	***52.79***	***25.29***	***55.98***	***40.98***

Approximately 93% of all permanent land use impacts and 97% of all temporary land use impacts resulting from implementation of the project action alternatives (1-6e) is conversion of wetlands to transportation corridor. Impacts resulting from this conversion are discussed in detail in Section 4.3.3 (Wetlands). Conversion of commercial and developed land uses combined represents the remaining minimal permanent and temporary impacts for all of the action alternatives.

Commercial and developed land use categories can experience short-term adverse impacts due to conversion activities. These include entrances that can be blocked by construction activities, and noise and fugitive dust generated by the construction activities. Construction activities may dissuade customers from visiting a commercial business operation or reduce the enjoyment of customers utilizing the business site. Long-term adverse impacts are associated with the loss of commercial or developed land uses to transportation corridor; however these impacts are minor given the small acreages that are involved.

Cumulative Impacts. The consequence of certain CERP and ROG related actions is to change land use from agricultural related activities to surface waters for water treatment or wetland habitats. While this change of land use has negative connotation in terms of lost jobs and tax base, the change of use is consistent with general land use of the area, which is former wetlands, and consistent with local policies and plans. The action alternatives (1-6e) of the proposed project would result in the change of wetland and commercial business land uses to transportation corridor. This change of land use will have a minor, adverse, short and long-term adverse effect on land use within the project area. The action alternatives in combination with other related actions in the vicinity of the project area will have a negligible long-term cumulative effects on land use.

Conclusion. Implementation of all action alternatives would have a minor, short-term, localized, adverse, effect associated with project construction and a long-term, localized, adverse, minor effect on land use in association with the conversion of existing land uses to transportation corridor.

4.6 Special Status Species

4.6.1 Guiding Regulations and Policies

The primary regulation governing this topic is the ESA, 16 USC § 1531-1543. The purpose of the ESA is to conserve "the ecosystem upon which endangered and threatened species depend" and to conserve and recover listed species. The ESA is a comprehensive wildlife conservation law administered by the Department of Interior's USFWS and NOAA's NMFS. This act mandates that all federal agencies protect listed species and preserve their habitats.

The state of Florida also has regulations for the protection of threatened and endangered species. The Florida Endangered and Threatened Species Act (Title 28, Florida Statutes, Natural Resources Conservation, Reclamation, and Use, Chapter 372, Wildlife, Section 372.072) is the primary regulation in the state, and sets the policy to conserve and wisely manage these resources, as well as provide for research and management to conserve and protect these species as a natural resource. This act also emphasizes coordination with state agencies, and outlines annual reporting requirements as well the development of specific biological goals for manatees.

The Endangered Species Protection Act (Florida Statutes Section 372.0725) prohibits the intentional wounding or killing of any fish or wildlife species designated by the Florida Game and Freshwater Fish Commission (now known as the FFWCC) as "endangered", "threatened" or of "special concern". This prohibition also extends to the intentional destruction of the nests or eggs of any such species.

The protection of endangered, threatened, or "commercially exploited" plants is addressed in the Preservation of Native Flora of Florida Act (Florida Statutes Section 581.185). Commercially exploited plants are defined as species native to the state which are subject to being removed in substantial numbers from native habitats in the state and sold or transported for sale. This act sets the policy for the state of Florida relating to these species, and includes several prohibitions covering the "willful destroying or harvesting" of such plants. It also contains an exemption for agricultural and silviculture uses.

Section 4.4.2.3 of the NPS *Management Policies 2006* provides specific guidance for management of threatened or endangered plants and animals. These policies dictate that the NPS would survey for, protect, and strive to recover all species native to national park system units that are listed under the ESA. The NPS would fully meet its obligations under the NPS Organic Act and the ESA to both proactively conserve listed species and prevent detrimental effects on these species. This section also states that the NPS would inventory, monitor, and manage state and locally listed species in a manner similar to its treatment of federally listed species to the greatest extent possible. In addition, the Service would inventory other native species that are of special management concern to parks (such as rare, declining, sensitive, or unique species and their habitats) and would manage them to maintain their natural distribution and abundance.

4.6.2 Assumptions, Methodology and Impact Thresholds

The USFWS and NOAA NMFS guidance for implementing Section 7 consultation under the ESA uses the following terminology to assess impacts to listed species (USFWS and NMFS, 1998):

"No Effect" – This conclusion is reached if the proposed action and its interrelated and interdependent actions will not directly or indirectly affect listed species or destroy/adversely modify designated critical habitat. Formal section 7 consultation is not required when the no effect conclusion is reached. However, a request for the optional written concurrence is encouraged to facilitate a complete administrative record.

"May Affect, but is not likely to adversely affect" – This conclusion is appropriate when effects to the species or critical habitat are expected to be beneficial, discountable, or insignificant. Beneficial effects are contemporaneous positive effects without any adverse effects to the species or habitat. Insignificant effects relate to the size of the impact (and should never reach the scale where take occurs), while discountable effects are those that are extremely unlikely to occur. Based on best judgment, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur. If the project scientist making the determination and the project manager agree that the project "is not likely to adversely affect" listed species or critical habitat, the intra-Service section 7 consultation process is completed. If formal section 7 consultation is required for other species affected by this proposed action, then it may be easier and less confusing to fold the "is not likely to adversely affect" concurrence into the formal section 7 consultation rather than doing a separate concurrence.

"May affect, and is likely to adversely affect" – This conclusion is reached if any adverse effect to listed species or critical habitat may occur as a direct or indirect result of the proposed Service action or its interrelated or interdependent actions, and the effect is not discountable or insignificant (see definition of "is not likely to adversely affect". In the event the overall effect of the proposed action is beneficial to the listed species or critical habitat, but may also cause some adverse effect on individuals of the listed species or segments of the critical habitat, then the determination should be "is likely to adversely affect." Such a determination requires formal section 7 consultation.

Based on these impact levels, the thresholds for threatened and endangered species are as follows:

Negligible: There would be no observable or measurable impacts to federally-listed species, their habitats, or the natural processes sustaining them in the proposed project area. This impact intensity would equate to a determination of "no effect" under Section 7 of the ESA.

Minor: Individuals may temporarily avoid areas. Impacts would not affect critical periods (e.g., breeding, nesting, denning, feeding, resting) or habitat. This impact intensity would equate to a determination of "not likely to adversely affect" under Section 7 of the ESA.

Moderate: Individuals may be impacted by disturbances that interfere with critical periods (e.g., breeding, nesting, denning, feeding, resting) or habitat; however, the level of impact would not result in a physical injury, mortality, or extirpation from the park. This impact intensity would equate to a determination of "likely to adversely affect" under Section 7 of the ESA.

Major: Individuals may suffer physical injury or mortality or populations may be extirpated from the park. This impact intensity would equate to a determination of “likely to adversely affect” under Section 7 of the ESA.

4.6.3 Impacts of the Alternatives

No-Action Alternative

Analysis. If the No-Action Alternative is selected as the preferred alternative, there would be no additional direct or indirect short- or long-term impacts to special status species other than those already realized from construction of the 2008 LRR/EA preferred alternative (1-mile eastern bridge). The current unnatural altered hydrologic conditions within the vicinity of the project area would continue to have a negative impact on special status species within ENP and Northeast Shark River Slough.

Cumulative Impacts. On-going and future projects are expected to provide some degree of restoration of habitat benefits including, restoration of more natural sheet flows to the Northeast Shark River Slough and improved hydrology in other portions of the Everglades which would improve special status species habitats. Implementation of CERP, the MWD and other Everglades restoration projects in the area will improve special species habitats and is anticipated to have beneficial, long-term cumulative effects on special status species.

Conclusion. No short- or long-term adverse or beneficial effects to special status species would result from the selection of the No-Action Alternative. Consequently, there would be no impairment to special status species as a result of the No-Action Alternative.

Action Alternatives

Analysis.

Everglades mink

Everglades mink were not detected in a recent wildlife camera monitoring study conducted near the Tamiami Trail culverts. However, it is possible that the Everglades minks are in the project area and they were not detected in the camera monitoring study. Should any Everglades minks be detected in the project area, the FFWCC and the USFWS will be notified. Because of the limited potential for occurrence of this species, it is concluded that any of the action alternatives may affect, but are not likely to adversely affect, the Everglade mink.

West Indian Manatee

For the POR of over 20 years, there has been only one record of a manatee utilizing the L-29 Canal adjacent to Tamiami Trail. Therefore, it is highly unlikely that a manatee would be encountered in the project area. However, The Guidelines for Manatee Conservation During CERP Implementation (CERP Interagency Manatee Task Force, 2006) would be followed during all phases of construction. Therefore, the implementation of any of the action alternatives may affect, but are not likely to adversely affect the West Indian manatee.

Florida Panther

According to radio collar telemetry data, no Florida panther activity has been recorded in the project area in the past six years. The status and activities of uncollared panthers is unknown (USFWS, 2008). Under the recent USFWS panther consultation protocols, any loss of habitat greater than five acres in the primary habitat zone must undergo formal consultation. The primary habitat zone for the panther extends north through Northeast Shark River Slough to the southern edge of Tamiami Trail. Because construction of any of the Tamiami Trail Modifications:

Next Steps project alternatives would impact more than five acres of primary panther habitat, formal USFWS consultation under Section 7 of the ESA is required.

Radio telemetry data collected within the Florida Everglades from 1981-2003 from over 57,000 radio locations of 100 Florida panthers and eight introduced Texas cougars (*Puma concolor stanlyana*) provides evidence that panthers actively select forested habitats and avoid open water wetlands within their home range (Cox et al., 2006). The habitat within Northeast Shark River Slough, ENP was included in the radio telemetry studies and was classified as the open water wetland habitat that panthers actively avoid (Cox et al., 2006). However, panthers have been recorded in Northeast Shark River Slough, ENP and are known to use a mosaic of habitats while they select their home range and traverse through less preferred habitats to reach more preferred forested habitats (Cox et al., 2006).

The radio telemetry studies provide evidence that panthers are avoiding crossing the Tamiami Trail from ENP to WCA-3B in the location of the Tamiami Trail Modifications: Next Steps project (Cox et al., 2006). It is possible that the Tamiami Trail is acting as a barrier to Florida panther movements. A study conducted in Banff National Park, Canada provides evidence that open span bridges with fencing provide a preferred cougar (*Puma concolor*) crossing structure type at highways as compared to five other types of crossing structures that were evaluated (Gloyne and Clevenger, 2001). While the Tamiami Trail Modifications: Next Steps project is not comparable to the benefits described in the Gloyne and Clevenger (2001) study, replacing the Tamiami Trail roadway with open span bridges such as those described in the Tamiami Trail Modifications: Next Steps preferred alternative may improve panther movements between WCA-3B and Northeast Shark River Slough, ENP, especially when implemented with other Everglades restoration projects such as the WCA-3A Decompartmentalization.

However, it remains relatively uncertain if the Tamiami Trail Modifications: Next Steps bridging project will provide any benefits to the Florida panther since they may not be in project area and the freshwater marshes within Northeast Shark River Slough are clearly not their preferred habitat (Cox et al., 2006). Also, even with the open span bridges described in the Tamiami Trail Modifications: Next Steps project, panthers may avoid the Tamiami Trail altogether or prefer to cross on the drier, unbridged portions of the Tamiami Trail roadway. It is uncertain if fencing along the unbridged portions of the roadway would be needed to ensure panthers would cross beneath the open span bridges as compared to the unbridged roadway portions.

In summary, our evaluation indicates that the habitat impacted by construction of the Tamiami Trail Modifications: Next Steps project is not preferred panther habitat and the Tamiami Trail may be acting as a barrier to panther movements north of the Tamiami Trail. The open span bridges in the preferred alternative may provide some benefit to improve Florida panther movements between WCA-3B and Northeast Shark River Slough ENP. Coordination will continue with the USFWS to mitigate for the loss of panther habitat, if needed.

Therefore, because of the lack of recent panther activity, the small size and poor quality of panther habitat proposed to be impacted, and the potential increased habitat connectivity provided by the bridging proposed under any of the action alternatives, the implementation of any of the proposed action alternatives may affect, but are not likely to adversely affect the Florida panther.

American Alligator

Construction related activities associated with all action alternatives would likely cause alligators to abandon man altered waterways in the project area for more natural habitats within the Northeast Shark River Slough. However, because construction activities would be restricted to the immediate vicinity of the highway, it is concluded that the proposed project may affect, but is not likely to adversely affect the American alligator.

Eastern indigo snake

This species has the potential to occur in the project area, although there are no known occurrences in the project area. Because the eastern indigo snake could potentially be found the area affected by construction activities, The Standard Protection Measures for the East Indigo Snake (USFWS, 2004) would be followed during all phases of project construction. It is concluded that any of the action alternatives may affect, but are not likely to adversely affect, the eastern indigo snake.

Cape Sable Seaside Sparrow

There is no designated Cape Sable seaside sparrow critical habitat located within the construction footprint area, so no Cape Sable seaside sparrow habitat is anticipated to be impacted by construction of any of the action alternatives. The closest occupied Cape Sable seaside sparrow habitat is approximately ten miles south of the project area and no Cape Sable seaside sparrows are anticipated to be in the project area. Therefore, we anticipate that construction activities would not likely affect this species. Because construction of the proposed project is not anticipated to have a direct effect on the Cape Sable seaside sparrow nor its habitat, it is concluded that the action alternatives may affect, but are not likely to adversely affect, the Cape Sable seaside sparrow. It should be noted that no operational plan has been developed for the Tamiami Trail Modifications: Next Steps infrastructure so it is not possible to anticipate potential effects that an operational plan in association with the Tamiami Trail Modifications: Next Steps infrastructure may have on the Cape Sable seaside sparrow and its associated habitat[36].

Wood Stork

Based on photographs and observations during SRF wading bird surveys of the Tamiami colonies in 2010, the Tamiami colony boundaries were re-delineated (***Figure 4-4***). Using the NAIP (2007) GIS layer and the 2010 SRF information, the wading bird colonies were manually digitized into a GIS shape file depicting the estimated wood stork colony locations using ArcMap (v. 9.3). The revised GIS shape file also contains the estimated wood stork primary and secondary management zones for each of the respective Tamiami Colonies. A primary management zone buffer of 1,000 ft surrounding the boundary of each of the Tamiami colonies was designated. A 1,500 ft buffer surrounding the boundary of the primary management zone was designated to delineate the boundary of the secondary management zone. The revised management zone delineations (***Figure 4-4***) meet the requirements described in the Draft USFWS Habitat Management Guidelines for the wood stork in the southeastern United States (2006).

36 Additional explanation of the development of a water operations plan can be found in the cumulative impacts analysis discussion in Section 4.1.3.

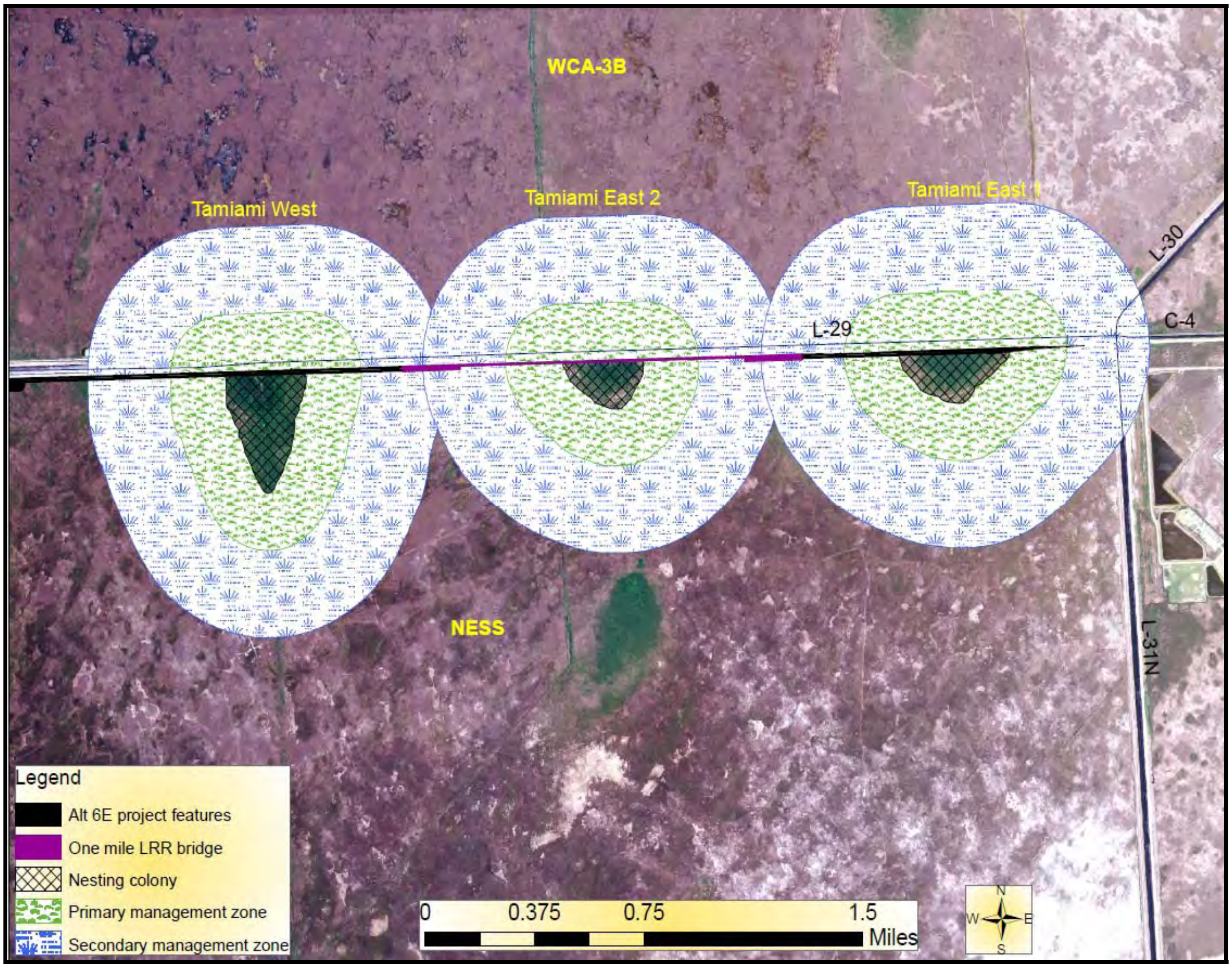


Figure 4-4 - Wood stork colonies and management zones in relation to Alternative 6e

To estimate the amount of habitat lost from the wood stork primary and secondary management zones, the NPS wood stork management zone delineation GIS layer was intersected with the USACE Tamiami Trail Modifications: Next Steps design GIS layer in ArcMap (v. 9.3). ***Table 4-7*** summarizes the results of our analysis.

All action alternatives (1-6e) would involve construction activities within the primary and secondary management zones of the Tamiami West and Tamiami East 1 colonies that include permanent habitat loss within each respective colony. Because of the location of the respective project alternatives and colony locations, impacts to wood stork habitat are not directly related to bridge length. Only Alternative 2a would impact the primary and secondary management zones of the Tamiami East 2 Colony. Permanent loss of wading bird nesting, loafing, roosting, and foraging habitat would result from implementation of any of the project alternatives. Direct impacts within the secondary zones could impact wood stork foraging and loafing habitat, while impacts within the primary zone could impact foraging, loafing, nesting and fledging behaviors. Impacts to the colonies could reduce the amount of available of nesting habitat. Filling of wetlands within the project area also reduces foraging habitat within the 18.6-mile CFA for the two rookeries.

Table 4-7 –Estimated Impacts to Tamiami Trail Wood Stork Colonies

Alternative	Temporary Colony Impacts (Acres)	Permanent Colony Impacts (Acres)	Temporary Primary Management Zone Impacts (Acres)	Permanent Primary Management Zone Impacts (Acres)	Temporary Secondary Management Zone Impacts (Acres)	Permanent Secondary Management Zone Impacts (Acres)
Tamiami West						
1	0.33	0.51	0.46	2.53	1.41	2.15
2a	1.32	1.55	1.40	3.20	2.31	3.13
4	0.33	0.50	0.46	1.88	0.35	1.05
5	0.33	0.50	0.46	1.88	0.35	1.05
6e	1.66	1.02	2.31	2.51	2.57	2.23
Tamiami East 2						
1	0.00	0.00	0.00	0.00	0.00	0.00
2a	1.67	0.18	2.33	0.35	2.13	0.37
4	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00
6e	0.00	0.00	0.00	0.00	0.00	0.00
Tamiami East 1						
1	0.46	0.80	0.35	1.64	0.04	0.11
2a	1.96	2.13	1.39	3.01	1.29	1.87
4	0.46	0.80	0.35	1.64	0.11	0.04
5	0.46	0.80	0.35	1.64	0.04	0.11
6e	1.93	2.02	1.39	2.47	0.94	0.77

Note: Impacts in the primary management zone in this table refer to impacts within the primary management zone surrounding the nesting colony itself.

In order to minimize impact to wood storks the following guidelines would be implemented during project construction:

- The following protective measures for wood storks will be implemented:
  - Primary Zone (the wood stork colony and a 1,000 ft buffer): From onset of nesting activity through the onset of the rainy season (or when the young have fledged), highway construction (e.g., heavy human/equipment activity, pile driving, blasting) should not be permitted in the reach of the highway affected by that alternative. The SRF surveys will be used to determine the nesting status of wood storks.
  - Secondary Zone (a 1,500 ft buffer surrounding the primary zone): No unauthorized human activity (on foot, airboat, or off-road vehicle) should occur at any time of the year within the reach of highway affected by that alternative on the south side of the highway and particularly during the nesting season.

- Length of Restrictions: These restrictions shall remain in effect during the construction phase of the Tamiami Trail project.
- Qualified Observer: Subject to the approval of the USFWS, FFWCC, and NPS, a qualified observer(s) shall be stationed onsite during the construction phase of the Tamiami Trail project. The observer shall monitor wood stork activity and shall notify USFWS, FFWCC and the NPS if wood stork behavior is modified such that roosting, breeding, nesting, foraging, and/or fledging of young is disrupted or otherwise interfered with.
- Modification of Restrictions: If new information becomes available concerning the wood stork colonies, the NPS, USFWS and FFWCC should immediately contact each other to determine what modifications, if any, are warranted.

<u>State-listed wading birds nesting in the Tamiami Colonies: little blue heron, snowy egret, tricolored heron, white ibis</u>

The Frog City rookery, which supports nesting by tricolor herons and great egrets, is located in WCA-3B close to the L-29 Levee approximately one-quarter mile west of the Tigertail Camp. Because all alternatives would be located north of the L-29 Levee/Canal, no buffer zone restrictions would need to be applied to the Frog City colony. The colony is protected from construction noise by the approximately 20- foot-high L-29 Levee; the wading birds nesting at this colony have acclimated to continuous highway traffic and noise. Therefore, no adverse impacts to this rookery are anticipated.

The little blue heron, snowy egret, tricolored heron, and white ibis nest within the Tamiami colonies in association with the wood stork. Therefore, please refer to ***Table 4-7*** for an estimated amount of colony habitat loss that would be incurred by these state-listed wading bird species. Similar to the reasoning provided in the wood stork assessment, there would be a loss of nesting, foraging, loafing, and roosting habitat to state-listed wading birds nesting in the Tamiami colonies. Therefore, it is concluded that implementation of the action alternatives may affect, and is likely to adversely affect state-listed wading birds that nest in the Tamiami colonies.

A 100 meter nest protective buffer zone would be implemented for state-listed wading birds (little blue heron, snowy egret, tricolored heron, and white ibis) in the Tamiami colonies during the construction phase of the project. Coordination will be conducted with the FFWCC and the USFWS to determine the types of construction related activities that would be restricted should this mitigation measure need to be implemented.

<u>Limpkin and Florida sandhill crane</u>

While considered relatively uncommon in ENP (NPS, 2006b), the limpkin and the Florida sandhill crane have previously been observed within freshwater marshes of ENP and have also previously bred within ENP (Loughlin et al., 1990; NPS, 2006b). Therefore, limpkins and the Florida sandhill crane have the potential to occur and potentially to breed and forage within Northeast Shark River Slough. Should active nests of these species be encountered in the project area, coordination will be conducted with the FFWCC and the USFWS to develop protective nest buffers. Because of the potential for the limited occurrence of these species within Northeast Shark River Slough and the protective nest buffer protective mitigation measure, we anticipate that implementation of the action alternatives may affect but is not likely to adversely affect the limpkin and the Florida sandhill crane.

Audubon's crested carcara

The Audubon's crested caracara is considered an accidental within freshwater marshes of ENP with no regular pattern of occurrence and fewer than 10 reported records of occurrence within ENP (Loughlin et al., 1990). This species prefers dry or dry or wet prairie areas containing cabbage palms and is also found in wooded habitats (USFWS, 1999). Because the project area is not their preferred habitat and because of the limited occurrence of this species in the project area, it is concluded that any one of the action alternatives is not anticipated to significantly impact the Audubon's crested caracara.

Marsh wren

Although not reported as breeding within Northeast Shark River Slough, ENP, marsh wrens have previously been observed within the freshwater marshes of ENP and therefore, have the potential to occur within Northeast Shark River Slough (Loughlin et al., 1990; NPS, 2006b). Because of the limited use of habitat in the project area, it is concluded that implementation of the action alternatives may affect but is not likely to adversely affect the marsh wren.

American kestrel

Although not reported as breeding within Northeast Shark River Slough, ENP, American kestrels have previously been observed within the freshwater marshes of ENP and therefore, have the potential to occur within Northeast Shark River Slough (Loughlin et al., 1990; NPS, 2006b). Because of the limited use of habitat in the project area, it is concluded that implementation of the action alternatives may affect but is not likely to adversely affect the American kestrel.

White-crowned pigeon

While the white-crowned pigeon has been observed within freshwater marshes of ENP, this species is not breeding in the project area. Because of this species' limited use of habitat in freshwater marshes of ENP, it is concluded that implementation of the action alternatives may affect but is not likely to adversely affect the white-crowned pigeon.

Reddish egret and roseate spoonbill

While Northeast Shark River Slough, ENP does not constitute key breeding grounds for reddish egrets or roseate spoonbills, both species have previously been observed within the freshwater marshes of ENP and therefore, have the potential to occur within Northeast Shark River Slough (Loughlin et al., 1990; NPS, 2006b). Because of the limited use of habitat in the project area, it is concluded that implementation of the action alternatives may affect but is not likely to adversely affect the reddish egret and the roseate spoonbill.

Everglade Snail Kite

The project construction footprint is not located within Everglade snail kite Critical Habitat, therefore there would be no impacts to Everglade snail kite Critical Habitat.

While no Everglade snail kite nests have ever been reported in the Tamiami Trail Modifications: Next Steps construction footprint area, previous protective nesting buffer areas have fallen within the Tamiami Trail Modifications: Next Steps construction footprint. Everglade snail kites do not necessarily utilize the same nest location every year and to provide protection for any nesting Everglade snail kites during construction of the Tamiami Trail Modifications: Next Steps project, the Draft Snail Kite Management Guidelines (USFWS, 2006) will be followed during all phases of project construction. Short-term adverse impacts are expected to be limited to the timeframe of construction and Everglade snail kites would be expected to fully return to the areas of temporary impact following completion of construction activities.

Due to the permanent impacts to Everglade snail kite habitat, long-term, minor, adverse, localized impacts to the Everglade snail kite would be expected with implementation of any of the proposed action alternatives. Everglade snail kite activity (nest construction and usage) will be monitored during all stages of construction and the USFWS Draft Snail Kite Management Guidelines (USFWS, 2006) will be followed during all phases of project construction. Therefore, the implementation of any of the proposed action alternatives may affect but are not likely to adversely affect the Everglade snail kite.

The *Second Report and Initial Recommendations* published by the Miami-Dade CCATF states that global warming would result in many changes to the natural environment, “including changing atmospheric circulation and temperature patterns, changes in rainfall and severe weather, changes in biologic community distribution, increased extinction rates, changes in disease and pest distribution, and changes in sea level” (Miami-Dade, 2008). All these environmental impacts may affect South Florida, ENP, and the project area within the next century, with the key concern for the low topography project area being rising sea level, “with a very high likelihood” that the sea level would rise an additional 1.5 feet in the next 50 years and a cumulative total of three to five feet within a century (Miami-Dade, 2008). Special status species may be impacted by habitat changes caused by intrusion of saltwater into interior freshwater marshes of the Northeast Shark River Slough and southern ENP. Changing conditions could lead to decrease in populations of special status species, or shifts in habitat ranges.

Cumulative Impacts. While construction of the Tamiami Trail Modifications: Next Steps action alternatives has adverse effects to wood storks and other state-listed birds, implementation of a Tamiami Trail Modifications: Next Steps action alternative in conjunction with other Everglades related projects, such as the CERP and the MWD, is anticipated to provide overall, beneficial, long-term cumulative effects to special status species. Because of the anticipated improved hydrology and ecological connectivity that the Tamiami Trail Modifications: Next Steps in association with other Everglades restoration projects would provide, it is anticipated that the adverse effects from construction of the Tamiami Trail Modifications: Next Steps projects would be outweighed by the long-term cumulative benefits of Everglades restoration projects.

Conclusion. Impacts to special status species would range from short-term to long-term effects and would range in effect from minor to moderate, dependent upon the species. See ***Table 4-8*** below for a summary of the effect determination (per USFWS guidelines) and associated reasoning for each Federally-listed species with the potential to occur in the project area. Implementation of the Tamiami Trail Modifications: Next Steps action alternative in association with future Everglades restoration projects such as the CERP and the MWD is anticipated to provide long-term beneficial effects to special status species.

Table 4-8 – Effect Determinations for Federally-Listed Species

Species	Effect Determination	Reason
West Indian manatee	May affect, but is not likely to adversely affect	Species is not anticipated to occur in the project area. No manatees observed in the project area for 20 years.
Florida panther	May affect, but is not likely to adversely affect	Lack of recent usage of project area, poor quality habitat, linkage of Northeast Shark River Slough to WCA-3B via passage underneath bridges. Mitigation for loss of panther habitat will be done as required by the USFWS.
eastern Indigo snake	May affect, but is not likely to adversely affect	No sightings within project area. Implement The Standard Protection Measures for the East Indigo Snake (USFWS, 2004).
Cape Sable seaside Sparrow	May affect, but is not likely to adversely affect	Species is not anticipated to occur in the project area. No Critical Habitat within project area. Nearest nesting site is approximately 10 miles south of the project area.
wood stork	May affect, and is likely to adversely affect	Habitat impacts to both the primary and secondary management zones of multiple Tamiami colonies. Implement monitoring and construction restrictions in the primary and secondary management zones during the active nesting season.
Everglade snail Kite	May affect, but is not likely to adversely affect	No reported nesting in project construction footprint. Implementation of active monitoring and the USFWS draft snail kite management guidelines (USFWS, 2006).

Since Federally-listed threatened and endangered species are located within the study area and would be affected by the proposed project, a Biological Assessment is required by the USFWS for this project. Through ongoing coordination efforts with the USFWS (see Section 6.3.2.2), it has been agreed that the requirements for the Biological Assessment can be met through this EIS document.

A future operational plan for manipulation of water levels in the L-29 Canal will be developed in association with the proposed project's infrastructure[37]; however, since it has not been completed, it is not reviewed under this EIS. Full realization of project benefits is dependent upon an operational plan that utilizes the structural capacity of the preferred alternative. Potential benefits that would occur once an operational plan is defined and executed include enhancement of degraded habitats within the Northeast Shark River Slough system, benefiting special status species. It is highly likely that implementation of the preferred bridging alternative in conjunction with the operational plan is self-mitigating, and that permanent and temporary impacts to special status species and their habitats associated with the construction of the proposed project would be offset by the enhancement to special status species' habitats attributed to operation of the completed Tamiami Trail Modification: Next Steps project. However, long-term effects to habitats resulting from operations remain unknown since an operational plan has not yet been developed for the project alternatives.

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37 Additional explanation of the development of a water operations plan can be found in the cumulative impacts analysis discussion in Section 4.1.3.

Because there is uncertainty as to the level of habitat improvements that would be achieved with the operation of the project, mitigation for wetland impacts would be conducted at the Hole-in-the-Donut site at ENP if anticipated project benefits do not adequately offset the project's impacts to special status species' habitats. Therefore, there would be no impairment to special status species as a result of implementation of any of the action alternatives.

4.7 Wilderness/Unique Ecosystems

4.7.1 Guiding Regulations and Policies

The Wilderness Act, passed on September 3, 1964, established a National Wilderness Preservation System, "administered for the use and enjoyment of the American people in such manner as would leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness" (16 USC § 1131). Lands identified as being suitable for wilderness designation, wilderness study areas, proposed wilderness, and recommended wilderness (including potential wilderness) must also be managed to preserve their wilderness character and values in the same manner as "designated wilderness" until Congress has acted on the recommendations (NPS, 1999).

Wilderness regulations at the park include:

- It is illegal to feed wildlife. Backcountry sites are shared with alligators, sea turtles, nesting birds and other wildlife that would be observed but not disturbed;
- All plants, animals, and artifacts are protected and should not be collected or disturbed. Cutting mangroves or other vegetation in any manner is prohibited. Unoccupied shells may be gathered, up to one quart per person;
- Pets are not permitted at backcountry campsites, beaches, or ashore anywhere in the backcountry. Pets would disrupt feeding, nesting, and mating activities of wildlife;
- All vessels must conform to Coast Guard regulations. Boaters are required to obey all posted signs regarding closures, no wake zones, etc. Caution should be used in posted manatee areas, and all travel in these areas should be at idle speed;
- Operation of generators, chain saws, and other portable motors is prohibited at wilderness sites;
- Ground fires are not permitted at ground sites and chickees. Ground fires are only allowed at beach sites (except islands in Florida Bay), where they must be below the average high tide line. Only dead *and* down wood is allowed for fires, which should be cleaned up after use. Backpacking stoves are recommended, as wood is often wet;
- All sleep-aboard vessels in the wilderness must be anchored out of sight of chickees and 1/4 mile from other occupied sites;
- State fishing licenses in fresh and salt water are required, and species and size requirements are enforced;
- Food should not be left unattended, and should be stored in a secure compartment aboard a vessel or in a hard-sided cooler (not foam); and
- All trash must be removed from the backcountry. Burying it or disposing of it in toilets is prohibited. Toilets should be used for human waste only where provided. International laws prohibit dumping trash at sea.

Within the NPS, Chapter 6 of the NPS *Management Policies 2006* addresses wilderness issues. The purpose of Chapter 6 of the NPS *Management Policies 2006* is to provide accountability, consistency, and continuity within the NPS' wilderness management program, and to otherwise guide Service-wide efforts in meeting the letter and spirit of the 1964 Wilderness Act. In addition, policies are based on provisions of the 1916 NPS Organic Act, the 1964 Wilderness Act, and legislation establishing individual units of the national park system.

Chapter 6 of the NPS *Management Policies 2006* addresses all aspects of wilderness management and preservation of designated wilderness in units of the NPS. This chapter requires that wilderness considerations be integrated into all planning documents to guide the preservation, management, and use of the park's wilderness area and ensure that wilderness is unimpaired for future use and enjoyment as such. According to section 6.1, the purpose of wilderness in the national parks includes the preservation of wilderness character and wilderness resources in an unimpaired condition and, in accordance with the Wilderness Act, wilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use.

4.7.2 Assumptions, Methodology and Impact Thresholds

Section 6.2.1 of the NPS *Management Policies 2006*, dictates that NPS lands would be considered eligible for wilderness if they are at least 5,000 acres or of sufficient size to make practicable their preservation and use in an unimpaired condition, and if they possess the following characteristics (as identified in the Wilderness Act):

- The earth and its community of life are untrammeled by humans, where humans are visitors and do not remain;
- The area is undeveloped and retains its primeval character and influence without permanent improvements or human habitation;
- The area generally appears to have been affected primarily by the forces of nature, with the imprint of humans' work substantially unnoticeable;
- The area is protected and managed so as to preserve its natural conditions; and
- The area offers outstanding opportunities for solitude or a primitive and unconfined type of recreation.

Per section 6.3.4.3, in evaluating environmental impacts, this EIS considers (1) wilderness characteristics and values, including the primeval character and influence of the wilderness; (2) the preservation of natural conditions (including the lack of man-made noise); and (3) assurances there would be outstanding opportunities for solitude, that the public would be provided with a primitive and unconfined type of recreational experience, and wilderness would be preserved and used in an unimpaired condition. Mitigation measures considered in this analysis are listed in Chapter 2 and are mentioned in the analysis where appropriate.

The thresholds for the intensity of an impact are defined for wilderness as follows:

Negligible: There would be little or no effect on wilderness character or wilderness experience. The effect on wilderness character would be so small that it would not be of any measurable or perceptible consequence.

Minor: An effect on one or more attributes of wilderness character and wilderness experience and associated values would occur; it would be slightly detectable and highly localized.

Moderate: Attributes of wilderness character and wilderness experience would be affected in a substantial way in a single distinct area, or the impact would affect multiple areas but would not be permanent and would not affect an entire visitor season.

Major: One or more attributes of wilderness character and wilderness experience would be affected substantially across more than one distinct area of the park on either a permanent or frequent but temporary basis during the course of an entire visitor season.

Analysis area: The focus of this analysis is the area adjacent to the 10.7-mile project corridor along Tamiami Trail that would be directly affected by the proposed action; however, impacts to wilderness extending beyond the vicinity of the project corridor occurring as a result of project impacts are also discussed.

4.7.3 Impacts of the Alternatives

No-Action Alternative

Analysis. If the No-Action Alternative is selected as the preferred alternative, there would be no additional direct or indirect short- or long-term impacts to wilderness other than those already realized from construction of the 2008 LRR/EA preferred alternative (1-mile eastern bridge). The current unnatural altered hydrologic conditions within the vicinity of the project area would continue to have a negative impact on the wilderness character and experience within the WCAs, ENP, and Northeast Shark River Slough.

Cumulative Impacts. The goal of past, on-going and future related projects is to restore hydrology to the Everglades ecosystem and to provide enhanced water flows to areas south of Tamiami Trail. The result of these activities will be to enhance the ecosystem which occurs within the wilderness areas of ENP. The No-Action Alternative would lead to no improvement within the ENP wilderness, however related actions in other areas are expected to have a beneficial long-term cumulative effect on wilderness within ENP.

Conclusion. No short- or long-term adverse or beneficial effects to wilderness would result from the selection of the No-Action Alternative. Consequently, there would be no impairment of wilderness as a result of the No-Action Alternative.

Action Alternatives

Analysis. Minor, short-term, localized, adverse impacts and long-term beneficial effects to wilderness would occur from the implementation of any of the action alternatives (Alternatives 1 through 6e). The only difference in impacts to wilderness between the various action alternatives would be related to the length of bridging of each of the alternatives. The action alternative with the shortest length of proposed bridging (Alternative 4) would experience of least amount and shortest duration of construction-related adverse impacts as well as the least amount of both adverse and beneficial long-term effects and vice versa for the alternative with the longest length of proposed bridging (Alternative 6e). However, since bridge length is the only variable factor between the action alternatives, the thresholds for both short- and long-term impacts would be the same for all of the action alternatives.

In regards to short-term impacts caused by construction of any of the bridging alternatives (Alternatives 1 through 6e), designated wilderness within ENP would be impacted by construction-related noise and vibration; reduced quantity/diversity of wildlife caused by construction-related noise and vibration impacts that cause wildlife to flee from construction areas; construction-related dust and fumes; and the visual presence of construction vehicles and heavy equipment in construction zones.

Minor short-term impacts from construction-related noise and vibration would be experienced in wilderness areas adjacent to the Tamiami Trail project area. Construction-related noise impacts and abatement/mitigation measures have been thoroughly evaluated for this project and can be found in Sections 2.5.10 and 4.11.3 of this document. Generally, construction-related noise and vibration would comply with all noise regulations and would be limited to the project area and close proximity only during periods of active construction. Therefore, the impact to wilderness and the wilderness experience of visitors should be minor and short-term in duration.

Wilderness areas would also temporarily experience indirect effects from construction-related noise and vibration impacts in the form of reduced quantity and diversity quality of wildlife caused by construction-related noise and vibration impacts that cause wildlife to flee from construction areas and the close proximity. However, these adverse effects are expected to be limited to the timeframe of construction and wildlife is expected to fully return to the project area following completion of construction activities. Therefore, these adverse impacts to wilderness and the wilderness visitor experience are expected to be minor and short-term in nature.

The air quality of the area within the project corridor is a valuable park resource, enhancing visitation quality by providing clean air and high visibility to match the unique ecosystem experience. Everglades National Park is a designated Class I air quality area under the CAA, which dictates the most stringent air quality regulations for the park that only permit very limited increases in pollution in the vicinity. If any of the action alternatives are implemented, short-term emissions generated from transport and construction equipment would be mitigated and would not measurably contribute adversely to air quality conditions or adversely affect visitor use and experience conditions. Because of the high water table, it is unlikely that large quantities of dust would be generated, and any occurrence of fugitive dust would be localized and very transient. If dust were generated during construction, BMPs for dust suppression would be initiated. Emissions from construction equipment would be kept to a minimum by restricting idling time. Therefore, adverse impacts to wilderness and the wilderness visitor experience as a result of construction-related dust would be negligible.

Finally, minor short-term adverse effects to the aesthetics of wilderness would be experienced by visitors along the project corridor. While many visitors patron ENP in order to experience the unique aesthetics of the wilderness area, the views on both sides of the project segment along Tamiami Trail are somewhat limited and constrained by the L-29 Canal, the L-29 Levee, several water control structures, Tigertail Camp, and tall invasive exotic vegetation. Therefore, the short-term impacts of the visual presence of construction vehicles and heavy equipment in construction zones along the project corridor should only cause minor disturbances to wilderness and the wilderness visitor experience.

While all of the construction-related impacts to wilderness would be short-term in nature, the wilderness areas would also be impacted by some long-term adverse and beneficial effects from the implementation of any of the action alternatives. Because the project is located within a wilderness area, long-term, minor, adverse, localized impacts would occur from construction of the bridges associated with any of the action alternatives. However, long-term beneficial effects would occur as a result of project implementation of any of the action alternatives. Negligible to minor improvements in ground-dwelling wildlife quantity may be observed in the area following project implementation of any of the action alternatives due to the increased connectivity between ENP and the Water Management Areas north of Tamiami Trail. Additionally, the potential for a future increase in number and diversity of wildlife species in proximity to the project area is possible if a water operations plan is implemented in the area of the project, which would improve the quality of designated wilderness areas within the Park. However, this benefit cannot be realized as a part of this project until a water operations plan is developed[38].

The *Second Report and Initial Recommendations* published by the Miami-Dade CCATF states that global warming would result in many changes to the natural environment, "including changing atmospheric circulation and temperature patterns, changes in rainfall and severe weather, changes in biologic community distribution, increased extinction rates, changes in disease and pest distribution, and changes in sea level" (Miami-Dade, 2008). All these environmental impacts would affect South Florida, ENP, and the project area within the next century, with the key concern for the low topography project area being rising sea level, "with a very high likelihood" that the sea level would rise an additional 1.5 feet in the next 50 years and a cumulative total of three to five feet within a century (Miami-Dade, 2008). Wilderness areas would be impacted as saltwater intrusion into freshwater marshes would lead to ecosystem shifts that would alter the wilderness character and experience.

Cumulative Impacts. The goal of past, on-going and future related projects is to restore hydrology to the Everglades ecosystem and to provide enhanced water flows to areas south of Tamiami Trail. The result of these activities will be to enhance the ecosystem which occurs within the wilderness areas of ENP. The action alternatives (1-6e) of the proposed project will provide for conditions (bridges) that will allow for enhanced flows to be delivered to the park, thus wilderness areas will benefit once an operational plan for water deliveries is in place[39]. Therefore, the action alternatives of the proposed project in combination with related actions in other areas are expected to have a beneficial long-term cumulative effect on wilderness within ENP.

Conclusion. Minor, short-term, localized, adverse impacts would occur from the implementation of any of the action alternatives (Alternatives 1 through 6e) as a result of noise, vibrations, and dust generated during construction activities. Minor, long-term, localized, adverse effects to wilderness would also occur from the implementation of any of the action alternatives (Alternatives 1 through 6e) as a result of direct footprint impacts to wilderness. Beneficial effects would occur as a result of improved connectivity and potential for improved hydrologic flow in the project area and ENP. Consequently, there would be no impairment of wilderness with the implementation of any of the action alternatives.

4.8 Cultural Resources

4.8.1 Guiding Regulations and Policies

The primary law related to cultural resources is the NHPA of 1966, as amended. Section 106 of this act requires federal agencies to consider the effects of their undertakings on properties listed or potentially eligible for listing in the NRHP. Other regulatory guidance includes:

<u>Tile 36, CFR, Part 800 – Protection of Historic Properties</u>.

These regulations of the Advisory Council on Historic Preservation define procedures for implementing Section 106 of the NHPA.

<u>Native American Graves Protection and Repatriation Act</u> – This law assigns ownership or control of Native American human remains, funerary objects, sacred objects, and objects of

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38 Additional explanation of the development of a water operations plan can be found in the cumulative impacts analysis discussion in Section 4.1.3.

39 Additional explanation of the development of a water operations plan can be found in the cumulative impacts analysis discussion in Section 4.1.3.

cultural patrimony that are excavated or discovered on federal lands or tribal lands to lineal descendants or affiliated Indian tribes If discoveries of human remains are made within ENP, the protocols outlined in the May 2008 *Native American Graves Protection and Repatriation Act Plan of Action for Inadvertent Discoveries, Everglades National Park and Associated Tribes* would be followed.

<u>Executive Order 13007 – Indian Sacred Sites</u>

This Executive Order directs Federal agencies, to (1) accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, and (2) avoid adversely affecting the physical integrity of such sacred sites on federal lands, to the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions.

<u>NPS Director's Order 28 – Cultural Resource Management Guideline</u>

These policies outline the basic principles and components for managers, planners, and cultural resource specialists to use in developing and implementing a good park cultural resource management program.

<u>NPS Management Policies 2006</u>

Chapter 5, Section 5.3.1 Protection and Preservation of Cultural Resources stipulates that the NPS employ the most effective concepts, techniques, and equipment to protect cultural resources against theft, fire, vandalism, overuse, deterioration, environmental impacts, and other threats without compromising the integrity of the resources.

4.8.2 Assumptions, Methodology and Impact Thresholds

Assessment of the potential effects on the cultural environment was based primarily on criteria defined by regulations for Protection of Historic Properties (Title 36, CFR, Part 800.5). Those regulations define an effect as a direct or indirect alteration to the characteristics of a historic property that qualify it for inclusion in the NRHP. Effects are adverse when the alterations would diminish the integrity of a property's location, setting, design, materials, workmanship, feeling, or association. Examples of adverse effects include:

- Physical destruction, damage, or alteration of all or part of a property;
- Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provisions of handicapped access, that is not consistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties (Title 36, CFR, Part 68) and applicable guidelines;
- Removal of a property from its physical location;
- Change of the character of the property's use or of physical features in the property's setting that contribute to its historic significance;
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the properties significant historic features;
- Neglect of a property, which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and
- Transfer, lease, or sale of the property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance [Title 36, CFR, Part 800.5(a)(2)].

The criteria for adverse effects were applied to each cultural resource identified within the area of potential effects and evaluated as eligible or potentially eligible for the NRHP (Price et al., 2010). The following impact thresholds were used for the types of cultural resources assessed in this EIS:

Negligible: Impacts would be barely perceptible and not measurable. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Minor: Impacts would not affect the character defining features of a NRHP-eligible or listed structure or building. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Moderate: Impacts would alter one or more character defining features of the structure or building but would not diminish the integrity of the resource to the extent that its NRHP-defining elements are diminished. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Major: Impacts would alter one or more character defining features of the structure or building in a manner that diminishes the integrity of the property's location, design, setting, materials, workmanship, feeling, or association to a degree that may or may not be reduced or satisfactorily mitigated through consultation with parties participating in the Section 106 review of the project. For purposes of Section 106, the determination of effect would be *adverse effect*.

Analysis Area: The area of analysis for cultural resources is the APE, as discussed in Section 3.7. The APE includes areas that could be disturbed by construction activities within existing and expanded rights-of-way and TCEs, as well as the properties along the south side of the Tamiami Trail that could be affected by visual changes and access modifications.

4.8.3 Impacts of the Alternatives

<u>No-Action Alternative</u>

Analysis. If the No-Action Alternative is selected as the preferred alternative, there would be no additional direct or indirect short- or long-term impacts on cultural resources other than those already realized from construction of the 2008 LRR/EA preferred alternative (1-mile eastern bridge).

Cumulative Impacts. The goal of on-going and future related projects is to increase water levels in portions of the Everglades ecosystem. Rising water levels can have adverse effects on historic and cultural resources by causing direct damage or changing the setting of the affected resource. Additionally, the historic materials, design, and setting of the affected segment of Tamiami Trail have been altered by prior upgrades, maintenance, widening and improvement of the adjacent The No-Action Alternative is not anticipated to have an effect on cultural resources, however, past, present, and reasonably foreseeable future actions will have overall cumulative effects on cultural resources that are expected to be minor, long-term, and adverse.

Conclusion. No short- or long-term adverse or beneficial effects to cultural resources would result from the selection of the No-Action Alternative. Consequently, there would be no impairment of cultural resources as a result of the No-Action Alternative.

<u>Action Alternatives</u>

Analysis. The impacts of the five action alternatives are described and compared in the following sections. Because Section 106 consultations are ongoing, the discussion of effects and mitigation measures are preliminary, and would be confirmed or revised as the consultations are completed.

Alternative 1

Alternative 1 includes four bridges and one ConSpan that would remove approximately 2.2 miles of the Tamiami Trail (8DA6510). Prior Section 106 consultations for the No-Action Alternative concluded that removal of a section of the historic highway was an adverse effect, but that raising the remaining segments was not. Similarly, removal of additional segments of the highway under Alternative 1 would be a major impact (adverse effect), but raising the height of the remaining segments would be a moderate impact (no adverse effect).

Alternative 1 would require expansion of the highway ROW into a small portion of property on the 10-acre Airboat Association of Florida property (8DA6768) to accommodate the widening of the roadway embankment needed to increase the height of the roadway and for a TCE. Because the three historic buildings on the property are set back from the highway about 150 to 170 feet they would not be directly affected, and the less than 1-foot increase in the height of the highway and widening of the roadbed would be a minor change to the setting of the buildings. The impacts on the Airboat Association of Florida property are likely to be minor (no adverse effect).

The highway in front of the Coopertown Restaurant and Airboat Rides property (8DA6767), as at the Airboat Association of Florida property, would be raised less than 1 foot. The increase in the height of the highway, widening of the roadbed, and placement of TCEs would require expansion of the highway ROW into a small portion of the Coopertown 3-acre property. The modifications of the highway would be a minor change to the setting of the two historic buildings at Coopertown. The buildings, however, are only about 55 to 85 feet south of the highway and they might need to be moved farther south on the parcel to accommodate the reduction in the parking area. Because almost all buildings in the Everglades environment are of a design to accommodate moving, the slight shifting of the building locations is likely to result in a moderate impact to their historic values (no adverse effect).

There are no intact historic buildings at the Osceola Camp (Fred Dayhoff, personal communication). Shovel testing has not been conducted to check for buried cultural resources since fill has been placed at the site. Aerial photography indicates there is a tree island on the north side of the highway, to the north of the camp, which is a candidate for having archeological resources. The Osceola Camp is on the south tail of this tree island and appears to have been developed in a low area that was raised with fill material. As such, the potential for buried archeological resources in the fill is low. If archeological deposits are present at the camp, they have been covered by the recently placed fill. The evaluation of the NRHP eligibility of the Osceola Camp remains in incomplete, but for purposes of this project, it was considered potentially eligible. The highway in front of the Miccosukee Osceola Camp would be raised and a small area of the existing property would be converted to highway ROW and for use as a TCE. Those impacts would be outside the existing fence that separates the camp from the highway and are expected to result in only a minor impact to any historic values that the camp might have (no adverse effect).

Alternative 2a

Alternative 2a includes six bridges and one ConSpan that would remove approximately 3.3 miles of the Tamiami Trail (8DA6510), which is 1.2 miles more than Alternative 1 and a major impact (adverse effect). Otherwise the impacts on the Airboat Association of Florida property (8DA6768), Coopertown Restaurant and Airboat Rides property (8DA6767), and Miccosukee Osceola Camp would be the same minor and moderate impacts as described for Alternative 1.

Alternative 4

Alternative 4 includes two bridges that would remove approximately 1.0 mile of the Tamiami Trail (8DA6510), which is 1.2 mile less than Alternative 1, but still a major impact (adverse effect). Otherwise the impacts on the Airboat Association of Florida property (8DA6768), Coopertown Restaurant and Airboat Rides property (8DA6767), and Miccosukee Osceola Camp would be the same minor and moderate impacts as described for Alternative 1.

Alternative 5

Alternative 5 includes three bridges that would remove approximately 1.5 miles of the Tamiami Trail (8DA6510), which is 0.70-mile less than Alternative 1 but still a major impact (adverse effect). Otherwise the impacts on the Airboat Association of Florida property (8DA6768), Coopertown Restaurant and Airboat Rides property (8DA6767), and Miccosukee Osceola Camp would be the same minor and moderate impacts as for Alternative 1.

Alternative 6e

Alternative 6e includes four bridges that would remove approximately 5.5 miles of the Tamiami Trail (8DA6510), which is 3.3 miles more than Alternative 1 and a major impact (adverse effect). The impacts of Alternative 6e on the Airboat Association of Florida property (8DA6768) and the Miccosukee Osceola Camp would be the same minor impacts as described for Alternative 1.

Alternative 6e would involve construction of a bridge across the front of the Coopertown Restaurant and Airboat Rides property (8DA6767), which would require a ramp to provide access to the parcel from the elevated bridge. Additional fill materials would be added to provide parking at the end of the down ramp, and an adjacent segment of the highway would be left in place to provide additional parking on the north side of the new bridge. The historic restaurant building would need to be moved out of the expanded ROW, and historic house also might need to be moved. The new elevated bridge immediately across the front of the parcel is likely to result in an adverse visual effect.

All Action Alternatives

Real Estate

The project area for the Tamiami Trail Modifications: Next Steps project is contiguous with the Everglades National Park Expansion Area. These lands were authorized for acquisition by Congress in the *Everglades National Park Protection and Expansion Act of 1989.* The only parcels excluded within the contiguous ENP Expansion Area were those lands comprising the Airboat Association, located immediately south the current alignment of the Tamiami Trail road corridor. The NPS has completed approximately 99% of the land designated for acquisition within the Area. Lands still in private ownership include the three commercial airboat facilities, Everglades Safari, Gator Park, and Coopertown; the Florida Power and Light lands; and the lands occupied by the two commercial radio tower facilities owned, respectively, by Salem Communications and Lincoln Financial Media. Currently, insufficient funds are available to complete these acquisitions. Therefore, the NPS has included the costs for the acquisition of these parcels in the costs associated with this project since an operational plan subsequent to roadway modifications described in this report will likely increase water levels within the ENP Expansion Area and potentially adversely affect these properties. For additional information about these parcels and their disposition under the *Everglades National Park Protection and Expansion Act of 1989*, refer to Section 4.12.2.

Climate Change

The *Second Report and Initial Recommendations* published by the Miami-Dade CCATF states that global warming would result in many changes to the natural environment, "including changing atmospheric circulation and temperature patterns, changes in rainfall and severe weather, changes in biologic community distribution, increased extinction rates, changes in disease and pest distribution, and changes in sea level" (Miami-Dade, 2008). All these environmental impacts would affect South Florida, ENP, and the project area within the next century, with the key concern for the low topography project area being rising sea level, "with a very high likelihood" that the sea level would rise an additional 1.5 feet in the next 50 years and a cumulative total of three to five feet within a century (Miami-Dade, 2008). Cultural resources would be impacted by increasing water levels as a result of tidal intrusion into interior freshwater marshes of the southern ENP.

For additional information about impacts to cultural resources, refer to ***Appendix F*** – Cultural Resources Report.

Cumulative Impacts. The goal of on-going and future related projects is to increase water levels in portions of the Everglades ecosystem. Rising water levels can have adverse effects on historic and cultural resources by causing direct damage or changing the setting of the affected resource. Additionally, the historic materials, design, and setting of the affected segment of Tamiami Trail have been altered by prior upgrades, maintenance, widening and improvement of the adjacent Tamiami Canal, and construction of the WCA-3 levees on the north side of the canal. The action alternatives (1-6e) of the proposed project will have minor to major adverse effects on historic resources located along the project corridor including Tamiami Trail itself and the Coopertown Restaurant and Airboat Rides property. Therefore, the action alternatives of the proposed project in conjunction with past, present, and reasonably foreseeable future actions will have overall cumulative effects on cultural resources that are expected to be minor, long-term, and adverse,

Conclusion. In summary, the impacts of all the action alternatives are evaluated as having a major impact [adverse effect as defined by regulations for Protection of Historic Properties (Title 36, CFR, Part 800.5)] because they would remove segments of the historic Tamiami Trail (8DA6510) in addition to the 1 mile of the highway that is being removed under the No-Action Alternative (***Table 4-9***). Because the highway created the blockage of water flows to the Everglades that is being addressed by the Next Steps project, there is no way to address the problem without affecting the highway. The variation among the alternatives in the length of highway that would be removed (ranging from 1.0 to 5.5 miles) is a small fraction of the total length of the Tamiami Highway, which is about 245 miles long.

All action alternatives would have the same minor impacts on the 10-acre Airboat Association of Florida property (8DA6768) and the 5-acre Miccosukee Osceola Camp. The raising of the highway in front of those properties and the relatively small ROW expansions and TCEs within those properties are expected to have no adverse effect on their historic values.

Alternatives 1, 2a, 4, and 5 would have similar moderate impacts on the 3-acre Coopertown Restaurant and Airboat Rides property (8DA6767). The parcel is smaller than the Airboat Association of Florida parcel and Miccosukee Osceola Camp and because the two historic buildings on the parcel are closer to the road than are the buildings on the other two properties, they might need to be moved farther south on the parcel. Those impacts are not expected to adversely affect the historic values of the two historic buildings. Alternative 6e would involve construction of an elevated bridge across the front of the property, reducing the overall area of the property and possibly requiring razing and removing the two historic buildings. If the two buildings require moving, this would constitute a major impact (adverse effect).

The evaluated alternatives do not include an operations plan, which would be addressed by a subsequent project. The analysis of an operations plan would address water supply and the actual volume of water that might flow beneath the Tamiami Trail as a result of any increase in capacity provided by an alternative approved by a ROD at the termination of the Next Steps EIS. That analysis would address potential impacts on cultural resources due to raised water levels south of the Tamiami Trail.

Consultation with the State Historic Preservation Officer (SHPO) and other interested parties pursuant to Section 106 of the NHPA is ongoing. It is anticipated that the treatment of the adverse effects of the No-Action Alternative, which involves development of a display within the Shark Valley Interpretive Area of ENP to publicly interpret the history of the Tamiami Trail and associated properties, would adequately address the removal of additional segments of the Tamiami Trail under Alternatives 1, 2a, 4, and 5. Alternative 6e would result in additional adverse impacts to the two historic buildings at the Coopertown Restaurant and Airboat Rides property but both buildings have been well recorded and their history has been documented. Additional documentation is not likely to add important information. The Section 106 consultations might conclude that the memorandum of agreement developed for the No-Action Alternative is adequate for addressing the impacts of the Next Steps project, or that it needs to be modified to address the similar but expanded impacts of any Next Steps project action alternative that is approved for construction. That treatment is expected to satisfactorily mitigate the adverse effect. Consequently, there would be no impairment of cultural resources as a result of implementation of any of the alternatives.

Table 4-9 – Summary of Impacts on Cultural Resources

Alternative	Tamiami Trail (8DA6765)	Coopertown Restaurant and Airboat Rides (8DA6767)	Airboat Association of Florida (8DA6768)	Miccosukee Osceola Camp[1]	Effect[2]	Treatment[2]
No-Action	adverse: 1 bridge, removal of 1 mile	setting slightly altered by raised roadway and increased water level	setting slightly altered by raised roadway and increased water level	setting slightly altered by raised roadway and increased water level	adverse	interpretive display pursuant to memorandum of agreement; monitor archaeological sites for increased erosion
Impacts in addition to those of the No-Action Alternative						
1	major: 4 bridges and 1 ConSpan, removal of 2.2 miles	moderate: take 0.29 acre of 3-acre parcel for expanded highway ROW and 0.1 acre for TCE, might need to relocate 2 historic buildings	minor: take 0.3 acre of 10-acre parcel for expanded highway ROW and 0.1 acre for TCE, setting slightly altered	minor: use 0.4 acre of 5-acre parcel for expanded highway ROW and 0.1 acre for TCE, setting slightly altered	adverse	same as No-Action

Alternative	Tamiami Trail (8DA6765)	Coopertown Restaurant and Airboat Rides (8DA6767)	Airboat Association of Florida (8DA6768)	Miccosukee Osceola Camp[1]	Effect[2]	Treatment[2]
2a	major: 6 bridges and 1 ConSpan, removal of 3.3 miles	moderate: take 0.2 acre of 3-acre parcel for expanded highway ROW and 0.1 acre for TCE, might need to relocate 2 historic buildings	minor: take 0.3 acre of 10-acre parcel for expanded highway ROW and 0.1 acre for TCE, setting slightly altered	minor: use 0.4 acre of 5-acre parcel for expanded highway ROW and 0.2 acre for TCE, setting slightly altered	adverse	same as No-Action
4	major: 2 bridges, removal of 1.0 mile	moderate: take 0.2 acre of 3-acre parcel for expanded highway ROW and 0.1 acre for TCE, might need to relocate 2 historic buildings	minor: take 0.3 acre of 10-acre parcel for expanded highway ROW and 0.1 acre for TCE, setting slightly altered	minor: use 0.4 acre of 5-acre parcel for expanded highway ROW and 0.2 acre for TCE, setting slightly altered	adverse	same as No-Action
5	major: 3 bridges, removal of 1.5 miles	moderate: take 0.2 acre of 3-acre parcel for expanded highway ROW and 0.1 acre for TCE, might need to relocate buildings	minor: take 0.3 acre of 10-acre parcel for expanded highway ROW and 0.1 acre for TCE, setting slightly altered	minor: use 0.4 acre of 5-acre parcel for expanded highway ROW and 0.2 acre for TCE, setting slightly altered	adverse	same as No-Action
6e	major: 4 bridges, removal of 5.5 miles	major: take 0.4 acre of 3-acre parcel for bridge across front of property, add 0.8 acre for replacement parking, visual impacts of elevated bridge likely to be adverse	minor: take 0.3 acre of 10-acre parcel for expanded highway ROW and 0.1 acre for TCE, setting slightly altered	minor: use 0.4 acre of 5-acre parcel for expanded highway ROW and 0.2 acre for TCE, setting slightly altered	adverse	same as No-Action

[1] The eligibility of the Miccosukee Osceola Camp for the National Register of Historic Places is incomplete, but the site was assumed to be potentially eligible under Criterion A and B and impacts were considered.
[2] The indicated effects and mitigation measures are preliminary, and would be confirmed or revised as the ongoing Section 106 consultations are completed.

4.9 Visitor Use and Experience

4.9.1 Guiding Regulations and Policies

<u>NPS Management Policies 2006</u>

Chapter 8, Section 8.2, Visitor Use, addresses "enjoyment of park resources and values by the people of the United States" as "part of the fundamental purpose of all parks." The NPS is committed to "providing appropriate, high-quality opportunities for visitors to enjoy the parks," by maintaining "an atmosphere that is open, inviting, and accessible" (NPS, 2006). Section 8.2.2 of the NPS *Management Policies 2006* discusses recreational activities within the parks and specifically addresses visitor use issues applicable to the Tamiami Trail Modifications: Next Steps project.

Section 8.2.5.1 discusses visitor safety in the parks, stating that while "Park visitors must assume a substantial degree of risk and responsibility for their own safety when visiting areas that are managed and maintained as natural, cultural, or recreational environments … The saving of human life would take precedence over all other management actions as the [NPS] strives to protect human life and provide for injury-free visits" (NPS, 2006). This concern is limited by the constraints of the 1916 Organic Act, which only allows discretionary management activities to be undertaken to the extent that they would not impair park resources and values (NPS, 2006). While the NPS acknowledges that there are limitations on its ability to protect park employees and visitors from all hazards, the Service would strive to "provide a safe and healthful environment" (NPS, 2006). "When practicable and consistent with congressionally designated purposes and mandates, the Service would reduce or remove known hazards and apply other appropriate measures" (NPS, 2006). The NPS would conduct such actions to have the least possible impact on park resources and values (NPS, 2006).

<u>Architectural Barriers Act Accessibility Standards (ABAAS)</u>

As outlined in the NPS *Management Policies 2006* and *Director's Order 42: Accessibility for Visitors with Disabilities in NPS Programs and Services*, as of May 8, 2006, the relevant law for NPS regarding visitors with disabilities is the ABAAS. The Architectural Barriers Act requires that buildings and facilities covered by the law meet standards for accessibility by disabled persons. Such access "would be provided consistent with preserving park resources and providing visitor safety and high quality visitor experiences" (NPS, 2006).

4.9.2 Assumptions, Methodology and Impact Thresholds

General information on visitors to southern Florida and ENP was collected from NPS visitor statistics and previous studies at ENP. These data were used to make a qualitative evaluation of the potential impacts to visitor use and experience under each alternative.

The following thresholds were used to assess impacts to visitor use and experience:

Negligible: Visitors would not be affected and/or changes in the experience would be below levels of detection. Visitors would likely be unaware of any effects associated with implementation of the alternative. There would be no noticeable change in visitor use and experience or in any defined indicators of visitor satisfaction or behavior.

Minor: Changes in visitor use and/or experience would be slight but detectable. The changes would not appreciably limit or enhance critical characteristics of the visitor experience. Visitors would be aware of the effects associated with the alternative, but the effects would be slight.

Moderate: Some characteristics of the desired visitor experience would change and/or the number of participants engaging in an activity would be altered. The visitor would be aware of the effects associated with implementation of the alternative and would likely be able to express an opinion about the changes. Visitor satisfaction would begin to either decline or increase as a direct result of the effect.

Major: Multiple critical characteristics of the desired visitor experience would change and/or the number of participants engaging in an activity would be greatly reduced or increased. The visitor would be aware of the effects associated with implementation of the alternative and would likely express a strong opinion about the change. Visitor satisfaction would markedly decline or increase.

Analysis Area: The area of analysis for visitor use and experience includes direct impacts to visitor use activities that occur along the 10.7-mile project corridor along Tamiami Trail, the L-67 extension levee, the L-30 levee and canal, the L-31N levee, and the L-29 levee and canal. The area of analysis for visitor use and experience also includes indirect impacts to visitor use areas such as the Shark Valley Information Center, the FFWCC Francis S. Taylor Wildlife Management Area, and greater ENP, accessed by visitors via Tamiami Trail.

4.9.3 Impacts of the Alternatives

No-Action Alternative

Analysis. If the No-Action Alternative is selected as the preferred alternative, there would be no additional direct or indirect short- or long-term impacts on visitor use and experience other than those already realized from construction of the 2008 LRR preferred alternative (1-mile eastern bridge). Visitor use activities (i.e. boating, airboating, fishing, wildlife observation, etc.) would be expected to continue as currently practiced within the study area. Additionally, no impacts would be expected to the number of visitors who currently patron ENP.

Cumulative Impacts. Many facets of visitor experience would be greatly enhanced by the cumulative effect of the hydrologic restoration efforts currently underway and planned for the future. Increased connectivity, reduced habitat fragmentation, and restored hydrologic flow within the Everglades ecosystem brought about by the cumulative restoration projects currently occurring and planned for the future could be expected to increase the quality of habitat and the quality/quantity of wildlife within ENP and elsewhere in the Everglades and in turn, increase the quality of the visitor experience. The No-Action Alternative will not affect visitor use and experience, however past, future, and reasonably foreseeable future projects will have a beneficial cumulative effect on visitor use and experience.

Conclusion. No short- or long-term adverse or beneficial effects to visitor use and experience would result from the selection of the No-Action Alternative.

Action Alternatives

Analysis. Minor to moderate, short-term, localized, adverse impacts and long-term beneficial effects to visitor use and experience would be realized from the implementation of any of the action alternatives (Alternatives 1 through 6e). Since no visitor use facilities would be directly impacted by any of the proposed action alternatives, the only difference in impacts experienced between the various action alternatives would be related to the length of bridging of each of the alternatives. The action alternative with the shortest length of proposed bridging (Alternative 4) would experience of least amount and shortest duration of construction-related adverse impacts as well as the least amount of beneficial long-term effects and vice versa for the alternative with the longest length of proposed bridging (Alternative 6e). However, since bridge length is the only variable factor between the action alternatives, the thresholds for both short- and long-term impacts would be the same for all of the action alternatives.

In regards to short-term impacts caused by construction of any of the bridging alternatives (Alternatives 1 through 6e), visitors utilizing the section of Tamiami Trail within the project corridor would experience minor to moderate inconveniences such as lane closures; reduced speed limits; reduced accessibility to visitor facilities/activities (i.e. four commercial airboat operations, FFWCC Francis S. Taylor Wildlife Management Area, Flight 592 Memorial, bank fishing, etc.); construction-related noise and vibration; reduced quality of wildlife-related recreational activities (i.e., wildlife viewing, hunting, fishing, frogging, etc.) caused by construction-related noise and vibration impacts that cause wildlife to flee from construction areas; construction-related dust and fumes; and the visual presence of construction vehicles and heavy equipment in construction zones. These adverse effects would be noticed by visitors utilizing Tamiami Trail to access any of the visitor features located within the construction corridor or beyond in areas such as the ENP visitor centers.

Short-term transportation-related impacts such as lane closures, reduced speed limits, and reduced accessibility to visitor facilitates/activities would be limited to the areas currently under construction and would be mitigated by measures such as a MOT plan and construction scheduling during off-peak traffic hours. Additionally, at least one access route to all public and commercial visitor use facilities (including boat launch ramps) would be kept open at all times during construction. However, recreational bank fishing by visitors and subsistence fishing by locals would be limited to bank areas not under construction. A more detailed discussion of transportation impacts is detailed in Section 4.13.3 and transportation mitigation measures that would be implemented during construction of any of the action alternatives are discussed in further detail in Section 2.5.11.

Minor short-term impacts from construction-related noise and vibration would be experienced by visitors traveling along the project corridor and participating in visitor activities in proximity to the project area. Construction-related noise impacts and abatement/mitigation measures have been thoroughly evaluated for this project and can be found in Sections 2.5.10 and 4.11.3 of this document. Generally, construction-related noise and vibration would comply with all noise regulations and would be limited to the project area and close proximity only during periods of active construction. Therefore, visitors should experience minor to moderate direct impacts from construction-related noise and vibration.

Visitors would also experience moderate indirect impacts from construction-related noise and vibration impacts in the form of reduced quality of wildlife-related recreational activities (i.e., wildlife viewing, hunting, fishing, frogging, etc.) caused by construction-related noise and vibration impacts that cause wildlife to flee from construction areas and the close proximity. However, these adverse effects are expected to be limited to the timeframe of construction and wildlife is expected to fully return to the project area following completion of construction activities. Therefore, these adverse impacts to the visitor use and experience quality of the project area are expected to be moderate and short-term in nature.

The air quality of the area within the project corridor is a valuable park resource, enhancing visitation quality by providing clean air and high visibility to match the unique ecosystem experience. Everglades National Park is a designated Class I air quality area under the CAA, which dictates the most stringent air quality regulations for the park that only permit very limited increases in pollution in the vicinity. If any of the action alternatives are implemented, short-term emissions generated from transport and construction equipment would be mitigated and would not measurably contribute adversely to air quality conditions or adversely affect visitor use and experience conditions. Because of the high water table, it is unlikely that large quantities of dust would be generated, and any occurrence of fugitive dust would be localized and very transient. If dust were generated during construction, BMPs for dust suppression would be initiated. Emissions from construction equipment would be kept to a minimum by restricting idling time. Therefore, adverse impacts to visitor use experienced as a result of construction-related dust would be negligible.

Finally, minor short-term adverse effects to the aesthetics would be experienced by visitors along the project corridor. While many visitors patron ENP in order to experience the unique aesthetics of the area, the views on both sides of the project segment along Tamiami Trail are somewhat limited and constrained by the L-29 Canal, the L-29 Levee, several water control structures, Tigertail Camp, and tall invasive exotic vegetation. Therefore, the short-term impacts of the visual presence of construction vehicles and heavy equipment in construction zones along the project corridor should only cause minor disturbances to visitor use and experience.

While all of the construction-related impacts to visitor use and experience would be short-term in nature, visitors would also experience some long-term beneficial effects from the implementation of any of the action alternatives. However, most aspects of visitor use and experience would experience no change or a negligible change due to the implementation of any of the action alternatives proposed for the project.

The area that comprises SCORP Region 11 (7,500 square miles) should experience either no long-term impacts or very negligible long-term impacts to visitor use and experience as a result of the implementation of any of the proposed action alternatives. Additionally, public visitor use facilities in close proximity to the project corridor (e.g., the Shark Valley Information Center, the FFWCC Francis S. Taylor Wildlife Management Area, and the Flight 592 Memorial) and commercial visitor use facilities/activities in close proximity to the project corridor (e.g., the four commercial airboat operators and the Airboat Association of Florida) would experience either no long-term impacts or very negligible long-term impacts to visitor use and experience as a result of the implementation of any of the proposed action alternatives. Other facilities such as boat ramps, wildlife viewing areas, and picnicking areas along the project corridor would also experience either no long-term impacts or very negligible long-term impacts to visitor use and experience as a result of the implementation of any of the proposed action alternatives. Everglades National Park should also not be expected to experience any changes in the number of duration of stay of patrons visiting the park due to implementation of any of the action alternatives.

The only visitor use activity that might be expected to suffer negligible consequences from project implementation of any of the action alternatives would recreational and subsistence bank fishing. Since any of the action alternatives includes the bridging of some areas along the 10.7-mile project corridor that are currently utilized to participate in recreational and subsistence bank fishing, some of these areas would be unavailable for bank fishing following project implementation of any of the action alternatives. However, impacts would be expected to be negligible since there appears to be adequate area along the unbridged portion of the roadway (under any of the action alternatives) to which fishermen could relocate.

Long-term beneficial effects would occur as a result of project implementation of any of the action alternatives in terms of consumptive recreational activities (i.e., hunting, fishing, frogging, etc.) and non-consumptive recreational activities (i.e., wildlife viewing, camping, boating, airboating, picnicking, etc.). Negligible to minor improvements in ground-dwelling wildlife quantity may be observed in the area following project implementation of any of the action alternatives due to the increased connectivity between ENP and the Water Management Areas north of Tamiami Trail. Additionally, the potential for a future increase in number and diversity of wildlife species in proximity to the project area is possible if a water operations plan is implemented in the area of the project. However, this benefit cannot be realized as a part of this project until a water operations plan is developed[40].

The long-term effects to the aesthetics experienced by visitors along the project corridor could be expected to greatly improve due to the implementation of any of the action alternatives. Since the views along both sides of the project segment are currently somewhat limited and constrained, bridging of sections of Tamiami Trail (and thus raising the height of the roadbed

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40 Additional explanation of the development of a water operations plan can be found in the cumulative impacts analysis discussion in Section 4.1.3.

that vehicles travel along) would allow visitors to bypass at least some of the existing obstructions and experience a more panoramic view of the Water Management Areas to the north of the project corridor and ENP to the south of the project corridor. Thus, effects to the aesthetics along the project corridor would be considered to be moderate in intensity with the implementation of any of the proposed action alternatives.

Additionally, the NPS received significant public interest and support for incorporating a multi-use/bicycle path along Tamiami Trail. A preliminary evaluation of the feasibility of adding such a feature to the project showed that it would add to both the cost of the project and the project duration. The cost for adding a multi-use/bicycle path was determined to be approximately $6 million per mile (bridge) and $600,000 per mile (road). The budgetary costs and impacts of a multi-use/bicycle path have not been included in this analysis because the feature has not been included in the current design of the project. The NPS supports the addition of a multi-use/bicycle path in the final design of the project (if funding is available). A multi-use/bicycle path would increase visitor use of the area, encourage environmentally-friendly alternative transportation, and provide a safe passageway for pedestrians and cyclists. However, additional analysis of impacts would be required if this feature is added to the final design of the project.

The *Second Report and Initial Recommendations* published by the Miami-Dade CCATF states that global warming would result in many changes to the natural environment, "including changing atmospheric circulation and temperature patterns, changes in rainfall and severe weather, changes in biologic community distribution, increased extinction rates, changes in disease and pest distribution, and changes in sea level" (Miami-Dade, 2008). All these environmental impacts would affect South Florida, ENP, and the project area within the next century, with the key concern for the low topography project area being rising sea level, "with a very high likelihood" that the sea level would rise an additional 1.5 feet in the next 50 years and a cumulative total of three to five feet within a century (Miami-Dade, 2008). Visitor use and experience would be impacted as a result of shifting vegetation types and increasing water levels due to sea level rise which would alter the activities and experiences that visitors currently enjoy.

Combined, all of these effects to the various aspects of visitor use and experience along the project corridor would improve overall visitor experience along the project corridor.

Cumulative Impacts. The cumulative effect of any of the proposed action alternatives combined with other restoration projects would be long-term and beneficial since the action alternatives all provide some length of bridging which (with the future implementation of a water operations plan[41]) would allow for increased hydrologic connectivity in the Everglades. While visitor use activities (i.e. boating, airboating, fishing, wildlife observation, etc.) would be expected to continue as currently practiced within the greater Everglades and ENP, many facets of visitor experience would be greatly enhanced by the cumulative effect of the hydrologic restoration efforts currently underway and planned for the future. Increased connectivity, reduced habitat fragmentation, and restored hydrologic flow within the Everglades ecosystem brought about by the cumulative restoration projects currently occurring and planned for the future could be expected to increase the quality of habitat and the quality/quantity of wildlife within ENP and elsewhere in the Everglades and in turn, increase the quality of the visitor experience.

[41] Additional explanation of the development of a water operations plan can be found in the cumulative impacts analysis discussion in Section 4.1.3.

Conclusion. Short-term impacts caused by construction of any of the bridging alternatives (Alternatives 1 – 6e) would cause visitors utilizing the section of Tamiami Trail within the project corridor to experience minor to moderate inconveniences such as lane closures; reduced speed limits; reduced accessibility to visitor facilities/activities; construction-related noise and vibration; reduced quality of wildlife-related recreational activities caused by construction-related noise and vibration impacts that cause wildlife to flee from construction areas; construction-related dust and fumes; and the visual presence of construction vehicles and heavy equipment in construction zones. Visitors would also experience some long-term beneficial effects (i.e., increased wildlife, increased aesthetic qualities, etc.) from the implementation of any of the action alternatives. However, most aspects of visitor use and experience would experience no change or a negligible change due to the implementation of any of the action alternatives proposed for the project. Therefore, minor to moderate, short-term, localized, adverse impacts and long-term beneficial effects to visitor use and experience would result from the implementation of any of the action alternatives (Alternatives 1 – 6e).

4.10 Park Management and Operations

Park management and operations refers to the current staff available to adequately protect and preserve vital park resources and provide for an effective visitor experience. This topic also includes the operating budget necessary to conduct park operations.

4.10.1 Guiding Regulations and Policies

Direction for management and operations at ENP is set forth in the park's enabling legislation, *NPS Management Plan 2006*, *Strategic Plan* (2000), the *Superintendent's Compendium* (NPS, 2008), and the *Everglades National Park General Management Plan/East Everglades Wilderness Study/Environmental Impact Statement* (in development).

<u>Education and Interpretation</u>

The Organic Act of 1916 created the NPS to conserve park resources and "provide for the enjoyment of the same in such manner and by such means as would leave them unimpaired for future generations." The purpose of NPS interpretive and educational programs is to advance this mission by providing memorable educational and recreational experiences that would (1) help the public understand the meaning and relevance of park resources, and (2) foster development of a sense of stewardship (NPS, 2006).

The NPS *Management Policies 2006* provides guidance and direction in establishing an interpretive and educational program. Section 7 of the NPS *Management Policies 2006* states: "Every park would develop an interpretive and educational program that is grounded in (1) park resources, (2) themes related to the park's legislative history and significance, and (3) park and Service-wide mission goals. The intent would be to provide each visitor with an interpretive experience that is enjoyable and inspirational within the context of the park's tangible resources and the meanings they represent. In addition, visitors should be made aware of the purposes and scope of the national park system."

<u>Maintenance</u>

The NPS *Management Policies 2006* provides guidance and direction for the park's maintenance programs. Section 9.1.4 of the NPS *Management Policies 2006* states: "the [NPS] would conduct a program of preventive and rehabilitative maintenance and preservation to (1) provide a safe, sanitary, environmentally protective, and aesthetically pleasing environment for park visitors and employees; (2) protect the physical integrity of facilities; and (3) preserve or maintain facilities in their optimum sustainable condition to the greatest extent possible. Preventive and rehabilitative maintenance programs would incorporate sustainable design elements and practices to ensure that water and energy efficiency, pollution prevention, and waste prevention and reduction are standard practice."

Enforcement

The NPS law enforcement program is managed and supervised in accordance with all applicable laws and regulations; Part 446 of the Department of the Interior Manual; all applicable Secretarial directives, the NPS *Management Policies 2006*; and *Director's Order 9: Law Enforcement Program* and Reference Manual 9 (or U.S. Park Police General Orders, as appropriate). The authority and responsibility to manage the NPS Commissioned Park Ranger program and U.S. Park Police operations would flow in a logical order from the Director and in accordance with departmental policy. To help sustain the high level of public trust necessary for an effective law enforcement program, commissioned employees would adhere to the Department of the Interior's law enforcement code of conduct and the standards of ethical conduct found in Reference Manual 9.

4.10.2 Assumptions, Methodology and Impact Thresholds

Park management and operations, for the purpose of this analysis, refers to the quality and effectiveness of park staff to maintain and administer park resources and provide for an effective visitor experience. This includes an analysis of the projected need for NPS staff time and materials in relation to the visitor services provided under each of the alternatives. The analysis also considers possible staff changes necessary to address the actions proposed under the alternatives and details the adverse or beneficial effects that may occur.

The following thresholds for evaluating impacts on park operations and management were defined and applied to adverse impacts:

Negligible: Park operations would not be affected or an action would have no measurable impact on operations in the park unit.

Minor: Effects to park operations would not be readily apparent and difficult to measure. The impacts on park operations and budget would have little material effect on other ongoing park operations.

Moderate: Effects to park operations would be readily apparent and would measurably affect park operations. The changes would be noticeable to park staff and visitors. Mitigation measures would probably be necessary to compensate for adverse effects and would likely be successful.

Major: Effects to park operations would be readily apparent and would result in a substantial change to park operations. The changes would be noticeable to park staff and visitors and be markedly different from existing operations. Mitigation measures would be necessary to compensate for adverse effects, and their success would not be guaranteed.

Analysis area: The area of analysis for park management and operations includes direct impacts to park management and operations as a result of project activities that would occur along the 10.7-mile project corridor along Tamiami Trail. The area of analysis for park management and operations also includes indirect impacts to park management and operations within ENP that occur as a result of activities associated with the project.

4.10.3 Impacts of the Alternatives

No-Action Alternative

Analysis. If the No-Action Alternative is selected as the preferred alternative, there would be no additional direct or indirect short- or long-term impacts on park management and operations other than those already realized from construction of the 2008 LRR preferred alternative (1-mile eastern bridge). Activities associated with park management and operations (e.g., education and interpretation, maintenance, and enforcement) would be expected to continue as currently practiced within ENP.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions would not affect park management or operations by causing changes in the way the park is currently managed or operated. The No-Action Alternative is also not anticipated to have any impact on park management or operations. Therefore, the No-Action Alternatives and other related actions will have no cumulative impact on park management or operations.

Conclusion. No short- or long-term adverse or beneficial effects to park management and operations would result from the selection of the No-Action Alternative.

Action Alternatives

Analysis. Activities associated with park management and operations (e.g., education and interpretation, maintenance, and enforcement) would experience no long-term change due to the implementation of any of the action alternatives (Alternatives 1 through 6e) proposed for the project. A minor impact on park management might occur in the short-term due to oversight of the project that would be required as a result of implementation of any of the action alternatives[42]. Since bridge length is the only variable factor between the action alternatives, the thresholds for both short- and long-term impacts would be the same for all of the action alternatives.

Short-term impacts to park management and operations would be limited to the project management and oversight required by NPS personnel during the design and construction phases of the project. Personnel from the park would be required to coordinate permitting of the project, oversee and contribute to decisions associated with project design, respond to any public inquiries associated with the project, and oversee construction of any of the action alternatives. Since this requirement would be limited to the time-frame of the project and such a project falls under the normal duties of park staff, the impact to park management as a whole would be expected to be short-term and minor.

All education and interpretation activities currently provided and conducted by NPS would be expected to continue as currently practiced within ENP. All visitor use activities provided by the NPS would also be expected to continue as currently practiced with the exception of the minor limiting circumstances mentioned in the discussion of impacts to visitor use and experience (Section 4.9.3). Therefore, there would be no long-term impact on the education and interpretation responsibility of park management as a result of the implementation of any of the action alternatives.

The 264-mile section of U.S. Highway 41 referred to as Tamiami Trail is currently managed and maintained by the FDOT under the jurisdiction of the U.S. Department of Transportation. Coordination concerning long-term management of the roadway post-construction of the project has been conducted with FDOT representatives since project inception and throughout the project scoping process. Coordination efforts with FDOT representatives indicated that FDOT would own the roadway and bridges at the conclusion of any construction completed for this

[42] Please note that the NPS is only responsible for the content of the information contained in this EIS. All future actions associated with the implementation of the Tamiami Trail Modifications: Next Steps project subsequent to the release of this document will be determined at a later date. However, there is a potential that NPS personnel would need to conduct oversight activities for the project regardless of what agency is implementing the project since construction would be occurring on Park lands.

project and FDOT would continue to be responsible for maintenance activities associated with the roadway and bridges. Therefore, there would be no long-term impact on the maintenance responsibility of park management as a result of the implementation of any of the action alternatives.

Illegal activities that have occurred or may occur along the section of Tamiami Trail within the project area which may require enforcement consist of: littering and improper disposal of waste along the roadway; illegal fishing activities in the surrounding waterways; tampering with or harassing threatened and endangered wildlife; trespassing on private or government property; and traffic-related infractions. However, none of these activities would typically fall under the enforcement jurisdiction of the NPS. The local law enforcement agencies that currently have jurisdiction of the areas along the project corridor would continue to have the jurisdiction and responsibility for enforcement activities during and after any project construction. If necessary, these law enforcement agencies could coordinate with the appropriate federal, state, or local environmental agencies (e.g., USEPA, USFWS, FDEP, FFWCC, and DERM) for any issues that arise regarding impacts to wildlife or the environment. Any environmental issues arising within the boundaries of ENP could be handled by NPS staff at the park, but since these activities would be expected to fall under the realm of activities ordinarily conducted for the Park, no additional long-term impact would be expected to result from implementation of any of the action alternatives. Therefore, there would be no long-term impact on the enforcement responsibility of park management as a result of the implementation of any of the action alternatives.

The *Second Report and Initial Recommendations* published by the Miami-Dade CCATF states that global warming would result in many changes to the natural environment, "including changing atmospheric circulation and temperature patterns, changes in rainfall and severe weather, changes in biologic community distribution, increased extinction rates, changes in disease and pest distribution, and changes in sea level" (Miami-Dade, 2008). All these environmental impacts would affect South Florida, ENP, and the project area within the next century, with the key concern for the low topography project area being rising sea level, "with a very high likelihood" that the sea level would rise an additional 1.5 feet in the next 50 years and a cumulative total of three to five feet within a century (Miami-Dade, 2008). Park management and operations would be impacted by shifting ecosystems and the increased water levels within the park that would result from saltwater intrusion into the interior freshwater marshes of the southern ENP.

Combined, all of these effects to the various aspects of park management and operations would cause no long-term impact.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions would not affect park management or operations by causing changes in the way the park is currently managed or operated. The action alternatives (1-6e) of the proposed project also are not anticipated to have any impact on park management or operations. Therefore, the No-Action and action alternatives of the proposed project in conjunction with other actions will have no cumulative impact on park management or operations.

Conclusion. Activities associated with park management and operations (e.g., education and interpretation, maintenance, and enforcement) would experience no long-term impact due to the implementation of any of the action alternatives (Alternatives 1 – 6e) proposed for the project. A minor, localized, adverse impact on park management might occur in the short-term due to oversight of construction activities that would be required as a result of implementation of any of the action alternatives.

4.11 Noise/Soundscapes

4.11.1 Guiding Regulations and Policies

In accordance with NPS *Management Policies* (2006) and *Director's Order 47: Sound Preservation and Noise Management* (NPS, 2000), an important part of the NPS mission is preservation of natural soundscapes associated with national park units. Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all the natural sounds that occur in park units, together with the physical capacity for transmitting natural sounds. Natural sounds occur within and beyond the range of sounds that humans can perceive and can be transmitted through air, water, or solid materials.

As stated in the *Director's Order 47*, natural sounds are intrinsic elements of the environment that are often associated with parks and park purposes. They are inherent components of the "scenery and the natural and historic objects and the wildlife" protected by the NPS Organic Act. Intrusive sounds are of concern to the NPS because they can impede the NPS's ability to accomplish its mission.

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. While performing certain tasks, people expect and, as such, accept certain sounds that are considered unpleasant under other circumstances. For example, if a person works in an office, sounds from printers, copiers, telephones, and keyboards are generally acceptable and not considered unduly unpleasant or unwanted. By comparison, when resting or relaxing, these same sounds may be intolerable.

Sound levels are usually measured in A-weighted decibels, and descriptors such as the energy equivalent noise level (Leq) and the day-night average noise level (Ldn) are commonly used to account for fluctuations of sound over time. Generally, a 3 dBA increase in ambient sound levels is considered the minimum threshold at which most people can detect a change in the sound environment; an increase of 10 dBA is perceived as a doubling of the ambient sound level.

Sounds found desirable during times of rest and relaxation are referred to as natural quiet, and include natural, outdoor ambient sounds, without the intrusion of human-caused sounds. Natural sounds throughout ENP – including flowing water, animals, and rustling leaves – are not considered noise. The enjoyment of natural sounds in ENP enhances the visitor's experience, and natural quiet can be essential in order for some individuals to achieve a feeling of peace and solitude.

Since this project involves modifications to a Federally funded State highway, Federal and State (FDOT) highway noise regulations were referenced in performing the highway noise analysis for nearby noise sensitive sites. The FHWA noise impact regulation is 23CFR772, the State of Florida regulation is Florida Statute Chapter 335.17. In accordance with these regulations, FHWA and FDOT criteria were used to assess highway noise impacts.

4.11.2 Assumptions, Methodology and Impact Thresholds

For the purposes of this analysis, impacts to the natural ambient soundscape would reference visitor experiences and existing conditions. Context, time of day, duration and intensity of noise together determine the level of impact for an activity associated with human-generated sound. The following thresholds for evaluating impacts on soundscapes were defined and applied to adverse impacts:

Negligible: Natural sounds would prevail; activities associated with noise (human-generated sound) would be very infrequent or absent.

Minor: Natural sounds would predominate within the human-generated sounds from appropriate recreational activities can be heard occasionally.

Moderate: Natural sounds would predominate, but activities associated with noise would occur occasionally at low to moderate levels. Human activity associated with noise is consistent with park objectives, noise would predominate during daylight hours during periods of peak use. Noise (activity) would not be overly disruptive to noise-sensitive visitor activities and natural sounds could still be heard.

Major: Natural sounds would be impacted by activities associated with noise frequently or for periods of extended time. Where activities associated with human-generated noise are consistent with park objectives, the natural soundscape would be impacted most of the day throughout the week during the peak season. Noise would disrupt conversation for long periods of time, and make enjoyment of other activities in the area difficult.

Short-Term: Impacts to the natural soundscape occurring during the period of construction.

Long-Term: Impacts that affect visitor use patterns and consequently the associated impacts of human generated noise on the natural soundscape for years to come.

Impairment: The level of noise would be heard consistently and would be readily perceived by other visitors throughout the day during the peak season such that a visitor to the park during the peak season within this zone would rarely have an opportunity to experience the natural soundscape. In addition, these adverse, major impacts to park resources and values would contribute to deterioration of the park's soundscape to the extent that the park's purpose could not be fulfilled as established in its enabling legislation; affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or affect the resource whose conservation is identified as a goal in the park's GMP or other planning documents.

Analysis area: The area of analysis for soundscapes is within approximately 1,500 feet of the alignment of the Tamiami Trail. Beyond this distance, highway noise levels are expected to drop off to nearly background levels and be minimally intrusive.

Methodologies used to evaluate highway noise impacts for nearby noise sensitive sites such as residences were taken from 23CFR772 and Part 2, Chapter 17 of the FDOT PD&E Manual. The FHWA has developed Noise Abatement Criteria (NAC) for most common land use types. In conjunction with the FHWA NAC, highway noise impacts were also assessed using the FDOT's Noise Abatement Approach Criteria (NAAC). The FDOT defines "approach" as meaning within 1.0 dBA of the NAC for each Land Use Activity Category (LUAC). Noise abatement is considered for projects where highway noise levels approaching or exceeding the FHWA NAC are predicted to occur as a result of increased roadway capacity or significant alterations to the roadway geometry. The FHWA NAC and FDOT NAAC are presented in ***Table 4-10***. Noise abatement is also considered when a substantial noise level increase is predicted to occur. A substantial noise level increase is defined by the FDOT and accepted by FHWA for use in Florida as one where the existing noise level is predicted to be exceeded by 15 dBA or more as a result of a transportation improvement project.

The FHWA's TNM was used to predict highway noise levels for the three areas identified in Section 3.10 of this EIS. Model receiver locations within these areas were selected based upon site characteristics including topography, number of buildings, building arrangement, recreation or other outdoor use areas, building location with respect to the highway, and site features such as fences and walls. Please refer to ***Table 3-16*** in Chapter 3 for a description of the model receiver sites used for this analysis. Model input data for other project features, such as roadways and canals, were taken from the project's roadway design concepts and from aerial photographs of the project study area. Peak-hour highway noise levels were predicted for all of the Design Year alternatives, including the No-Action Alternative. Since all of the action alternatives are functionally the same with regard to highway noise levels at the three noise sensitive areas, they are treated as a single “action alternative” for the purposes of the noise analysis.

Table 4-10 – FHWA Noise Abatement Criteria and FDOT Noise Abatement Approach Criteria

Land Use Activity Category	FHWA NAC (L_{Aeq1h})	FDOT NAAC (L_{Aeq1h})	Description of Activity Category
A	57 dBA (Exterior)	56 dBA (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B	67 dBA (Exterior)	66 dBA (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, RV parks, day care centers and hospitals.
C	72 dBA (Exterior)	71 dBA (Exterior)	Developed lands, properties, or activities not included in Categories A or B above
D	Not Defined	Not Defined	Undeveloped lands
E	52 dBA (Interior)	51 dBA (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums

According to 23CFR772 and Part 2, Chapter 17 of the FDOT PD&E Manual, the reasonableness and feasibility of noise abatement must be considered for noise sensitive sites where the FHWA’s NAC is approached or exceeded. Potential abatement measures that were considered include the following:

- Traffic Management Measures (e.g. traffic control devices and signing for prohibition of certain vehicle types, time-use restriction for certain vehicle types, modified speed limits, and exclusive lane designations);
- Alignment Modifications;
- Construction of Noise Barriers Within the Highway Project's ROW;
- Acquisition of Property Rights (either in fee or lesser interest) for Construction of Noise Barriers by Donation, by Purchase or by Condemnation;
- Acquisition (by purchase or condemnation) of ROW for Landscaping Adjacent to Noise Barriers and for Buffer Zones; and,
- Acquisition (by purchase or condemnation) of the Balance of a Noise-Sensitive Property from Which There is a Taking, if Acquisition is Less Expensive and Disruptive than the Methods Shown Above.

The FDOT specifies a FHWA accepted design noise level reduction goal of 10 dBA and minimum acceptable reduction of 5 dBA for assessing the feasibility of noise abatement along State highways. Noise barrier costs are estimated using the current FDOT statewide cost estimate for noise barrier construction ($30.00 per square foot). A maximum cost guideline of

$42,000 per benefitted receiver site as presented in Chapter 17 of Part 2 of the FDOT PD&E Manual is used in assessing the cost reasonableness of any noise barriers.

4.11.3 Impacts of the Alternatives

Predicted design-year (2038) highway noise levels for all of the nearby noise sensitive sites are presented in ***Table 4-11***.

Table 4-11 – Predicted Design Year Highway Noise Levels

Location	Receiver Number	FHWA Land Use Activity Category	Predicted Design Year (2038) Highway Noise Levels* (dBA)	
			No-Action	Action
Flight 592 Memorial	Flt592	B	58.2	59.3
Osceola Camp	OC-1	B	68.2	**69.0**
	OC-2	B	59.3	62.1
	OC-3	B	55.7	58.1
	OC-4	B	60.1	63.0
	OC-5	B	61.7	62.9
Tiger Tail Camp	TTC-1	B	58.2	59.5
	TTC-2	B	59.2	60.5

*Bold numbers indicate noise levels approaching or exceeding the FHWA NAC.

No-Action Alternative

Analysis. If the No-Action Alternative is selected as the preferred alternative, there would be no additional direct or indirect short- or long-term impacts on soundscapes other than those already realized from construction of the 2008 LRR/EA preferred alternative (1-mile eastern bridge). Traffic levels along the Tamiami Trail are predicted to grow from the current level of 5,800 vpd to 7,200 vpd by 2038 regardless of project construction. Design Year highway noise levels at noise sensitive sites (Flight 592 Memorial, Osceola Camp, and Tiger Tail Camp) along the project corridor are predicted to only increase by an average of approximately 1 dBA from the existing conditions, far less than the 3 dBA minimum threshold where most people can detect a change in the sound environment. This slight noise level increase is due to naturally occurring growth in traffic volumes expected by 2038.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions are not expected to appreciably affect existing noise levels, additionally the No-Action Alternation will have no impact on noise or soundscapes. Therefore, Cumulative effects on noise as a result of related actions would be negligible.

Conclusion. No short-term impacts and localized, negligible, long-term, adverse impacts to soundscapes would result from the selection of the No-Action Alternative. Consequently, there would be no impairment to soundscapes as a result of the No-Action Alternative.

Action Alternatives

Analysis. The short-term effects of the action alternatives related to highway noise are primarily due to construction of the project. There are no known businesses particularly sensitive to construction noise along the project corridor. No known County or local ordinances that set specific limitations on construction noise levels are applicable to this project. In accordance with NPS Management Practices, construction activities would be limited to the smallest area possible in order to minimize impacts, including noise impacts. Also, the contractor would be required to adhere to the latest edition of FDOT *Standard Specifications for Road and Bridge Construction*. Specifications include noise screening guidelines for stationary equipment, exhaust noise, noise from loose equipment parts, and excessive tailgate banging. It is anticipated that short-term noise impacts during construction would be moderate and localized to areas near the construction zone.

The long-term effects of the action alternatives with regard to highway noise are primarily due to operation of the project. Highway noise levels with the action alternatives are predicted to increase slightly due to planned minor horizontal and vertical realignment of the roadway and due to greater traffic volumes expected by 2038. Design Year, peak-hour noise levels at the Flight 592 Memorial are predicted to be 59.3 dBA with the action alternatives, representing increases of 2.0 dBA above the existing conditions and 1.1 dBA above the No-Action noise levels. At the Osceola Camp, Design Year, peak-hour noise levels are predicted to range from 58.1 to 69.0 dBA with the action alternatives. The action alternative noise levels at the Osceola Camp are predicted to increase by 2.0 dBA above the existing conditions and 1.0 dBA above the No-Action noise levels. Design Year, peak-hour noise levels in the Tiger Tail Camp are predicted to range from 59.5 to 60.5 dBA with the action alternatives. The action alternative noise levels are predicted to increase by 2.3 dBA above the existing conditions in the Tiger Tail Camp and 1.3 dBA above the No-Action noise levels.

Compared to the noise levels predicted with the No-Action Alternative, Design Year highway noise levels with the action alternatives are predicted to increase by far less than the 3 dBA minimum threshold where most people can detect a change in the sound environment. Furthermore, none of the action alternative noise levels are predicted to increase substantially from existing noise levels. Thus, none of the noise sensitive sites are expected to experience noticeable noise level increases with the action alternatives and the overall impact to the natural soundscape is expected to be negligible in comparison to the No-Action Alternative.

With the exception of one (1) first row residence at the Osceola Camp, the predicted noise levels with the action alternatives do not exceed the FDOT NAAC or the FHWA NAC. According to 23CFR772 and Chapter 17 of the FDOT PD&E Manual, the reasonableness and feasibility of noise abatement must be considered for the residence in the Osceola Camp where the FHWA's NAC was exceeded. Traffic management measures and alignment modifications were considered in order to abate highway noise but were found to be infeasible and ineffective given the function and location of Tamiami Trail. The noise abatement measures incorporating property acquisition are also not considered feasible given the proximity of the Osceola Camp to Tamiami Trail. Construction of a long continuous noise barrier located within highway ROW as close as possible to the one (1) impacted residence was considered further. The FHWA's TNM model was used to develop conceptual noise barrier designs.

A noise barrier up to 22 feet tall was evaluated along the south side of Tamiami Trail adjacent to the Osceola Camp. In order to maintain access to the camp through the main driveway entrance, two noise barrier segments extending at least 180 feet from the driveway in both directions would be required. It was found that it would not be possible to reduce noise levels by at least 5 dBA at the impacted residence due to the required driveway opening. In addition, it would not be possible to benefit enough residences in this community with a noise barrier that costing less than the FDOT's noise barrier cost threshold of $42,000 per benefited site. Thus, it was determined that it was not possible to provide reasonable and feasible noise abatement for the one (1) impacted residence in the Osceola Camp and a noise barrier would not be considered further for this community.

Cumulative Impacts. Cumulative effects on noise would be negligible because the localized minor impacts associated with the action alternatives (1-6e) of the proposed project would not add to noise impacts of related actions in other locations.

Conclusion. By following the NPS management practices and FDOT standards, no impairment or unacceptable impacts to noise sensitive sites in the project study area are expected to occur as a result of construction of this project. Likewise, considering the existing conditions and the long-established presence of traffic along the Tamiami Trail, the negligible increase in highway noise predicted to occur with the action alternatives is not expected cause operation and maintenance of this project to result in impairment or unacceptable impacts to nearby noise sensitive sites or the park's soundscape. Therefore it is concluded that the proposed project would cause short-term, moderate, adverse, localized, effects to the park's soundscape associated with project construction; however, there would be no long-term effects associated with the project's operation.

4.12 Socioeconomics

4.12.1 Guiding Regulations and Policies

Executive Order 12898

In February 1994, the President of the United States issued Executive Order 12898 requiring federal agencies to analyze and address, as appropriate, disproportionately high adverse human health and environmental effects of federal actions on ethnic and cultural minority populations and low income populations, when such analysis is required by NEPA.

The USEPA defines environmental justice as:

> *The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.*

"Meaningful involvement" means that: (1) potentially affected community residents have an appropriate opportunity to participate in decisions about a proposed activity that will affect their environment and/or health; (2) the public's contribution can influence the regulatory agency's decision; (3) the concerns of all participants involved will be considered in the decision-making process; and (4) the decision-makers seek out and facilitate the involvement of those potentially affected.

An adverse effect on minority and/or low-income populations occurs when: 1) The adverse effect occurs primarily to a minority and/or low income population; or 2) the adverse effect suffered by the minority and/or low-income population is more severe or greater in magnitude than the adverse effect suffered by the non-minority and/or non-low-income populations.

4.12.2 Assumptions, Methodology and Impact Thresholds

The following five elements were considered in the socioeconomic impact analysis:

- The socioeconomic profile of the study area;
- The anticipated effects of the alternative bridge configurations on the national economic development account;
- An evaluation of the project costs versus the project benefits;
- An evaluation of the regional economic development effects; and
- Other social effects that may be realized by the implementation of the alternatives.

This EIS is responsible for considering a variety of social conditions relevant to the project. These conditions are interconnected with the economics of the project; and are inclusive of elements such as demographics, water demand, and a variety of other considerations.

<u>Socioeconomic Profile of the Study Area</u>

This profile includes population and economic forecasts for the region, using a GIS delineated zone of concern surrounding the project footprint.

<u>Anticipated Effects of Alternative Projects on the National Economic Development Account</u>

Alternative plans could result in positive or negative impacts to net national economic efficiency due to project induced impacts to the following in South Florida:

- Agricultural Water Supply
- Municipal and industrial water supply
- Flood protection
- Recreation
- Commercial and recreational fishing
- Transportation

<u>Regional Economic Development (RED) Effects</u>

The RED effects of the alternatives include changes in income, employment, or economic output of the region.

This project analysis examines the potential effects of the alternative plans on the RED account. The RED account registers indirect and secondary effects to the region that are expected to result from the direct expenditures of the alternative plans. Direct economic effects represent the impacts of economic stimuli in terms of changes in regional industrial output, earnings, or employment. Indirect economic impacts represent the resultant economic changes in the industries that support and rely upon the industries directly affected by the stimuli. In addition, induced economic impacts are those impacts experienced by all local industries as direct and indirect effects alter household income and ultimately change local household spending patterns.

A regional input-output (I-O) model [Impact Analysis for Planning (IMPLAN) model] was used to estimate the RED effects of the alternative plans. Regional I-O analysis provides the classic tool for tracing economic impacts throughout the regional economy. Based on the region's industrial structure, I-O analysis tracks the expected inter-industry flow of goods and services. For the RED analysis, the regional economy was defined as encompassing Miami-Dade County using

IMPLAN. Using county-level economic data, which was procured from the software vendor, the model was used to estimate the economic effects of the alternatives on wages, employment, and production output (sales). Specifically, IMPLAN was employed in a four-part methodology to: (1) describe the study area economy, (2) create economic scenarios, (3) introduce economic changes, and (4) estimate resulting direct, indirect, and induced economic effects.

Real Estate and Effects of Other Land Acquisitions. Real estate sales may result in various impacts to the local economy. The sale of land may be regarded as a simple change in which the owner held the value in real estate and now holds an equal value in cash. If the cash is spent locally or reinvested in regional enterprise, then new economic activity might be stimulated in the region and even more funds might be leveraged by the enterprise.

Alternatively, a real estate transaction resulting in a transfer of funds into a regional bank may experience a general economic expansion in the region as supported through the banking multiplier if the funds are invested locally. If, however, there is foreign or corporate land ownership, then the expansionary effects of large transfers of funds may not occur in the study area. A similar result would occur if funds were held in a foreign bank. Additionally, if the land is owned by a governmental agency, then it may just be a land transfer resulting in very little regional economic effect.

Due to the ambiguity of the ultimate use of real estate funds, the expenditures on land were not input into the IMPLAN model. Therefore, the regional impacts of real estate purchases were assumed to be minimal and not calculated. If it were possible to know more about the future use of these funds, expenditures for land, commissions, leases, appraisal fees, title fees, and other administrative activities involved with real estate, those values could be used in the IMPLAN analysis or another model. However, even with a higher degree of certainty regarding the future of this knowledge, it is anticipated that the financial inputs would be marginal, and any regional impact model would have significant reliability concerns.

The anticipated Regional Economic Effects would be a one-time injection into the local economy, lasting the duration of the construction, and would cease upon the completion of construction.

<u>Other Social Effects</u>

The potential social effects of the SAP include effects on minority, elderly, and disadvantaged groups, population displacements, and effects on community cohesion.

<u>Impact Thresholds</u>

The following thresholds were used to assess socioeconomic impacts:

Negligible **–** The effects on socioeconomic conditions are below or at the level of detection and localized.

Minor **–** The effect on socioeconomic conditions are slight but detectable, and only affect a small number of national historical park services and/or a small portion of the surrounding population. The impact would be considered slight and not detectable outside the affected area.

Moderate **–** The effects on socioeconomic conditions are readily apparent. Any effects would result in changes to socioeconomic conditions on a local scale in the affected area.

Major **–** The effects on socioeconomic conditions are readily apparent. Measurable changes in social and economic conditions at the county level occur. The impact is severely adverse or exceptionally beneficial within the affected area.

4.12.3 Impacts of the Alternatives

No-Action Alternative

Analysis. If the No-Action Alternative is selected as the preferred alternative, there would be no additional direct or indirect short- or long-term impacts on socioeconomics other than those already realized from construction of the 2008 LRR preferred alternative (1-mile eastern bridge). Commercial activities would be expected to continue as currently practiced within the study area.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions have resulted in the removal of agricultural lands (sugar cane) from production and the conversion of these lands to wetlands and water treatment reservoirs. This shift of land use can cause downward shifts in employment numbers and tax bases. However, construction of Everglades restoration projects provides employment and revenues to local communities. The implementation of the No-Action Alternative would have a negligible effect on socioeconomics and environmental justice. Therefore, cumulative effects of related actions would be negligible.

Conclusion. No short- or long-term adverse or beneficial effects to socioeconomics would result from the selection of the No-Action Alternative.

Action Alternatives

Analysis.

IMPLAN Regional Economic Effects Results

RED effects have only been calculated for construction expenditures and not for changes resulting from impacts to navigation, water usage, flood control or real estate expenditures. Economic impacts to total industry output and employee compensation are expected to persist through each year of construction. Wages include salaries, non-wage compensation, and benefits. Employment is measured as the number of jobs, not necessarily full-time equivalents.

Table 4-12 and ***Table 4-13*** present the IMPLAN output for direct, indirect, and induced impacts of the alternatives on employee compensation and regional output (sales), and ***Table 4-14*** provides an indicator of the employment effects of the construction expenditures. These impacts account for less than one percent of total economic activity in each of the different output categories.

Table 4-12 – Direct, Indirect, and Induced Impacts on Employee Compensation as a Result of IMPLAN Model Runs (2007 Dollars)

Alternative	Direct	Indirect	Induced	Total
1	$35,357,666	$15,871,179	$13,481,327	$64,710,171
2a	$40,839,474	$18,331,826	$15,571,455	$74,742,755
4	$23,297,687	$10,457,753	$8,883,045	$42,638,485
5	$28,231,314	$12,672,336	$10,764,160	$51,667,811
6e	$71,263,512	$31,988,422	$27,171,666	$130,423,600

Table 4-13 – Direct, Indirect, and Induced Impacts on Regional Output as a Result of IMPLAN Model Runs (2007 Dollars)

Alternative	Direct	Indirect	Induced	Total
1	$129,000,000	$45,099,876	$44,154,139	$218,254,015
2a	$149,000,000	$52,092,105	$50,999,742	$252,091,847
4	$85,000,000	$29,716,973	$29,093,813	$143,810,785
5	$103,000,000	$36,009,979	$35,254,855	$174,264,834
6e	$260,000,000	$90,898,975	$88,992,839	$439,891,814

Table 4-14 – Direct, Indirect, and Induced Impacts on Employment as a Result Of IMPLAN Model Runs (2007 Dollars)

Alternative	Direct	Indirect	Induced	Total
1	1,105	365	371	1,841
2a	1,276	422	428	2,126
4	728	241	244	1,213
5	882	292	296	1,470
6e	2,227	736	747	3,710

<u>Other Social Effects</u>

The OSE account considers the effects of alternative plans in areas that are not already contained in the NED and regional economic development accounts. The alternative plans could result in either beneficial or adverse OSE within the study area. The categories of effects contained within the OSE account include:

- Urban and community impacts including effects on income, employment and population distribution
- Life, health, and safety factors (including slowed evacuation during emergencies)
- Displacement, Long-term productivity
- Energy requirements and energy conservation

Project alternatives have the potential to raise property values in the surrounding area, increase attractiveness to the community, increase recreational opportunities, and improve environmental health such as water and air quality among other impacts. All of these factors could influence the demographics of the surrounding community which may or may not have implications for environmental justice issues.

The alternatives of this project all require an increased roadway footprint. Despite the area needed, there is currently very little development and population in the immediate project area; this would help to avoid any adverse social effects. All alternatives are being formulated to minimize impact on the Tigertail and Osceola Camps and the Airboat Association, and limit any adverse impacts to the Florida Gladesmen.

Real Estate

The project area for the Tamiami Trail Modifications: Next Steps project is contiguous with the Everglades National Park Expansion Area. These lands were authorized for acquisition by Congress in the *Everglades National Park Protection and Expansion Act of 1989.* Specifically, the Act states the following:

> *SEC. 102. BOUNDARY MODIFICATION.*
>
> *(a) AREA INCLUDED – The park boundary is hereby modified to include approximately 107,600 acres as generally depicted on the map entitled `Boundary Map, Everglades National Park Addition, Dade County, Florida', numbered 160-20,013B and dated September 1989. The map shall be on file and available for public inspection in the offices of the National Park Service, Department of the Interior.*
>
> *(b) BOUNDARY ADJUSTMENT – The Secretary may from time to time make minor revisions in the boundaries of the park in accordance with section 7(c) of the Land and Water Conservation Fund Act of 1965 (16 U.S.C. 4601-4 and following). In exercising the boundary adjustment authority the Secretary shall ensure all actions will enhance resource preservation and shall not result in a net loss of acreage from the park.*
>
> *(c) ACQUISITION –*
>
> *(1) Within the boundaries of the addition described in subsection (a), the Secretary may acquire lands and interests in land by donation, purchase with donated or appropriated funds, or exchange. For purposes of acquiring property by exchange, the Secretary may, notwithstanding any other provision of law, exchange the approximately one acre of Federal land known as `Gilberts' Marina' for non-Federal land of equal value located within the boundaries of the addition. Any lands or interests in land which are owned by the State of Florida or any political subdivision thereof, may be acquired only by donation.*
>
> *(2) <u>It is the express intent of Congress that acquisition within the boundaries of the addition shall be completed not later than 5 years after the date of enactment of this section. The authority provided by this section shall remain in effect until all acquisition is completed</u>* [emphasis added].

The only parcels excluded within the contiguous ENP Expansion Area were those lands comprising the Airboat Association, located immediately south the current alignment of the Tamiami Trail road corridor. The NPS has completed approximately 99% of the land designated for acquisition within the Area. Lands still in private ownership include the three commercial airboat facilities, Everglades Safari, Gator Park, and Coopertown; the Florida Power and Light lands; and the lands occupied by the two commercial radio tower facilities owned, respectively, by Salem Communications and Lincoln Financial Media. Currently, insufficient funds are available to complete these acquisitions. Therefore, the NPS has included the costs for the acquisition of these parcels in the costs associated with this project since an operational plan subsequent to roadway modifications described in this report will likely increase water levels within the ENP Expansion Area and potentially adversely affect these properties.

Commercial Airboat Facilities. The most immediate need for acquisition includes the purchase of the commercial airboat facilities since these lands are located directly within the proposed corridor of the roadway improvements associated with any of the actions plans considered. Since other provisions in the 1989 Act also provided the opportunity for these lands to eventually be used for providing future visitor services, the assumption for all alternatives examined in this report was to provide access to these facilities until final determination is made on the use of the facilities in the ENP General Management Plan, scheduled for release early in 2011. Therefore, all of the plans considered in this report provide either direct access off of the elevated roadway or provide a downramp from an elevated bridge to these airboat facilities. Should the selected plan identified in this report be authorized and funded, the selected plan would be modified based on the findings and recommendations of the ENP General Management Plan. These modifications to the selected plan would occur during the final design and in advance of the highway modifications.

Florida Power and Light Lands. Florida Power and Light purchased lands within the now designated ENP Expansion Area in the 1960's as part of a longer strip of land extending both north and south of the ENP Expansion Area for purposes of locating future utility lines. The Omnibus Public Lands Management Act of 2009 authorized the potential exchange of these lands located more central to the ENP Expansion Area for lands located on the eastern boundary of the park, adjacent to the L-31N canal alignment. The status of this exchange is currently the subject of an independent National Environmental Policy Act study. The status of these lands will be determined through the analysis and conclusions resulting from this study.

Commercial Radio Towers. No potential future use, analogous to the commercial airboat facilities described above, was identified in the 1989 Act for the radio towers lands. However, the NPS did identify some specific issues associated with the acquisition of these lands in the ENP Expansion Area as part of the *Land Protection Plan: East Everglades Addition, Everglades National Park.* Specifically, this document states the following pertaining to the commercial radio tower lands:

> *"At present, two AM radio antenna fields exist along the U.S. 41 (Tamiami Trail), consisting of multiple antenna arrays several hundred feet in height. Before acquisition is initiated, an assessment will be completed to address issues such as intrusion on park resources, impact upon wetlands and the GDM implementation which will increase hydroperiod in the Shark Slough, frequency and location authorizations granted by the Federal Communications Commission (FCC), and aesthetic intrusion."* (NPS, 1991)

Consistent with the 1991 Land Protection Plan and Environmental Assessment, the NPS will undertake a supplemental assessment of the above issues prior to acquisition of these lands. Each of the issues included in the 1991 Land Protection Plan Environmental Assessment will also be addressed in a manner consistent with the compatible and incompatible uses of private ownership guidance also included in that document. Specifically, the plan states the following:

> *"Since the East Everglades addition represents an area to be protected and managed for enhancement and restoration of ecological values (including the restoration and management of endangered species habitat), the restoration of natural hydrologic conditions (which would extend the hydroperiod on lands) and the provision for appropriate public enjoyment, private uses of the addition that would perpetuate these values and are consistent with laws applicable to the National Park System, would be compatible with addition purposes. Activities that would disturb the ecology, interfere with the restored hydrologic system, or prevent enjoyment of the addition would be incompatible."* (NPS, 1991)

The proposed supplement will occur subsequent to the allocations of funds for acquisition of these properties but prior to the acquisition and also prior to the implementation of any roadway modifications associated with this report. However, both the 1989 Act and the 1991 Land

Protection Plan and Environmental Assessment were clear that the Congressional intent of the Act was to acquire all lands within this area. With this clear purpose, the supplemental assessment will include evaluations of the potential for flood protection for the radio tower facilities, the potential impacts due to the operation of flood protection facilities on the water quality and water quantity, and any impacts of these facilities on existing wetlands and other impacts such as the effects on the viewshed. The physical improvements needed to provide flood protection for the commercial radio towers will also be evaluated as to compatible versus incompatible use as described above and further evaluated to ensure that these improvements are consistent with the dredge and fill requirements also specified in the 1991 Land Protection Plan and Environmental Assessment. Should the selected plan identified in this report be authorized and funded, the selected plan would be modified based on the findings and recommendations of this supplemental assessment. These modifications to the selected plan would occur during the final design and in advance of the highway modifications.

For additional information about the socioeconomic impacts of the project, refer to ***Appendix G*** – Socioeconomic Report. For additional information about the impacts of real estate acquisition associated with the project, refer to ***Appendix H*** – Real Estate Report.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions have resulted in the removal of agricultural lands (sugar cane) from production and the conversion of these lands to wetlands and water treatment reservoirs. This shift of land use can cause downward shifts in employment numbers and tax bases. However, construction of Everglades restoration projects provides employment and revenues to local communities. Cumulative effects of implementation of any of the action alternatives or combined with other past and future projects in the area would have some positive effect on employment, gross output, and the gross regional product of Miami-Dade County; and to a lesser extent, the State of Florida, and any social impacts would be minimal. Additionally, no disproportionate adverse environmental impacts would be expected to occur to any racial, ethnic, or socioeconomic group. Therefore, overall cumulative impacts from the selection of any of the action alternatives in conjunction with related actions in other areas would be long-term and beneficial.

Conclusion. Implementation of any of the action alternatives would have some positive effect on employment, gross output, and the gross regional product of Miami-Dade County; and to a lesser extent, the State of Florida, and any social impacts would be minimal. Therefore, the long-term impacts from the selection of any of the action alternatives would be beneficial.

4.13 Transportation

4.13.1 Guiding Regulations and Policies

In accordance with NPS *Management Policies* (2006) “the location, type, and design of transportation systems and their components (e.g., roads, bridges, trails, and parking areas), and the use of alternative transportation systems all strongly influence the quality of the visitor experience.” Pursuant to management policy guidance consideration should be given to whether a proposed transportation project would be appropriate and necessary to meet park management needs or to provide for visitor use and enjoyment and would reduce traffic congestion, noise, air pollution and adverse effects on park resources.

Director’s Order 87D: Non-NPS Roads sets up a system where the NPS can be a participant in decision making where non-NPS maintain roads are to be constructed on NPS property. Pursuant to this Order the NPS is to take into consideration all impacts that construction or modification of a non-NPS maintained road would have on park resources.

4.13.2 Assumptions, Methodology and Impact Thresholds

The FHWA has designated Level of Service (LOS) C as the minimum acceptable LOS standard on federal facilities; however, the FHWA has stated that LOS standards vary by facility type (i.e., urban freeways, mountainous roads, etc.). For this analysis, a peak hour LOS C is taken as the threshold for acceptable traffic operations along the Tamiami Trail.

Impact threshold definitions for traffic are as follows:

Negligible: There would be no change in the number of vehicles. Tamiami Trail would operate at LOS B.

Minor: There would be a small increase in the number of vehicles. Tamiami Trail would continue to operate at LOS B.

Moderate: Increases in the number of vehicles would be apparent. Tamiami Trail would experience a decrease to LOS C.

Major: Increases in the number of vehicles would be noticeable to all motorists. Tamiami Trail would experience a decrease to LOS D or F.

Analysis area: The area of analysis for transportation is the 10.7 mile Tamiami Trail project corridor.

4.13.3 Impacts of the Alternatives

No-Action Alternative

Analysis. If the No-Action Alternative is selected as the preferred alternative, there would be no additional direct or indirect short- or long-term impacts on transportation other than those already realized from construction of the 2008 LRR preferred alternative (1-mile eastern bridge). Transportation/traffic would be expected to remain unchanged.

Cumulative Impacts. On-going and future related actions are not anticipated to impact traffic levels, while the No-Action Alternative is expected not to increase traffic levels within the project area. Therefore, past, present, and reasonably foreseeable actions will have a negligible cumulative effect on traffic.

Conclusion. No short- or long-term adverse or beneficial effects to transportation would result from the selection of the No-Action Alternative.

Action Alternatives

Analysis. Under all action alternatives no increases in traffic levels are anticipated due to the proposed project improvements to Tamiami Trail. Future projected increases in traffic volumes are tied to population growth and not project improvements. Traffic volume along Tamiami Trail within the proposed project area was estimated to be 5,375 vpd in 2000 (USACE, 2005) with the latest (2008) traffic estimate at 5,200 vpd (USACE, 2009), therefore traffic volume has shown no net increase in almost a decade. By 2018 traffic volume is anticipated to increase to 5,800 vehicles or by only 600 vpd (USACE, 2009). Assumed traffic LOS for Year 2038 for Tamiami Trail remains at LOS B (USACE, 2009).

Short-term transportation-related impacts such as lane closures, reduced speed limits, and reduced accessibility to visitor facilitates/activities would be limited to the areas currently under construction and would be mitigated by measures such as a MOT plan and construction scheduling during off-peak traffic hours. At least one access route to all private, public, and commercial facilities would be kept open at all times during construction, thus further minimizing short-term impacts to the transportation facility. Additionally, in the event of an emergency evacuation event (such as evacuation orders for a major hurricane), all construction would cease during evacuation (and return) and at least one lane would be available and open in the direction of the ordered evacuation (and return).

Cumulative Impacts. On-going and future related actions are not anticipated to impact traffic levels, while the action alternatives (1-6e) of the proposed project are expected not to increase traffic levels within the project area. Therefore, the proposed action alternatives along with related projects will have a negligible cumulative effect on traffic.

Conclusion. Transportation effects associated with the action alternatives (1-6e) would be adverse, local, minor, and short-term and primarily associated with traffic delays related to construction activities. Mitigation of these effects would be though implementation of MOT plans. No long-term increases in traffic levels are associated with any of the action alternatives.

4.14 Hazardous, Toxic, and Radioactive Waste

4.14.1 Guiding Regulations and Policies

Park Service Resource Protection Act (PSRPA) – This act provides the NPS separate authority to collect damages for injury to park resources and is not restricted to damage from hazardous substances but from damage in all circumstances. This act imposes strict liability on individuals who cause injury to park resources and allows NPS to recover damages and costs to restore injured park resources.

NPS Management Policies 2006

NPS *Management Policies 2006* (Section 3, Land Protection) states that:

> *The National Park Service will use all available authorities to protect lands and resources within units of the national park system, and the Park Service will seek to acquire nonfederal lands and interests in land that have been identified for acquisition as promptly as possible. For lands not in federal ownership, both those that have been identified for acquisition and other non federally owned lands within a park unit's authorized boundaries, the Service will cooperate with federal agencies; tribal, state, and local governments; nonprofit organizations; and property owners to provide appropriate protection measures. Cooperation with these entities will also be pursued, and other available land protection tools will be employed when threats to resources originate outside boundaries.*

Chapter 4, Section 4.11, Chemical Information and Odors states:

> *The Service will preserve, to the greatest extent possible the natural flow of natural chemical information and odors by preventing (1) the release of human-generated chemicals that can block the release, deposition, or perception of natural chemicals; and (2) human actions that disrupt or commingle the pathways through which natural chemicals are dispersed.*

This section also notes that the NPS must comply with all applicable laws and regulations when undertaking activities that disrupt the natural flow of natural chemicals.

Director's Order 14: Resource Damage Assessment and Restoration provides guidance on ameliorating damage to natural resources as a result of releases of hazardous substances. The director's order describes policy and sets forth a plan of action under which the NPS can collect civil damages for injury to park system resources and collect appropriate costs incurred by the NPS for response actions and assessment.

4.14.2 Assumptions, Methodology and Impact Thresholds

Maps showing the Tamiami Trail project area and communications with NPS staff were used to identify land use in the project area. Available information was also taken from other NPS and non-NPS resources to describe these resources in more detail.

The thresholds for the intensity of an impact are defined as follows:

Negligible: Proposed construction of facilities and/or location or introduction of recreational or other activities in all cases pose very little contamination concerns to the existing properties, any existing city or county zoning, and existing easements, licenses, rights-of-way, and leases. No remediation of contaminants would be required.

Minor: Proposed construction of facilities and/or location or introduction of recreational or other activities in all cases pose little contamination concern to the existing properties, any existing city or county zoning, and existing easements, licenses, rights-of-way, and leases. Remediation of contaminants may be required; however remediation efforts are minor and easily accomplished.

Moderate: Proposed construction of facilities and/or location or introduction of recreational or other activities in all cases pose some contamination concerns to the existing properties, any existing city or county zoning, and existing easements, licenses, rights-of-way, and leases. These concerns can be remediated to bring them into conformance; however, such remediation efforts are difficult and expensive and may result in substantial changes to the proposal.

Major: Proposed construction of facilities and/or location or introduction of recreational or other activities in all cases pose considerable contamination concerns to the existing properties, any existing city or county zoning, and existing easements, licenses, rights-of-way, and leases, and constitutes a conflicting use. Mitigation measures cannot be implemented to change the level of conformance.

Analysis area: The focus of this analysis is the area that would be directly affected by the proposed actions, primarily the project footprint.

4.14.3 Impacts of the Alternatives

No-Action Alternative

Analysis. If the No-Action Alternative is selected as the preferred alternative, there would be no additional direct or indirect short- or long-term impacts from hazardous, toxic, or radioactive wastes other than those already realized from construction of the 2008 LRR/EA preferred alternative (1-mile eastern bridge). Status of existing contamination would remain unchanged

Cumulative Impacts. The No-Action Alternative will have no effect on the environment due to hazardous, toxic, and radioactive wastes. Hazardous, toxic, and radioactive wastes associated with other related actions will have a negligible effect on the environment as they will be remediated during construction. Therefore, cumulative impacts of hazardous, toxic, and radioactive wastes as a result of related actions are negligible.

Conclusion. No short- or long-term adverse or beneficial effects resulting from the presence of hazardous, toxic or radioactive wastes would result from the selection of the No-Action Alternative.

Action Alternatives

Analysis.

Alternative 1

Alternative 1 proposes the construction of four (4) Bridges (A1, B1, C1, & E1) and a ConSpan (H1) for a total of 2.2 miles of bridging. According to the Phase I Assessment completed in September 2009, two sites, Gator Park and Everglades Safari, were identified in the western half of the project corridor as having groundwater contamination. The Phase I Report classified the two sites as RECs, assigning the risk rating for the Gator Park site and Everglades Safari as "High".

Everglades Safari is located midway between proposed Bridges B1 and C1 approximately 0.38 miles to the west of Bridge C1, approximately 0.40 miles to the east of Bridge B1 and approximately 1 mile east of Bridge A1. The Everglades Safari site may pose moderate contamination risk for Bridge C1 but creates a negligible contamination risk to the proposed construction of Bridge A1 or B1 based on its distance and location.

Gator Park lies approximately 0.8 miles to the east from the proposed western end of Bridge E1. The Gator Park site creates a negligible contamination risk to the proposed construction of Bridge E1 based on its distance and cross gradient location.

It should also be noted that an asbestos survey will be necessary for the demolition of any structures in association with this alternative, including any buildings or drainage features (i.e., culverts). If asbestos is discovered during the survey, asbestos abatement and removal will be required during demolition.

Implementation of Alternative 1 could have long-term, adverse, moderate, localized effects associated with the construction of Bridge C1 in the vicinity of the Everglades Safari property. Additionally, implementation of Alternation 1 may have long-term, adverse, negligible, localized effects associated with the construction of Bridges A1, B1, and E1.

Alternative 2

Alternative 2 proposes the construction of six (6) proposed bridges (A1, B1, C1, E1, I1, & J1) for a total of 3.3 miles of bridges. Four of these bridges are located in the western half of the corridor (A1, B1, C1, & E1), between Gator Park and Osceola Camp. Two (I1, & J1) are located in the eastern half of the corridor between the Salem Communications radio tower and the S-354/S-356 control structure.

Everglades Safari is located midway between proposed Bridges B1 and C1 approximately 0.38 miles to the west of Bridge C1, approximately 0.40 miles to the east of Bridge B1, and approximately one mile east of Bridge A1. The Everglades Safari site creates a moderate contamination risk to Bridge C1 but creates a negligible contamination risk to the proposed construction of Bridge B1 based on its distance and location.

Gator Park lies approximately 0.8 miles to the east from the proposed western end of Bridge E1. The Gator Park site creates a negligible contamination risk to the proposed construction of Bridge I1 based on its distance, cross gradient location, and its LOW ranking as a REC.

The Salem Communications radio tower site lies approximately 0.06 miles west of Bridge I1. The Coopertown site lies approximately 0.87 miles west from Bridge I1. The Coopertown site creates a negligible contamination risk to the proposed construction of Bridge I1 based on its distance, cross gradient location, and its LOW ranking as a REC. However, the Salem Communications radio tower site could create a moderate contamination risk to the proposed construction of Bridge I1 based on its distance and documented contamination if dewatering activities were to be conducted at the proposed Bridge I1 construction site. Based on the available information, the identified sites could create a negligible contamination risk to the proposed construction of Bridge J1.

It should also be noted that an asbestos survey will be necessary for the demolition of any structures in association with this alternative, including any buildings or drainage features (i.e., culverts). If asbestos is discovered during the survey, asbestos abatement and removal will be required during demolition.

Implementation of Alternative 2 could have long-term, adverse, moderate, localized effects associated with the construction of Bridge C1 in the vicinity of the Everglades Safari property and Bridge I1 in the vicinity of the Salem Communications radio tower property. Additionally, implementation of Alternation 2 may have long-term, adverse, negligible, localized effects associated with the construction of Bridges B1, and J1.

Alternative 4

This alternative includes 2 bridges: A1 and B1 (for a total of 1.0 mile), as described for Alternative 1. The bridges would create a conveyance opening through Tamiami Trail by removing the sections of the existing highway and embankment under the bridges and ConSpan. The bridges would be constructed over the openings to replace the removed sections of road and maintain motor vehicle traffic. The remaining highway embankment (approximately 8.70 miles) would be reconstructed to raise the crown elevation to 13.13 feet.

Everglades Safari is located approximately 0.40 miles to the east of Bridge B1 and approximately 1 mile east of Bridge A1. The Everglades Safari site could create a negligible contamination risk to the proposed construction of Bridges A1 or B1 based on its distance and cross gradient location.

It should also be noted that an asbestos survey will be necessary for the demolition of any structures in association with this alternative, including any buildings or drainage features (i.e., culverts). If asbestos is discovered during the survey, asbestos abatement and removal will be required during demolition.

Implementation of Alternative 4 could have a long-term, adverse, negligible, localized effect associated with the construction of Bridges A1 and B1 in the vicinity of the Everglades Safari property.

Alternative 5

Alternative 5 consists of 3 bridges; bridges A1, B1, and C1 (for a total of 1.5 miles) as described for Alternative 1. The three proposed bridges (A1, B1, & C1) are located in the Western half of the corridor and would be located between Gator Park and Osceola Camp.

Everglades Safari is located midway between proposed Bridges B1 and C1 approximately 0.38 miles to the west of Bridge C1, approximately 0.40 miles to the east of Bridge B1, and approximately 1 mile east of Bridge A1. The Everglades Safari site could create a moderate contamination risk to Bridge C1 but poses a negligible contamination risk to the proposed construction of either Bridge B1 or A1 based on its distance and location.

It should also be noted that an asbestos survey will be necessary for the demolition of any structures in association with this alternative, including any buildings or drainage features (i.e., culverts). If asbestos is discovered during the survey, asbestos abatement and removal will be required during demolition.

Implementation of Alternative 5 could have long-term, adverse, moderate, localized effects associated with the construction of Bridge C1 in the vicinity of the Everglades Safari property. Additionally, implementation of Alternation 5 may have long-term, adverse, negligible, localized effects associated with the construction of Bridges A1 and B1.

<u>Alternative 6e</u>

Alternative 6e is the maximum bridging option and consists of four bridges totaling 5.5 miles and elevating the remaining roadway. The bridge configurations include: (1) a 2.60 mile bridge located between the Osceola Camp and the Airboat Association (A1-B2), (2) a 0.376 mile bridge located between the Airboat Association and the Tiger Tail Camp (E1), (3) a 1.77 mile bridge located between the Tiger Tail Camp and the existing one-mile bridge (G1-I1), and (4) a 0.66 mile bridge located between the existing 1-mile bridge and the S-334 structure (J1).

Everglades Safari is located midway along bridge segment B2 and approximately 1 mile east of bridge segment A1. The Everglades Safari site could create a moderate contamination risk to bridge segment B2 but poses a negligible contamination risk to the proposed construction of bridge segment A1 based on its distance and location.

Gator Park lies approximately 0.8 miles to the east from the proposed western end of Bridge E1. The Gator Park site poses a negligible contamination risk to the proposed construction of Bridge E1 based on its distance, cross gradient location, and its LOW ranking as a REC.

The Salem Communications radio tower lies approximately 0.06 miles west of bridge segment I1. The Coopertown site lies approximately 0.87 miles west from bridge segment I1. The Coopertown site poses a negligible contamination risk to the proposed construction of bridge segment I1 based on its distance, cross gradient location, and its LOW ranking as a REC.

However, the Salem Communications radio tower site could create a moderate contamination risk to the proposed construction of bridge segment I1 based on its distance and documented contamination if dewatering activities were to be conducted at the proposed bridge segment I1 construction site. Based on the available information, the sites identified with contamination concerns pose a negligible contamination risk to the proposed construction of Bridge J1.

The proposed eastern and western Bridge Access Ramps could be impacted by the existing contamination at the Coopertown site and Everglades Safari site, moderately, respectively.

It should also be noted that an asbestos survey will be necessary for the demolition of any structures in association with this alternative, including any buildings or drainage features (i.e., culverts). If asbestos is discovered during the survey, asbestos abatement and removal will be required during demolition.

Implementation of Alternative 6e could have long-term, adverse, moderate, localized effects associated with the construction of bridge segment B2 in the vicinity of the Everglades Safari property and bridge segment I1 in the vicinity of the Salem Communications radio tower property. Additionally, implementation of Alternation 6e may have long-term, adverse, negligible, localized effects associated with the construction of Bridges E1, and J1 and bridge segment A1.

For additional information, refer to the Phase I HTRW Assessment for the Tamiami Trail Modifications: Next Steps project in ***Appendix I***.

Cumulative Impacts. Cumulative effects of Hazardous, Toxic, and Radioactive Wastes on the environment would be negligible because the localized adverse impacts associated with implementation of the action alternatives (1-6e) of the proposed project would be remediated during construction and would not add to Hazardous, Toxic, and Radioactive Waste effects of related actions in other locations.

Conclusion. The Implementation of Action Alternatives 1, 2a, 5 and 6e may lead to a long-term, adverse, negligible to moderate, localized affects to the environment due to potential contamination by hazardous or toxic waste. The implementation of Action Alternative 4 may lead to a long-term, adverse, negligible, localized effect to the environment due to potential contamination by hazardous or toxic waste. A Phase II Environmental Assessment is strongly recommended for three properties adjacent to the Tamiami Trail Bridge Project Corridor. Groundwater sampling for VOAs and Volatile Organic Compounds (VOCs) should be conducted at Everglades Safari, Gator Park, and at the entrance to the Salem Communications radio tower.

EVERGLADES NATIONAL PARK
TAMIAMI TRAIL MODIFICATIONS: NEXT STEPS
FINAL ENVIRONMENTAL IMPACT STATEMENT

CHAPTER 5
ENVIRONMENTAL COMPLIANCE FOR THE PREFERRED ALTERNATIVE

CHAPTER 5: ENVIRONMENTAL COMPLIANCE FOR THE PREFERRED ALTERNATIVE

5.1 Unavoidable Adverse Environmental Impacts

Implementation of any of the action alternatives would lead to unavoidable adverse environmental impacts. Project construction would cause unavoidable short-term adverse impacts to soils, water quality, wetlands, floodplains, wildlife, and special status species. Additionally, project construction and operation would cause unavoidable long-term adverse impacts to soils, wetlands, special status species including the wood stork, and cultural resources.

5.2 Irreversible and Irretrievable Commitment of Resources

NEPA regulations (40 CFR 1502.16) require an EIS to address the irreversible and irretrievable commitment of resources caused by the alternatives. An *irreversible* commitment of resources is defined as the loss of future options. The term applies primarily to the effects of using nonrenewable resources (such as minerals or cultural resources) or resources that are renewable only over long periods (such as soil productivity). It could also apply to the loss of an experience as an indirect effect of a "permanent" change in the nature or character of the land. An *irretrievable* commitment of resources is defined as the loss of production, harvest, or use of natural resources; irretrievable resource commitments may or may not be irreversible.

5.2.1 Irreversible Commitment of Resources

The potential to have to move or remove historic structures would have an irreversible impact. However, prior to the removal or disturbance of these resources, documentation and data recovery would be completed, thus maintaining the historical record and limiting the impact to the loss of or change to the physical structure and historic associations.

5.2.2 Irretrievable Commitment of Resources

Wetlands, soils, and vegetation would be adversely affected as a result of construction of the proposed project. This represents an irretrievable commitment of these resources at least for the duration of the operation of the roadway. It is possible to rehabilitate these affected resources and return them to their preconstruction state sometime in the future if the roadway is removed. Nonrenewable resources and energy used during construction of the project represent irretrievable commitment of these resources.

5.3 Relationship between Local Short-Term Uses of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity

NEPA regulations (40 CFR 1502.16) require an EIS to consider the relationship between short-term uses of the environment and the maintenance and enhancement of long- term productivity. Special attention should be given to impacts that narrow the range of beneficial uses of the environment or pose a long- term risk to human health or safety.

<u>No-Action Alternative and Action Alternatives</u>

Short-term, minor adverse impacts to water quality, wetlands, soils, wildlife/habitats, and special status species would consist of construction related impacts such as soil disturbance, filling and excavation of wetlands, increased erosion, and noise from construction equipment. However, the long-term productivity of all these resources would be enhanced by all proposed project alternatives including the No-Action Alternative since the restoration of more natural sheet flow patterns would lead to long term benefits to water quality, wetlands, soils, and wildlife habitats, and the increase in ecological connectivity would benefit wildlife and special status species.

5.4 Effects on Energy Requirements and Conservation Potential

In the short term, fuel consumption would increase as a result of construction activities associated with the implementation of the project. However, long-term energy requirements would not be affected as the road improvements would not result in an increase of traffic. No conservation potential is anticipated with implementation of the project as fuel efficiency standards have not been implemented for construction equipment.

5.5 Compatibility with Federal, State, and Local Objectives

The proposed project is consistent with the overall goals and objectives stated in CERP. The project is also consistent with the water management goals and objectives of the SFWMD. The project has also been coordinated with agencies of Federal and state governments. Agency representatives have participated in workshops and scoping meetings. There is no known incompatibility with the objectives of Federal, state, or local entities.

5.6 Conflicts and Controversy

Comments received throughout the public scoping portion of the project and during the 60-day public comment review period for the Draft EIS have identified the following areas of conflict and controversy (in no particular order):

- Comments were received which expressed the need for adequate clearance under any proposed bridging to allow access for airboats with the Miami-Dade County Fire Department in emergency situations (i.e., a plane crash).
- Several respondents requested that non-motorized boating access features be included as a design element for each of the action alternatives.
- Many individuals and organizations expressed a concern about the cost/benefit of the project, project funding availability, the lack of a cost cap for the project. Other potential socioeconomic impacts and benefits mentioned included concerns about the use of taxpayer funds for implementation of the project; the economic benefits of project implementation in terms of employment during construction; the potential economic benefits that could be gained from the project (and specifically from a multi-use/bicycle/pedestrian path) through increased tourism; the methodology for real estate cost calculations in the Draft EIS; the potential cost of project implementation delay; and economic impacts on businesses within the project corridor.
- Numerous comments were received which advocated the selection of the longest possible bridging alternative, while comments were also received which supported the No-Action Alternative and offered the alternate options of cleaning out the existing culvert sets under Tamiami Trail or further implementation of the Spreader Swales project as viable project alternatives.
- Comments were received from individuals and organizations which expressed a concern about the project planning and decision-making processes and advocated a purely science-based decision-making process with no influence from political factors.
- A few respondents (including federal agency representatives) showed a concern about flooding and seepage control and requested that flood protection and impacts to floodplains should be thoroughly evaluated in the EIS. Comments received during the Draft EIS comment period requested additional floodplain/seepage management studies to be conducted before a water operations plan is implemented for this project.

- During the scoping portion of the project, several respondents mentioned the anticipated benefits of restored hydrologic flow within the Everglades (and specifically Shark River Slough) and requested that management/operations of hydrology be evaluated as part of the EIS. During the Draft EIS comment period, a very prevalent number of respondents, including agencies, expressed a concern about water operations associated with the project.
- Numerous comments were received regarding the need for an analysis and avoidance of impacts to natural resources (i.e., water quality and quantity, special status species, and wildlife) and cultural resources [historic structures (AAoF) property and Coopertown), "Gladesman" and American Indian Tribe cultures, and American Indian Tribal camps (Osceola and Tiger Tail)].
- Comments were received which requested an evaluation of climate change/sea level rise effects on the project.
- Many respondents expressed a concern that visitor access to recreational activities (i.e. fishing, boating, etc.) along Tamiami Trail be maintained throughout and following the project. Comments were also received regarding the visitor conflicts between motorized and non-motorized boating in ENP.
- Much concern was expressed by business owners and commercial interests about the potential for private property acquisition associated with the project and the potential economic impact of the project.
- The Miccosukee Tribe of Indians had concerns about the following topics during the scoping portion of the project: the limited area of analysis for the project; adverse impacts from construction on the Tiger Tail and Osceola camps; the lack of a water control operational plan; floodplain and flooding impacts; seepage control; restoration of Shark River Slough; the impacts of "unconstrained flows" and volume of water; consideration of a non-bridging culvert alternative; water quality impacts; endangered species impacts; amount and cost of land acquisition; the lack of a cost cap for the project; and the compatibility of the proposed action alternatives with CERP and non-CERP projects. During the public comment period for the Draft EIS, the Tribe expressed the following additional concerns about the Draft EIS: Failure to comply with NEPA, 4(f), the ESA, and Federal Advisory Committee Act; delay of project benefits; failure to analyze factual operations and *de facto* operations; failure to analyze all reasonable alternatives; improper analysis of the CERP DECOMP project; improper narrowing of the project and study area; inadequate impact analysis; failure to explain unconstrained flows and volumes; failure to adequately address seepage control; lack of a viable authority or project purpose; failure to adequately model the alternatives and impacts; lack of engineering design detail; improper limitation and skewing of the environmental impacts; inadequate water quality analysis; incompatibility of the project with other restoration projects; failure to divulge the lack of a cost cap in the Draft EIS; failure to assess the cost of project delay; and failure to meet the NPS trust responsibility to the Tribe.

5.7 Uncertain, Unique, or Unknown Risks

The direct site-specific impacts of the proposed project can be predicted with a high degree of certainty; therefore, uncertainty is minimized. However, predictions of cumulative impacts are, to a degree, inherently uncertain. This project is based on the best available scientific and engineering information, and although no significant adverse impacts are expected, a low probability of risk is always present. The project design is not unique; thus, it should not create unique risks.

5.8 Precedent and Principle for Future Actions

This project would not establish a precedent for future actions with significant effects or represent a decision in principle for future considerations.

5.9 Environmental Commitments

The NPS commits to avoiding, minimizing, or mitigating for adverse effects during construction activities. For a summary of these protective measures, please refer to Section 2.5, Mitigation Measures.

5.10 Environmental Compliance

Anadromous Fish Conservation Act

Anadromous fish species would not be affected by this project. This act is not applicable.

Bald Eagle Protection Act

No bald eagles are known to occur in the project area. This project is in compliance with the Act.

Clean Air Act of 1972

The proposed project is in full compliance with section 309 of the Clean Air Act. No air permit would be required for the construction. Because Miami-Dade County is in attainment with National Ambient Air Quality Standards (NAAQS), the project is in compliance with the Clean Air Act Conformity Rule.

Clean Water Act of 1972

Full compliance with this Act would be achieved upon the issuance of a Section 401 water quality certification and National Pollutant Discharge Elimination System (NPDES) permits from the State of Florida.

Coastal Barrier Resources Act and Coastal Barrier Improvement Act of 1990

There are no designated coastal barrier resources in the project area that would be affected by this project. These acts are not applicable.

Coastal Zone Management Act of 1972

A federal consistency determination in accordance with 15 CFR 930 Subpart C is required for all projects. The State's consistency review for this project was performed as part of the Draft EIS for this project. The Florida State Clearinghouse letter dated August 2, 2010, provided the following statement of consistency with the FCMP: Based on the information contained in the Draft EIS and enclosed state agency comments, the state has determined that, at this stage, the proposed federal activities are consistent with the FCMP. To ensure the project's continued consistency with the FCMP, the concerns identified by our reviewing agencies must be addressed prior to project implementation. The state's continued concurrence will be based on the activity's compliance with FCMP authorities, including federal and state monitoring of the activity to ensure its continued conformance, and the adequate resolution of issues identified during this and subsequent reviews. The state's final concurrence of the project's consistency with the FCMP will be determined during the environmental permitting process under Section 373.428, *Florida Statutes*."

Endangered Species Act of 1973

This project would comply with the ESA of 1973, as amended, 16 U.S.C. 1531*, et seq.;* PL 93-205. Since Federally-listed threatened and endangered species are located within the study area and would be affected by the proposed project, a Biological Assessment would be required by the USFWS for this project. Through ongoing coordination efforts with the USFWS (see Section 6.3.2.2), it has been agreed that the requirements for the Biological Assessment can be met through this EIS document. A commitment has also been made to provide ornithological observers during construction and to stage construction such that it does not interrupt nesting activities at the three wood stork rookeries located in close proximity to Tamiami Trail. The USFWS informally concurred with the USACE “may affect, not likely to adversely affect” determinations for all listed species except the Florida panther (2003 GRR/SEIS). Subsequently (2005 RGRR/SEIS), the USFWS concluded that the project may affect, but is not likely to adversely affect the Florida panther.

The USFWS issued the BO for the Tamiami Trail Modifications: Next Steps project on October 18, 2010. The findings of the BO have been incorporated into this EIS. Documentation of compliance with the ESA is provided in ***Appendix J***.

Estuary Protection Act of 1968

No designated estuary would be affected by project construction activities however; operations of the project may benefit Florida Bay. Full compliance with the Act would occur upon review of this EIS by the NMFS.

Farmland Protection Policy Act of 1981

No prime or unique farmland would be impacted by implementation of this project. The project is in compliance.

Federal Water Project Recreation Act

This project is in full compliance with the Federal Water Project Recreation Act, as amended, 16 U.S.C 460-1 (12), *et seq.,* P.L. 89-72.

Fish and Wildlife Coordination Act of 1958

This project has been extensively coordinated with the USFWS. Fish and Wildlife Coordination Act (FWCA) reports were submitted by the USFWS for the 1994 GRR, 2002 IOP FEIS, 2006 IOP FSEIS, and 2008 LRR/EA. The draft EIS for this project would also be coordinated with the USFWS. This project is in compliance with the Act.

Magnuson-Stevens Fishery Conservation and Management Act

This project is inland and not expected to adversely affect EFH. Full compliance with the Act would occur upon review of this EIS by the NMFS.

Marine Mammal Protection Act of 1972

The West Indian manatee is not likely to be adversely affected by the project. Coordination with USFWS would continue as construction and operational guidelines are incorporated to avoid impacts to this species. Full compliance with the Act would occur after review of this EIS by the USFWS

Marine Protection, Research and Sanctuaries Act (MPRSA)

The term “dumping” as defined in the Act (3[33 USC. 1402] (f)) does not apply to this project. Therefore, the MPRSA does not apply.

Migratory Bird Treaty Act and Migratory Bird Conservation Act

No migratory birds would be adversely affected by project activities. The project would be in compliance with these acts upon review of this EIS by the USFWS.

National Environmental Policy Act of 1969

The NPS has prepared a Draft and Final EIS for the Tamiami Trail Modifications: Next Steps project in compliance with NEPA.

The NPS conducted scoping for the Tamiami Trail Modifications: Next Steps project, which elicited public participation in the discussion of issues, area to be studied, and potential alternatives for the project. A NOI to prepare an Environmental Impact Statement was published in the Federal Register on May 29, 2009. A project scoping newsletter was distributed by the NPS by U.S. mail and electronic mail also in May 2009. This notice announced the Park's proposal and described preliminary alternative and resource considerations, and identified opportunities for public participation in the EIS process. A public scoping meeting was held on June 2, 2009, at the South Dade Regional Library in Miami, Florida. The structure of the meeting allowed individuals interested in participating in the planning process to be directly involved. Each of the information stations had a flip chart where comments could be provided; in addition those attending the meeting were also directed to the EIS newsletter, which provided additional opportunities for comment on the project, including direct comments by mail, e-mail, or through the NPS's PEPC website.

The NPS published a Notice of Availability (NOA) about the availability of a Draft EIS for the project in the Federal Register (Volume 75, Number 100, pages 29359-29361) on Tuesday, May 25, 2010. The notice invited interested parties to submit their views or concerns regarding the project to the Park. The 60-day comment period was scheduled from May 25 through July 27, 2010. The NOA in the Federal Register also announced that a public meeting would be held during the 60-day comment period. The public meeting was held on June 24, 2010, at the South Dade Regional Library in Miami, Florida, to initiate public involvement and to obtain community feedback regarding the Draft EIS. The public meeting date/time and place was published on the NPS's website and a public meeting announcement was printed in the Miami Herald and El Nuevo Herald on June 16, 2010.

Numerous methods were available for the community to provide comment about the Draft EIS. Those attending the public meeting were given comment forms, which could be filled out at the meeting or mailed back to the park. Public meeting participants were also informed of additional opportunities for comment on the project, including directing comments by mail, e-mail, or through the NPS's PEPC website. Public meeting participants were also given the opportunity to provide a formal comment on the project during the public comment session of the public meeting, during which a court reporter was available to record all statements.

National Historic Preservation Act of 1966 (Inter Alia) (PL 89-665, the Archeology and Historic Preservation Act (PL 93-291), Archeological Resources Protection Act of 1979, Native American Graves Protection and Repatriation Act of 1990, and Executive Order 11593)

Archival research, field work and consultation with the SHPO have been conducted in accordance with statutes protecting archaeological, cultural, and historic resources. The Tamiami Trail and structures on the Coopertown and Airboat Association of Florida properties have been identified as eligible for NRHP listing. Additionally, the Osceola Camp is potentially eligible for NRHP listing. A Memorandum of Agreement between NPS and SHPO for this EIS was signed by SHPO on April 19, 2010. This Memorandum of Agreement states that "evidence that the effects of the undertaking on historic properties has been taken into account and mitigated so that the undertaking may proceed.” Therefore, this project is in compliance with the provisions of the above statutes and executive orders.

Resource Conservation and Recovery Act (RCRA) as amended by the Hazardous and Solid Waste Amendments (HSWA) of 1984, Comprehensive Environmental Response Compensation and Liability Act (CERCLA) as amended by the 5.26.21 Superfund Amendments and Reauthorization Act (SARA) of 1996, Toxic Substances Control Act of 1976

A preliminary Phase I HTRW assessment was conducted in late 2006 to address the potential for the occurrence of HTRW in the study area. No specific sites were identified within the footprint of the proposed project. The project is in compliance with these Acts.

Rivers and Harbors Act of 1899

The proposed work would not obstruct navigable waters of the United States. The project is in full compliance.

Submerged Lands Act of 1953

The project would not occur on submerged lands of the State of Florida. This Act does not apply.

Wild and Scenic River Act of 1968

No designated Wild and Scenic river reaches would be affected by project related activities. This act is not applicable.

Executive Order 11514, Protection of Environment

E.O. 11514 directs federal agencies to "*initiate measures needed to direct their policies, plans and programs so as to meet national environmental goals."* This project is in compliance.

Executive Order 11988, Flood Plain Management

This E.O. instructs Federal Agencies to avoid development in flood plains to the maximum extent feasible. A determination has been made that there is no alternative location for this project. This project is in compliance.

Executive Order 11990, Protection of Wetlands

The locations that would be used for construction of bridges, approaches, and construction access areas are a mosaic of wetlands with small tree island uplands. A permanent loss of wetlands is expected, but this project would result in an overall improvement in the quality of several thousand acres of wetlands. This project complies with the goals of this executive order.

Executive Order 12962, Recreational Fisheries

Executive Order 12962 requires the evaluation of federally funded, permitted, or authorized actions on aquatic systems and recreational fisheries. This project is in compliance.

Executive Order 12898, Environmental Justice

This E.O. directs federal agencies to provide for full participation of minorities and low-income populations in the federal decision-making process and further directs agencies to fully disclose any adverse effects of plans and proposals on minority and low-income populations. Efforts were made to avoid, minimize, or compensate for any adverse effect of this project on the Native Americans living in the project area. The project would not result in disproportionately high and adverse human health or environmental effects on minority populations and low income populations. The project is in compliance with this E.O.

Executive Order 13045, Protection of Children

Executive Order 13045, requires each Federal agency to "identify and assess environmental risks and safety risks [that] may disproportionately affect children" and ensure that its "policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks." This project has no environmental or safety risks that may disproportionately affect children. The project is in compliance with the E.O.

Executive Order 13089, Coral Reef Protection

No coral reefs would be impacted by this project. This E.O. does not apply.

Executive Order 13112, Invasive Species

The project would help reduce the abundance and variety of invasive plant species in the project area. The project is in compliance with this E.O.

Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds

The project has been coordinated with the USFWS. The project is expected to benefit migratory birds by improved habitat and increased availability of forage species (amphibians, fish, aquatic invertebrates) for wading birds. The project is in compliance.

Executive Order 13423 and 13514 –Environmental, Energy, Transportation, and Economic Management

This project is in compliance with Executive Orders 13423 and 13514, which require federal agencies to "conduct their environmental, transportation, and energy-related activities under the law in support of their respective missions in an environmentally, economically and fiscally sound, integrated, continuously improving, efficient, and sustainable manner."

EVERGLADES NATIONAL PARK
TAMIAMI TRAIL MODIFICATIONS: NEXT STEPS
FINAL ENVIRONMENTAL IMPACT STATEMENT

CHAPTER 6
CONSULTATION AND COORDINATION

CHAPTER 6: CONSULTATION AND COORDINATION

Everglades National Park staff place a high priority on meeting the intent of public and interested agency involvement, both internal and external, in the NEPA process. In addition to giving the public an opportunity to comment on proposed actions, regulatory agency comments, interested party comments, and comments from NPS staff familiar with the proposed project were highly encouraged. As part of the NPS NEPA process, issues associated with the action were identified during scoping meetings with NPS staff, coordination with other affected agencies, public meetings, and public comment periods.

During the development of the EIS, the Park has actively involved the public in the process. The Park's goals for public participation include: understanding and acceptance of the EIS by the public; substantive and valuable input to help guide Park decisions; and minimization of conflicts through dissemination of information and initiating discussion.

The Park places a high value on maintaining a meaningful dialogue with interested parties, agencies, and organizations. The Park elicited public participation in the discussion of alternatives for the EIS. Scoping, public, and agency involvement efforts included open house meetings, press releases, website postings, and dissemination of information and gathering of comments through the internet.

6.1 Scoping Process and Public Involvement

The NPS divided the scoping process into three categories: internal scoping (NPS staff and individuals working directly on the project), external scoping (public), and agency/organizational scoping (federal and state agency, and Tribal staff). Internal scoping for this EIS involved discussions among the NPS and other federal and state agencies and Tribes regarding the purpose and need for the project, issues, objectives, management alternatives, mitigation measures, appropriate level of documentation, lead and cooperating agency roles, and other related dialogue. Public scoping for this EIS included the early involvement of the interested and affected public in the environmental analysis process. The public scoping process helps ensure that individuals have been given an opportunity to comment and contribute early in the decision-making process. Finally, agency scoping consisted of meetings and ongoing coordination with state and federal agency and Tribal staff since the inception of the project to ensure that the project meets all regulatory requirements and to allow agency and Tribal staff the opportunity to provide early and ongoing input on the project.

6.1.1 Internal Scoping

An internal scoping meeting for the Tamiami Trail Modifications: Next Steps project was conducted on May 20, 2009, at the NPS Krome Center, South Florida Ecosystem Office in Homestead, Florida. A field visit was conducted on May 19, 2009. Participants that took part in the internal scoping process included staff from NPS and their contractor [URS Corporation (URS)], USACE, SFWMD, FDEP, and FDOT.

The purpose of internal NPS scoping activities was to develop a framework for the planning process and the fundamental foundation (e.g., purpose and need for the plan, plan objectives, area of effect) needed to prepare the EIS for the Tamiami Trail Modifications: Next Steps project. This scoping supports the planning process by ensuring that the requirements of NEPA and NPS *Director's Order 12* would be fulfilled throughout the planning process.

Prior to the internal scoping meeting, NPS ENP staff and their contractor reviewed the scope of work, assembled a workshop briefing package, and drafted the internal scoping meeting agenda via phone, email conversations, and a pre-internal scoping meeting. These staff, facilitated by the NPS and the contractor, worked collectively to:

- Define the purpose and need for action for the project
- Define the objectives for the project
- Identify the issues and concerns related to the project
- Discuss and refine the alternatives presented in the 2005 RGRR/SEIS and the 2008 LRR/EA
- Define the performance measures for the evaluation of alternatives
- Determine which impact topics should be analyzed in the EIS and which impact topics should be dismissed

The scoping process was implemented by recording individual comments and responses to questions posed by the facilitator. Discussions during internal scoping examined the range of potential natural and cultural resources that might be of concern or might be affected during the planning and impact assessment processes. The results of the internal scoping team's collaborative efforts have been incorporated into the appropriate sections of this EIS.

6.1.2 Public Scoping

A project scoping newsletter was distributed by NPS to individuals, organizations, agencies, and American Indian Tribes by U.S. mail and electronic mail in May 2009. This notice announced the Park's proposal and described preliminary alternative and resource considerations, and identified opportunities for public participation in the EIS process. The notice invited interested parties to submit their initial views or concerns regarding the project to the Park. The scoping period was scheduled from May 21 through June 12, 2009.

A public scoping meeting was held on June 2, 2009, at the South Dade Regional Library in Miami, Florida, to initiate public involvement early in the planning stage and to obtain community feedback regarding the initial concepts for the development of the Tamiami Trail Modifications: Next Steps EIS. A total of 47 public participants and 13 project personnel attended.

The purpose of the public scoping meeting was to solicit input from the community on the project purpose, need, and objectives; to identify issues and concerns to be addressed in the EIS; and to receive comments on potential alternatives for the Tamiami Trail Modifications: Next Steps project. The public meeting included numerous methods for the community to provide comment. Each of the information stations had a flip chart where comment could be provided. Those attending the meeting were also directed to the EIS newsletter, which provided additional opportunities for comment on the project, including directing comments by mail, e-mail, or through the NPS's PEPC website. Public comments received are detailed in the following sections of this report.

During the comment period, 2,355 pieces of correspondence were received with 2,623 comments. Correspondence was received by one of the following methods: e-mail, hard copy letter, or entered into the PEPC website. Letters received by e-mail or hard copy, as well as comments from the public meeting transcript, were entered into the PEPC system for analysis. Each of these letters or submissions is referred to as correspondence.

6.1.3 Scoping Comments

Correspondence from respondents regarding the Tamiami Trail Modifications: Next Steps project ranged from strong support to strong opposition to the project. Based on all of the scoping comments received, 96.7% percent of respondents were strongly in favor of the project and 0.4% of respondents were generally in favor of the project but had concerns or questions about certain aspects of the project. Approximately 0.8% of respondents expressed a strong opposition to the project and 0.8% of respondents were generally in opposition to the project but expressed concerns or questions that, if resolved, could garner their support for the project. The remaining 1.4% of respondents raised questions about the project but did not express an opinion supporting or opposing the project. These concerns, addressed in this EIS, are discussed below.

Comments in favor of the project were mostly directed towards Everglades restoration, including restoration of sheet flow hydrology, restoration of habitat for wildlife, protection of threatened and endangered species, and preservation of the Everglades for future generations. Those respondents in opposition to the project voiced concerns about project costs, the planning process, potential unforeseen environmental impacts (i.e. floodplain impacts), and potential socioeconomic and cultural impacts. The comments, concerns, and suggestions of the respondents fell into several categories including alternatives, consultation and coordination, the cost/benefit value of the project, environmental impacts, socioeconomic impacts, historic/cultural impacts, and visitor use and experience.

Correspondence regarding the proposed alternatives for the project included suggestions for engineering elements applicable to all alternatives such as the use of ConSpans, the inclusion of a pedestrian/bicycle trail and non-motorized boating access features, and bridge clearance height for the passage of airboats. Several respondents strongly supported Alternative 6 (the longest bridging alternative), while several respondents stated that they did not support implementation of any of the proposed action alternatives, since all included at least some length of bridging. Comments opposed to any bridging suggested the cleaning out of culvert sets as a viable alternative.

Many comments were received regarding the cost/benefit value of the project. Comments included concerns about the use of taxpayer funds for implementation of the project; the need for a thorough cost/benefit analysis; and the costs of mitigation versus acquisition of private properties along Tamiami Trail. The potential costs of inflation from the time of the EIS to the time of construction and the methodology for calculating construction costs were also mentioned by respondents.

Consultation and coordination issues were mentioned by a few respondents. One respondent requested that the USFWS be added to the project as a cooperating agency, while another respondent requested that the FHWA be sought out as a cooperating agency for the project. Several comments were also received requesting and encouraging continuous public involvement opportunities with the project.

Correspondence included numerous comments about the environmental impacts and benefits of the project. Most respondents in support of the project commented on the potential environmental benefits of the project such as restored hydrologic flow through Northeast Shark River Slough, restored wildlife habitat, and protection of special status species. A few respondents in opposition to the project commented on the potential negative impacts to habitat and species and voiced the need for more studies before an alternative is selected for implementation. Several respondents, both in favor of and in opposition to the project, mentioned climate change as a factor for selecting a preferred alternative and requested that the topic be analyzed in the EIS. Impacts to floodplains and water quality issues were also discussed by correspondents.

Based on the correspondence received, the greatest opposition to the project was due to the potential socioeconomic impacts to the airboat concessions along Tamiami Trail. Respondents expressed concerns about NPS acquiring private property for construction of the project, property access routes with all of the alternatives, and the economic impacts from reduced tourism during construction. Several respondents also requested that an economic/ socioeconomic study be conducted as part of the EIS for the project. One respondent expressed concern about opposition from commercial businesses along Tamiami Trail influencing the environmental need for the project.

Those commenting on the project also expressed their concern about the potential historic/cultural impacts of the project. Respondents provided comments about the historical significance of both structures and cultural traditions along Tamiami Trail. Comments were received requesting avoidance of the two Miccosukee camps (e.g., Osceola and Tiger Tail) and three airboat concessions along Tamiami Trail. The "Gladesmen" cultural traditions were also mentioned in the correspondence received for the project. Respondents requested a historic/cultural impact study be conducted as part of the EIS for the project.

Correspondence about impacts to visitor use and experience included questions and concerns about continued visitor use activities such as fishing, sight-seeing, walking, bird-watching, and airboating. Concerns were expressed about access issues with each of the action alternatives (i.e., such as access to boat ramps and airboat concessions). Respondents requested that none of these activities be impacted in any way or at any time by implementation of the preferred alternative. Many respondents also voiced concerns about current conflicts in Everglades National Park between motorized boats/airboats and non-motorized boating.

Correspondence from agencies, organizations, and businesses included letters and comments from the following entities with the number of correspondences denoted in parentheses (***Table 6-1***).

Table 6-1 – Agencies, Organizations, and Businesses that Provided Comments during Public Scoping

Airboat Association of Florida (3)	Kayak Jeff, Inc (1)
Audubon (2)	League of Women Voters (1)
Bicycle of Pedestrian Advisory Committee of Miami-Dade County (2)	Little Manatee Kayaking (1)
Caloosa Riders Bicycle Club (1)	Loxahatchee Sierra Club (1)
Caloosahatchee River Citizens Association, Board Member (1)	Miami-Dade County DERM (1)
Center for Biological Diversity (1)	Miccosukee Tribe of Indians of Florida (2)
Coopertown (2)	N/A (113)
COPHA (1)	Naples Pathways Coalition (3)
Elders for Earth's Future (1)	Nature Conservancy (1)
Everglades Bicycle Club (1)	National Parks Conservation Association (2)
Everglades Coordinating Council (2)	National Wildlife Federation (1)
Everglades Park (1)	Palm Beach Kayak Fishing club (1)
Everglades Safari Park (1)	Palm Beach Meeting of the Religious Society of Friends (Quakers) (1)
FLFFC.org (1)	Palm Beach Water Yaks (1)
Florida Atlantic University (1)	Project NatureConnect (1)

Florida Biodiversity Project (2)	River of Grass Greenway Committee (4)
Florida Trail Association (1)	South Florida Anglers for Everglades Restoration (2)
Friends of the Florida Panther Refuge (1)	Sanibel Captiva Conservation Foundation (1)
Federal Transit Administration (1)	Save Boca Raton Green Space (1)
Gladesman Cultural Community (1)	Save It Now Glades (1)
Greater Hollywood Chamber of Commerce (1)	Sierra Club (2,187)
Hendry BPAC (1)	University of California Merced (1)
J.N."Ding" Darling Wildlife Society (1)	University of Miami (1)
Jet Port Conservation & Recreation Club (1)	Wildlands CPR (1)
Kayak Explorers Club (1)	Multiple Organizations (5)

6.2 Draft EIS Process and Public Involvement

Pursuant to 42 U.S.C. 4332(2)(C) of NEPA and NPS policy in Chapter 2 of NPS *Management Policies 2006* and *Director's Order 12* (Conservation Planning, Environmental Impact Analysis, and Decision-making), the NPS published a NOA about the availability of a Draft EIS for the Tamiami Trail Modifications: Next Steps project for ENP, Florida, in the Federal Register (Volume 75, Number 100, pages 29359-29361) on Tuesday, May 25, 2010. The notice invited interested parties to submit their views or concerns regarding the project to the park. The 60-day comment period was scheduled from May 25 through July 27, 2010. The NOA in the Federal Register also announced that a public meeting would be held during the 60-day comment period.

6.2.1 Public Meeting

A public meeting was held on June 24, 2010, at the South Dade Regional Library in Miami, Florida, to initiate public involvement and to obtain community feedback regarding the Tamiami Trail Modifications: Next Steps Draft EIS. The public meeting date/time and place was published on the NPS's website and a public meeting announcement was printed in the Miami Herald and El Nuevo Herald on June 16, 2010. A total of 100 public participants and 10 project personnel attended.

The purpose of the public meeting was to solicit input from the community on the Draft EIS and to identify issues and concerns to be addressed in the Final Environmental Impact Statement (FEIS) for the project.

The meeting was structured into the following sessions. From 6:00 p.m. to 7:00 p.m., an open house session was held with a series of maps and exhibits illustrating the project alternatives. NPS and URS staff were available to discuss the project and answer questions. From 7:00 p.m. to 7:15 p.m., there was a brief presentation about the project, outlining the EIS process, public involvement opportunities, and project alternatives. From 7:15 p.m. to 7:45 p.m., a question and answer (Q&A) period was held allowing public participants to ask general questions about the project, with NPS and URS staff available to respond. From 7:45 p.m. to 8:45 p.m., the public was provided with an opportunity to provide official statements on the project. The meeting was adjourned at 9:00 p.m.

6.2.2 Agency Meeting

An interagency roundtable discussion meeting for this project was held on August 18, 2010, at the NPS South Florida Natural Resources Center in Homestead, Florida. Local, state, and federal agencies and Tribes involved in this project were invited to this roundtable meeting to discuss any issues, concerns, or comments about the Draft EIS. Along with NPS staff and consultants, FDEP, SFWMD, USACE, and the Miccosukee Tribe participated in the meeting (note that some participants joined in the discussion via conference call). The meeting involved a detailed discussion of any concerns that arose during the review of the Draft EIS and NPS staff were available to clarify any questions or concerns. All issues discussed during the meeting were documented in formal correspondence during the 60-day comment period; these formal communications have been summarized throughout Section 6.3 of this document.

6.2.3 Public/Agency Comment Process

Numerous methods were available for the community to provide comment about the Tamiami Trail Modifications: Next Steps project. Those attending the public meeting were given comment forms, which could be filled out at the meeting or mailed back to the park. Public meeting participants were also informed of additional opportunities for comment on the project, including directing comments by mail, e-mail, or through the NPS's PEPC website. Public meeting participants were also given the opportunity to provide a formal comment on the project during the public comment session of the public meeting, during which a court reporter was available to record all statements.

During the comment period, 14,735 pieces of correspondence were received with 40,643 comments[43]. Correspondence was received by one of the following methods: e-mail, hard copy letter, NPS comment form, or entered into the PEPC website. Letters received by e-mail, hard copy, or NPS comment form, were entered into the PEPC system for analysis. Each of these letters or submissions is referred to as correspondence.

6.2.4 Public Comments

Correspondence from respondents regarding the Tamiami Trail Modifications: Next Steps project ranged from strong support to strong opposition to the project. Almost 98 percent of respondents were in favor of the project, while 0.08% of respondents expressed opposition to the project. The remaining individuals, 2.04%, either raised questions or made requests about the project but did not express an opinion supporting or opposing the project. These concerns, addressed in this EIS, are discussed below.

Comments in favor of the project were mostly directed towards Everglades restoration, including restoration of sheet flow hydrology, restoration of habitat for wildlife, protection of threatened and endangered species, and preservation of the Everglades for future generations. Those respondents in opposition to the project voiced concerns about project costs, the planning process, potential unforeseen environmental impacts (i.e. floodplain impacts), and potential socioeconomic and cultural impacts. Numerous respondents also made comments about engineering/design components of the project. The comments, concerns, and suggestions of the respondents fell into several categories including alternatives, engineering/design, socioeconomic impacts, environmental impacts, historic/cultural impacts, and visitor use and experience.

43 Please note that 5,680 pieces of correspondence were form letters sent by members of the Sierra Club and 8,455 pieces of correspondence were form letters sent by members of the National Parks Conservation Association. Fifteen other form letters were also received from other organizations.

Comments regarding the proposed alternatives for the project included numerous comments (including form letters from the Sierra Club and NPCA) supporting the NPS Preferred Alternative 6E. Many of those respondents which supported the implementation of Alternative 6E also requested the need for bridging in addition to the 5.5 miles included in Alternative 6E. A few respondents, which were opposed to the project and the NPS Preferred Alternative, recommended that no action be taken on this project and cleaning out of the existing culverts or further implementation of the Spreader Swales project be considered as viable alternatives. The Miccosukee Tribe of Indians stated that they believed that all reasonable alternatives had not been considered in the Draft EIS.

Correspondence about engineering/design components of the project was mainly focused on the need for a multi-use/pedestrian/bicycle path along the proposed project corridor. A large proportion of the non-form letter comments received were strongly in favor of a multi-use/pedestrian/bicycle path, and cited reasons ranging from safety and health/wellness to visitor use/tourism and the environmental benefits of a non-motorized transportation access route. Other suggestions for engineering elements included the need for enough bridge clearance height for the passage of airboats (in both recreational and emergency situations) and the desire for recreational access features such as boat ramps. The FDOT also provided numerous detailed comments about the engineering/design of the project.

Many comments were received regarding potential socioeconomic impacts and the cost/benefit value of the project. Comments included concerns about the use of taxpayer funds for implementation of the project; the economic benefits of project implementation in terms of employment during construction; and the potential economic benefits that could be gained from the project (and specifically from a multi-use/bicycle/pedestrian path) through increased tourism. Concerns were also expressed about impacts to businesses within the proposed project corridor. The Miccosukee Tribe of Indians of Florida expressed concerns about the real estate cost calculations in the Draft EIS, the lack of a cost cap for the project, the potential cost of project implementation delay, and potential economic impacts on businesses within the project corridor.

Correspondence included numerous comments about potential environmental impacts and benefits of the project. Most respondents in support of the project commented on the potential environmental benefits of the project such as restored hydrologic flow through Northeast Shark River Slough, restored wildlife habitat, and protection of special status species. A very prevalent number of respondents, including agencies, expressed a concern about water operations associated with the project. A few respondents, including the FFWCC, commented on the potential negative impacts to wetlands/habitats and species and one respondent commented about the potential for aquatic invasive species impacts with project implementation. The FDEP, the USEPA, and the Miccosukee Tribe all expressed concerns about potential water quality impacts of the project. Impacts to floodplains and potential seepage management issues were also discussed by correspondents. Several correspondents, including the USEPA (see USEPA section below), also discussed many issues related to greenhouse gas reduction and climate change /sea level rise impacts/mitigation.

Those commenting on the project also expressed their concern about the potential historic/cultural impacts of the project. The Miccosukee Tribe of Indians and the Seminole Indian Tribe both expressed concerns about cultural resource impacts that they wish to be resolved before the FEIS. The Florida Department of State (DOS) concurred with the finding of the Draft EIS regarding impacts to historic structures and cited that all regulations must be followed during construction.

The most prevalent comment about visitor use and experience was the request for a multi-use/bicycle/pedestrian path. These comments cited the potential benefits that such a path could have on visitor use and experience as well as increased tourism. Other correspondence about impacts to visitor use and experience included questions and concerns about continued visitor use activities.

Correspondence from local, state, and federal agencies and Indian Tribes included letters and Florida State Clearinghouse comments from the following agencies and Tribes: FDEP, Florida DOS, FDOT, FFWCC, Miami-Dade County DERM, Miccosukee Tribe of Indians of Florida, Seminole Tribe of Florida, SFWMD, and the USEPA.

Correspondence from organizations and businesses included letters and comments from the following entities with the number of correspondences denoted in parentheses (***Table 6-2***).

Table 6-2 – Organizations and Businesses that Provided Comments on the Draft EIS

AAA (1)	Islamorada, Village of Islands (1)
Advanced Surgical Techniques, LLC (1)	Lake Sumter MPO (1)
Adventure Cycling Association (2)	Lauderdale Cyclery (1)
Airboat Association of Florida (4)	League of American Bicyclists (1)
American Institute of Certified Planners (1)	Miami Velo Racing (1)
Arco Courier (1)	Miami-Dade County Park and Recreation (1)
Audubon (18)	Morningside Civic Association
BASIC (1)	NAHB (1)
Big Pine Bicycle (1)	Naples Pathways Coalition (5)
Bikes Belong (1)	National Parks Conservation Association (8,455)
Bikes for Tykes, Inc. (1)	National Wildlife Federation (1)
BikeWalkLee (1)	North Carolina Outward Bound School (1)
Borges inc (1)	North Florida Bicycle Club (1)
Buddy Bike, LLC (1)	NPC (1)
CCA (1)	PABA (1)
CIty of Tampa Greenways & Trails Committee (1)	Pathway Advisory Committee for Collier County (1)
City of Temple Terrace (1)	People for Trees, Inc. (1)
Coastal Cruisers Bicycle Club (1)	Pro Energy Consultants (1)
Colada Bicycle Team (1)	Rails-To-Trails Conservancy (98)
Conservancy of Southwest Florida (2)	RCA (1)
Dragonfly Expeditions (1)	Recumbent Rag Tops (1)
Emerald Coast Cyclists (2)	River of Grass Greenway (4)
Estero Council of Community Leaders (1)	Sanibel Bicycle Club, Inc. (1)
Everglades Bicycle Club (1)	Sanibel Captiva Conservation Association (1)

Everglades Bicycle Club (3)	Save the Everglades (1)
Everglades foundation (6)	SFTR (1)
FBA (2)	Sierra Club (5,696)
Florida Bicycle Association (2)	South Broward Wheelers (1)
Florida Biodiversity Project (1)	South Florida Recumbent Riders (2)
Florida Federation of Garden Clubs (1)	St. Johns County Horse Council (1)
Florida Paddling Trails Association (1)	Storm Riders (1)
Florida State Clearinghouse (1)	Students for Environmental Action at FIU (1)
Florida Trail (4)	Suncoast Cycle Club (1)
Florida's Eden (1)	SWAMP-Southwest Association of MT Bike Peddlers (1)
Friends of Legacy Trail (2)	Team Storm Riders (1)
Friends of the Carlton Reserve (1)	The Lindsay Company, Realtor (1)
Friends of the Everglades (1)	Transitopia (1)
Gainesville Cycling Club (1)	Treemendous Miami (1)
Great EsSkate (1)	University of Florida (2)
Greater Miami Chamber (1)	University of Miami (4)
Green Mobility Network (3)	Urban Environment League (1)
Highlands Pedalers Bicycle Club (1)	Virginia Bicycling Federation (1)
Hold the Line (1)	Volusia County Council (1)
Islamorada Foundation (1)	West Palm Beach Bicycle Club (1)

6.3 Agency and Tribal Consultation

Copies of all project correspondence with local, state, and federal agencies and tribes have been included for reference in ***Appendix J***. Additionally, a table showing all agency and tribal comments received on the DEIS and the response provided by NPS is included in ***Appendix K***.

6.3.1 Congressional Representatives

State Representative Mark S. Pafford provided the following comment during the Public Scoping portion of the project:

> "As a Florida native and member of the state's legislature, I am in support of proposal six (6). I feel the proposal provides the most benefit for the Everglades and am confident the project will restore the historic water flow this improving habitat and quality of water in Florida Bay."

No formal comments have been received from Federal Congressional representatives to date.

6.3.2 Federal Agencies

6.3.2.1 U.S. Environmental Protection Agency

The USEPA provided comments on the Draft EIS via a letter dated July 19, 2010. The USEPA rated the Draft EIS and the preferred alternative – LO (Lack of Objections), "recognizes the importance of removing obstacles to flow at Tamiami Trail and supports the NPS in the implementation of this project," and highlighted the potential ecological benefits of the project. However, the USEPA also expressed some concerns about the project. Concerns expressed by the USEPA included issues related to temporary construction impacts to water quality, and temporary and permanent direct impacts to wetlands. The USEPA offered the following comments for consideration in development of the FEIS. The FEIS should "include a discussion of sea level rise and adaptation of the preferred alternative in the context of the proposed modifications." The USEPA also recommends that the FEIS discuss the timing of development of a water operations plan and an adaptive management strategy that would address appropriate mitigation responsibilities should anticipated project benefits not adequately offset the project's impacts to wetland value and functions. The USEPA also recommends that "a number of specific resource protection measures, as well a comprehensive monitoring evaluation program … be implemented during and after construction… including the use of best management practices."

6.3.2.2 U.S. Fish and Wildlife Service

The NPS initiated formal consultation with the USFWS via electronic mail dated February 25, 2010. The NPS requested an amendment to the Tamiami Trail portion of the MWD Project BO, which was originally issued on January 12, 2006 (and later amended on June 25, 2008). The following comments were provided in the response letter from the USFWS on February 25, 2010:

> *In the original Biological Opinion dated January 12, 2006 … the U.S. Army Corps of Engineers (Corps) made a determination that the project "may affect, but is not likely to adversely affect" the wood stork. The Service concurred with this determination since disturbance would be minimized by the Corps' agreement to manage the construction activities according to the Service's "Draft Supplemental Habitat Management Guidelines for the Wood Stork in the South Florida Ecological Services Consultation Area." The Corps agreed to implement the primary and secondary zone restrictions for the Tamiami West and East colonies however, new information has surfaced regarding the location of a previously unidentified wood stork colony (East 2) within the project area.*

After reviewing the Draft Tamiami Trail Modifications: Next Steps EIS, the USFWS submitted a Memorandum to the NPS on July 26, 2010, that stated the USFWS recommended findings for threatened and endangered species. Within the Memorandum, the USFWS requested that the NPS provide a wood stork foraging assessment and a panther habitat unit assessment to assist in the ESA Section 7 Consultation. On August 25, 2010 the NPS submitted the requested information to the USFWS.

Additionally, the NPS has been informally consulting with the USFWS (Kevin Palmer) about all protected species impacts via telephone and electronic mail throughout the development of the EIS.

The USFWS issued the Biological Opinion for the Tamiami Trail Modifications: Next Steps project on October 18, 2010. The findings of the Biological Opinion have been incorporated into this EIS.

6.3.3 American Indian Tribes

6.3.3.1 Miccosukee Tribe of Indians of Florida

The Miccosukee Tribe of Florida provided a letter dated June, 26, 2009, during the Public Scoping portion of the project. This letter expressed concerns about the following topics: the limited area of analysis for the project; adverse impacts from construction on the Tiger Tail and

Osceola camps; the lack of a water control operational plan; floodplain and flooding impacts; seepage control; restoration of Shark River Slough; the impacts of “unconstrained flows” and volume of water; consideration of a non-bridging culvert alternative; water quality impacts; endangered species impacts; amount and cost of land acquisition; the lack of a cost cap for the project; and the compatibility of the proposed action alternatives with CERP and non-CERP projects.

A meeting was held on December 11, 2009, between representatives of the NPS, USACE, and Miccosukee Tribe concerning the proposed Tamiami Trail Modifications project. During this meeting, Fred Dayhoff (Miccosukee Tribe of Florida) provided the position of the Tribe on several issues concerning Tamiami Trail. Mr. Dayhoff indicated that the Tribe did not have any specific concerns or cultural resources within the ROW footprint of the roadway corridor, with the exception of the Tigertail Camp and the Osceola Camp.

Additionally, in a letter dated March 22, 2010, Mr. Steve Terry (NAGPRA and Section 106 Coordination for Fred Dayhoff), on behalf of the Miccosukee Tribe, expressed “extreme interest” in all tree islands located in the Northeast Shark River Slough National Register Archeological District in terms of cultural and archeological importance to the Miccosukee Tribe.

The Miccosukee Tribe of Indians of Florida provided a letter dated July 26, 2010, in response to the Draft EIS. In this letter, the Tribe “strenuously objects to the Preferred Alternative 6(e) … and also objects to the legally inadequate process that produced it.” The Tribe states that the “NPS failed to analyze impacts to all of the areas of the human environment that will be impacted by the Preferred Alternative, which is required by [NEPA]; failed to conduct formal Section 7 consultation with the [USFWS] on the impacts to WCA 3A and the Snail Kite; failed to follow the Federal Advisory Committee Act (“FACA”) for the CBA advisory team; failed to conduct the Section 4(f) review required under the Department of Transportation Act (“DOT”) of 1966 … and failed to meet it federal Trust responsibility to maintain the lands in perpetuity in the ‘natural state,’ for the Miccosukee Tribe.” The Tribe further contends that “Alternative 6(e), which will cost at least $329.8 million dollars, is unnecessary and a waste of money.” The Tribe also claims that the project “could have seriously adverse environmental impacts on the Tribal Everglades and flood protected areas in Miami-Dade County, which the NPS has failed to analyze in the Draft EIS.” The Tribe believes that “the 2009 Omnibus Appropriations Act did not give the Park Authority to construct more bridges but merely directed that their feasibility be studied.” Further, the Tribe cites that the “Water Resources Development Act of 2000 (“WRDA 2000”) required completion of the [MWD] Project prior to funding components of CERP Decompartmentalization Project, including the bridging of Tamiami Trail.” Finally, the Tribe argues that “maximizing the efficiency of existing culverts, and constructing swales downstream, would also distribute and increase the flows across the entire 10.7 miles of Tamiami Trail”. The Tribe provided details about each of their general concerns about the project, including:

- The Draft EIS is fundamentally flawed and fails to comply with NEPA
  - Benefits, if any, will not be felt for decades
  - The EIS fails to adequately analyze factual operations and *de facto* operations
  - The Draft EIS process was pre-determined and all reasonable alternatives were systematically ignored
  - The Draft EIS fails to analyze reasonable alternatives
  - The Draft EIS improperly segments the CERP DECOMP project
  - The Draft EIS improperly narrows the project and study area

- o The cumulative impacts analysis is woefully inadequate
- o The Draft EIS fails to adequately analyze impacts of construction
- o The Draft EIS fails to explain unconstrained flows and volumes
- o The Draft EIS fails to adequately address seepage control
- o The Draft EIS is based upon no viable authority or project purpose
- o The Draft EIS failed to adequately model the alternatives and impacts
- o The Draft EIS does not detail what will be done to modify the road
- o The Draft EIS contains an improperly limited and inappropriately skewed environmental impact analysis
- o The Draft EIS fails to contain an adequate analysis of water quality
- o The Draft EIS fails to address compatibility with restoration projects
- o The Draft EIS fails to divulge that DOI had no cost cap
- o The Draft EIS fails to assess the cost of delay

- A Section 4(f) review is required to build bridges in the Park
- The NPS failed to comply with the ESA
- The NPS field to comply with FACA
- The NPS did not meet its trust responsibility to the Tribe

The Tribe also provided details about each of their specific concerns about the project, including:

- Impact on Tribal lands
- Impact on businesses
- Hurricane evacuation
- Real estate costs are not adequately assessed
- Modeling

6.3.3.2 Seminole Tribe of Florida

The Seminole Tribe of Florida provided a response to the Draft EIS via letter on July 22, 2010. The only concern expressed by the Seminole Tribe was whether the project would "interfere with traditional cultural properties utilized by the native peoples such as medicinal and plant gathering areas."

6.3.4 State of Florida Agencies

6.3.4.1 Florida Department of Environmental Protection

The FDEP provided comments on the Draft EIS through the Florida State Clearinghouse via a letter dated July 19, 2010. The FDEP offered a number of recommendations for the FEIS pertaining to: the assessment of wetland impacts and sufficient mitigation to offset those impacts; the necessity of developing an operational plan to enhance the benefits of hydrologic connectivity to wetlands; the proximity of the eastern bridge to the Tamiami Trail East Wood Stork Colony; a seepage analysis of the L-31 North Canal; the assessment of short-term and long-term water quality impacts; impeded culvert flow during construction; stormwater treatment strategies; the inclusion of passive recreational facilities and bicycle/pedestrian lanes in project design; and safe wildlife crossings.

6.3.4.2 Florida Department of State

The DOS reviewed the Draft EIS and provided comments via the Florida State Clearinghouse. The DOS "concurs with the NPS' finding that the proposed undertaking will have an adverse effect on historic properties. The procedures outlined in 36 CFR 800.6 regarding SHPO consultation and development and evaluation of alternatives or modifications that avoid, minimize or mitigate adverse effects must, therefore, be followed."

6.3.4.3 Florida Department of Transportation

The NPS met with FDOT on April 21, 2009, at FDOT's District VI office in Miami to introduce the proposed Tamiami Trail Modifications: Next Steps project. Personnel from the USACE also participated in the meeting to discuss any project engineering/design issues. NPS summarized the results of the April 21, 2009, meeting with FDOT in a letter dated May 19, 2009. The purpose of the letter was to seek FDOT concurrence on the meeting outcome pertaining to the project DHW and pavement overtopping criterion. The meeting participants (NPS, USACE, and FDOT) agreed to adhere to USACE calculations for using a DHW elevation of 9.7 feet and an overtopping criterion of 10.1 feet for this project. Additionally, the letter invited FHWA to be a cooperating agency to better meet the transportation requirements of the project. If FHWA agreed to participate as a cooperating agency on the project, this would also help facilitate FDOT staff involvement.

In response to the NPS May 19, 2009 letter, FDOT provided a letter dated June 10, 2009. The letter details FDOT's position on the following project issues:

- FDOT concurs with the USACE calculations resulting in a DHW of 9.7 feet and an overtopping stage of 10.1 feet for this project on Tamiami Trail involving unconstrained flows. If these calculations should change, FDOT requests that the USACE coordinate the new calculations with FDOT to establish revised DHW and overtopping design parameters.
- FDOT concurs with the minutes for the April 21, 2009, meeting with the following additions:
    - It is important that the pavement design abide by the FDOT *Flexible Pavement Design Manual* and the *Plans Preparation Manual*, including two feet of base clearance.
    - Transmissivity in the region is also a very important design parameter.
- Tamiami Trail is part of the State Highway System (SHS). As with any SHS roadway, any major improvements/modifications that the FDOT undertakes result from needs that are identified in the local Long Range Transportation Plan (LRTP) which establishes the priority of major transportation improvements for a 20-Year time horizon. Currently, no major transportation related needs are identified for Tamiami Trail in the Miami-Dade LRTP, as such, the FDOT's Work Program only reflects pavement restoration activities via periodic maintenance/resurfacing projects.
- In terms of restoration goals in the area, FDOT understands the Congressional direction to the DOI to restore more natural water flow to ENP and Florida Bay, and for the purposes of restoring habitat within the Park, and the ecological connectivity between

the Park and the WCAs. FDOT stands ready to coordinate with NPS to accomplish this goal.

- Though the FHWA has declined to be a cooperating agency, FDOT is willing to work closely with project staff to provide any needed assistance, technical reviews and other information as the project proceeds.

In a letter dated July 27, 2009, FDOT clarified their role in the Tamiami Trail Modifications: Next Steps project. FDOT stated that the agency "does not have any planned transportation improvements related to the Tamiami Trail, other than certain maintenance," and "FDOT does not anticipate seeking Federal-Aid Highway Program Funds for the proposed Interagency study or any potential project that might be identified through the study." Due to the fact that the FDOT does not planned transportation projects on Tamiami Trail in the project corridor, the FDOT "declines to be a cooperating agency" on the Tamiami Trail Modifications: Next Steps project. The letter also states that FDOT would like to have a staff member attend project meetings, when appropriate, to better position FDOT to respond to technical questions that may arise; however, the FDOT wants to be clear that staff is not authorized to enter into any agreements on behalf of FDOT concerning the Tamiami Trail Modifications: Next Steps project.

The FDOT provided a response to the Draft EIS in a letter dated July 27, 2010. The FDOT states that their interests are "unique, as owner of this transportation facility before, during and after its reconstruction," and reviewed the Draft EIS with the following assumptions:

- FDOT is in favor of the restoration of the Everglades and is not opposed to modifications of the Tamiami Trail
- FDOT is, in effect, a condemnee in this process as the owner of a facility being taken for a larger public project
- FDOT is not the designer, builder or permittee of this project and does not assume any responsibility/liability for those functions
- FDOT is concerned with:
    - Long term maintenance cost of the Tamiami Trail
    - Functionality/Feasibility of the proposed design
    - Maintaining an adequate margin of safety with design elevations to assure long-term integrity, safety and serviceability of the roadway (based on anticipated changes in operations of the overall Everglades system)
    - Long-term exposure as the owner of the facility resulting from design changes in the facility and the operations of the adjacent waterways, and access to adjacent properties
    - The consistency of this project design with future restoration objectives and projects
    - The inability to review final engineering information for this project alternative at this time, including all interagency correspondence on this information.

"Regardless of the selected alternative, FDOT has identified several key concerns which merit further attention in this NEPA process and must be satisfactorily addressed and resolved." FDOT's support of this project is "contingent upon clarification of water level and roadway base clearance information" prior to completion of the FEIS and subsequent publishing of the ROD. The FDOT also provided detailed engineering comments about the proposed project, which will need to be addressed prior to completion of the FEIS and subsequent publishing of the ROD.

6.3.4.4 Florida Fish and Wildlife Conservation Commission

The FFWCC responded to the Draft EIS through the Florida State Clearinghouse in a letter dated July 20, 2010. The FFWCC fully supports actions that will restore hydropatterns that improve current conditions that affect fish and wildlife and their habitats and supports the ecological benefits expected from this project, but identified the following issues that should be addressed during the planning process for the project: water management operations, state-listed species impacts (e.g., American alligator, Florida burrowing owl, roseate spoonbill, limpkin, little blue heron, snowy egret, tricolored heron, white ibis, wood stork, snail kite, Florida manatee, Cape Sable seaside sparrow, Florida panther, and Everglades mink), wading bird nesting habitat impacts, wildlife passage improvements, recreational fishing (specifically, continued public access to the L-29 canal boat ramp), and other related projects (e.g., Pilot Spreader Swale Project).

6.3.4.5 South Florida Water Management District

The SFWMD circulated the Draft EIS among several reviewers and provided a response letter dated July 26, 2010, summarizing the substantive comments, as well detailed comments from all reviewers with non-substantive comments. The SFWMD "continues to support implementation of the Modified Water Deliveries to ENP Project, as well as ENP's pursuit of this new federally funded project to restore more natural flows to ENP." The SFWMD provided two substantive concerns in response to the Draft EIS. The first substantive concern from the SFWMD deals with potential impacts of the proposed project on water quality within ENP. In reference to water quality, the SFWMD recommends phasing or sequencing of the project in coordination with other planned restoration efforts "to avoid water quality violations that would result from additional flows and phosphorous loading," or additional treatment capacity to avoid causing a violation. The second substantive concern expressed by the SFWMD was "the lack of a draft operating plan for the project." The SFMWD recommends that the FEIS includes "a discussion of the assumed operating conditions that resulted in the specified impacts and benefits, as well as a commitment to develop an interim and final operating plan during subsequent design analyses, and to adjust the assumed operating parameters … based on these subsequent analyses."

6.3.5 Local Government Agencies

6.3.5.1 Miami-Dade County Department of Environmental Resources Management

During the initial scoping portion of the project, DERM provided a letter dated June 12, 2009, in which the agency "recognizes that improvements to the Tamiami Trail are part of a critical step in achieving more natural flow of water from the Water Conservation Areas to northeast Shark River Slough and Everglades National Park." The letter also recognizes other important associated benefits of the project, including benefits to wildlife (including listed species), water quality, and water deliveries for human water supply, However, DERM also expressed their concern about potential seepage and flood protection issues and stated that "The EIS should include evaluation of ecological and hydrological benefits, including effects on fish, birds, and other wildlife in WCA3a and WCA3b, as well as ENP. It should also evaluate water quality and quantity effects on the natural system and regional wellfields. The EIS should evaluate flood protection, including operational criteria for S-357 and other seepage features under various canal stages and high water conditions." DERM concluded the letter by stating that they may have data that could be utilized in the EIS.

Staff members of DERM reviewed the Draft EIS and provided the following technical comments on the project via PEPC on July 27, 2010. DERM states in their response that it supports the project and understands that the Draft EIS is "intended only to address alternative locations and sizes of bridge spans, and that changes to water levels, operations of water management features, and seepage management are to be evaluated in separate planning projects." Therefore, DERM understands that the "evaluation of these types of performance measures is largely absent from the Draft EIS. In initial review of some sections of the Draft EIS, DERM found that "it is not as clear as it should be the 9.7-foot DHW elevation is not recommended as an operating criterion, or that operating criteria and seepage will be addressed through a separate process." DERM "recommends that a more detailed explanation of the process that will be used to address operating criteria in the region, flood protection, seepage management, and integration with other CERP projects be included prominently at the beginning of the report." DERM "generally concurs that alternatives with larger bridge openings may have some immediate benefits related to more even distribution of existing flows to a larger area of sloughs and also may provide benefits for passage of wildlife, and even recreational users…However, the county's full support for the [project] is conditioned upon a more comprehensive analysis, which includes operating criteria, seepage management and flood protection, and sequencing and integration with other restoration projects that address WCA3A and WCA3B." DERM staff also provided the following more specific technical comments regarding the Draft EIS:

- There was no flood routing analysis provided in the Draft EIS to evaluate possible impacts to the flood plain under stages as high as the DHW stage referenced in the Draft EIS.
- The stages provided by the systemwide model are not adequate to establish minimum flood protection levels of service (daily time step, 2-mile grid)
- The RMA analysis provided in the engineering appendix is only adequate to calculate the bridge capacity and surface flow velocity, once a complete flood routing is conducted
- The Draft EIS provided comments related to impacts to flood plain without the benefit of a floodplain analysis
- There is no mention of possible seepage control methods or mitigation for flood plain impacts other than within the 8.5 SMA
- Issues related to the operation of the S-356 pump station must be resolved, including proximity of the easternmost bridge opening

6.4 List of Preparers and Contributors

The following NPS staff, consultants, and agency personnel contributed to the preparation of this EIS.

Table 6-3 – List of Preparers and Contributors

Name	Title	Agency/Organization
Dan Kimball	Superintendent	NPS Everglades National Park
Keith Whisenant	Deputy Superintendent	NPS Everglades National Park
Bruce Boler	NPS Project Manager	NPS Everglades National Park
David Sikkema	Branch Chief, Project Management	NPS Everglades National Park
Patrick Malone	Natural Resources Specialist	NPS, Denver Service Center
Patrick Kenney	Branch Chief, Planning Division	NPS, Denver Service Center
David Hallac	Biologist	NPS Everglades National Park
Melissa Memory	Chief of Cultural Resources	NPS Everglades National Park
Jimi Sadle	Botanist	NPS Everglades National Park
Alicia Logalbo	Supervisory Biologist	NPS Everglades National Park
Gregg Reynolds	Hydrologist	NPS Everglades National Park
Dilip Shinde	Ecologist	NPS Everglades National Park
Ernest Clarke	USACE/NPS Everglades National Park Liaison	USACE
Bradley Foster	Ecologist	USACE
Gwendolyn Nelson	Engineer	USACE
Susan Conner	Biologist	USACE
Dan Levy	URS Project Manager	URS Corporation
Keith Stannard	Ecological Program Manager	URS Corporation
Valerie Chartier	Senior Environmental Scientist	URS Corporation
Ted Murray	Senior Environmental Scientist	URS Corporation
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Damon Quesenberry	GIS Specialist	URS Corporation
Babu Madabhushi	Geologist/Contamination Specialist	URS Corporation
Chris Reed	Senior Hydrologist	URS Corporation
Gene Rogge	Senior Cultural Resources Specialist	URS Corporation
Timothy Ogle	Senior Air/Noise Specialist	URS Corporation
Thom Rounds	Senior CBA Specialist	URS Corporation
Tom Lodge	Senior Environmental Scientist	Thomas E. Lodge Ecological Advisors
Dale McGregor	Engineer	HNTB
Greg Smith	Archaeologist	New South Associates
David Price	Historian	New South Associates
Cynthia Thomas	Archaeologist	New South Associates
James Shirk	Senior Environmental Project Manager	OHC Environmental Engineering, Inc.
Amy Swiecichowski	Senior Project Manager	EPJV
Inger Hansen	Watershed Management & Planning Engineer	FDEP
Kevin Palmer	Biologist	USFWS

6.5 List of Recipients of the Environmental Impact Statement

The following federal, state, and local government agencies; American Indian Tribes; and organizations have been sent a copy of this EIS. In addition, elected officials, libraries, individuals, businesses, organizations, media outlets, and other groups that have expressed interest in Everglades National Park in the past have been provided notice that this EIS is available for review and comment.

Federal Agencies

- National Park Service
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- National Oceanic & Atmospheric Administration - National Marine Fisheries Service
- U.S. Environmental Protection Agency

State Agencies

- Florida Department of Transportation
- Florida Department of Environmental Protection
- South Florida Water Management District
- Florida Fish and Wildlife Conservation Commission
- Florida State Historic Preservation Officer

Local Agencies

- Miami-Dade County DERM

Tribes

- Miccosukee Tribe of Indians of Florida
- Seminole Tribe of Florida
- Seminole Nation of Oklahoma

Organizations

- Airboat Association of Florida
- Coopertown
- Everglades Safari Park
- Gator Park
- National Parks Conservation Association
- Sierra Club

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