



PROJECT  
EVALUATION  
REPORT

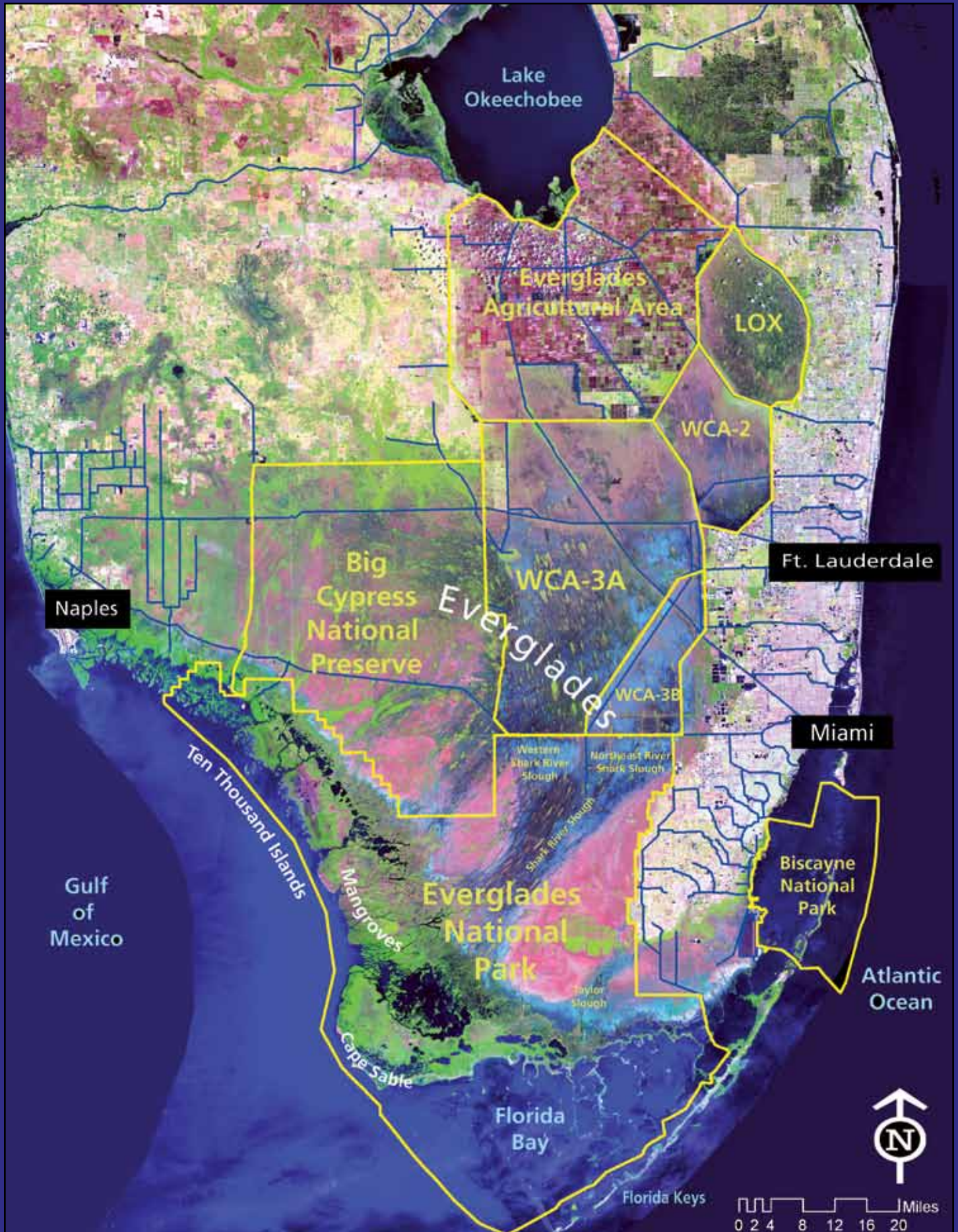
SFNRC Technical Series  
2010:1



# Tamiami Trail Modifications:

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Next Steps Project  
Summary of Findings and  
Draft Environmental Impact Statement



# Tamiami Trail Modifications: Next Steps Project

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## Summary of Findings and Draft Environmental Impact Statement

PROJECT EVALUATION REPORT  
SFNRC Technical Series 2010:1

South Florida Natural Resources Center  
Everglades National Park  
Homestead, Florida

National Park Service  
U.S. Department of the Interior

# Tamiami Trail Modifications: Next Steps Project

## Summary of Findings and Draft Environmental Impact Statement

PROJECT EVALUATION REPORT  
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### EXECUTIVE SUMMARY

#### Introduction

The need to eliminate barriers to overland flow of water in the Everglades is now considered one of the indisputable tenets of restoration. Much scientific information in support of this requirement has been amassed in recent decades indicating the importance of removing these barriers to flow in order to restore natural marsh connectivity. Science informs us that it is not sufficient to simply provide a particular volume of water to these wetlands to attain restoration. Flows must mimic the natural water depths and flooding durations, be distributed across this landscape in a manner that best approximates historical flow patterns, and travel at sufficient velocities to promote the maintenance of ridge and slough landscape characteristics. Sufficient water quality must also be achieved. Only when all of these conditions are met will the natural system respond in a manner that will promote marsh conditions capable of supporting the unique flora and fauna characteristic of the Everglades.

The Tamiami Trail (U.S. Highway 41) has long been recognized as one of the primary barriers to flow of water through the ecosystem. While the 1992 General Design Memorandum for the Modified Water Deliveries to Everglades National Park Project (16 U.S.C. § 410r-S) recommended a plan that only included minor modifications to Tamiami Trail, subsequent analyses conducted by the U.S. Army Corps of Engineers recognized this design deficiency and resulted in recommendations that were either too expensive or provided too little restoration benefit. Indeed, the final plan currently being constructed as part of the implementation of the Modified Water Deliveries Project is recognized as a first step for the modifications to Tamiami Trail that are needed for full restoration.

In recognition of this, the 2009 Omnibus Appropriations Act (Act) (H.R. 1105; P.L. 111-008, March 11, 2009), directed the Department of the Interior and the National Park Service to evaluate the feasibility of additional bridging for the Tamiami Trail necessary to improve the ecological connectivity within the remaining natural Everglades, including Everglades National Park and the State of Florida Water Conservation Areas. The Act further directed that more natural water flow and habitat restoration within the Everglades be achieved. This report responds to the direction set forth in the Act and summarizes the findings in the Draft Environmental

Impact Statement (DEIS), for which a 60-day public comment period will begin with publication of the Notice of Availability in the Federal Register.

The key finding is that an additional 5.5 miles of bridging and raising the balance of the 10.7-mile highway corridor are necessary to achieve the Act's restoration objectives. When combined with the 1-mile bridge presently under construction, 6.5 miles of the 10.7-mile stretch of the Tamiami Trail that is the focus of this evaluation would be bridged should Congress authorize and fund the roadway modifications. This level of bridging would eliminate historical hydrologic constraints and allow for more natural sheetflow patterns, improving ecological conditions throughout much of the southern Everglades, including the Water Conservation Areas and Everglades National Park. The increased water volumes and flow distributions would reestablish the seasonal water depths and flooding durations that are critical to the survival of fish and wildlife species, including many endangered species. The National Park Service evaluation now underway for the Tamiami Trail responds directly to the 2008 findings of the National Academy of Sciences in its Biennial Report to the Congress which warned that unless near-term progress with respect to restoration benefits is achieved, the Everglades would experience irreversible loss of natural resource values and function.

#### Tamiami Trail Modifications: Next Steps Project – Key Findings and Summary of Draft Environmental Impact Statement

The 2009 Omnibus Appropriations Act direction and recent science on restoration requirements, including science conducted by the State of Florida, provided the framework for the National Park Service's analysis of the question of how much additional bridging is needed and the benefits and impacts associated with the six alternatives that are the subject of the current evaluation. Eight separate factors were assessed by a project delivery team that included representatives of the National Park Service, the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, the South Florida Water Management District, the Florida Department of Environmental Protection, the Florida Department of Transportation, and the Miami-Dade County Department of Environmental Resource Management. These factors included marsh connectivity and flow velocity, reconnection of the ridge and slough landscape, and vehicular wildlife mortality, as well as preser-

vation of cultural resources and wetland loss. Analysis of the alternatives found a strong positive correlation between the amount of bridge span and the benefits provided and culminated in the selection of Alternative 6E as the preferred alternative as set forth in the Draft Environmental Impact Statement that is available for public comment and summarized in this publication. This alternative, consisting of four spans of bridging totaling 5.5 miles and road raising, provides the greatest environmental benefits. In addition to analyses conducted by the National Park Service, the U.S. Army Corps of Engineers evaluated the alternatives and affirmed the National Park Service’s selection of an additional 5.5 miles of bridging for the Tamiami Trail as the preferred alternative.

Although a similar project to bridge the Tamiami Trail is included in the Comprehensive Everglades Restoration Plan and is authorized for implementation by the U.S. Army Corps of Engineers in the Water Resources Development Act of 2000, the National Park Service lacks authority to build the 5.5 miles of additional bridging that it has determined to be necessary for restoration. However, if this project is authorized, funded, and implemented in conjunction with other planned restoration projects, ecological connectivity between the marshes located in the Water Conservation Areas and Everglades National Park will be substantially improved. Further, it will also be possible to move larger volumes of water through the Water Conservation Areas to Everglades National Park in a more natural sheetflow pattern, improving ecological conditions throughout the park and within the Water Conservation Areas. The increased water volumes and improved flow distributions will reestablish seasonal water depths and flooding durations that are critical to the survival of many fish and wildlife species, including the federally endangered Wood Stork, Everglade Snail Kite, and Cape Sable Seaside Sparrow, and state listed Roseate Spoonbill. Alternative 6E will also enable the reconnection of Water Conservation Area 3 to Everglades National Park, reducing the severity and duration of dry-down events in one compartment of this region (Water Conservation Area 3B) and the prolonged deep-water conditions associated with loss of tree islands in the southern portion of Water Conservation Area 3A. Achievement of the many ecological benefits through the implementation of Alternative 6E will not adversely affect Native American Indian camps located on the Tamiami Trail,

as it provides for a one-half-mile set-aside on either side of existing Native American Indian camps. The proposed location of the bridge spans also maintains access to existing airboat tour operations.

The total cost for implementation of Alternative 6E is \$330 million. The itemized cost breakdown is as follows:

<b>Construction:</b>	\$260 million
<b>Land Acquisition:</b>	\$24 million
<b>Compensable Business Costs:</b>	\$30 million
<b>Demolition:</b>	\$16 million

Although the Draft Environmental Impact Statement was prepared in response to the language contained in the 2009 Omnibus Appropriations Act, the Department and the National Park Service note that a similar proposal for bridging the Tamiami Trail is contained in the Comprehensive Everglades Restoration Plan authorized by the Water Resources Development Act of 2000. That proposal includes 10 1,000-foot bridge spans which would be cost shared equally between the U.S. Army Corps of Engineers and the South Florida Water Management District. The project included in the Comprehensive Everglades Restoration Plan is different in both its legislative origins and scope and size from the preferred Alternative 6E selected by the National Park Service and evaluated in its DEIS and summarized in this report. It is worth noting that the framework authorization contained in the Comprehensive Everglades Restoration Plan was planned over a decade ago. Since that time, significant new scientific information indicates the importance of historic flow to fully restore and maintain the ridge and slough landscape of the park and the Water Conservation Areas. Further, it is important to note that the directive to which the National Park Service is responding — to more fully restore more natural water flow to Everglades National Park and Florida Bay and the ecological connectivity of the park and the Water Conservation Areas — is distinct from the legislative mandate that directed the U.S. Army Corps of Engineers to prepare the Comprehensive Everglades Restoration Plan with its planning assumption for the Tamiami Trail.

If the additional bridging and raising of the Tamiami Trail is authorized by the Congress, construction would be located predominantly within Everglades National Park, south of the alignment of the existing Tamiami Trail corridor, and would require 48.1 acres of lands currently within the park. The National Park Service would utilize current law to provide a highway easement deed to allow the use of these lands to construct the necessary bridging, and would ultimately seek authorization to exchange these lands with the State of Florida for an equal amount of state lands adjacent to the current park boundary. This approach is the same as was utilized for the implementation of the 1-mile bridge for the Tamiami Trail as part of the Modified Water Deliveries Project.



Ridge and slough habitat. Photo by William Perry, NPS.

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Pursuant to the legislative direction contained in the 2009 Omnibus Appropriations Act, the National Park Service has prepared a Draft Environmental Impact Statement (DEIS) analyzing alternatives for additional bridging in the Tamiami Trail to fully restore more natural water flow to Everglades National Park and Florida Bay and the ecological connectivity between the park and the Water Conservation Areas. The DEIS, which provides significantly more detail than summarized in this report, is provided on a CD attached to the back cover of this document. When the Notice of Availability of the DEIS is published in the Federal register, a 60-day public comment period will commence. If you wish to provide comment on the DEIS during the public comment period, or access the DEIS online, you may do so at the National Park Service's Planning, Environment, and Public Comment website at: <http://parkplanning.nps.gov> after the Federal Register publication date. To access the DEIS on this site select Everglades National Park from the drop down box and follow the links for the Tamiami Trail Modifications: Next Steps Project.

Please reference this report as follows:

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## FOREWORD

*In March 2009, Congress directed the National Park Service to complete a report evaluating additional bridging for the Tamiami Trail beyond what is being undertaken as part of the Modified Water Deliveries to Everglades National Park Project (16 U.S.C. § 410r-S) to fully restore more natural water flow to Everglades National Park and Florida Bay and to restore the ecological connectivity between the park and the Water Conservation Areas. This directive by Congress was an acknowledgement that major modifications of the Tamiami Trail are essential both to restoration of Everglades National Park and to restoration of the Greater Everglades Ecosystem.*

*This publication summarizes the work done during a year-long collaboration between federal, state, and local agencies and the general public. The National Park Service's preferred alternative is that an additional 5.5 miles of bridging of the Tamiami Trail is necessary to achieve the ecological restoration objectives as directed by the Congress. This preferred alternative is science-based and represents the first time that the National Park Service science staff has articulated what is needed to set the stage for full restoration. Consultation with the Miccosukee Tribe of Indians of Florida was conducted at numerous junctures during the development of the Draft Environmental Impact Statement (DEIS). The DEIS finds that an additional 5.5 miles of bridging and raising the unbridged portion of the highway corridor is necessary to achieve restoration and reflects the preferred alternative (Alternative 6E) that is presently undergoing public notice and comment pursuant to the National Environmental Policy Act and which is anticipated to be final in October 2010. This additional bridging is beyond the current plan being implemented by the Modified Water Deliveries Project, and is larger than plans developed by the U.S. Army Corps of Engineers in the late 1990s and included in the framework authorization for the Comprehensive Everglades Restoration Plan, and would increase the ecological connectivity between Everglades National Park and the upstream Water Conservation Areas by approximately 500 percent.*

*The single most important accomplishment that would be gained through the implementation of this project, should it ultimately be authorized and funded by the Congress, is the ability to pass unconstrained water flows under Tamiami Trail and into the historic eastern flowway of Northeast Shark River Slough in Everglades National Park. The cost to provide the additional bridging and roadway improvements is currently estimated at \$330 million. This plan is considerably more cost effective than previous plans associated with bridging and raising the Tamiami Trail and provides considerably more environmental benefits.*

*In carrying forward the continued development of recommendations for the Tamiami Trail through this process to respond to the direction in the 2009 Omnibus Appropriations Act, the Department of the Interior will work with its other federal and non-federal restoration partners to ensure that the Water Conservation Area 3 Decompartmentalization and Sheetflow Enhancement Project and the Everglades National Park Seepage Management Project are implemented in a manner that complements the ongoing work on Tamiami Trail. Addressing these related projects concurrently with the proposed Tamiami Trail improvements would reestablish flow patterns that are reminiscent of the historical flows that sculpted and sustained the ridge and slough landscape, and provide adequate freshwater flows to reduce the frequency and severity of hypersaline events in Florida Bay. The additional bridging for Tamiami Trail, in conjunction with ongoing efforts to improve water quality and enhance water storage opportunities, provides the ability to pass substantially larger volumes of clean water to the Everglades. This in turn will lead to improved ecological conditions for all of the remaining natural Everglades, both north and south of the Trail, and is an imperative if we are to see a restored Everglades in our lifetime. As the National Academy of Sciences has warned, if ecological resilience is not restored soon, the possibility exists that negative environmental changes to habitats and populations could precipitate rapid deleterious landscape-level changes that might be difficult to reverse.*

*Once the public comment period for the Draft Environmental Impact Statement ends, the National Park Service will respond to the comments and prepare the Final Environmental Impact Statement, which is expected to be available late in 2010. Subsequent to that, the National Park Service and the Department will report those findings to the Congress as directed in the 2009 Omnibus Appropriations Act.*

Jonathan B. Jarvis  
Director  
National Park Service

May 2010





## INTRODUCTION

### Legislative Mandate

The Omnibus Appropriations Act of 2009 (H.R. 1105; P.L. 111-008, March 11, 2009) directed the Department of the Interior and the National Park Service to evaluate what additional modifications to the Tamiami Trail roadway are necessary beyond the features currently being constructed under the Modified Water Deliveries to Everglades National Park authority for the purpose of restoring ecological connectivity between the Everglades National Park and the Water Conservation Areas and to restore more natural water flow to Everglades National Park and Florida Bay.

Specifically, the Omnibus Appropriations Act of 2009 (Act) states the following:

*Provided further, That the Secretary of the Interior, acting through the National Park Service, is directed to immediately evaluate the feasibility of additional bridge length, beyond that to be constructed pursuant to the Modified Water Deliveries to Everglades National Park Project (16 U.S.C. § 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. The feasibility study and the recommendation of the Secretary shall be submitted to the Congress no later than 12 months from the date of enactment of this Act.*

This publication summarizes the National Environmental Policy Act process that the National Park Service is utilizing to develop recommendations to respond to the requirements set forth in the Act. Through the analysis conducted to date, the National Park Service has selected a preferred alternative as set forth in a Draft Environmental Impact Statement, for which a 60-day public comment period will commence with publication of the Notice of Availability in the Federal Register. The National Park Service finds that an additional 5.5 miles of bridging is necessary beyond the present 1 mile under construction (for a total of 6.5 miles of bridging) to fully restore more natural water flow to Everglades National Park and Florida Bay and to restore the ecological connectivity between the park and the Water Conservation Areas. If authorized and funded, and assuming implementation of other planned restoration projects further upstream, the additional bridging would allow for unconstrained flow to Northeast Shark River Slough. The resulting flow patterns would closely resemble historical flows that sculpted and sustained the ridge and slough landscape and would provide adequate freshwater flows to reduce the frequency and severity of hypersaline events in Florida Bay.

### Existing Conditions

In 1928, the Tamiami Trail roadway and the Tamiami canal were constructed across the entire width of the Everglades (Fig. 1). While photos from the 1930s show water occasionally spilling over the top of the road, by 1940 aerial photos indicate that, in just 12 years, the construction of Tamiami Trail had resulted in the formation of two separate and distinct landscape types, a wetter, more preserved ridge and slough habitat north of the trail, in what is now Water Conservation Area 3A, and a much drier, degraded sawgrass-dominated habitat south of the trail, in what is now Everglades National Park. Tamiami Trail forms the northern boundary of the park and acts as a dam, preventing water from freely flowing from north to south along its historical and natural path. This alteration has effectively deprived the park of vital water, resulting in the deterioration of the park's unique ecosystems, and also hindering restoration of the Everglades.

In 1948, Congress authorized the Central and Southern Florida Project in part to provide for regional water supply and flood protection for the lower east coast of Florida. The Central and Southern Florida Project diverted much of the water historically flowing south out of Lake Okeechobee to the east and west coasts, allowing the creation of over 700,000 acres of agricultural lands in the heart of the Everglades ecosystem and eliminating overland flows south from the lake to the central and southern Everglades (see inside cover map). Over the next 20 years, a network of canals and levees constructed by the U.S. Army Corps of Engineers (Corps) increased the diversion of water from the Everglades to meet the expanding needs of agricultural and urban development. Some 1,800 miles of canals and levees, 200 water-control structures, and 16 major pumping stations were eventually constructed that altered flow patterns, fragmented the central Everglades into a set of compartments, and drained 1.7 million acres of wetlands, comprising almost half of the historical Everglades ecosystem (Fig. 2).

The ecological effects of the Central and Southern Florida Project on the Everglades, including Everglades National Park and the State's Water Conservation Areas, have been devastating. During drier periods the upstream Water Conservation Areas retain water to meet urban and agricultural water supply needs. During wetter periods excess water is released to the park; however, it does not follow the historic eastern flowway of Northeast Shark River Slough and causes flooding problems in Water Conservation Area 3A and in the marl prairies in Western Shark River Slough. Because of these hydrologic changes, entire populations of some endangered species, including the West Indian manatee, the Cape Sable Seaside Sparrow, the Everglade Snail Kite, the Wood Stork, and the Florida panther, are at risk of disappearing. Exotic non-native plants such as Melaleuca, Brazilian pepper, and Australian pine have invaded natural areas, choking out native plants and altering habitats. Massive algal blooms and die-offs of seagrass beds in Florida Bay have been followed by extensive losses of coastal wading birds, sportfish, shrimp,



Figure 1. Location of the Tamiami Trail in south Florida. The road was constructed in 1928 to connect the city of Miami on the east coast to Tampa on the west coast. The segment of the road that is the subject of this study (Project Area) is also depicted.

and sponges. Slough habitat, the unique Everglades wetland complex immortalized as the “river of grass” by Marjory Stoneman Douglas, is among the most adversely impacted habitats by reduction in water flow.

While the entire Greater Everglades ecosystem has been negatively impacted by certain aspects of the Central and Southern Florida Project, the unique subtropical habitat of Everglades National Park, located at the southern end of this compartmentalized system, is at risk due to the reduced water volumes and altered flow distributions. Research on water flow characteristics in the pre-drainage Everglades suggests that the average annual volume of water reaching the park has been reduced by approximately 1.3 million acre-feet, approximately a 65-percent reduction in historical flow volumes. In addition to the reduction in volume, research indicates there has also been a concurrent change in the distribution of the flow within the Shark River Slough drainage basin. Prior to implementation of the Central and Southern Florida Project, more than 60 percent of average annual flows to the park ran through Northeast Shark River Slough, with less than 40 percent flowing through the area to the west, commonly referred to as Western Shark River Slough. For example, data from 1959, a wet year prior to compartmentalization of Water Conservation Area 3, had a distribution of 29 percent of the annual flows to Western Shark River Slough and 71 percent to Northeast Shark River Slough. In comparison, in 2005, also a wet year, this distribution was reversed to 89 percent of



Wood Stork. Photo by Darlene Harris, NPS volunteer.

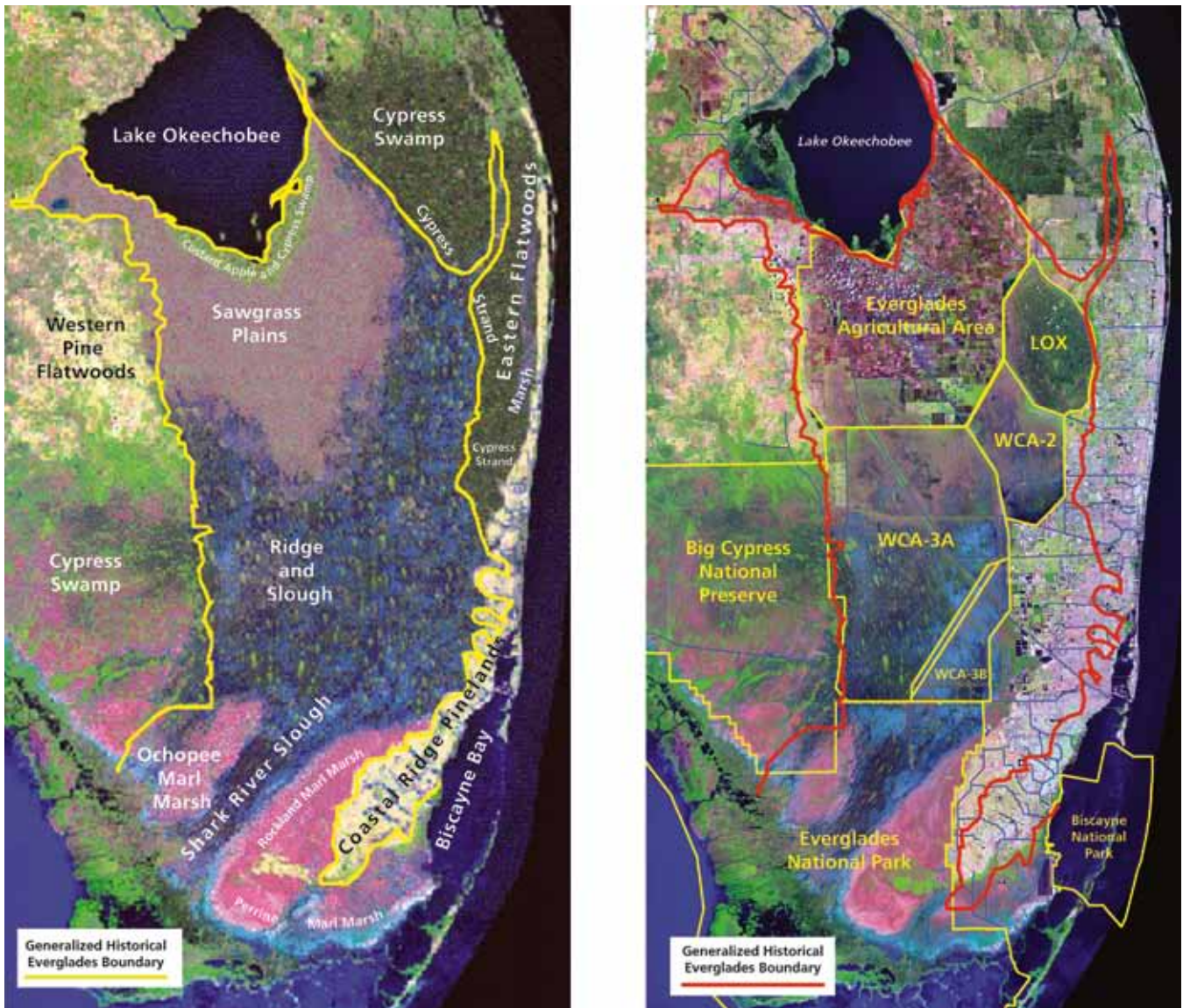


Figure 2. The historic, free-flowing, south Florida landscape, including the boundary of the Greater Everglades (left), compared to the highly compartmentalized landscape of today (right) with the historic boundary overlaid (red). The map of the current landscape illustrates how much of the historic landscape has been lost to agricultural and urban development. The barriers to sheetflow, due to the construction of Central and Southern Florida Project levees and canals, have resulted in the loss of natural marsh connectivity (adapted from a 2007 South Florida Water Management District map). State Water Conservation Areas (WCA) lie to the north of Everglades National Park.

the annual flows to Western Shark River Slough and only 11 percent to Northeast Shark River Slough (Fig. 3). Clearly, the managed system resulting from construction of the Tamiami Trail and the Central and Southern Florida Project significantly re-routes water flowing through the system to the detriment of the natural resources of Everglades National Park, as well as the State’s Water Conservation Areas.

Flow reductions to the Everglades resulted in dramatic alterations to the landscape. Historically, sloughs in the Northeast Shark River Slough area experienced water depths of 3 to 4 feet during the wet season and were numerous and interconnected, allowing early human inhabitants to travel by pole boats across the breadth of the area (Fig. 4). Over time the loss of water flow through Water Conservation Area 3B

and Northeast Shark River Slough caused the organic peat soils to oxidize, and the flow-sculpted ridge and slough landscape began to flatten, as open-water slough communities were replaced by emergent vegetation (primarily dense sawgrass). The U.S. Environmental Protection Agency reports that over 3 vertical feet of soil in approximately 30,000 acres in Northeast Shark River Slough have been lost through oxidation following severe dry-down events and destructive peat fires.<sup>1</sup> These peat fires have also burned hardwood hammocks that are hotspots of biological diversity.

<sup>1</sup> Scheidt, D., J. Stober, R. Jones, and K. Thornton. 2000. South Florida Ecosystem Assessment: Everglades Water Management, Soil Loss, Eutrophication and Habitat. Report No. 904-R-00-003, United States Environmental Protection Agency, West Palm Beach, Florida.

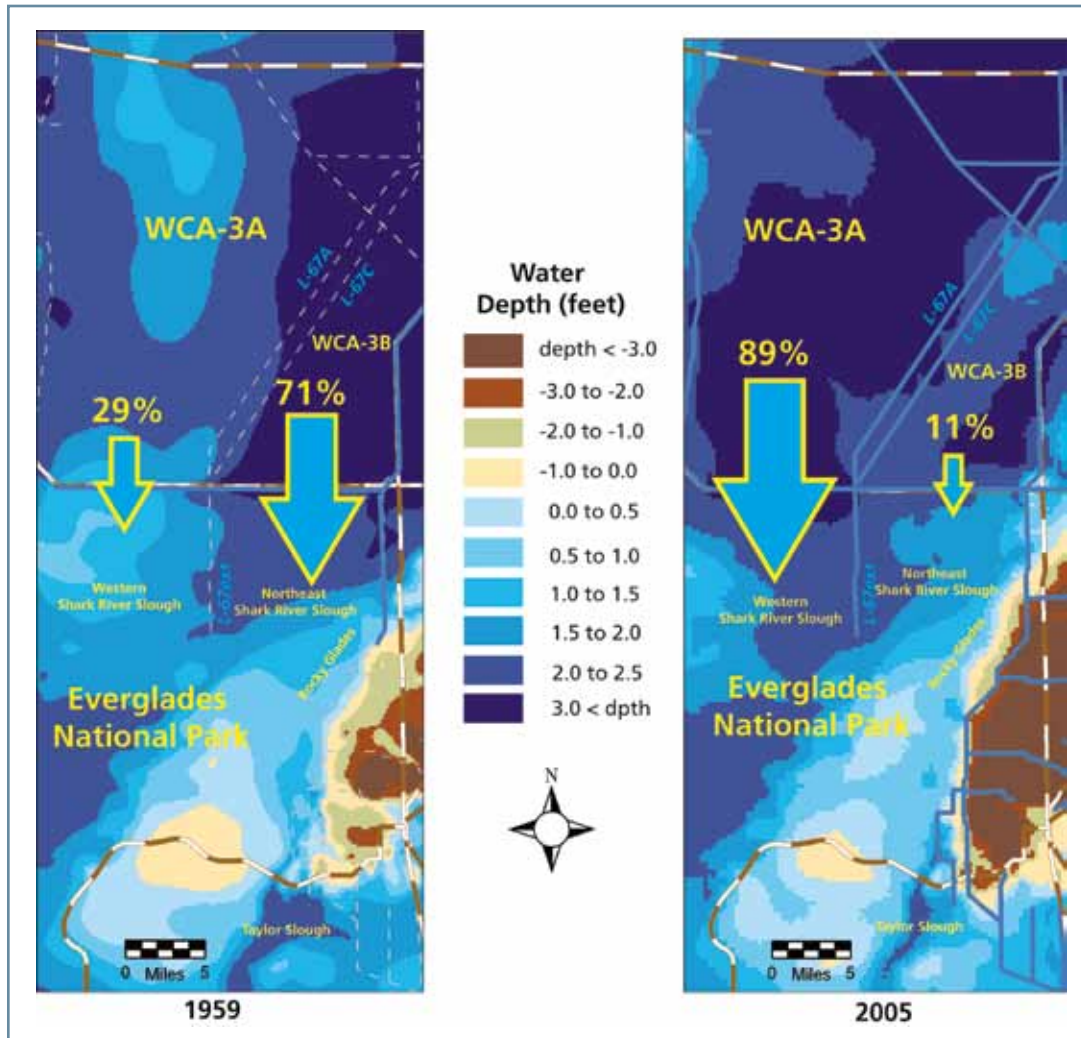


Figure 3. Water depths and flow distributions for two wet years (1959 and 2005) when more than 1 million acre-feet of water was discharged to Shark River Slough, Everglades National Park. These two years correspond to the period prior to compartmentalization (1959) and post-compartmentalized Water Conservation Area (WCA) 3 (2005). Prior to compartmentalization, the higher water depths and flow volumes were more confined to the eastern flowway through Northeast Shark River Slough. Today, as depicted in 2005, the deeper water and greater flows are more confined to Water Conservation Area 3A and Western Shark River Slough.

The sloughs functioned as nursery grounds for aquatic species during the rainy season and as refuges for many Everglades species during the dry season. The successful rearing of young wading birds is dependent on the availability of adequate numbers of prey species (fish and invertebrates) found primarily in the shallow waters of the sloughs during the early months of the dry season. As water depths slowly recede with the onset of each dry season, prey is concentrated in remaining pools, providing the foraging conditions needed for young birds to prosper. In addition, these sloughs once maintained some surface water year round, allowing for the growth of periphyton (a mixture of algae, cyanobacteria, and other micro-organisms) that supported a complex web of invertebrates and fish even during the driest months. However, as water flow to the system diminished, the primary food sources became reduced, and wading bird populations declined by 90 to 95 percent.

The reduction in water flow to Everglades National Park has not only resulted in the loss of slough habitat with its richness and diversity of wildlife, but has also translated into wholesale loss of landscape and ecosystem function. Deep-water sloughs are nearly nonexistent now in Northeast Shark River Slough, and shallow waters are filled in by a monoculture of sawgrass. This loss of habitat heterogeneity reduces the ability for Northeast Shark River Slough to recover from periodic extreme events, such as droughts and hurricanes. If ecological resilience is not restored soon, the possibility exists that environmental changes to habitats and populations within localized areas of the Everglades could precipitate rapid and deleterious landscape-level changes that might be difficult or impossible to reverse.<sup>2</sup>

<sup>2</sup> National Research Council. 2008. Progress towards restoring the Everglades: The second biennial review – 2008. National Academies Press: Washington D.C. 324 pp.



Figure 4. Ridge and slough landscape in Northeast Shark River Slough, 1917, prior to the drainage of the Everglades. The ridge and slough habitat was once the most dominant and diverse habitat in the central and southern Everglades. Most of the open-water sloughs in this area have been replaced with sawgrass, or lost entirely, due to persistent lower water depths in the region. Original mounted photograph and survey notes by King, 1917.<sup>3</sup>



Snowy Egret. Photo by William Perry, NPS.

While the adverse effects of the Tamiami Trail on the Water Conservation Areas and Everglades National Park are well-documented, its location makes it the focal point of a complex water management system. The Tamiami Trail north of Northeast Shark River Slough is bounded by water control structure S-333 on the west and S-334 on the east (Fig. 5). The delivery of water to Northeast Shark River Slough is controlled by the operation of these two structures which maintain water levels in the L-29 Canal within strict limits for protection of the roadway. The relatively small amount of water that does enter Northeast Shark River Slough is conveyed through 19 outlets under the 10.7-mile section of roadway, each outlet having three culverts ranging from 41 inches to 59 inches in diameter. The L-29 Canal is currently managed at a stage of 7.5 feet National Geodetic Vertical Datum (NGVD). Since the land surface elevation in Northeast Shark River Slough just south of the road is similar to the canal stage, there is an insufficient water-level gradient to allow any more than minimal flows into Northeast Shark River Slough during much of the year (Fig. 6).

<sup>3</sup> King, John W. 1917. Report of exploration, examination and reconnaissance of the lands of the Tamiami Trail in Dade County, Florida. Unpublished report found in the Jaudon Collection, Historical Museum of South Florida, Miami.

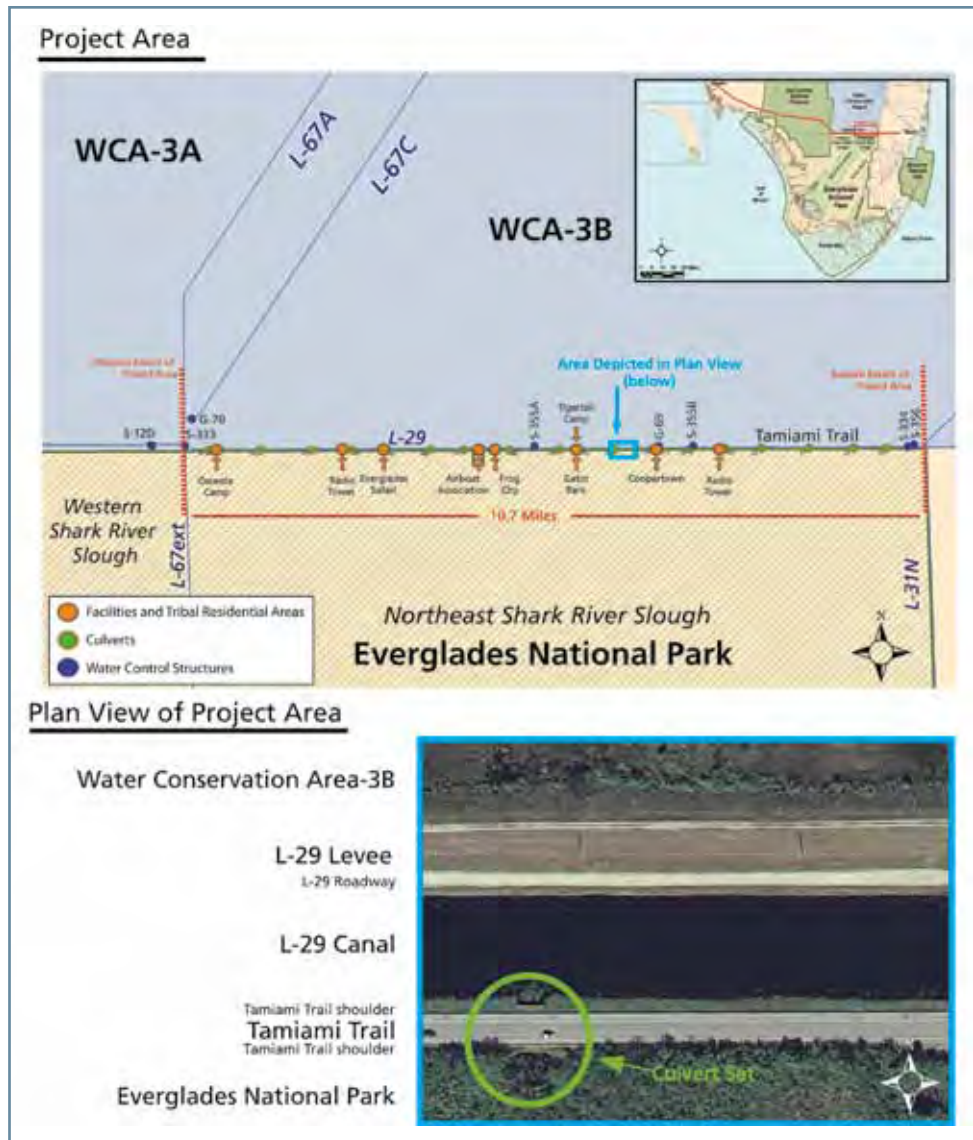


Figure 5. The project area for this study consists of a 10.7-mile section of the Tamiami Trail bounded by S-333 on the west and S-334 on the east. Also depicted is the relationship between this section of Tamiami Trail and Water Conservation Area (WCA) 3B, the L-29 levee and road, the L-29 Canal, and Everglades National Park. Today, water flows from the L-29 Canal into Northeast Shark River Slough, Everglades National Park, occur through a series of 19 outlets containing 3 culverts per outlet (not depicted) to the south side where marsh ground surface elevations are only slightly lower than canal stage (see also Fig 7.).

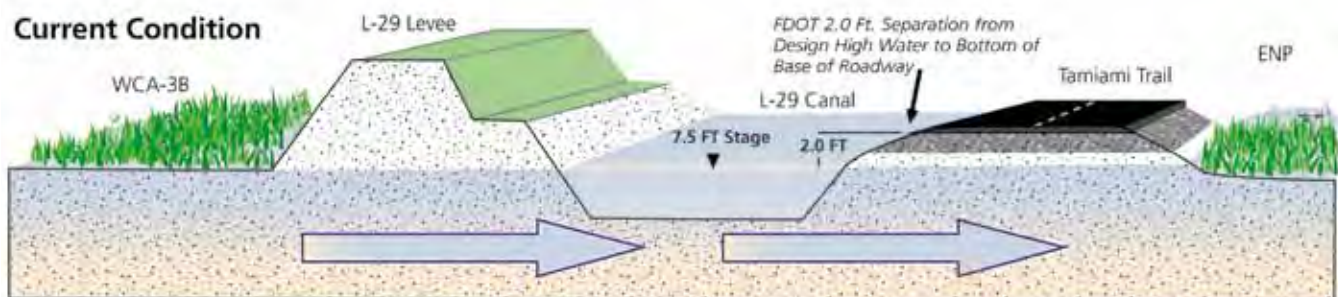


Figure 6. Current configuration of Water Conservation Area (WCA) 3B, L-29 Levee, L-29 Canal, existing Tamiami Trail, and Northeast Shark River Slough. Water levels in the L-29 Canal are maintained at 7.5 ft NGVD to prevent damage to the sub-base of the road, precluding the ability to transfer substantial volumes of surface water to Northeast Shark River Slough through a series of culverts (not depicted) to the south side where marsh ground surface elevations are only slightly lower than canal stage (see also Fig 7.).

## RESTORATION AND THE TAMIAMI TRAIL

The Tamiami Trail roadway not only acts as a physical barrier and marks the geographic division between the Water Conservation Areas and Everglades National Park, but also serves as a boundary between differing water management practices that have altered the natural flow of water and made some areas too wet and other areas too dry. Prior to the implementation of the Central and Southern Florida Project, the natural flow of water within the Everglades had the greatest volume of water entering Everglades National Park through North-

east Shark River Slough (Fig. 3). The water would flow to the southwest and periodically overflow the Rocky Glades, providing additional water into Taylor Slough and Florida Bay. In contrast, the majority of the flow into the park now enters farther to the west via the S-12 structures due to modifications to this section of the road corridor in the 1960s as part of the Central and Southern Florida Project construction to create Water Conservation Area 3A and 3B (L-29, L-67A, L-67C, and L-67 Extension) (Fig. 3 and Fig. 7). Recognition that these flows are unnatural and have caused ecological damage to the park was the impetus for authorization of the Modified Water



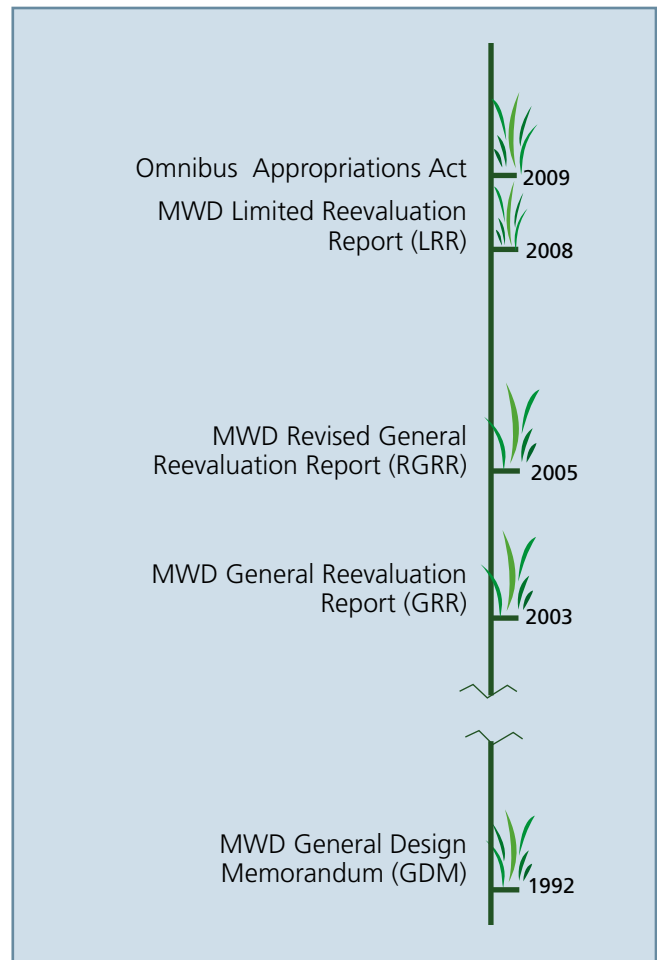
Figure 7. Significant differences exist between the sections of Tamiami Trail corresponding to Western Shark River Slough (west of the project area boundary or S-333) and the road corridor within the project area (east of S-333). When compartmentalization of Water Conservation Area (WCA) 3 was completed in the 1960s, the western section of Tamiami Trail was raised and the high-capacity S-12 water control structures were added to allow increased flow capacity to Western Shark River Slough (see Photo 1). In contrast, the portion of Tamiami Trail east of S-333 was not raised and has retained the culvert design until now. This eastern portion corresponds to the project area (see Photo 2).



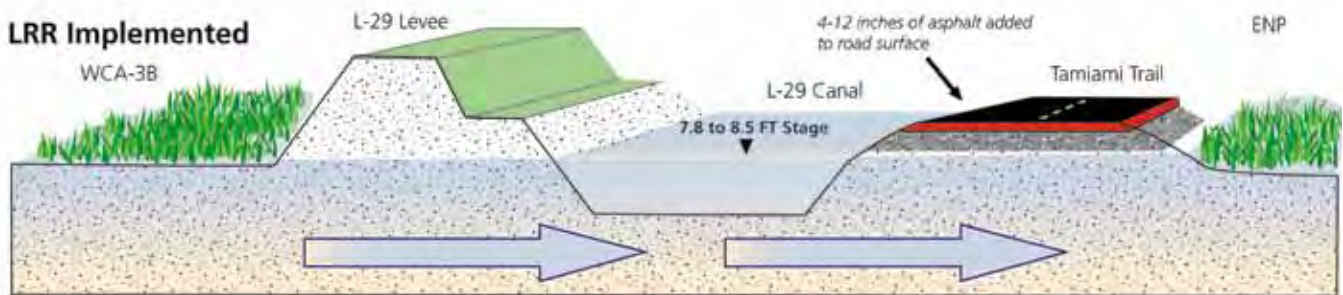
Deliveries Project in 1989. The purpose of the Modified Water Deliveries Project is to restore the natural timing, volume, and distribution of flows to Everglades National Park to the extent practicable, necessitating modifications to the Tamiami Trail north of Northeast Shark River Slough.

Earlier federal planning by the U.S. Army Corps of Engineers to meet the restoration targets for the Modified Water Deliveries Project included the 1992 General Design Memorandum, 2003 General Reevaluation Report and Supplemental Environmental Impact Statement, 2005 Revised General Reevaluation Report and Second Supplemental Environmental Impact Statement: Tamiami Trail Modifications, and the 2008 Limited Reevaluation Report (Fig. 8). All of these plans contained proposals for how to address flows through the Trail; however, no one plan was comprehensive in addressing the need for ecological connectivity between the park and the Water Conservation Areas. The last report recommended a plan that allows the water level in the L-29 Canal to increase to as much as 8.5 feet NGVD, an improvement from the current operating level of 7.5 feet NGVD, but insufficient to meet the Modified Water Deliveries Project target of 4,000 cubic feet per second (Fig. 9). In addition, this alternative provides only a portion of the hydrologic connectivity needed to restore ridge and slough landscape characteristics. Nonetheless, the one-mile bridge plan set forth in the 2008 Limited Reevaluation Report is a first step in Tamiami Trail modifications that are required for full restoration of more natural water flow.

While each of these previous efforts required modifications to the Tamiami Trail, the 2009 Omnibus Appropriations Act that directed the preparation of this study establishes well-defined ecological restoration targets associated with these modifications, including restoration of ecological connectivity between marshes severed by the road and restoration of natural marsh flow patterns.



**Figure 8. Timeline of project planning for modifications to the Tamiami Trail project area, 1992 to present. Significant planning efforts occurred throughout the time period; however, the first significant modifications to this portion of the road corridor did not take place until December 2009, when construction of the 2008 Limited Reevaluation Report (LRR) Project features was initiated.**



**Figure 9. Revised configuration of Tamiami Trail following the implementation of the 2008 Limited Reevaluation Report (LRR) project. Modifications include the addition of a 1-mile bridge (not depicted) and the addition of asphalt to raise the road surface elevation. Modifications will allow water levels to increase to a maximum of 8.5 feet NGVD but will be operated to maintain a 7.8 feet NGVD level as a precaution to prevent damage to the unbridged portion of the highway.**

## TAMIAMI TRAIL MODIFICATIONS: NEXT STEPS PROJECT

Acknowledging the need to restore more historical flow conditions in Northeast Shark River Slough, as well as overcoming legal challenges to raising the Tamiami Trail, Congress, in the 2009 Omnibus Appropriations Act, directed the Corps to immediately build the 2008 Limited Reevaluation Report plan. Implementation of the 2008 Limited Reevaluation Report plan will raise the road to allow L-29 Canal stages to occasionally rise to 8.5 feet; however, constraints associated with highway safety will require that the stage in the L-29 Canal be operated on a sustained basis at no higher than 7.8 feet (Fig. 9). This translates into only a 0.3-foot increase over the existing operational maximum canal stage (7.5 feet) and does not produce the water flow needed to restore the characteristic ridge and slough topography in Northeast Shark River Slough.

The Act also directed the National Park Service to complete a study that identifies additional modifications to the Tamiami Trail (e.g., bridging and road-raising) required to fully restore the ecological conditions in Northeast Shark River Slough and the Water Conservation Areas and establish the foundation for future restoration efforts in the Everglades. This initiative is referred to as the Tamiami Trail Modifications: Next Steps Project. The Tamiami Trail Modifications: Next Steps Project would modify the road to allow water stages in the L-29 Canal to rise to 9.7 feet, providing the capability to convey the historical volumes of water that once passed into Everglades National Park. Importantly, meeting the structural roadbed requirements for the 9.7-foot stage within this project would preclude the need for expensive future modifications to the Tamiami Trail when related projects that store and distribute the water required for full restoration are implemented.

To meet the Act's mandate, the National Park Service, as lead agency pursuant to the requirements of the National Environmental Policy Act, formed a project delivery team consisting of representatives from federal, state, and local agencies to develop project objectives, screen and evaluate the benefits and costs of alternatives, and assist in the alternative evaluations leading to the National Park Service's selection of a preferred alternative. The National Park Service invited the Miccosukee Tribe of Indians of Florida to participate as a member of the project delivery team. Although representatives of the Tribe attended most meetings, they indicated that they were not a member of the interagency team.

### Purpose and Objectives

The purpose of the Tamiami Trail Modifications: Next Steps Project is to comply with the Act that directs the Secretary of the Interior, acting through the National Park Service

*“to immediately evaluate the feasibility of **additional bridge length**, beyond that to be constructed pursuant to the Modified Water Deliveries to Everglades National Park Project (16 U.S.C. § 410r-S), including a continu-*

*ous 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.” (emphasis added)*

Based on the specific language in the Act, the project delivery team developed the following project objectives:

1. Improve flows to and ecological conditions in Everglades National Park by bridging the Tamiami Trail to provide for unconstrained flows to Northeast Shark River Slough and Florida Bay
2. Restore the natural pathways for species movements (ecological connectivity) by removing obstructions to sheetflow between Water Conservation Area 3B and Northeast Shark River Slough
3. Improve historic flow patterns between Water Conservation Area 3B and Northeast Shark River Slough by reconnecting remnant sloughs, allowing natural re-contouring of the ridge and slough landscape
4. Improve ecological habitats in Everglades National Park, including ridge and slough, the Rocky Glades, and coastal estuaries
5. Ensure compatibility with pre-Comprehensive Everglades Restoration Plan (CERP) and CERP projects.

In undertaking the required evaluation, Department and National Park Service staff determined that it was necessary to: (1) complete an Environmental Impact Statement for National Environmental Policy Act (NEPA) compliance, (2) include all real estate costs for acquisition of remaining properties in Northeast Shark River Slough authorized by the 1989 Everglades National Park Protection and Expansion Act, (3) continue to provide access to commercial airboat operators and Native American Indian camps located on the Tamiami Trail, (4) rely heavily on earlier studies that analyzed bridging alternatives for the Trail, particularly the alternatives and analyses conducted by the U.S. Army Corps of Engineers in the 2005 Revised General Reevaluation Report, (5) use existing technical information, (6) design the canal stage in the project to allow for unconstrained flow (later verified to be the same as the canal stage value used in the 2005 Revised General Reevaluation Report and equal to 9.7 feet NGVD), and (7) provide a 0.5-mile buffer between all bridge approaches and Native American Indian camps located within the project area as requested by these camps and the Miccosukee Tribe of Indians of Florida.

In addition, public scoping provided information and identified areas of support and concern. Approximately 97 percent of public comments strongly favored the project.

Comments in favor of the project included the need for restoration of the Everglades in general, restoration of sheetflow conditions, 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, and potential unforeseen environmental impacts (i.e., flood potential, socioeconomic, and cultural impacts). The Miccosukee Tribe of Indians of Florida expressed concerns about costs, safety issues with higher water levels, floodplain impacts, and the planning process. Further, the Tribe continued to express its opposition to the implementation of the 1-mile bridge presently under construction.

### Evaluation of Project Alternatives

This publication summarizes information contained in the National Park Service’s Draft Environmental Impact Statement on this project which is presently out for the 60-day public comment period that will begin with publication of the Notice of Availability in the Federal Register. A copy of the Draft Environmental Impact Statement may be obtained at: <http://parkplanning.nps.gov> and is also included on CD at the back of this report. A summary of the process that is described in greater detail in the Draft Environmental Impact Statement follows.

### Screening Project Alternatives

Acknowledging the aggressive schedule needed to complete the evaluation and report to Congress as called for in the Act, the National Park Service relied upon project alternatives developed for the 2005 Revised General Reevaluation Report and modified to meet Tamiami Trail Modifications: Next Steps Project objectives. All of the alternatives in the 2005 Revised General Reevaluation Report elevated the roadway to allow stages in the L-29 Canal to be raised to 9.7 feet (consistent with this project); however, bridging lengths for the alternatives ranged from less than 1.0 mile to a 10.7-mile causeway. The bridging alternatives shorter than 1.0 mile were screened out of this project due to minimal improvements above the

No Action Alternative (includes the Limited Reevaluation Report 1.0-mile bridge). The 10.7-mile causeway alternative was screened out due to potential impacts to Native American Indian camps (i.e., bridging over the two Native American Indian camps would result in both impacts to native customs and practices). No alternatives specifying features other than additional bridge spans were considered in this study due to the specificity of the language authorizing the study. This initial screening resulted in the selection of six conceptual action alternatives and their variations to carry forward into the Tamiami Trail Modifications: Next Steps Project for more detailed engineering analysis (Table 1).

After completion of the Preliminary Engineering Report, the six action alternatives were further modified. Alternative 2B was removed because Alternative 2A would provide greater benefits at similar costs. Alternative 3 was removed after the engineering analysis indicated this alternative would be similar in bridge length to Alternative 5. Because Alternative 6 was the alternative in which the project delivery team sought to maximize bridging, this alternative went through several iterations. Alternative 6A and 6B, the first two iterations, both included 5.05 miles of bridging. Alternative 6A was removed from further consideration because it did not provide access to two commercial airboat facilities. Alternative 6B was modified to remove a 0.66-mile easternmost bridge due to seepage management concerns expressed during an inter-agency workshop, creating Alternative 6C with a total of 4.39 miles of bridging. Updated real estate information, received after the inter-agency workshop, indicated that acquisition and complete removal of two radio towers, in lieu of providing flood protection to the facilities, was the preferred course of action. Alternative 6C was subsequently modified to provide bridging instead of access roads to the radio towers, increasing total bridging to 4.75 miles and resulting in Alternative 6D. Finally, it was also decided that the eastern 0.66-mile bridge, removed from Alternative 6B, should be included for consideration with the understanding that adequate seepage management would have to be provided to address concerns associated with the location of this particular bridge. This modification resulted in the identification of Alternative 6E with 5.5 miles of bridging. In addition to the No Action Alternative, Figure 10 depicts the final alternatives evaluated.

**Table 1. Six conceptual action alternatives and variations of these alternatives for both the amount and location of bridging.**

Alternative	Alternative Variations and Total Bridge Lengths				
Alternative 1	2.15 miles (No other variations)				
Alternative 2	2A. 3.33 miles		2B. 2.68 miles		
Alternative 3	1.39 miles (No other variations)				
Alternative 4	1.01 miles (No other variations)				
Alternative 5	1.52 miles (No other variations)				
Alternative 6	6A. 5.05 miles	6B. 5.05 miles	6C. 4.39 miles	6D. 4.75 miles	6E. 5.50 miles

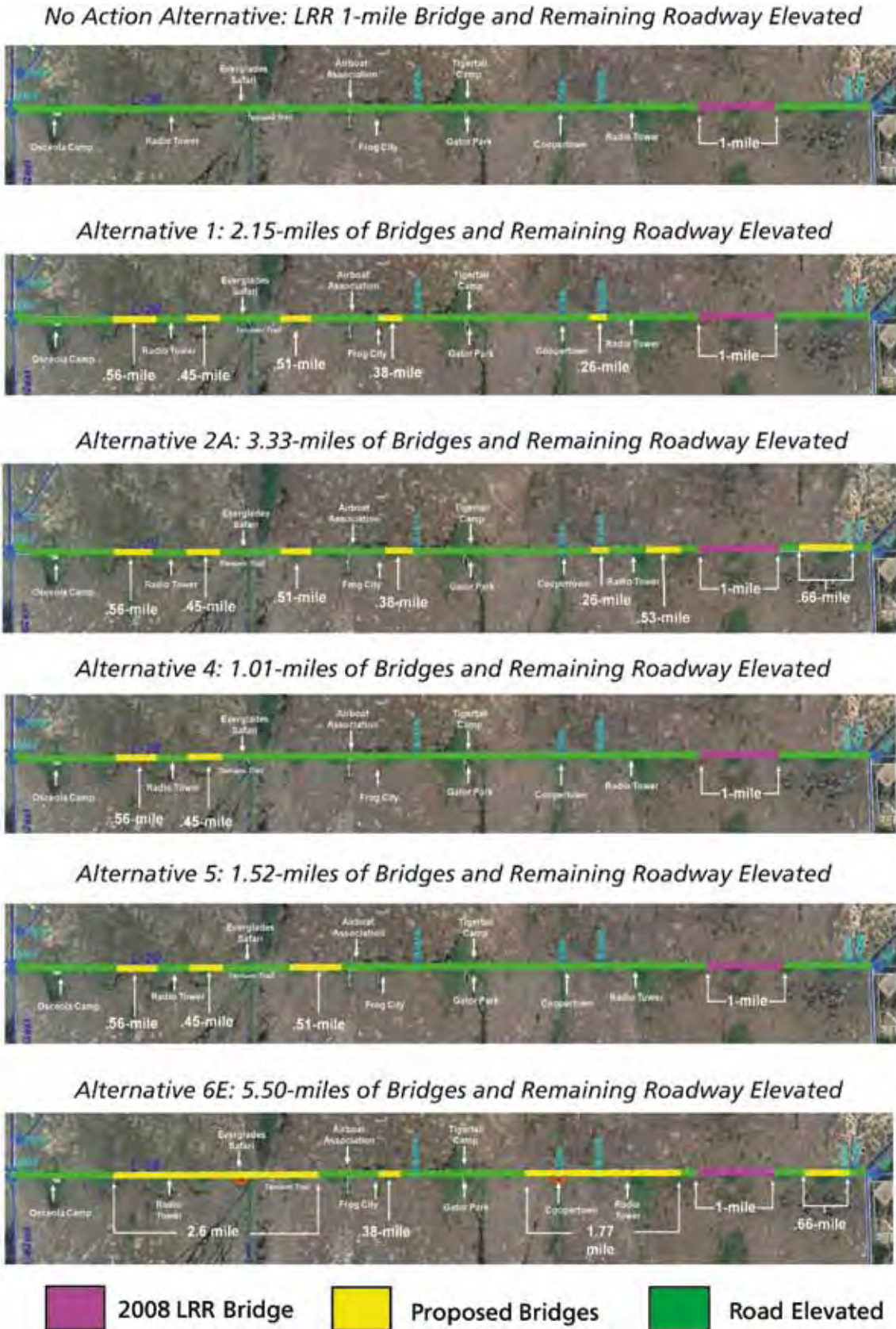


Figure 10. Final suite of alternatives evaluated in this study. The No Action Alternative consists of the road corridor modifications associated with the approved 2008 Limited Reevaluation Report (LRR) and includes only 1 mile of bridging. Alternatives evaluated in this study add to the LRR plan and have additional total span lengths ranging from 1.01 miles to 5.5 miles.

## **Benefits of Alternatives**

The project delivery team used the National Park Service Choosing by Advantages process to evaluate the benefits of each of the project alternatives and determine the preferred alternative based on both benefits and construction costs. The Choosing by Advantages process assists the agency in making its decision by evaluating the relative benefits of alternatives based both on the objectives of the project (e.g., ecological restoration) and National Park Service mission (e.g., protection of both natural and cultural resources). Critical to the Choosing by Advantages process is selection of performance measures (called factors in the Choosing by Advantages process) used to evaluate the relative importance of each alternative in meeting the objectives/mission of the project. The factors selected were (1) potential ecological connectivity between the marshes in Water Conservation Area 3B and Northeast Shark River Slough in Everglades National Park, (2) natural marsh flow conditions (velocity), (3) reconnection of sloughs fragmented by construction of Tamiami Trail, (4) restoration of sheetflow conditions, (5) reduction in vehicular wildlife mortality, (6) impacts to historic properties, (7) impacts to other cultural resources, and (8) direct wetland impacts.

While the Tamiami Trail Modifications: Next Steps Project alternatives ranged in bridging lengths from 1.01 to 5.5 miles, all of the action alternatives would raise Tamiami Trail to allow the stage in the L-29 Canal to be raised to 9.7 feet—the water level that the inter-agency team agreed would provide for the natural, unregulated flows between marshes to the north and marshes in the park essential to full restoration of both Everglades National Park and the Greater Everglades ecosystem. Increasing the stage in the L-29 Canal provides hydraulic head to push water from the L-29 Canal into Shark River Slough and to allow water to flow through the existing culverts and future bridges. Without a stage increase, a sufficient hydraulic gradient would not exist to push the water to the south. The greater the L-29 Canal stage increase, the greater the water availability to Northeast Shark River Slough and the greater the water depths and corresponding restoration benefit to the downstream ridge and slough community. The current canal stage of 7.5 feet was established to prevent damage to the sub-base of the road. Therefore, it is a fundamental assumption that the entire section of road will have to be raised or replaced with bridging to accommodate the increase in canal stage.

As reflected in Figure 11, numerical values were assigned to factors based on their importance in achieving the objectives of the project. The factor, restoring sheetflow conditions, was given the greatest importance value by the project delivery team for two reasons. First, this factor used distribution of flows across the 10.7-mile project area and topography to identify those areas where bridging would most enhance volumes of water flows and ecological benefits over the largest area in Northeast Shark River Slough. Second, modeling from the 2005 Revised General Reevaluation Report clearly

indicated that bridges located in the western portion of the 10.7-mile project corridor provided greater volumes of flows to Everglades National Park, with fewer seepage concerns, than bridges located farther to the east. The next-highest scoring factors were, in order, increasing ecological connectivity, reconnecting sloughs, and restoring marsh flow (velocity) conditions. Alternative 6E scored demonstrably higher in the total importance scores (402) than the other alternatives (Fig. 11).

## **Costs of Alternatives**

Total implementation costs for all alternatives were estimated and included the following (see Table 2 for detailed cost figures):

- ◆ Construction costs — includes all costs for materials and labor for construction of bridges and road improvements to the portion of the project area not containing bridges
- ◆ Real estate costs — includes all costs for the in-fee acquisition of three commercial airboat facilities, two commercial radio towers currently operating within the park, the relocation of a radio tower facility operated by the South Florida Water Management District, a flowage easement for a private airboat facility, as well as additional costs associated with business impacts and required demolition
- ◆ Management Costs — includes engineering and design (estimated at 10 percent of the construction costs), construction management (estimated as 10 percent of the construction costs), and contingency or potential error in the cost estimate (estimated at 25 percent of the construction costs).

## **The Preferred Alternative**

Alternative 6E, which has been identified as the preferred alternative in the Draft Environmental Impact Statement, most closely meets the project objectives and the National Park Service mission by having the highest total importance value after summing the importance scores for each of the eight factors for each alternative (Fig. 11). 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 Choosing by Advantages method, the alternatives were further evaluated using the cost-to-importance analysis prescribed by the Choosing by Advantages based on the importance scores in Figure 11 and the total project costs in Table 2.

When the total project cost is plotted against the importance scores for all alternatives (Fig. 12), 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

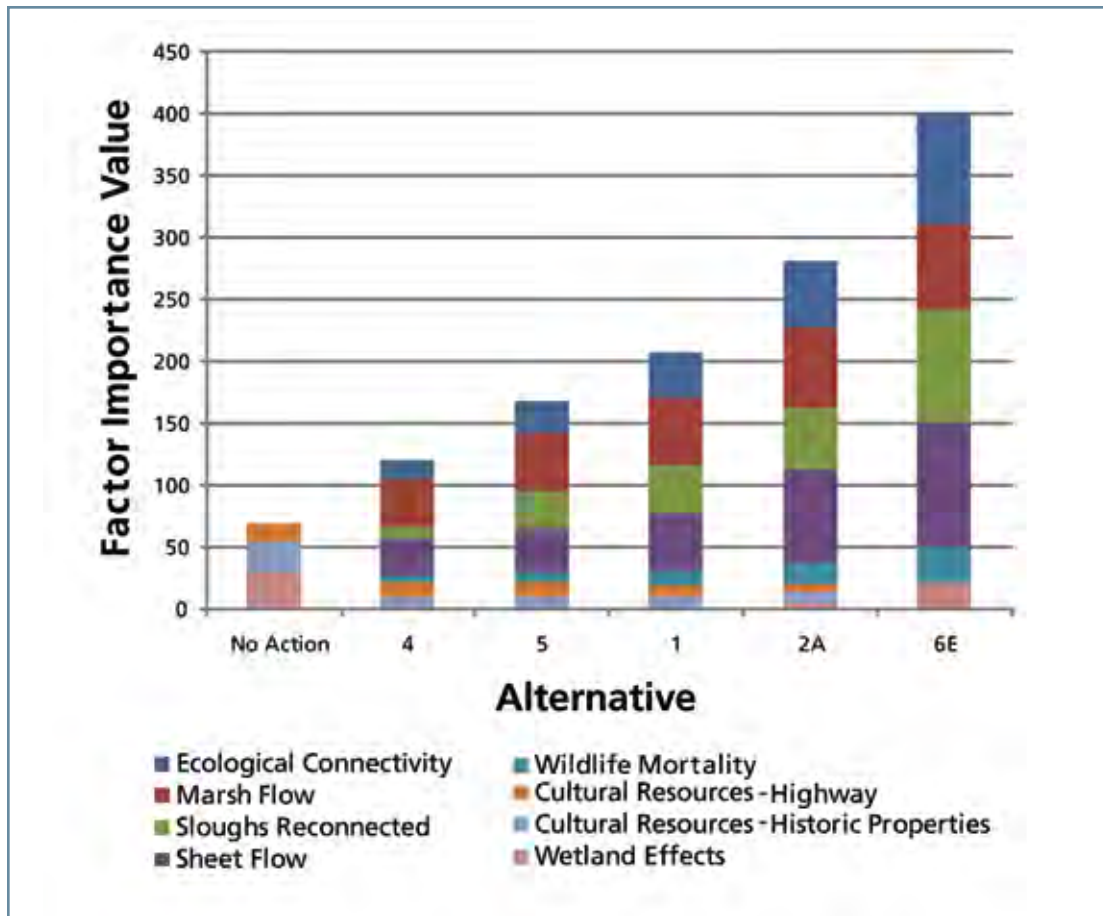


Figure 11. Importance scores for final alternatives using the Choosing by Advantages value analysis. This methodology resulted in Alternative 6E scoring the highest degree of importance, an indication of benefit.

Table 2. Construction durations and unescalated (2010) costs including construction, construction management, total construction, real estate, and total project costs for final alternatives evaluated. The alternative having the highest importance (Alternative 6E) has a total project cost of \$330 million.

Alternative	Construction Duration (yrs)	Construction Costs (M \$)	Management Costs (M \$) <sup>a</sup>	Total Construction Costs (M \$) <sup>b</sup>	RE Costs (M \$) <sup>c</sup>	Total Project Cost (M \$) <sup>d</sup>
Alt 4: 1.01 mi	3.8	\$59	\$27	\$85	\$70	\$155
Alt 5: 1.52 mi	3.6	\$71	\$32	\$103	\$70	\$173
Alt 1: 2.15 mi	3.6	\$89	\$40	\$129	\$70	\$199
Alt 2A: 3.33 mi	3.2	\$103	\$46	\$149	\$70	\$219
Alt 6E: 5.50 mi	3.7	\$185	\$75	\$260	\$70	\$330

<sup>a</sup>Costs estimated by the Corps to manage the construction contracts

<sup>b</sup>Total construction costs equal the summation of the construction costs and the management costs

<sup>c</sup>Includes fee acquisition, relocation, and management costs (estimated at \$24 M), compensable business costs (estimated at \$30 M), and relocation and demolition of South Florida Water Management District telemetry tower and demolition of two commercial radio towers (estimated at \$16 M)

<sup>d</sup>Total project costs equal the summation of the total construction costs and the real estate costs

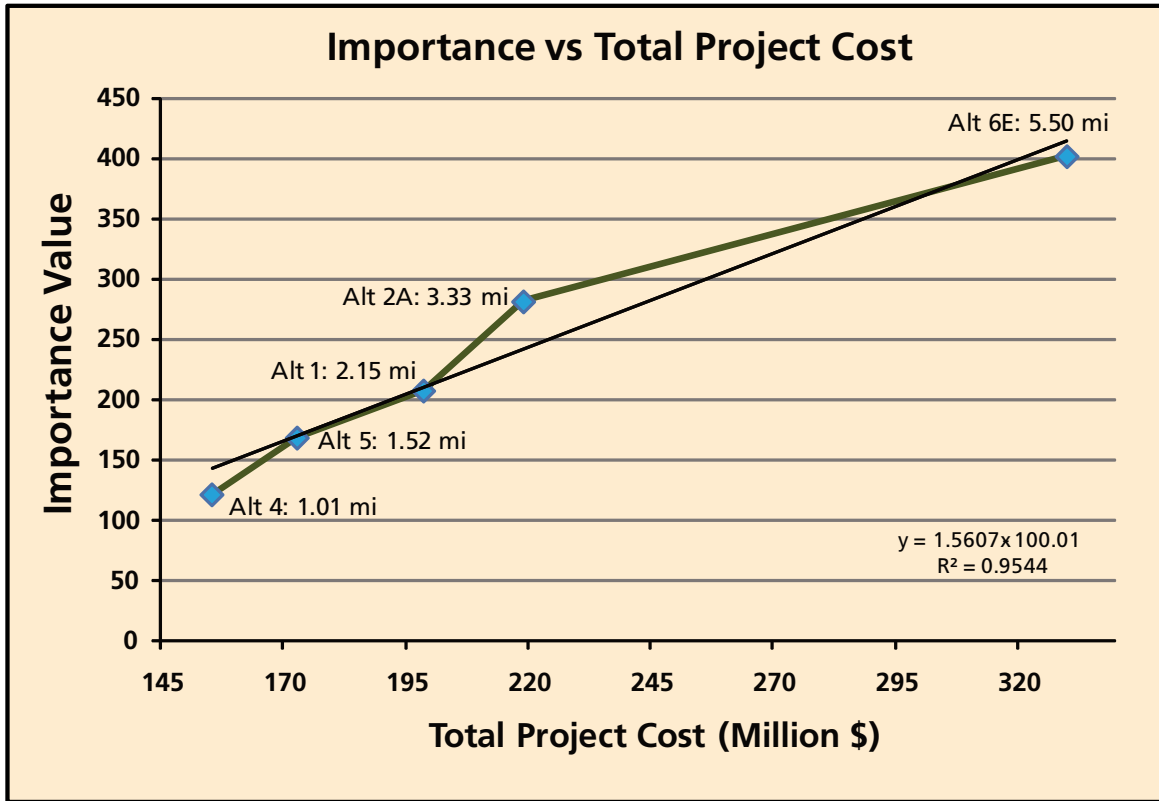


Figure 12. Total cost versus importance as prescribed by the Choosing by Advantages value analysis methodology. Alternative 6E had the highest importance but also the highest cost.

Alternative 2A was a true best value, or simply an artifact of the Choosing by Advantages scoring methodology, the National Park Service requested that the Corps apply the cost-benefit analysis technique commonly used in its project assessments. These results are depicted in Table 3 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 National Park Service Choosing by Advantages Importance Analysis, coupled with the Corps cost-benefit

analysis, resulted in the decision to identify Alternative 6E as the preferred alternative (Fig. 13).

Alternative 6E, in combination with the 1.0-mile bridge to be constructed under the 2008 Limited Reevaluation Report plan, would restore a total of 6.5 miles of ecological connectivity between Everglades National Park 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

Table 3. Results of Cost-Benefit Analysis performed by the Corps. 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.

Alternative	Total Cost (M \$) <sup>1</sup>	Importance Score	Lift over no-action	Cost per lift (M \$)	Cost Effective
No Action	0	70			
Alt 4: 1.01 mi	\$149.6	121	51	\$2.9	Yes
Alt 5: 1.52 mi	\$167.0	168	98	\$1.7	Yes
Alt 1: 2.15 mi	\$192.8	207	137	\$1.4	Yes
Alt 2A: 3.33 mi	\$213.2	281	211	\$1.0	Yes
Alt 6E: 5.50 mi	\$324.1	402	332	\$0.97	Most Efficient

<sup>1</sup>The Total Cost values in this table, and reflected in Figure 12, were completed by the Corps prior to NPS receiving additional demolition cost estimates reflected in the Total Cost values in Table 2.

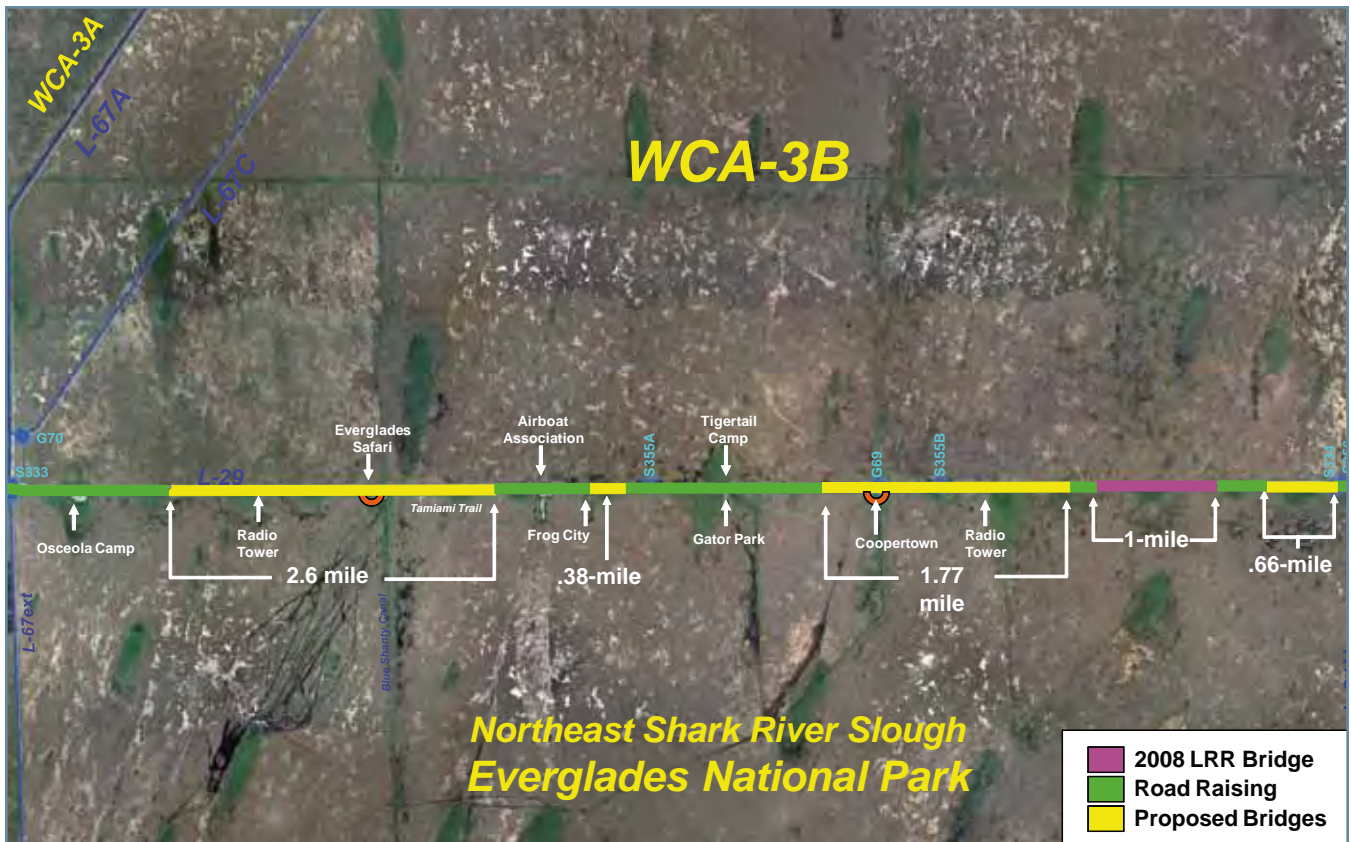


Figure 13. Alternative 6E had the highest importance score, consists of 5.5 miles of bridging, and would also maintain access to the commercial airboat facilities and the Native American Indian camps.

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 foot per second similar to historical conditions (0.05 foot per second). The removal of 6.5 miles of roadway will also reduce wildlife mortality and reconnect a large swath of the historic ridge and slough landscape, restoring breeding and foraging conditions for many aquatic and terrestrial species. Alternative 6E would provide the conveyance capacity to meet the original Modified Water Deliveries Project target water flow of 4,000 cubic feet per second and also accommodate future projects, including those of the Comprehensive Everglades Restoration Plan and recent State of Florida restoration initiatives. Importantly, the increased bridging of Alternative 6E will allow stages in the L-29 Canal to be raised to 9.7 feet. Hydrologic analysis conducted for the 2005 Revised General Reevaluation Report 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 Water Conservation Area 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 Everglades National Park. The construction easement for the 5.5 miles of bridges extends 50 linear feet south of the existing highway right-of-way, while the road-raising easement extends 30 linear feet south. The total wetland impact area would be 48.1 acres; however, the long-term benefits of the improved flow patterns and ecological connectivity outweighed these 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 on the basis of the substantial environmental benefits of Alternative 6E compared to the other alternatives.

### Regional Benefits

Two technical documents developed between 2002 and 2006 provide valuable insights into the broader ecological benefits of Alternative 6E: the 2005 Revised General Reevaluation Report, used extensively in the development and assessment of alternatives evaluated in this report, and the Modified Water Deliveries Project Combined Structural and Operational Plan, drafted by the Corps in 2006, but never finalized.



Regional modeling for the Combined Structural and Operational Plan, using the South Florida Water Management Model (36-year period of record from 1965-2000), was conducted concurrently with development of the 2005 Revised General Reevaluation Report and made similar assumptions that were later confirmed through technical analysis by the Corps and the Florida Department of Transportation. One of the major assumptions was that the eastern Tamiami Trail would require expansive bridging (culverts by themselves would not suffice) to allow unimpeded, unregulated flows between the marshes in Water Conservation Area 3 and Northeast Shark River Slough. It was determined that to provide these natural flow conditions in the marshes, the higher L-29 Canal stage of 9.7 feet was required. This stage value is the same assumption used in the Tamiami Trail Modifications: Next Steps Project.

In addition, the Combined Structural and Operational Plan regional modeling indicated substantial ecological benefits to Northeast Shark River Slough and Water Conservation Area 3 would result from a combination of higher stages (9.7 feet in L-29 Canal) and greater bridging lengths in the 10.7-mile section of the eastern Tamiami Trail. Bridging options, similar to those in Alternative 6E, would substantially improve the volume, distribution, and timing of flows to Northeast Shark River Slough, even under current conditions where flow volumes to Everglades National Park have been reduced by greater than one million acre-feet per year. The Combined Structural and Operational Plan modeling indicated that flow distributions following implementation of expansive bridging, such as the 5.5 miles of bridging provided by Alternative 6E, would improve from the current annual average distribution of 78 percent to Western Shark River Slough and 22 percent to Northeast Shark River Slough to 45 percent to Western Shark River Slough and 55 percent to Northeast Shark River Slough. This distribution is more indicative of the desired distributions following restoration and would be achievable with Alternative 6E. Combined Structural and Operational Plan modeling also indicated that the improved timing of flows achievable with an alternative such as Alternative 6E would reduce damaging high volume discharges to Western Shark River Slough through the S-12 structures, reducing the loss of wet prairie habitat in this area. In addition, the improved capacity to move greater volumes and better distributions of flows to Northeast Shark River Slough would reduce the number and severity of dry-down events (when water levels drop below the ground surface) and peat fires in both Northeast Shark River Slough and Water Conservation Area 3B.

Combined Structural and Operational Plan modeling also indicated that modifications to Tamiami Trail, such as those prescribed in Alternative 6E, would improve conditions for fish and wildlife species by providing improved average water depths and recession rates in all of Northeast Shark River Slough and areas of Water Conservation Area 3. These longer and more natural hydroperiods would begin the process of restoring ridge and slough landscape patterns and the peat soils that are the foundation of the ridge and slough habitat

in Northeast Shark River Slough. Modeling indicated that improving the flows and ecological conditions in Everglades National Park would also result in improved ecological conditions in Water Conservation Area 3. Alternative 6E could allow for both a reduction in the severity and duration of dry-down events in Water Conservation Area 3B and the prolonged deep-water conditions in southern Water Conservation Area 3A associated with loss of tree islands. The improved hydrologic changes resulting from the implementation of Alternative 6E are expected to translate into substantially improved ecological conditions in the region, benefiting threatened and endangered species, including the Wood Stork, Everglade Snail Kite, and the Cape Sable Seaside Sparrow.

In summary, Alternative 6E will remove major impediments to the natural, unregulated flow of water over greater than one million acres of the central and southern Everglades, providing the foundation for full restoration of the Greater Everglades ecosystem.



Wood Stork colony near Tamiami Trail. Photograph by Lori Oberhofer, NPS.

## SUMMARY OF FINDINGS

The 2009 Omnibus Appropriations Act directed the Department of the Interior and National Park Service to immediately evaluate the feasibility of additional bridging of the Tamiami Trail, beyond the Modified Water Deliveries to Everglades National Park Project, for purposes of restoring habitat within the park and the ecological connectivity between the park and the Water Conservation Areas. This study is ongoing. The Draft Environmental Impact Statement, which will be finalized later this year, is presently out for the 60-day public comment period that will begin with publication of the Notice of Availability in the Federal Register. Based upon the work completed to date, the Department of the Interior and the National Park Service have selected Alternative 6E, consisting of an additional 5.5 miles of bridging and road raising within a critical 10.7-mile portion of the Tamiami Trail, as the preferred alternative that best achieves the goals and purposes of the Act. Implementation of Alternative 6E, when combined with the ongoing work to implement the 1-mile bridge under the Modified Water Deliveries Project would allow for the natural, unimpeded flow of water between Water Conservation Area 3 and Northeast Shark River Slough. This segment of the Tamiami Trail would no longer function as a barrier to the restoration of Everglades National Park and the Greater Everglades ecosystem and would set the stage for full restoration of the remaining 4 million acres of Everglades that is set aside and protected under federal and state law for conservation purposes.

Alternative 6E, in conjunction with other planned restoration projects, would provide more than five times the connectivity between upstream and downstream marshes when compared to the modifications currently being constructed under the Modified Water Deliveries Project. This heightened degree of marsh connectivity would also allow for unconstrained flow patterns to Northeast Shark River Slough. In addition, ten of the historical sloughs that once flowed unobstructed within this portion of the Everglades would be reconnected. Altogether, this broad expanse of bridges would re-establish sheetflow conditions in the historic eastern flowway of Shark River Slough that closely approximate those of the natural marsh.

The total cost of Alternative 6E is \$330 million, which includes a total construction cost of \$260 million and real estate, business, and demolition costs of \$70 million. Real estate costs include the purchase of three commercial airboat facilities, two radio towers, and a flowage easement to a private recreational airboat facility. The locations of the bridges in Alternative 6E are designed to maximize environmental benefits in Everglades National Park by increasing sheetflow conditions, improving ecological connectivity, providing more natural marsh flow velocities, and reducing wildlife fatalities associated with the roadway. The bridge locations would also provide substantial buffers between the bridgeworks and all lands occupied by the Miccosukee Tribe of Indians of Florida and provide access to commercial and private airboat facilities

located along the roadway. Should Alternative 6E be authorized and funded for implementation, current law provides for the use of the park lands for this project.

In combination with an operational plan currently under development (the Combined Operational Plan), the benefits of this plan would result in immediate improvements to hundreds of thousands of acres of wetlands in Everglades National Park and Water Conservation Area 3. The 5.5 miles of bridging would allow for better distribution of existing flows to the park, improving conditions for endangered avian species, such as the Cape Sable Seaside Sparrow, Everglade Snail Kite, and the Wood Stork. This plan would also improve conditions for tree islands by reducing the duration of damaging water depths in Water Conservation Area 3A. These changes would also reduce the ongoing soil oxidation as well as the occurrence and severity of damaging peat fires in Everglades National Park and Water Conservation Area 3B.

The Department of the Interior and the National Park Service strongly endorse the preferred alternative presented in this publication as it would provide immediate and measurable benefits to both the upstream Water Conservation Areas and Everglades National Park. Upon receipt and analysis of the public comments, the National Park Service will work to finalize the study and issue a final Environmental Impact Statement and report to the Congress as required by the 2009 Omnibus Appropriations Act.



Florida panther. Photo courtesy of ©Rick Cruz, Rick Cruz Photography.







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