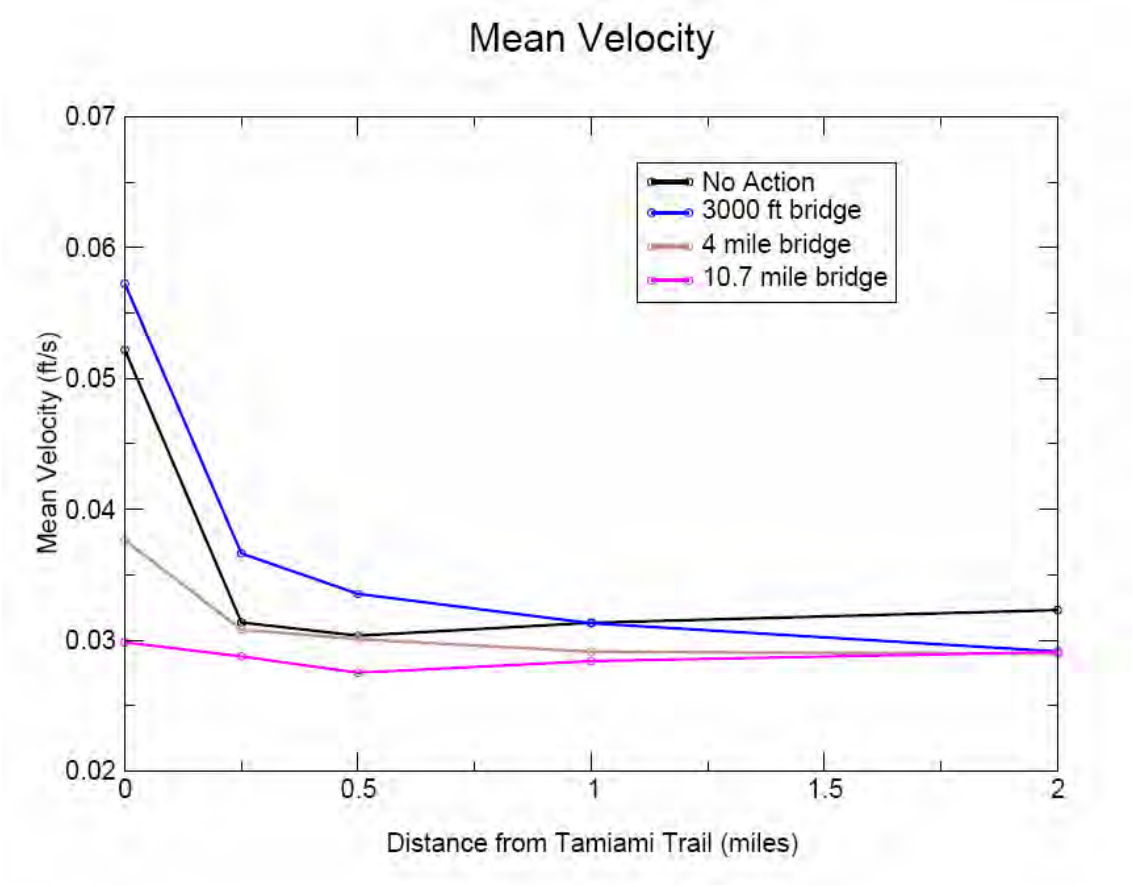

Figure 6.8. Mean velocity as a function of distance from Tamiami Trail for each of the alternatives.

The 4-mile bridge has a slightly higher mean velocity at the road (0.0375 ft/s) than downstream, and the velocity drops to a more natural velocity within the first ¼ mile. The existing condition, also achieves a more natural velocity within the first ¼ mile, although at the road it has a much higher velocity (0.052 ft/s). The 3,000-ft Bridge has roughly the same effect on marsh velocities, but has higher velocities at the road (0.057 ft/s) due to its shorter opening.

Standard deviation in the mean was also calculated for each transect. In the marsh, 5 miles from the road, the standard deviation for the simulations ranged from 0.003 to 0.005. To estimate the spatial extent of the higher velocities, the area inside the 0.045 ft/s contour (outside 3 standard deviations of the mean) was estimated for all of the alternatives. Because of the higher overall velocities in the four-bridge alternative, the analysis was performed using the mean marsh velocity of 0.043 ft/s (threshold of 0.58 ft/s) particular to this simulation. The full elevated highway, with completely unobstructed flow required only 165.7 acres to reach normal velocity. (This acreage is located directly downstream of the 4 structures contributing water to the L-29 canal which is effectively a spreader canal in this alternative).

Clearly, the full elevated highway reduces both the severity of the effect of the road and the total area affected by not forcing flow through constricting openings. The four mile bridge spreads flow over a long distance, and therefore could have a large area of impact, but the velocities are slow enough coming through the road to reach comparable marsh velocities over a very short distance.

In summary, shorter bridges force high velocities through the structures and impact larger areas downstream. Long bridges spread the velocity more uniformly over the marsh. The high flow zones alter sediment transport and nutrient dynamics, which tends to change natural marsh communities.

6.2.2.1.5. *NPS Performance Goal: Reduce high flow discharges associated with structures along Tamiami Trail*

The NPS goal is that the bridging of Tamiami Trail will provide for significant hydrological and ecological improvements to WCA-3 and ENP, but will also be accomplished with as few impacts as possible to the wetlands adjacent to Tamiami Trail. Previous RMA-2 modeling indicates that the 10.7-mile bridge (with its associated levee removed) would provide more marsh-like flow velocities at the trail than the other alternatives, causing impacts to only 165.7 acres of wetlands. The 4-Mile Bridge alternative with levee removed does not perform as well as the 10.7-mile bridge, causing impacts to 437.5 acres of wetlands. The 3,000-ft. Bridge alternative performs the worst, causing impacts to 1649.3 acres of wetlands. The No Action alternative was not modeled for this impact.

6.2.2.2. NPS Performance Goal: Restore historic water depths and hydroperiods in ENP

The weirs in the L-67 and L-29 canals in the 4-Mile Bridge alternative (and 10.7-Mile Bridge, presumably) alleviate the unnatural effects of impoundment of water especially in WCA-3A. The 4-Mile bridge provides a decrease in average wet season depths in WCA-3A closer to the natural system while increasing the depths in WCA-3B and NESS (Figure 6.9). The surface maps of water depths in Figure 6.10A and B illustrate the degree to which water is impounded in WCA-3A in the 3,000-ft Bridge alternative, compared to the 4-Mile Bridge alternative.

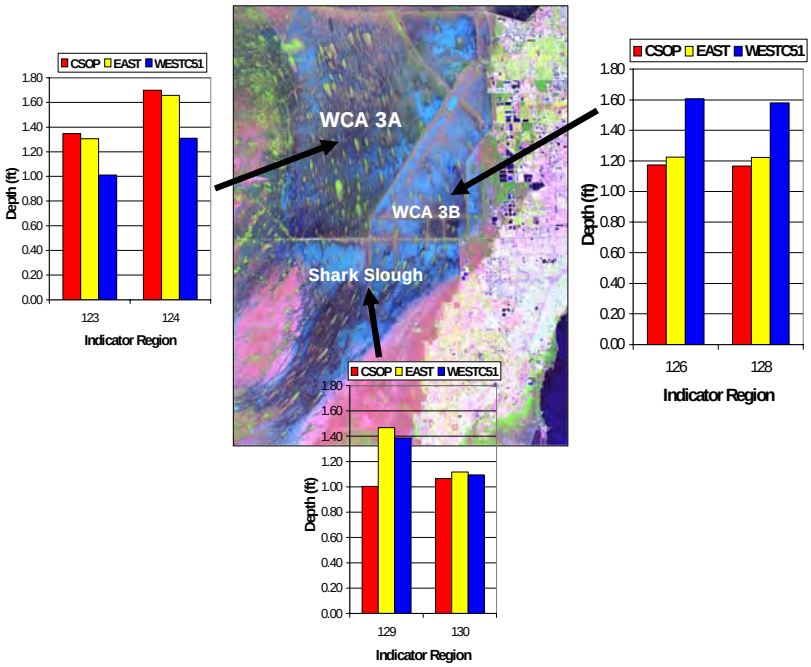

Figure 6.9. Average wet season depths for the simulation period 1965 -2000 for CSOP base/No Action (red), east bookend/3000-ft bridge (yellow), and west bookend/4-mile bridge (blue). The East Bookend increases NESS inflows, while the WCAs are largely unchanged. The West Bookend reduces damaging ponding in WCA 3A, but flows out of WCA 3B and into NESS are insufficient (WCA 3B inflows >> outflows).

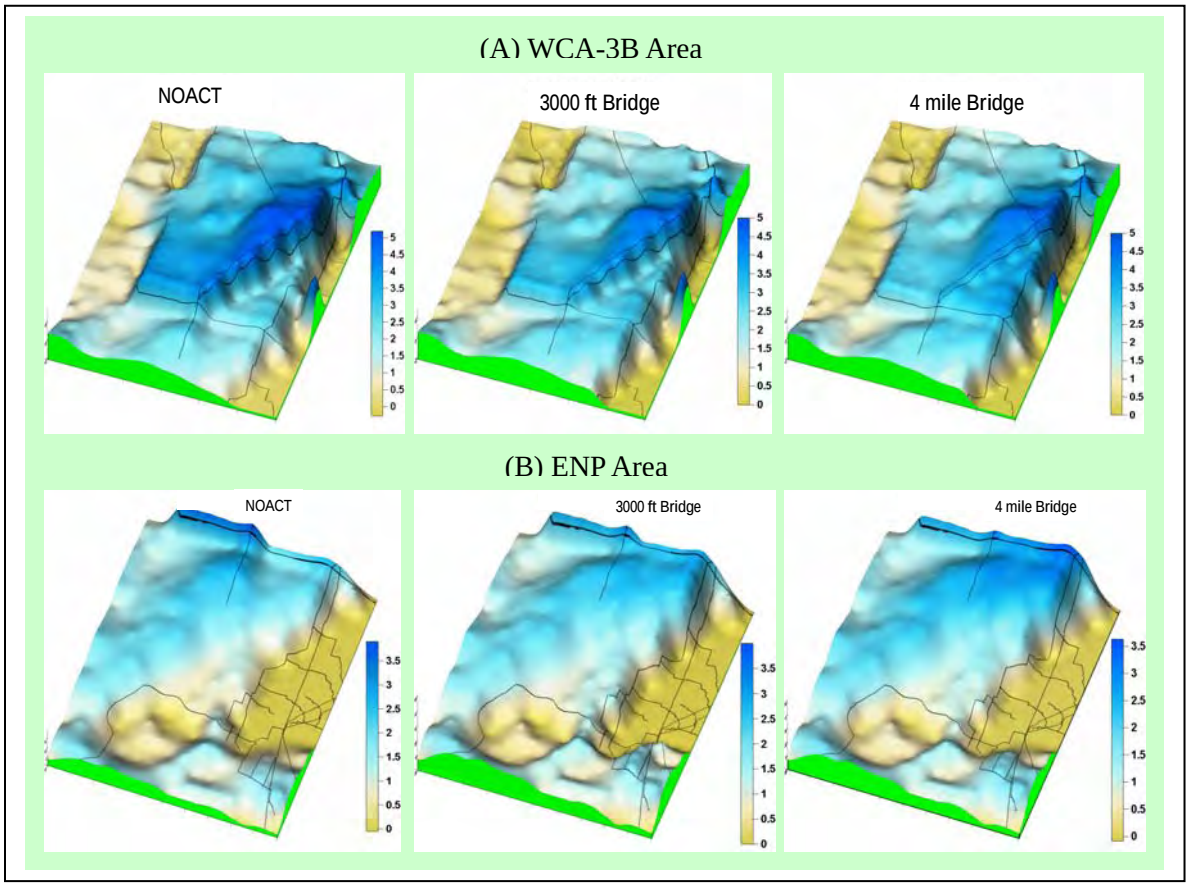

Figure 6.10 A. Average Simulated Ponding Depths in October 1995, WCA-3B Area for the No Action, 3000-ft Bridge, and 4-mile Bridge. Figure 6.10 B. Average Simulated Ponding Depths in October 1995, ENP for the No Action, 3000-ft Bridge, and 4-Mile Bridge

The 4-Mile Bridge alternative and 10.7 Mile Bridge alternatives improve stages in NESS (Figure 6.11), and the Rocky Glades (Figure 6.12 and 6.13), compared to the 3,000-ft Bridge and No Bridge alternatives. The 4-Mile Bridge and 10.7 Mile Bridge alternatives also allow for an increase in beneficial dry season flows into NESS that better mimic the monthly flow distribution of the NSM v4.6.2 (Figure 6.14).

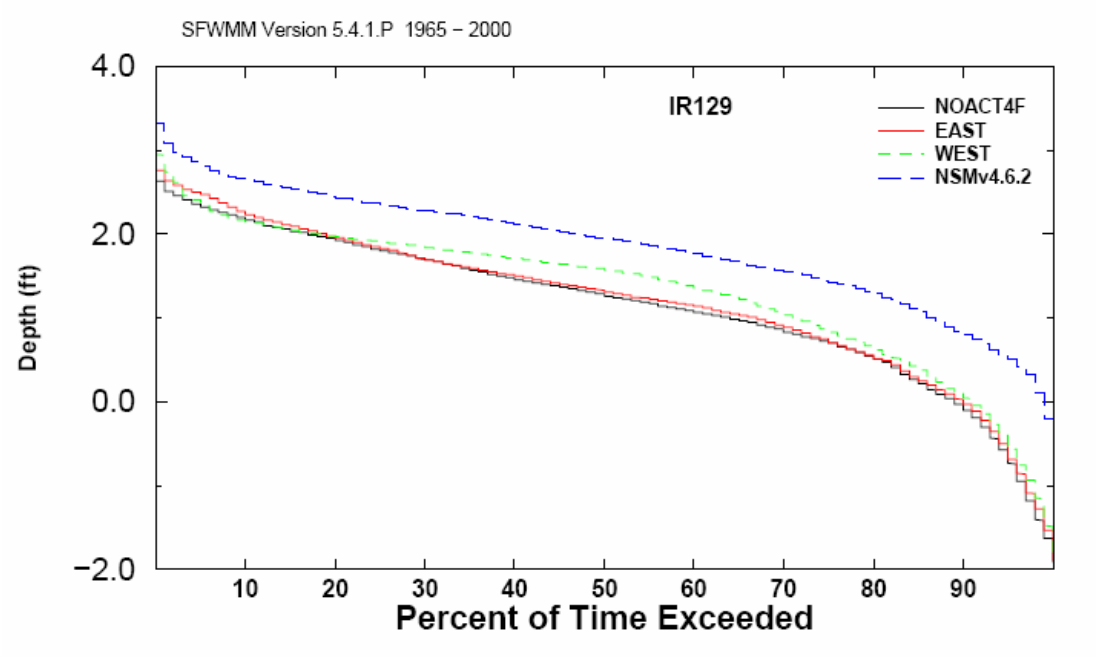

Figure 6.11. Depth duration curves for Indicator Region 129 in NESS for the simulation period 1965 – 2000.

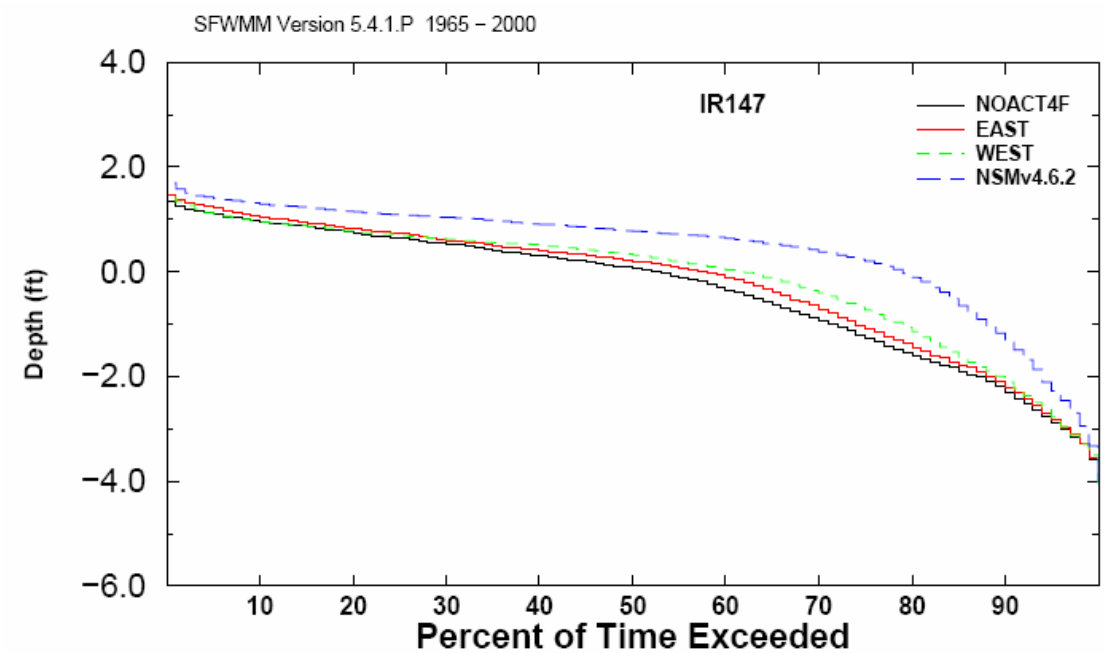

Figure 6.12. Depth duration curves for Indicator Region 147 in the western Rocky Glades for the simulation period 1965 – 2000

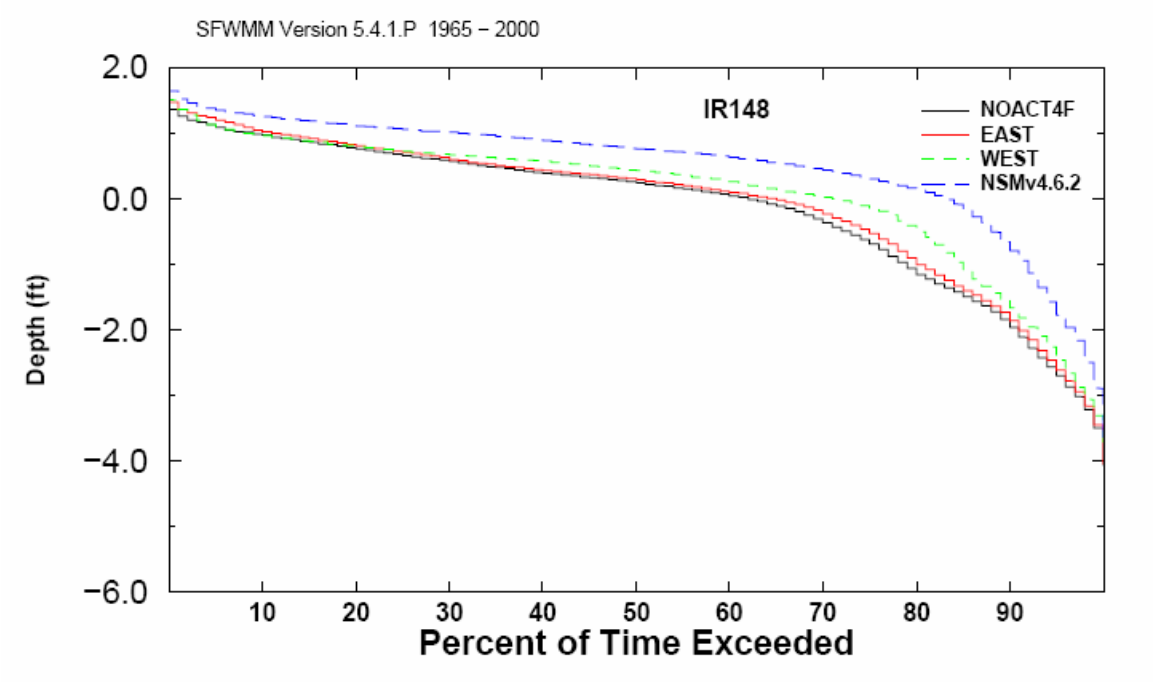

Figure 6.13. Depth duration curves for Indicator Region 148 in the eastern Rocky Glades for the simulation period 1965 – 2000

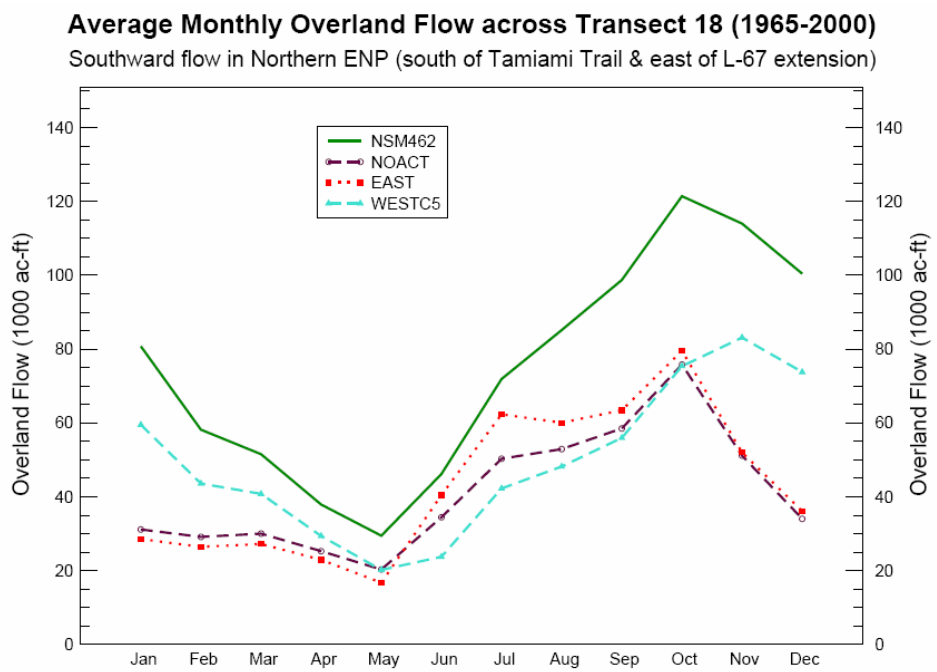

Figure 6.14. Average monthly distribution of overland flows across Transect 18 southward into NESS for the simulation period 1965 -2000.

The increased flows through the Rocky Glades in the 4-Mile Bridge and 10.7-Mile Bridge alternatives restore a natural flow-way connecting NESS with Taylor Slough. These alternatives also allow for an increase in beneficial dry season flows into NESS increasing hydroperiods towards more natural conditions and decreasing the number of MFL violations. The increase in dry season flows in the 10.7 Mile Bridge and 4-Mile Bridge alternatives reduce the number of MFL violations in NESS from 1-in-6 years to 1-in-12 years. Similarly, there is a reduction in MFL violations in mid-NESS from 1-in-6 years to 1-in-12 years when compared to the 3,000-ft Bridge alternative.

Table 6.3 summarizes the benefits of the 4-Mile Bridge alternative relative to the No Action and the 3,000-ft Bridge alternatives.

Table 6.3. Comparison of selected hydrological PMs for No Action alternative, 3,000-ft. Bridge and 4-Mile Bridge alternatives (10.7-Mile Bridge was not modeled).

Project Objectives	Metric	Alternatives		
		No Action	3,000-ft Bridge	4-Mile Bridge
Improve Distribution of Flow to Shark Slough (SS)	Percent of Total Flow (West SS /East SS)	78/22	55/45	44/56
Reduce water depths in WCA3A	Average Water Depth (ft)	1.34	1.29	1.00
Improve hydrologic connectivity between WCA3A and WCA3B	WCA3A to WCA3B flow (ac-ft x 1000)	0	192	903
Improve hydrologic connectivity between WCA3B and NESS	WCA3B to NESS flow (ac-ft x 1000)	0	61	531
Eliminate Tamiami Canal stage Constraint	L-29 Stage (ft)	7.5 ft (highly constrained)	9.3 ft (mod. constrained)	9.8 ft (unconstrained)

In conjunction with improvements in depths and hydroperiods, improvements in the timing of water deliveries to ENP are essential to the restoration of the ridge and slough landscape. The 10.7-Mile Bridge and/or 4-Mile Bridge alternative improve the timing of water deliveries so that flows fluctuate once again in consonance with natural climatic changes. This more natural flow regime based on climatological conditions reduces the deleterious effects of pulsed flows associated with regulatory discharges. The target is to mimic the NSM (shape of curve) for hydroperiods. The model results indicate that the 10.7 Mile Bridge and 4-Mile Bridge alternatives more closely mimic NSM hydroperiods in NESS and WCA-3 (see Appendix C). These results are supported by recent work by Trexler et al. (Appendix H) that indicates the following benefits associated with the 10.7-Mile Bridge and 4-Mile Bridge alternatives, including (1) improved natural recession rates in the dry season supporting larger populations of fish and invertebrates in ENP and WCA-3B, (2) reduction in dry-down events that result in damaging fires and loss of peat soils, and (3) improved recession rates needed to support healthy aquatic communities, as well as, wading birds.

In addition, the restoration of historic water depths in NESS will eliminate the discontinuity in water levels above and below Tamiami Trail. This will result in the reduction in the number and extent of dry-down events in NESS and WCA-3B, improving ecological conditions for numerous flora and fauna, including fish and invertebrates, alligators, and wading birds. Increased depths and hydroperiods in conjunction with improved timing of water deliveries to NESS will once again support the formation of

peat-forming sloughs, the most dynamic attribute of the ridge and slough landscape. Recent studies (Appendix A) indicate that the 10.7-Mile Bridge and 4-Mile Bridge alternatives would provide substantial improvements in water depths and hydroperiods in NESS associated with flow volumes and the timing of flows to support the re-establishment of ridge and slough processes. Barriers to sheetflow have resulted in the filling in of sloughs with sawgrass, reducing biodiversity and contributing to the loss of wading bird foraging habitat. Increased water depths in WCA-3B and NESS will also benefit the apple snail, a food source for a wide array of animals, and the essential food source for the endangered snail kite. Regional snail kite populations, therefore, would be expected to increase as the snail kites repopulate the area. Increased flows and water depths in NESS will also benefit the CSSS by reducing flows and depths in western Shark Slough.

6.2.2.3. Enhance and restore ecological functions in ENP

The NPS goal is that improved water deliveries to ENP will result in substantial enhancement and restoration of ecological functions in ENP, including improvements in the following four broad categories: 1) the restoration of ridge and slough processes, 2) restoration of vegetative communities, 3) restoration of fish and wildlife resources, and 4) improvements to water quality. Specific quantitative and qualitative expectations for ecological indicators of restoration within each of these broad categories are explained in the sections to follow.

6.2.2.3.1. *Restore Ridge and Slough Processes*

The NPS goal is that restoration of ridge and slough processes will provide substantial improvements in the following areas: (A) Reconnect historic slough habitats between WCA-3B and NESS, (B) Increase physical connectivity of marshes between WCA-3B and ENP, (C) Reduce pattern of scour and deposition at culverts and weirs, (D) Restore sediment flow and transport needed for Ridge & Slough building in all sloughs, (E) Reverse filling in of sloughs, and (F) Minimize difference between average velocity at the road and average velocity in the marsh.

A. Reconnect historic slough habitats between WCA-3B and NESS

The NPS goal is to maximize the reconnection of historic sloughs between WCA-3B and NESS. The 10.7-Mile Bridge would reconnect 100% of these sloughs. The 4-Mile Bridge would reconnect 37% of the sloughs, while the 3,000-ft. Bridge alternative would only reconnect 2% of the sloughs. The No Action alternative was not evaluated for this PM. It is clear that the 10.7-Mile Bridge would be much more effective in reconnecting historic slough habitats, although the 4-Mile Bridge would be much more effective than the other two alternatives.

B. Increase physical connectivity of marshes between WCA-3B and ENP

The NPS goal is to eliminate obstructions to sheetflow in Tamiami Trail and maximize the linear feet of connectivity between WCA-3B and NESS. This physical connectivity is needed in conjunction with adequate flow volumes, distributions and timing of flows to provide restoration of many of the ecological attributes in ENP**.** The ENP expectation is that the selected alternative will provide flow patterns between WCA-3B and ENP adequate to substantially reconnect and restore slough habitats in NESS. The 10.7-Mile Bridge performed best by reconnecting 55,366.08 linear ft of marsh. The 4-Mile Bridge reconnected 20,338.56 linear ft of marsh, while the 3,000-ft Bridge reconnected only 3,000 ft of marsh. This linear ft of reconnection does not assume that the flow patterns (volumes, hydroperiods, depths, etc.) are sufficient to restore slough habitats, only that increased connectivity is a critical element in slough restoration.

C. Reduce pattern of scour and deposition at culverts and weirs

The NPS goal is that the re-established flows between WCA-3B and NESS will be of sufficient breadth (bridge expanse) to prevent the pattern of scour and deposition at weirs and culverts associated with existing conditions. Based on the RMA-2 modeling results, it is expected that the 10.7-Mile Bridge and 4-Mile Bridge alternatives would provide the marsh-like flow conditions conducive to reduce the scour and deposition at the culverts and weirs evidenced in the predicted flow patterns for the 3,000-ft Bridge and No Action alternatives.

D. Restore sediment flow and transport needed for Ridge & Slough building in all sloughs

The NPS goal is that the selected alternative will substantially improve sediment flow and transport needed for ridge and slough building in NESS. The SEDFLOW modeling (Appendix E) indicates that the 10.7-Mile Bridge and 4-Mile Bridge alternatives would provide sufficient volumes and depths of flows (during wet and dry seasons) to restore sediment flow and transport needed for ridge and slough building in all sloughs. The 3,000-ft Bridge alternative does not provide adequate flow volumes or timing of flows to recreate the necessary processes for ridge and slough formation in any of the remnant sloughs.

E. Reverse filling in of sloughs

The NPS goal is that the selected alternative will reverse the current trend of filling in of sloughs. Based on the SEDFLOW modeling (Appendix B), the 10.7-Mile Bridge alternative performs the best, providing a high reduction of infilling in 100% of the sloughs. The 4-Mile Bridge alternative would reverse the infilling in approximately 37% of the sloughs, while the 3,000-ft Bridge alternative would reverse the infilling in only a small number (2%) of the sloughs.

F. Minimize difference between average velocity at the road and average velocity in the marsh.

The NPS goal is to eliminate and/or significantly minimize the impact of the bridge span on upstream and downstream flow velocities. This potential impact was investigated using the RMA-2 model and the SEDFLOW model. The RMA-2 model did not consider the increase in flow volume associated with the 4 mile and 10.7 mile bridges and therefore the flow velocity patterns produced by these simulations would underestimate the actual flow velocities. The SEDFLOW model simulates the flow pattern that result from water levels extracted from the SFWMM west bookend simulation. The SEDFLOW model explicitly accounts for vegetative resistance to water flow. Since the stages are specified in the SEDFLOW model, the changes in stage that accompany the various bridge configurations are approximate, not definitive. The RMA model runs apply no flow boundary conditions to the eastern and western boundaries, ignoring losses to canal seepage. The model simulations indicate that the 3000-ft bridge would create a concentrated zone of high flow velocity and high sediment and nutrient loading. This effect would be reduced with construction of a 4 mile bridge and be eliminated with the construction of a 10.7 mile bridge.

6.2.2.3.2. *Restore Vegetative Communities*

NPS expects successful hydrologic restoration to produce the following alterations in vegetation communities:

- Shift to open water, spikerush marsh and other slough communities in NESS
- Reduce encroachment of sawgrass and wet prairie vegetation into ENP and WCA-3B sloughs
- Reduce risk of peat-burning fires in NESS and the Rocky Glades
- Increase the extent of slough vegetation communities

- Restore deepwater slough vegetative communities (e.g., *Nymphaea*)
- Reduce potential for invasion of exotic plant species
- Reduction in area of disturbed vegetation associated with concentrated flow zones along Tamiami Trail

A. Shift to open water, spikerush marsh and slough communities in NESS

It is the NPS goal that the selected alternative will provide flow patterns to support the restoration of open water, water-lily dominated slough communities in NESS. The results of scientific analyses indicate that the 3,000-ft. Bridge and No Action alternatives would provide only a moderate recovery of slough communities; however, the 10.7-Mile Bridge and 4-Mile Bridge alternative would provide a high level of recovery for open water, slough communities.

B. Reduce encroachment of sawgrass and wet prairie vegetation into ENP and WCA-3B sloughs

The NPS goal is that the selected alternative should provide annual water depths greater than 2.5 ft in NESS to restore deep-slough vegetation and prevent encroachment of sawgrass and wet prairie vegetation. The results indicate that the slough habitats would continue to be adversely impacted by encroachment of sawgrass and wet prairie vegetation in the 3,000-ft Bridge and No Action alternatives. Conversely, the 10.7-Mile Bridge and 4-Mile Bridge alternatives would significantly reduce the encroachment of sawgrass and wet prairie vegetation.

C. Reduce risk of ridge and tree island peat burning in NESS and the Rocky Glades

The NPS goal is to eliminate the risk of peat-burning fires in NESS and in the Rocky Glades. The 3,000-ft Bridge alterative would provide only a slight reduction in risk of ridge and tree island peat burning fires in NESS; however, the 4 mile bridge and 10.7 mile bridge would provide a significant decrease in the risk of ridge and tree island peat-burning fires.

D. Increase extent of slough vegetation communities

The NPS goal is to restore annual water depths of greater than 2.5 ft. to areas characterized historically as slough habitats in NESS. The 4-Mile Bridge alternative (presumably the 10.7-Mile Bridge, as well) produces substantial improvements in water depths and durations in NESS, thus they would be expected to provide for the restoration of slough vegetation communities in much of NESS. The No Action and 3,000-ft Bridge alternatives would only have slight benefits to the restoration of slough-like conditions. The depth duration curve shows that the 4-Mile Bridge alternative and 10.7-Mile Bridge would produce significant increases in the maximum water depth in NESS, raising the water depth to nearly 3.0 ft at its highest; thus, they are likely to result in the recovery of deepwater slough vegetation communities. Table 6.4 summarizes the results of the effects of each of these alternatives on vegetative community responses.

Table 6.4. Summary of performance goals for Tamiami Trail bridge alternatives

Vegetation Target	3000-ft Bridge	4-Mile Bridge	10.7-Mile Bridge
Increase in slough vegetation	Slight	Moderate	Moderate
Restored deepwater slough	Little or none	Some	Some

Vegetation Target	3000-ft Bridge	4-Mile Bridge	10.7-Mile Bridge
Reduced risk of peat-burning fires -- NESS	Slight reduction	Slight reduction	Slight reduction
Reduced risk of peat-burning fires – rocky glades	Significant reduction	Significant reduction	Very significant reduction
Reduction in disturbed zones	Possible increase	Decrease	Mostly eliminated
Decreased invasion of exotic plants	Slight reduction	Moderate reduction	Moderate reduction

E. Decrease potential for invasion of exotic species

NPS goals for exotic plants are to 1) reduce the populations of exotic plants to a low level and maintain them there, and 2) decrease the potential for invasion of exotic plant species into the park. The drying of park habitats to the east has been associated with rapid establishment and spread of a large number of exotic plant species. The 10.7-Mile Bridge and 4-Mile Bridge alternatives perform much better than the 3,000-ft. Bridge alternative in meeting these expectations for decreasing the potential for exotic plant establishment, as they provide significantly increased hydroperiods and depths for NESS**.**

6.2.2.3.3. *Restore fish and wildlife resources*

Improvements in flow patterns, especially volume, depth, velocity, and duration of flows, should lead to restoration of the ridge and slough landscape in NESS. These improvements should result in similar benefits to fish and wildlife resources. We examined five aspects of the fish and wildlife resources of ENP in order to analyze the benefits of the different alternatives for raising portions of the Tamiami Trail.

A. Improve characteristics of aquatic communities

The 10.7-Mile Bridge alternative does best at minimizing the impact of anthropogenic structures on native fish communities across the landscape: the 4-Mile Bridge alternative also does well. The 3,000 ft bridge does not meet NPS expectations for minimizing the impact of anthropogenic structures on fish communities. In terms of increasing total biomass of fishes over current conditions in NESS and the Rocky Glades, the 4-Mile Bridge alternative provides a greater increase in fish abundance (~17%) than does the 3,000-ft Bridge (~8%) compared to the No Action alternative. The 10.7-mile Bridge was not analyzed for its effects on fish abundance. Lastly, the 10.7-mile Bridge and the 4-Mile Bridge do moderately well in terms of the potential to maintain a low proportion and abundance of exotic aquatic species within all park habitats, whereas the 3,000-ft Bridge alternative does not meet ENP expectations (Appendix H).

B. Improve conditions for wading bird foraging and nesting

With respect to bridging of the Tamiami Trail and associated increases in flow volume and hydroperiods into NESS, NPS goals for wading birds are to 1) substantially increase total abundance of wading bird populations found in ENP compared to current levels, and 2) to approximate pre-drainage patterns of colony formation, including increasing the percentage of breeding colonies found in and adjacent to the estuarine region, and increasing the frequency of formation of super colonies of wading birds.

The 10.7 mile Bridge and the 4 mile bridge are significantly more likely to substantially increase total abundance of wading bird populations found in ENP, than is the 3,000-ft Bridge alternative. The 3,000-ft Bridge alternative is unlikely to provide an increased extent of high quality foraging habitat for wading birds in ENP: it does not provide sufficient water, and the available water is in the wrong place. In addition, the 3,000-ft Bridge alternative, because it is less linked to passive management, is unlikely to provide the consistent patterns of recession and ascension of waters throughout the year that are needed for healthy colony formation and nesting success. Lastly, the 3,000-ft Bridge alternative maintains long-hydroperiod pools in the northern end of the system, rather than in the southern end near historical nesting habitat in the mangrove fringe. The 10.7-mile Bridge and the 4-Mile bridge alternative are much more likely to provide the extent and location of high quality foraging habitat needed to restore patterns of colony formation that reflect pre-drainage conditions (Appendix C).

C. Improve alligator nesting numbers and distribution

Restoration goals for alligators in ENP include the following:

1. Expansion of the geographic range of breeding age alligators

2. A shift in distribution of alligator nests from the central areas of Shark Slough toward the peripheral marshes

3. Increases in alligator total population numbers and increases in numbers of females nesting per year

4. Reduction in the frequency of excessive nest flooding associated with releases from flood control structures.

Hydrologic conditions that will lead to ENP restoration expectations for alligators include increasing the quantity of water entering NESS from the north, providing an unimpeded flow-way that allows water levels in the slough and peripheral marshes to track natural rainfall patterns, and minimizing the frequency and severity of operational hydrologic events that reverse or highly exaggerate natural hydrologic cycles. Hydrologic conditions that allow for about 2 ft of water at gauge NP-203 during late April and early May result in an increase in the number of nests produced.

The 10.7-Mile Bridge alternative would have a high potential for meeting each of the alligator expectations identified above. The 4-Mile Bridge alternative would have a high to moderate potential to meet these expectations, while the 3,000-ft. Bridge and No Action alternatives would have a low potential.

D. Reduce wildlife mortality

The 10.7-mile Bridge would provide the most benefit for wildlife moving north or south in the Tamiami Trail area (Table 6.5). The 4-Mile Bridge provides about a 37% improvement over the No Action alternative, while the 3,000-ft Bridge provides only about a 5% improvement over the No Action alternative**.**

Table 6.5. Benefits to Wildlife of the Tamiami Trail Bridging Alternatives

	Minimum # of roadkills per year*	Estimated % reduction in wildlife mortality**	Minimum # of collisions avoided
No Change	2799	0	0
3,000-ft Bridge	2650	5	149
4.0-Mile Bridge	1753	37	1046
10.7-Mile Bridge	some roadkills***	<100%	>2000

*focus is on the 10.7 mile section of Tamiami Trail east of the L67 junction

**mortality is assumed to be directly related to the length of road in contact with the ground; inversely related to the length of the bridge.

***wildlife mortality is unlikely to ever reach zero

6.2.2.4. Improve water quality in ENP

The NPS goal is that the preferred alternative will improve water quality conditions in ENP. These improved conditions include reducing the numeric concentration of total phosphorus to levels required in the Consent Decree—8.0 ppb. In addition, ENP expects that the 4-Mile Bridge or 10.7-Mile Bridge alternative will substantially reduce canal discharges to the park by providing more overland flow through WCA-3B. This increased overland flow should provide the following specific ecological benefits: (1) reduce the injurious effects of organic forms of nutrients—total organic carbon, total organic nitrogen, and total organic phosphorus—on aquatic communities, (2) increase the levels of dissolved oxygen in park wetlands, contributing to the improved viability of many wetland species, (3) reduce specific conductance and sulfate concentrations, thus reducing the debilitating effects of mercury methylation on aquatic species, (4) reduce erosion that contributes to the transportation of suspended solids and the loss of photosynthesis needed for the production of dissolved oxygen, and (5) increase nutrient cycling by reducing the aforementioned stressors that prevent nutrient uptake by plants as well as nutrient cycling by soil bacteria.

The 10.7-Mile Bridge and 4-Mile Bridge alternatives would reduce concentrations of total phosphorus entering the ENP to 8.0 ppb (OFW criteria); whereas, the 3,000-ft Bridge alternative would discharge into ENP at 11.0 ppb (3.0 ppb above the OFW criteria). In addition, the 10.7-Mile Bridge and 4-Mile Bridge alternative scored a High to High/Moderate on the following ENP performance expectations: (1) reduce the injurious effects of organic forms of nutrients—total organic carbon, total organic nitrogen, and total organic phosphorus—on aquatic communities, (2) increase the levels of dissolved oxygen in park wetlands, contributing to the improved viability of many wetland species, (3) reduce specific conductance and sulfate concentrations, thus reducing the debilitating effects of mercury methylation on aquatic species, (4) reduce erosion that contributes to the transportation of suspended solids and the loss of photosynthesis needed for the production of dissolved oxygen, and (5) increase nutrient cycling by reducing the aforementioned stressors that prevent nutrient uptake by plants as well as nutrient cycling by soil bacteria. In contrast, the 3,000-ft Bridge alternative scored a “Low” on each of these performance expectations.

6.3. Environmentally Preferred Alternative

Based on the performance of the environmental project objectives and performance measures from the matrix (Table 6.1), the NPS concludes that Alternative 4 (10.7-mile elevated highway) exhibits superior performance in meeting the stated environmental objectives compared to the other proposed alternatives. The ENP position is that Alternative 4 is the environmentally preferred alternative as evidenced by the following:

- Provides the highest ratio of overland flows to NESS from WCA-3B.
- Performs equally as well as the 4-Mile Bridge in providing NSM flow volumes to NESS and ENP.
- Provides the highest degree of unrestricted flow across the entire 10.7-mile project corridor between WCA-3B and ENP, providing nearly 69% of historic (NSM) flow volumes to NESS.
- Substantially shifts the historic flow distributions (30/70 W/E) back to the east side of the L-67A canal—from the present 78/22 W/E split to 44/56.
- Provides the highest level of physical connectivity between WCA-3B and NESS with the highest reduction in wetland impacts compared to the other alternatives.
- Reduces and nearly eliminates wildlife mortality by 1,584 individuals, or a 100 percent reduction
- Has no increase in average velocity at the road over marsh velocity
- Eliminates the discontinuity in water levels above and below Tamiami Trail
- Eliminates the pattern of scour and deposition at culverts and weirs, restoring sediment flow and transport needed for ridge building in all sloughs
- Significantly reduces the risk of ridge and tree island peat burning fires in NESS and in the Rocky Glades
- Substantially reduces encroachment of sawgrass and wet prairie vegetation into sloughs, and provides a significant shift toward open water, spikerush marsh and slough communities in NESS
- Provides the highest level of improvement to aquatic fish communities
- Has the highest reduction in the risk for invasion of exotic aquatic species
- Provides the greatest improvement in conditions for wading bird foraging and nesting
- Provides the highest level of improvement for alligator nesting numbers and distribution
- Provides the highest level of water quality improvement to ENP by (1) reducing the concentration of TP discharged to ENP, (2) reducing the injurious effects of TOC, TON, and TOP, (3) increasing levels of dissolved oxygen in ENP, (4) reducing effects of high sulfate concentrations, and (5) increasing nutrient cycling and uptake by biota

7. ENP Views and Recommendations for the Tamiami Trail Component of the Modified Waters Deliveries to Everglades National Park Project

7.1. Review of Evaluation Criteria and Environmentally Preferred Alternative

Four alternatives were evaluated in this report using 30 performance measures (PMs) associated with the two major environmental objectives of this project: (1) meet the Reasonable and Prudent Alternative for the CSSS as specified in the FWS Biological Opinion of February 1999, and (2) allow for restoration consistent with the 1989 ENP Protection and Expansion Act. The latter objective was further sub-divided into six specific environmental objectives: (1) restore water deliveries to ENP, (2) restore historic water depths and hydroperiods in ENP, (3) restore ridge and slough processes, (4) restore vegetative communities, (5) restore fish and wildlife resources, and (6) improve water quality in ENP. These 6 environmental project objectives were further sub-divided into the 30 environmental performance measures (refer to Table 6.1).

The analyses of these performance measures represents a broad spectrum of scientific expertise from both inside and outside of the NPS and represents the best available scientific information at the time of this report. Each of the alternatives was evaluated initially for performance in meeting the environmental objectives of the project for the explicit purpose of identifying the environmentally preferred alternative. Based on this approach, the 10.7-Mile Bridge was determined to be the environmentally preferred alternative, as its performance in meeting the environmental objectives was superior to all other alternatives. These analyses identified the 4-Mile Bridge as the preferred project alternative.

7.1.1. Evaluation Process Used to Identify the Recommended Alternative

The hydrological performance measures used in this report are based primarily on SFWMD model (version 5.4) outputs from the No Action, 3,000-ft Bridge and 4-mile Bridge model runs. RMA-2 and SEDFLOW modeling was also used, where appropriate. The ecological performance measures are based on the aforementioned modeling results, as well as, recent scientific studies by ENP staff and scientists from outside the park (see Appendix for complete list). The PM units range from the highly quantitative, such as acres impacted, to the less quantitative, such as a qualitative score based on best professional judgment. In order to present all of the performance measures for all of the objectives into a unified evaluation tool, all performance measures were combined into a matrix for purposes of comparing alternatives. The matrix is used in conjunction with the project constraints and the evaluation methodology described above to identify the ENP recommended plan.

Using the evaluation matrix, the four alternatives were assigned a numeric performance score. The values for the performance scores are provided in Table 7.1 and summarized in Figure 7.1. Scores are based on the relative performance of each of the alternatives from worst (low numeric score) to best (high numeric score). The scores assigned to the 30 PMs were chosen to simply provide a numeric separation of the alternatives, especially the alternative that provides the most ecological/hydrological benefits. The exact value of the performance score was derived based on the following scoring approach. A score from 1-5 was assigned to each of the 30 PMs based on the following logic: a score of (1) was given to the lowest performing PM; a score of (2) was given to the second lowest performing PM; a score of (3) was given to the second highest performing PM, and a score of (5) was given to the highest performing PM. Whenever

there was a tie for the highest performing PM, both PMs were scored a (5). If there was a tie for lowest performing PM, both were scored a (1). The elevation in score from the second best PM to the best (3 to 5) was used to help differentiate the top two alternatives.

Table 7.1. Objectives and Performance Measure Scores

Objectives and Performance Measures	Tamiami Trail Alternatives				
	NPS	1	4	3	2
	Expectation	No Action	3,000 ft. Bridge	4-Mile Bridge	10.7-Mile Bridge
Project Objectives					
1. Meet the RPA for the CSSS as specified in the FWS BO of Feb. 1999					
A. Design flow passing under the eastern section of Tamiami Trail (between the S-334 and the L-67s) meets 60 percent of the regulatory portion of the rainfall formula derived total flows across the Tamiami Trail.	5	5	5	5	5
2. Allow for restoration consistent with 1989 ENP Protection and Expansion Act					
2A. Restore water deliveries to ENP					
A. Restore historic distribution of flows to ENP	5	2	1	5	5
B. Restore historic flow volumes to ENP	5	1	2	5	5
C. Restore historic overland flow volumes from WCA-3A to WCA-3B	5	2	1	5	5
D. Restore historic overland flow volumes to NESS	5	2	1	5	5
E. Restore historic sheetflow conditions to NESS	5	2	1	5	5
F. Reduce high flow discharges associated with structures in Tamiami Trail	5	1	2	3	5
2B. Restore historic water depths and hydroperiods in ENP					
A. NESS Stage Requirement: Eliminate discontinuity in water levels above and below Tamiami Trail	5	1	1	5	5
B. Reduce water depths in WCA-3A	5	1	2	5	5
C. Reduction in MFL violations in NESS (dry-season depths)	5	1	1	5	5
D. Reduction in MFL violations in mid-NESS (dry-season depths)	5	1	1	5	5
2C. Enhance and restore ecological functions in ENP					
Restore ridge and slough processes					
A. Reconnect historic slough habitats between WCA-3B and NESS	5	1	2	3	5
B. Increase physical connectivity of marshes between WCA-3B and ENP	5	1	2	5	5
C. Reduce pattern of scour and deposition at culverts and weirs	5	1	1	5	5
D. Restore sediment flow and transport needed for R & S building in all sloughs	5	1	1	5	5
E. Reverse filling in of sloughs	5	1	1	3	5
F. Minimize difference between average velocity at the road and average velocity in the marsh.	5	1	1	3	5
Restore vegetative communities					
A. Shift to open water, spikerush marsh and slough communities in NESS	5	1	1	5	5
B. Reduce encroachment of sawgrass and wet prairie vegetation into ENP and WCA-3B sloughs	5	1	1	5	5
C. Reduce risk of ridge and tree island peat burning in NESS	5	1	1	5	5
D. Reduce risk of ridge and tree island peat burning fires in Rocky Glades	5	1	1	5	5
E. Increase extent of slough vegetation communities	5	1	1	3	5
F. Potential for invasion of exotic plant species	1	1	2	5	5
Restore fish and wildlife resources					
A. Improve characteristics of freshwater aquatic communities					
- Increase total abundance of fishes in ENP marshes, including Shark Slough and Taylor	5	1	2	5	5
- Potential for invasion of exotic aquatic species	1	1	1	5	5
B. Improve conditions for wading bird foraging and nesting	5	1	1	3	5
C. Improve alligator nesting numbers and distribution	5	1	1	3	5
D. Reduction in wildlife mortality (shown as % reduction compared to no action)	5	1	2	3	5
Improve water quality in ENP					
A. Reduce concentration of TP discharges to ENP from L-67A Canal	5	1	1	5	5
B. Reduce injurious effects of organic forms of nutrients--TOC, TON, and TOP	5	1	1	3	5
C. Increase dissolved oxygen to support health of aquatic species	5	1	1	3	5
D. Reduce specific conductance and sulfate concentrations	5	1	1	3	5
E. Reduced erosion--less sediment and TSS transport	5	1	1	3	5
F. Increase in nutrient cycling, uptake by biota	5	1	1	3	5
Objective Mean Score		1	1	3	5
Sum		37.00	41.00	139.00	165.00
Rank		4	3	2	1

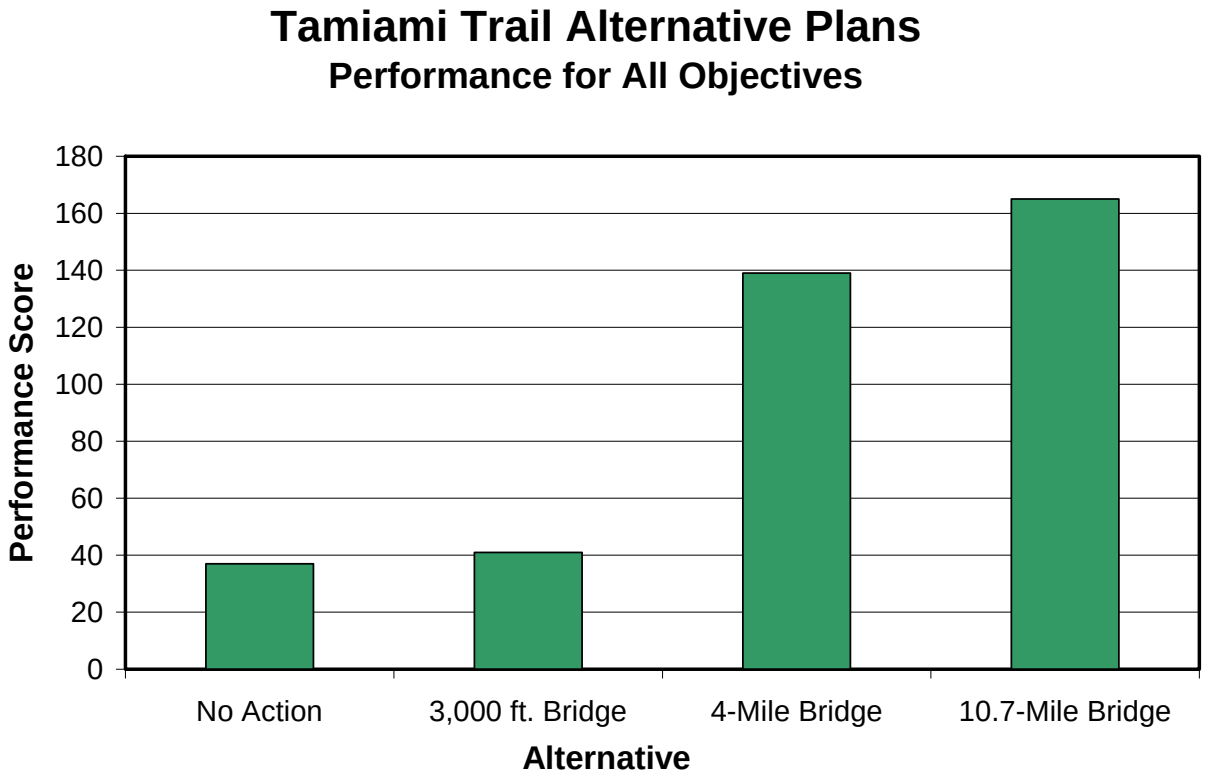

Figure 7.1. Alternative Performance Summary

7.1.2. Screening of Alternatives Based on FDOT Concerns

As stated earlier, NPS will not consider implementation of any alternative that could result in the unmitigated deterioration of the Tamiami Trail roadbed or other conditions that would result in a human safety hazard associated with the continued use of the Tamiami Trail. The No Action and 3,000-ft bridge alternatives, as modeled by the Corps using the SFWMD Model, do not meet the road safety requirements as identified by FDOT.

Based on these designs and the NPS position on road safety, only the 10.7-Mile Bridge and 4-Mile Bridge alternatives meet the FDOT screening criteria for acceptability. More recent CSOP modeling identified a 3,000-ft. bridge alternative with an unconstrained L-29 canal stage that would meet FDOT requirements. These results were not available for evaluation by the scientists who contributed to this report. However, a review by hydrologists of ENP indicates that this 3,000-ft. bridge alternative had similar overland flow characteristics as the 3,000-ft alternative with the 9.3 DHW evaluated in this report, i.e., only 13% of flow from WCA-3B to NESS was overland flow similar to the 11% overland flow from WCA-3B to NESS in the 9.3 DHW alternative.

7.1.3. Screening of Alternatives Based on Current Fiscal Constraints

While the 1989 ENP Expansion and Protection Act states that the MWD Project features are “justified by the environmental benefits to be derived by the Everglades ecosystem in general and by ENP in particular and shall not require further economic justification…” ENP also recognizes the fact that limited funds are

available to the project from the NPS. The March 2005 version of the Capital Asset Plan (OMB Circular A-11 Exhibit 300[b], Modified Water Deliveries) indicates that the current level of funding available from the NPS for the Tamiami Trail component of the MWD Project is $130.3 million (Corps confirm). The current Office of Management and Budget baseline cost for the MWD Project is $398.42 million. This baseline was approved in January 2005 and it includes a cost-sharing proposal in the FY 2006 President's Budget between the DOI, the Corps, and the State of Florida for $259.65M, $123.76M, and $15M, respectively. Should the contribution from the State of Florida not materialize, the funding allocation will be assumed by the DOI.

While this level of funding does not represent the final amount that could potentially be made available by the NPS, it is the opinion of the NPS that alternatives significantly higher than the amounts stated in the Capital Asset Plan would not be supported due to the current funding priorities within the NPS.

The two alternatives that were not eliminated due to FDOT constraints—10.7-Mile Bridge and 4-Mile Bridge—were assessed for relative performance for the environmental objectives in the context of the fiscal constraints imposed by the DOI. The 10.7-Mile Bridge (Environmentally Preferred Alternative) has a construction cost of approximately $230 million (Corps confirm). This exceeds the current amount available by approximately 100 million from the DOI. Based on this decision, the NPS is compelled to screen from further consideration the 10.7-Mile Bridge alternative.

Should additional funding be made available from other sources, NPS would amend this position to include the environmentally preferred alternative that clearly exhibited superior performance for the environmental objectives. However, in the absence of additional sources of funding only the 4-Mile Bridge alternative meets the fiscal constraints identified by NPS.

7.2. Summary of Alternative Performance for the Recommended Plan

7.2.1. 4-Mile Bridge—Alternative 3

The ENP has identified the 4-Mile Bridge alternative as the recommended plan. It is the position of the ENP that Alternative 3 performs sufficiently well for all environmental project objectives and falls within the limits imposed by the project constraints as evidenced by the following:

- Provides the same high ratio of overland flows to NESS from WCA-3B 44/56 (W to E), as in the 10.7-Mile Bridge alternative.
- Provides 69% of historic flow volumes to NESS (same as 10.7-Mile Bridge).
- Substantially shifts the historic flow distributions (30/70 W/E) back to the east side of the L-67A Canal—from the present 22/78 W/E split to 44/56 (same as 10.7-Mile Bridge).
- Meets the FDOT concern for road safety by providing necessary mitigation to offset the adverse impacts to road safety associated with the projected high water following implementation of the MWD Project.
- Provides the acceptable performance for all project objectives for the funds expended. The estimated construction costs are also within the capability of the limited funding available from the NPS.
- While the ENP has concerns that the current configuration of Alternative 3 provides only 37% of the potential connectivity between WCA-3B and NESS, the NPS anticipates that additional connectivity can be provided through future CERP related modifications, such as future removal of the levee paralleling the L-29 canal.
- Reduces wildlife mortality—a reduction of 570 individuals, or a 37% reduction

- Reduces flow velocities and impacts to only 437.5 acres of wetlands
- Increases average velocity at the road by 0.008 ft/s over marsh velocity
- Reduces discontinuity in water levels above and below Tamiami Trail
- Provides the opportunity for reconnection of 37% of sloughs (4 large sloughs)
- Eliminates pattern of scour and deposition at culverts and weirs
- Restores sediment flow and transport needed for ridge building in 37% of area
- Reverses infilling in 37% of sloughs
- Significantly reduces risk of ridge and tree island peat burning fires in NESS and in the Rocky Glades
- Restores vegetative communities in 37% of sloughs
- Reduces encroachment of sawgrass and wet prairie vegetation into ENP and WCA-3B sloughs
- Creates a substantial shift toward open water, spikerush marsh and slough communities in WCA-3B and NESS
- Provides the a moderate level of improvement to aquatic fish communities
- Provides a moderate reduction in the risk for invasion of exotic aquatic species
- Provides a moderate improvement in conditions for wading bird foraging and nesting
- Provides a high to moderate level of improvement for alligator nesting numbers and distribution
- Provides the high to moderate level of water quality improvement to ENP by (1) reducing the concentration of TP discharged to ENP, (2) reducing the injurious effects of TOC, TON, and TOP, (3) increasing levels of dissolved oxygen in ENP, (4) reducing effects of high sulfate concentrations, and (5) increasing nutrient cycling and uptake by biota

7.3. Alternatives Eliminated based on Poor Environmental Performance and/or Human Safety Concerns—No Action and 3,000-ft Bridge alternatives

7.3.1. 3,000-ft Bridge—Alternative 2

- Has a poor distribution of flows to ENP—55/45 (W to E)
- Provides much less flow volumes to ENP, compared to the 4-Mile Bridge alternative—666,000 ac-ft/per year, compared to 987,000 ac-ft/per year.
- Provides only 61,000 ac-ft/per year of flows through WCA-3B to NESS, compared to 531,000 in alternatives 3 and 4.
- Provides only 11% of overland flows to NESS from WCA-3B, compared to 56% in alternatives 3 and 4.
- Increases MFL violations in NESS and Mid-NESS from 1-in-12 years to 1-in-6 years for NESS and 1-in-12 to 1-in-7.2 years for Mid-NESS.
- Continued discontinuity in water levels above and below Tamiami Trail.
- North-south connectivity is only 5.4% of the 10.7-mile project length.
- Wildlife mortality remains a concern with a reduction of only 84 individuals, or a 5.3% reduction.
- Increases flow velocity in 1649.3 acres, compared to only 437.5 for Alt. 3 and 165.7 for Alt. 4.
- Increases average velocity at the road by 0.027 ft/s over marsh velocity;
- Opportunity to reconnect only 2% of sloughs (1 small slough)
- Continued pattern of scour and deposition at culverts and/or weirs

- Continued lack of sediment flow and transport needed for ridge building (and tree island formation)
- Continued filling in of sloughs
- Slightly reduced risk of ridge and tree island peat burning fires in NESS and Rocky Glades
- Continued high water levels in southern WCA-3A, with large open water areas and reduced sawgrass ridge vegetation
- Slight reduction of sawgrass and wet prairie vegetation into sloughs in ENP and eastern WCA-3B
- Reduced but continued encroachment of sawgrass and wet prairie vegetation into sloughs
- Provides low level of improvement to aquatic fish communities
- Provides low reduction in the risk for invasion of exotic aquatic species
- Provides low improvement in conditions for wading bird foraging and nesting
- Provides low level of improvement for alligator nesting numbers and distribution
- Only minimally improves water quality conditions in ENP.

7.3.2. No Action—Alternative 1

- Has a poor distribution of flows to ENP—48/52 (W to E)
- Provides much less flow volumes to ENP, compared to the 4-Mile Bridge alternative-790 thousand ac-ft/per year, compared to 949.
- Provides only 104 thousand ac-ft/per year of flows through WCA-3B to NESS, compared to 531 in alternatives 3 and 4.
- Provides only 13% of flows to NESS from WCA-3, compared to 56% in alternatives 3 and 4.
- Increases MFL violations in NESS and Mid-NESS from “1-in-12” years to “1-in-6” years for NESS and “1-in-7.2” years for Mid-NESS.
- Continued discontinuity in water levels above and below Tamiami Trail
- Wildlife mortality remains a concern with no reduction in mortalities.
- Flow velocities at the trail are not reduced.
- Opportunity to reconnect 0% of sloughs.
- Continued pattern of scour and deposition at culverts and/or weirs
- Continued lack of sediment flow and transport needed for ridge building (and tree island formation)
- Continued filling in of sloughs
- Slight reduced risk of ridge and tree island peat burning fires in NESS and Rocky Glades
- Continued high water levels in southern WCA-3A, with large open water areas and reduced sawgrass ridge vegetation
- Slight reduction of sawgrass and wet prairie vegetation into sloughs in ENP and eastern WCA-3B
- Reduced but continued encroachment of sawgrass and wet prairie vegetation into sloughs
- Provides low level of improvement to aquatic fish communities
- Provides low reduction in the risk for invasion of exotic aquatic species
- Provides low improvement in conditions for wading bird foraging and nesting
- Provides low level of improvement for alligator nesting numbers and distribution
- Only minimally improves water quality conditions in ENP.

7.4. NPS Recommendations for Implementation of the Recommended Plan

The Corps concluded in their 1992 GDM that the final plan for "Conveyance of water from WCA-3A to WCA-3B would restore the historic flow patterns in the Everglades Basin. By so doing, 100,000 acres of prime Everglades' habitat would be brought back as a fully functional component of the Everglades system. The surface water component added to direct rainfall effects in WCA-3B would recreate the hydrologic dynamics in the system that has been almost totally lost since the area was impounded. The additional volume would create a fluctuating water level with seasonally deeper water in the center of the historic slough in WCA-3B, and would restore the historic short hydroperiod in the marshes along the eastern edge. This would build up the food resource base of small fishes and macroinvertebrates for harvesting by wading birds during the dry season recession. The increased water levels and secondary productivity combined with the topographical heterogeneity of the area would create a seasonal diversity of feeding habitats. This would greatly increase the opportunities for wading birds to forage sites under a wide range of water conditions. Ecological restoration of WCA-3B is believed to be the key to restoring long-term trends in successful nesting by wood storks and other wading birds in the park because it historically played such an important role in sustaining the large nesting colonies during the dry season. Increased water depths would also benefit the apple snail, a food resource for a wide array of animals, and the essential food source for the snail kite. Regional snail kite populations, therefore, would be expected to increase as the kites repopulate the area." The 1992 GDM also states that "hydrologic restoration of WCA-3B is also essential to restoring natural water conditions in the park. Diversion of flood waters from WCA-3A into detention in WCA-3B would decrease the volume of and, in some cases, the need for regulatory water releases into the park from WCA-3A."

This emphasis by the Corps on the hydrological and ecological restoration of WCA-3B and restoring the hydrologic connection between WCA-3B and NESS complements many of the hydrological and ecological expectations and subsequent recommendations in this report by the NPS. Importantly, NPS believes that restoring "substantial" overland flows through WCA-3B to NESS must be an essential component of the Tamiami Trail Project. The justification for raising the Tamiami Trail roadbed, removing the parallel levee, and bridging the trail must be based on the scientific understanding that substantial overland flows from WCA-3B to NESS are required to restore the many ecological attributes of both WCA-3B and ENP (as noted in the Corps summary above). It is the scientific position of the NPS that "substantial" volumes of flows from WCA-3B to NESS should be >500,000 ac-feet/per year (refer to Table 6.1). This volume could be considered "substantial" in the sense that it is a reasonable step toward NSM levels (NSM levels are approximately 1.3 million ac-feet/per year). The NPS would find it difficult to scientifically support or monetarily justify any alternative that does not meet a minimum threshold of 374,000 ac-ft/per year. This 374,000 ac-ft/per year figure is based on the expectation that the Tamiami Trail alternative will provide for CERP-level (CERP0) overland flows from WCA-3A through WCA-3B to NESS. Finally, full restoration of "substantial" flows through WCA-3B to NESS will not be effectuated without the removal of the levee that parallels the section of the trail where the bridge is located.

7.5. The NPS Recommendations for Location of the 4-Mile Bridge

The NPS recommends that the 4-Mile Bridge be located along the Tamiami Trail corridor based on the following siting criteria:

1. Enhance ecological connectivity
2. Facilitate hydraulic passage of flows
3. Avoid or minimize adverse effects on state and federally listed species

4. Minimize wildlife mortality
5. Maintain CERP compatibility, and
6. Reduce seepage losses east of L-30 and L-31N

1. Enhance ecological connectivity- A 4-Mile Bridge location in a west-central location of the Tamiami Trail provides more ecological benefits than an eastern location. These benefits include greater reconnection between historic ridge and slough habitats between WCA-3B and NESS, as the eastern area of WCA-3B and NESS has undergone significant subsidence and loss of historic ridge and slough flow patterns. In addition, since the west-central location is less degraded, i.e., maintains the corrugated features associated with a ridge and slough system (Figure 7.2), these locations will be more effective in restoring sediment flow and transport needed for ridge and slough building, reverse filling in of sloughs, restore more vegetative communities, and improve fish and wildlife resources.

2. Facilitate Hydraulic Passage of Flows- As evidenced in Table 7.2, the majority of historic flows (51%) passed through culverts 43-50 in the west-central location of the trail; whereas, only 37% passed through the culverts 51-59 on the eastern end of the trail (Table 7.2). This is because the land elevation is lowest in this area and there is still evidence of slough corrugation, allowing some flows even during the dry seasons. Obviously, the reason the airboat enterprises are located more in the west-central location is due to the fact that there are flows through this area, even during the dry season (Figure 7.2). The NPS recommends that the 4-Mile Bridge be located to optimize the hydrological and ecological benefits of this historic flow path. Moreover, the U.S. Army Corps of Engineers completed a Value Engineering Study in 2001 that evaluated conveyance and seepage features for the MWD project. In this VE report, the Corps recommends passive weirs for the L-67A canal, filling in of the L-67C canal, and the addition of three passive weirs in the L-29 canal to facilitate the passage of flows to NESS. The Corps recommends that two of the weirs be located to the west of S-355A and B in a west-central location of L-29—similar to that proposed by NPS for the 4-Mile Bridge alternative. The other weir would be located to the east of the S-355s. This recommendation by the Corps is consistent with the NPS recommendation designed to maximize flows through WCA-3B to NESS.

Table 7.2. Average Seasonal Culvert Flow for a dry-average and wet year.

	Average Seasonal Flow (cfs)	
Year	**Culverts 43-50**	**Culverts 51-59**
Dry-Average Year 1943 Wet Season	47.19	11.41
1943 Dry Season	30.3	13.23
Wet Year 1947 Wet Season	555.85	331.9
1947 Dry Season	576.02	508.25

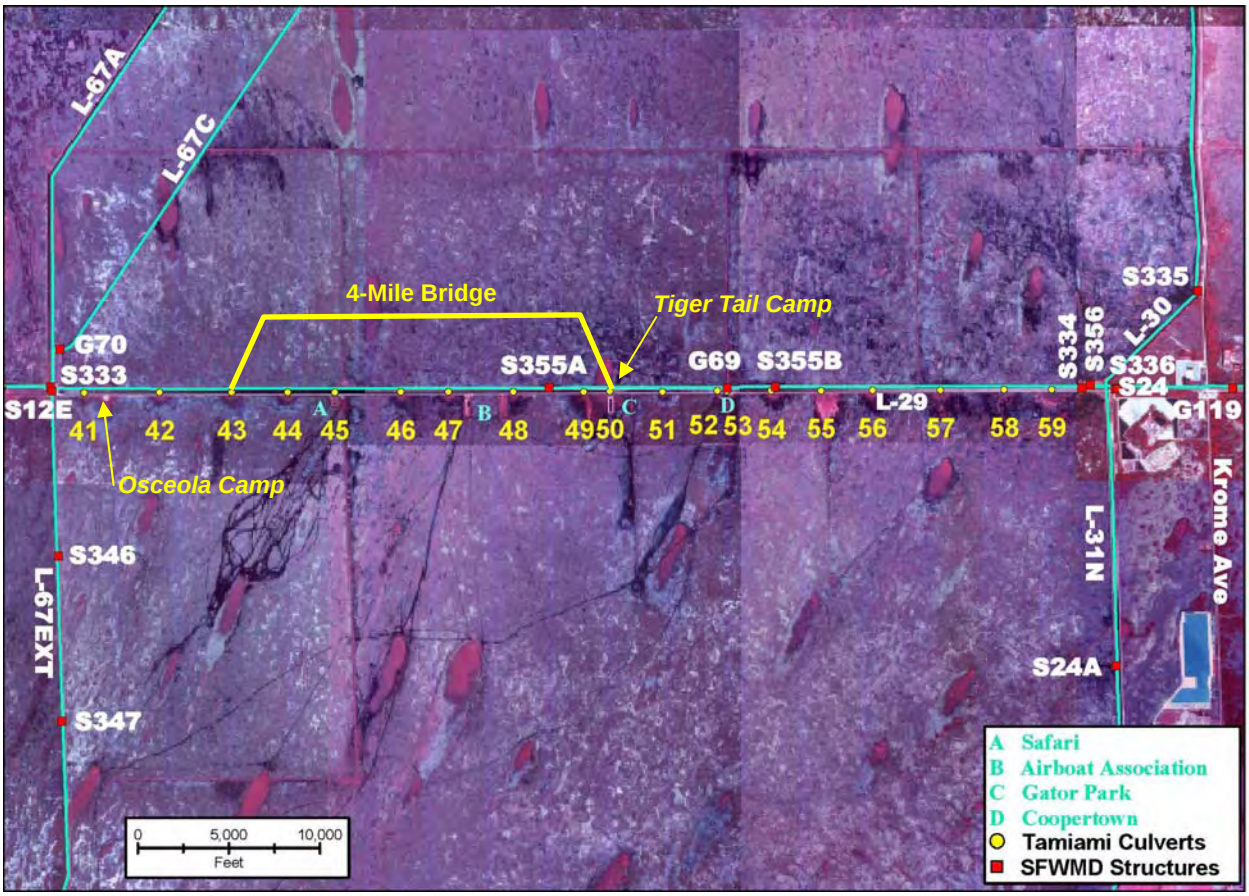

Figure 7.2. Proposed location of the 4-Mile Bridge alternative.

3. Avoid or Minimize Adverse Effects on State and Federally Listed Species- The FWS has identified the potential eastern location as having potential impacts to a colony of wood stork (*Mycteria Americana*) in that area. Based on this information, a more western location would be preferable due to concern for this endangered species.

4. Minimize Wildlife Mortality- There is no significant difference in the performance of different bridge locations in meeting the siting criterion of meeting wildlife mortality.

5. Maintain CERP Compatibility- The west-central location would be more consistent with future CERP objectives compared to the proposed eastern location, as these sites would be more effective in reconnecting historic sloughs between WCA-3B and NESS. The reconnection of these historic sloughs will allow for the increase in flow volumes to NESS associated with future CERP objectives without the increased seepage problems associated with a bridge on the eastern side of the trail.

6. Reduce Seepage Losses east of L-30 and L-31N- Aquifer properties vary along Tamiami Trail and as a result hydraulic control structures breaching the L-29 levee may have different influences on surface waters, depending on where they are located. In highly transmissive areas, surface waters will only minimally converge towards a breach, since they easily pass under the levee. The most transmissive area of Tamiami Trail is along its eastern-most section where L-30 and L-31N meet. This high transmissivity means increased flow volumes from WCA-3B to NESS may be

compromised by similar increases in seepage to the east. Flow convergence may be much greater to the west, since the levee is a more significant barrier, therefore, a larger fraction of surface waters will flow through a western breach than an eastern one. Because of this change in aquifer transmissivity, a 4-mile bridge in the western part of WCA-3B will influence the hydrologic balance over a wider extent than the same bridge in the eastern part.

The NPS has determined that a west-central location of the 4-Mile Bridge starting just west of the Tiger Tail Camp would provide the most ecological and hydrological benefits to WCA-3 and Everglades National Park (Figure 7.2). It would restore or enhance hydrological and ecological conditions in WCA-3 and ENP, facilitate the hydraulic passage of flows between WCA-3B and NESS, avoid impacts to threatened and endangered species, be most compatible with future CERP objectives, and would avoid complications associated with seepage issues to the east of the park. This location would also allow for restoration of flows into areas that are deeper on either side of the trail so that flow volumes will be maximized. Allowing for increased flow volumes from WCA-3 to NESS will reduce the flows through WCA-3A, reducing damaging high water levels in WCA-3A and reducing impacts to the CSSS.

This goal is most attainable for the section of the ridge and slough landscape south of Tamiami Trail, east of S-333 and west of S-355A (Figure 7.2). This is the section of ridge and slough landscape in NESS that is least degraded and therefore most feasible to restore. 100% restoration of this section would require water depths greater than 2 ft for 80-100% of the time in the sloughs and less than 25% of the time on the ridges. Flow velocities should be maximized in the sloughs over large reaches. Reconnection of this flow section would provide for reconnection of approximately 40% of the historic slough habitats between WCA-3B and NESS, and, given the proper upstream conditions, could provide the flow patterns required to restore the ecological functions that are supported by the ridge and slough landscape in this region of the Everglades.

7.6. Segmentation of the 4-Mile Bridge

From an ecological perspective, the more segments in the bridge, the greater the loss of ecological connectivity between WCA-3B and NESS. From a hydrologic perspective, multi-bridge locations could optimize the hydraulic connectivity between WCA-3B and NESS, if the bridge spans could be strategically placed to straddle the major sloughs. In evaluating these options, the NPS has determined that a single 4-mile bridge span between the Tiger Tail Camp and the Osceola Camp (see Figure 7.2) would provide the greatest ecological and hydrological benefits, while reducing costs associated with providing access to establishments along U.S. 41.

7.7. NPS Conclusions

The NPS recommends implementation of the 4-Mile Bridge Alternative based on its performance in providing substantial ecological and hydrological improvements in a cost-effective manner. The alternative exhibiting the best performance for the environmental objectives, the 10.7-Mile Bridge Alternative (Environmentally Preferred Alternative) has a construction cost of approximately 230 million dollars. This level of funding exceeds the current amount available from the NPS. It is the opinion of the NPS that any alternative exceeding the current level of funding is beyond the capability of the NPS and should be eliminated from further consideration.

Should additional funding be made available from other sources, NPS reserves the option to amend this position in order to support the 10.7-Mile Bridge alternative that exhibited superior performance for the environmental objectives.

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FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION

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March 17, 2004

Mr. James C. Duck
Chief, Planning Division
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Re: Tamiami Trail Final General Reevaluation Report/Supplement to the 1992 Final Environmental Impact Statement (GRR/SEIS) on Modified Water Deliveries to Everglades National Park, Miami-Dade County

Dear Mr. Duck:

The Office of Environmental Services of the Florida Fish and Wildlife Conservation Commission (FWC) has reviewed the referenced document, and provides the following comments.

This project is one of four components that have arisen from the original 1992 Modified Water Deliveries General Design Memorandum. The other highly interrelated components include flood protection of the 8.5-square-mile-area residential development along the eastern side of Northeast Shark River Slough (NESRS); conveyance of water between Water Conservation Area (WCA)-3A, WCA-3B, and NESRS; and an overall operational plan for the newly constructed water control structures. Many of our comments and concerns on the Tamiami Trail Feature have previously been conveyed directly to the Army Corps of Engineers (COE) via a preliminary Coordination Act Report (attached) dated June 24, 2003, and through a Planning Aid Letter (attached) dated February 23, 2001, and through the Florida State Clearinghouse in a letter to Ms. Jasmin Raffington dated January 16, 2002 (attached). Our comments in this letter focus on the status of a real estate agreement between the COE and the Florida Department of Transportation (FDOT), timely integration with the Decompartmentalizaion and Sheetflow Enhancement project (Decomp), and proper sequencing of the various Mod Waters project components.

First of all, we understand that the COE is still seeking a real estate agreement with the FDOT on the potential maintenance of the Tamiami Trail in lieu of raising the entire road profile. In our letter to Ms. Jasmin Raffington dated January 16, 2002, we had previously requested that an agreement be formalized and made available for public review prior to the release of this final GRR/SEIS. It is stated in the GRR/SEIS that such an agreement will be finalized with FDOT during development of the construction Plans and Specifications for the final approved plan under Mod Waters, and that this timeframe should coincide with the final decision on a plan for Tamiami Trail under the Comprehensive Everglades Restoration Plan (CERP). To accommodate this integration, the Decomp project was split into two separate project implementation reports (PIR), one of which would focus solely on the necessary modifications to the Tamiami Trail in order to pass the additional CERP flows. According to the COE's current Master Program Implementation Schedule, it now appears that a separate PIR for the Tamiami

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Trail will not be developed. We also understand that delays in the development of the Decomp PIR are anticipated due to budget shortfalls. Consequently, we are concerned that these factors may result in a lack of integration of the two Tamiami Trail projects, and could result in costly retrofitting of the roadway under Decomp if the entire road profile were to be raised under Mod Waters.

Another area of concern is the sequencing of the Seepage and Conveyance, the 8.5-square-mile-area, and the Combined Structural Operational Plan (CSOP) components with the Tamiami Trail component of Mod Waters. The completion date for the Seepage and Conveyance component, which includes the construction of passive weir structures across the L-67 and L-29 levees, is now scheduled for June 2006. However, the Tamiami Trail component is not scheduled to be complete until 2007. We are concerned about the potential for ecological damage to WCA-3B and further delay in benefits to NESRS, if the Tamiami Trail is not capable of passing the augmented flows by the time these other conveyance features area in place.

We are encouraged that the COE has concurred with us on the placement of the 3,000-foot bridge immediately east of the Blue Shanty Canal. Please refer to our previous comments on the Draft GRR/SEIS in our letter to Ms. Jasmin Raffington, dated January 16, 2002, for a more detailed discussion of our concerns on wildlife passage beneath the bridge, the need for annual surveys of state-listed wildlife species prior to construction activities, and the need for an accurate accounting of impacts to recreational access along the Tamiami Trail.

In conclusion, we support the final recommended plan (7a) with the understanding that 1) a real estate agreement between the COE and FDOT will be formalized as soon as possible to avoid unnecessary delays in implementation of the CSOP and to avoid costly retrofitting during implementation of the Comprehensive Everglades Restoration Plan, 2) appropriate surveys will be conducted for state-listed wildlife species prior to construction, and 3) all potential recreational access impacts are fully addressed.

Sincerely,

Brian Barnett

Brian S. Barnett, Interim Director
Office of Environmental Services

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Enclosures
cc: Environmental Branch, COE, Jacksonville
Mr. Jay Slack, USFWS, Vero Beach
Mr. Dan Kimball, Acting Superintendent , ENP, Homestead
Regional Director, FWC, West Palm Beach

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June 24, 2003

Colonel James G. May
District Engineer
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Re: General Reevaluation Report/ Supplemental Environmental Impact Statement (GRR/SEIS) for the Tamiami Trail, Modified Water Deliveries to Everglades National Park, Miami-Dade County

Dear Colonel May:

The Office of Environmental Services of the Florida Fish and Wildlife Conservation Commission (FWC) has reviewed the revised preliminary draft GRR/SEIS for the Tamiami Trail Project of Modified Water Deliveries to Everglades National Park ("Mod Waters"), dated June 2001. This project is one of four components that have arisen from the original 1992 Modified Water Deliveries General Design Memorandum. The other highly interrelated components include flood protection of the 8.5-square-mile area residential development along the eastern side of Northeast Shark River Slough (NESRS); conveyance of water between Water Conservation Area (WCA)-3A, WCA-3B, and NESRS; and an overall operational plan for the newly constructed water control structures. This report is being submitted following a hiatus in activity on the Tamiami Trail Project due to a legal challenge to the 8.5-square-mile flood protection project, which has since been satisfactorily resolved. Our comments and concerns on the Tamiami Trail Project component are included in the following preliminary Coordination Act Report (CAR), which is being submitted under the authority of the Fish and Wildlife Coordination Act of 1958.

Description of Alternatives

This GRR/SEIS is being developed because new information acquired since the project was approved in 1992 indicates that the original design would be insufficient to pass the volume of water that would need to be conveyed under the Tamiami Trail via Mod Waters. In addition to the six basic alternatives (nine, if water quality treatment options are considered separately) previously addressed in our Planning Aid Letter (PAL), dated February 23, 2001, two completely

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