5.9 COMPARISON OF ALTERNATIVES

5.9.1 Cost Effectiveness and Incremental Cost Analysis

Cost effectiveness analysis shows whether an alternative plan's restoration output can be produced more effectively by another alternative. If an alternative is cost-effective, no other plan provides more benefits for the same or less money, and for a given level of benefit, no other plan costs less. Table 31 summarizes the cost effectiveness analysis conducted for all alternative plans.

Table 31. Cost Effective Alternatives

Alternative	Cost (millions)	Environmental Performance Score	Cost Effective Alternatives
1	$13.5		
2a	$24.4	28	
2b	$58.6		
3a	$68.0	18	
3b	$73.5	18	
4a	$45.2		
4b	$47.1		
5a	$142.4	46	X
5b	$146.8	45	
6a	$74.7	37	X
6b	$82.6		
7a	$23.3	31	X
7b	$50.5		
8a	$44.3	32	X
8b	$96.4		
9a	$48.0	33	X
9b	$69.7		

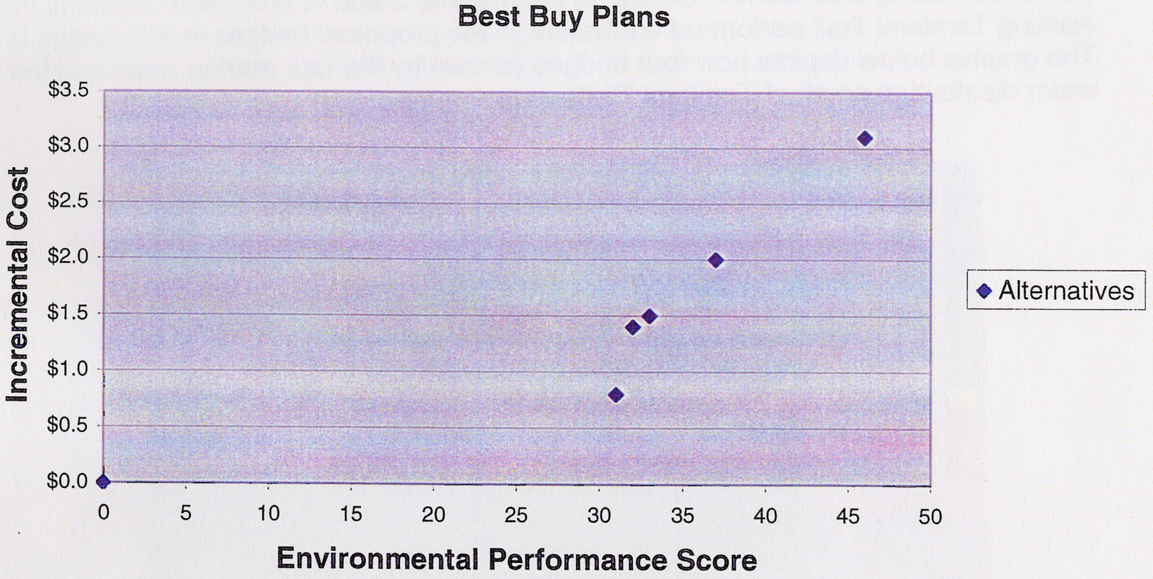
Ecosystem benefit, or output, was represented by an alternative's performance on a group of environmental objectives, including minimization of impacts to Federally or state listed species, consistency with RPA's for the Cape Sable Seaside Sparrow, restoration of ecological function and minimization of permanent wetland losses in ENP. Further details on comparison of alternatives based on environmental objectives can be found in the USFWS coordination act report in Appendix I.

Analysis shows that alternatives 5a, 6a, 7a, 8a and 9a are all cost effective. In order to make a better decision about which alternative to recommend, the team also conducted an incremental cost analysis. It helps evaluate which cost effective plan provides the greatest benefit, given the Corp's and sponsor's constraints. Table 32 summarizes this analysis, and Figure 31 represents the results graphically.

Table 32. Incremental Cost Analysis of Cost Effective Alternatives

Cost Effective Alternatives	Performance Score	Incremental Performance	Cost (millions)	Incremental Cost	Incremental Cost per Performance Unit Gained (millions)
No Action	0	0	0	0	0
7a	31	31	$23.3	$23.3	$0.8
8a	32	32	$44.3	$44.3	$1.4
9a	33	33	$48.0	$48.0	$1.5
6a	37	37	$74.7	$74.7	$2.0
5a	46	46	$142.4	$142.4	$3.1

Figure 31. Incremental Cost and Performance Comparison



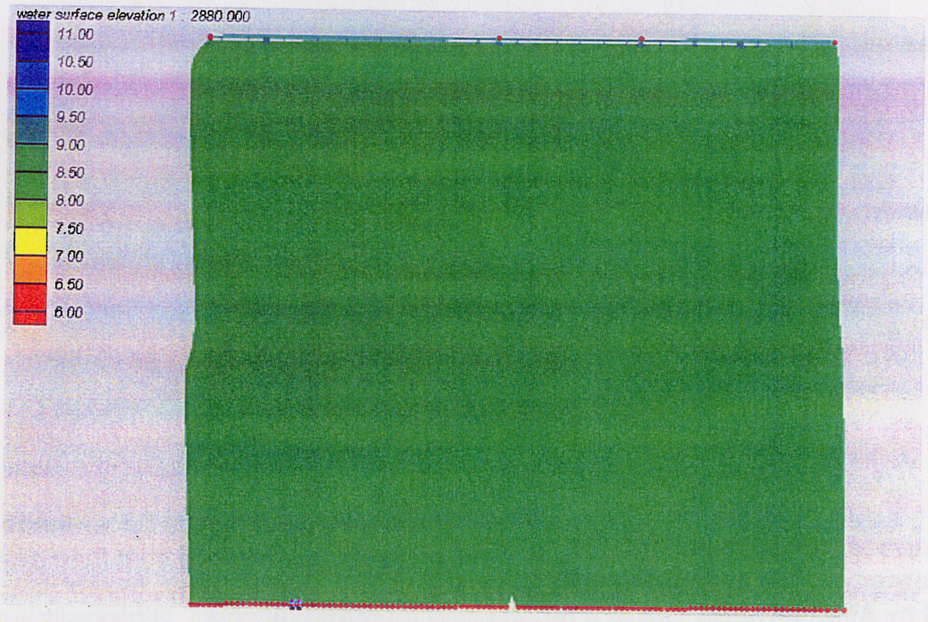
Together, Table 32 and Figure 31 show that Alternative 5a provides by far the highest environmental performance, but also at a much higher incremental cost than any of the other alternatives. Alternative 7a, however, provides a significant portion of benefits provided by Alternative 5a, but at a much lower incremental cost. While neither analysis provides a simple selection rule, dictating which choice must be made, they help team members and decision makers decide which level of output is worth the cost. Output targets and thresholds and implementation funding constraints also play a critical role.

5.9.2 Incremental Hydrologic Analysis

An incremental hydrologic analysis was performed to determine the optimal bridge opening needed to pass MWD flows and achieve acceptable water distribution south of Tamiami Trail. This incremental analysis was instrumental in determining the width opening required to pass the expected MWD flows and in the determination of how the flows react south of Tamiami Trail with the various width openings investigated.

5.9.2.1 Four Bridges (Alternatives 2, 3, 4)

The Corps of Engineers has designed similar improvements to roads in ENP (Taylor Slough for the C-111 project). The purpose of the project was to add bridges to Park Road in the same manner as the project purpose for Tamiami Trail. That is, pass additional flows through a road structure for environmental enhancement/hydrologic conveyance. The same approach used for Park Road was used in solving the Tamiami Trail problem. Alternative 2 proposed adding a series of bridges into the existing Tamiami Trail alignment to accommodate the additional hydrologic conveyance needed for the MWD project. Hydrologic modeling was used to determine the necessary lengths to convey the higher flows with acceptable head-loss. Four bridges with a combined length of 1,450 feet met the hydrologic criteria. Proposed bridge locations were selected based on the following criteria: proximity to control structures (S-333, S355A&B, S-356); downstream obstructions (vegetation, airboat camps, etc); low areas in the road; and distribution along L-29 Borrow Canal. In alternatives 3 and 4, proposed openings in the existing Tamiami Trail performed equivalent to the proposed bridges in Alternative 2. The graphic below depicts how four bridges (shown by the four marks) react and the water distribution south of Tamiami Trail.

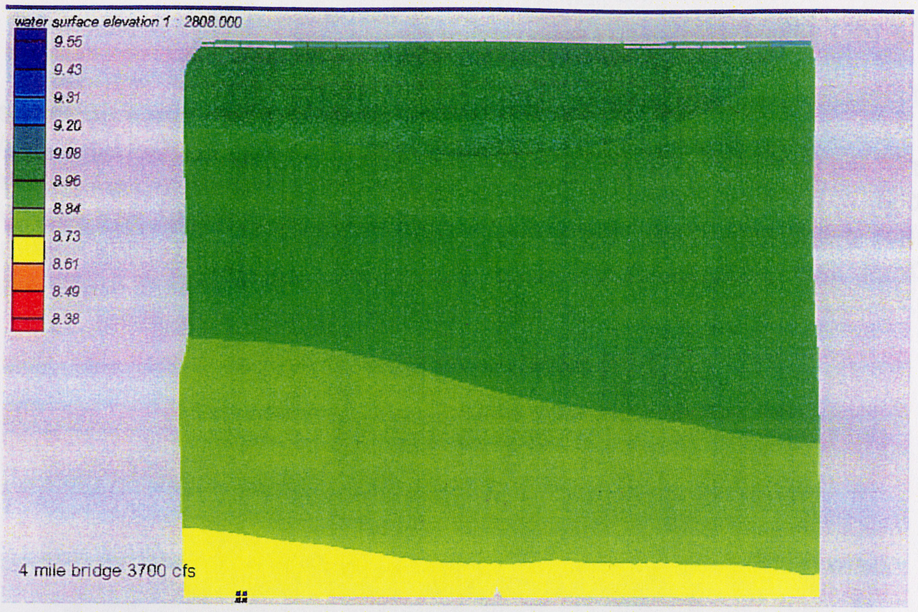


5.9.2.2 10.7-Mile Causeway (Alternative 5)

A full causeway spanning the entire project area of 10.7 miles was developed as one of the 13 conceptual alternatives for Tamiami Trail. This was carried forth as Alternative 5. Alternatives 2, 3, and 4 were viewed as minimal modifications to Tamiami Trail that would allow for the passage of 4000 cfs. Alternative 5, however, has been viewed as a plan that would completely remove barriers to sheet flow and provide maximum hydrologic and ecological connectivity. The graphic below depicts how a single opening of 10.7 miles would react and the water distribution south of Tamiami Trail.

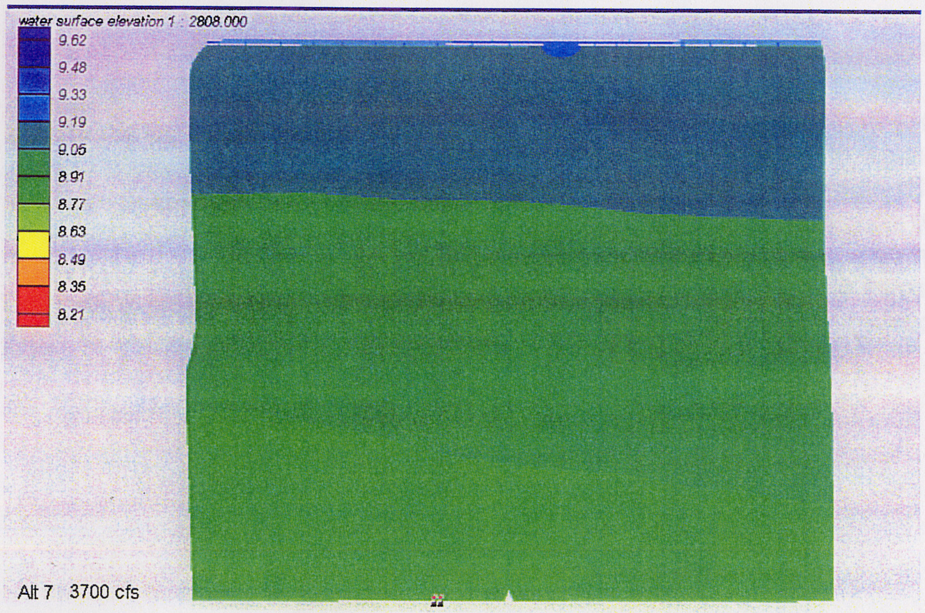
5.9.2.3 Four-Mile Bridge (Alternative 6)

A four-mile bridge alternative, Alternative 6, was developed as a less expensive, scaled-down version of Alternative 5. This alternative was developed based on coordination with the Department of Interior as another means to achieve sheet flow. Although not achieving complete hydrologic restoration, i.e., unimpeded sheet flow, this alternative was seen as a compromise between the minimum necessary to pass MWD flows and the maximum for hydrologic/ecological connectivity. The graphic below depicts how a single opening of four miles would react and the water distribution south of Tamiami Trail.



5.9.2.4 3,000-Foot Bridge (Alternative 7)

Further refinement of the width opening needed to pass MWD flows in a single location was investigated. Since preliminary siting located the opening near the center of the project limits, head loss in the L-29 Canal became a concern. Water deliveries from the eastern- and western-most water control structures caused a backwater effect in the L-29 Canal and raised stages in the L-29 Canal. Hydrologic modeling was used to determine the required single opening to convey the higher flows with acceptable head loss across the road. Modeling resulted in a 3,000-foot opening meeting these criteria (Alternative 7). In comparing this alternative to previous alternatives investigated, it was determined that the hydrologic connectivity was acceptable while meeting the other objectives of the project. The graphic below depicts how a single opening of 3,000 feet reacts and the water distribution south of Tamiami Trail.



5.9.2.5 Summary

Based on hydrologic modeling results analyzing the flow of water south of Tamiami Trail and how each alternative performs against established project objectives, it was determined that all alternatives convey the required flow of water into ENP.

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