4 ENVIRONMENTAL EFFECTS

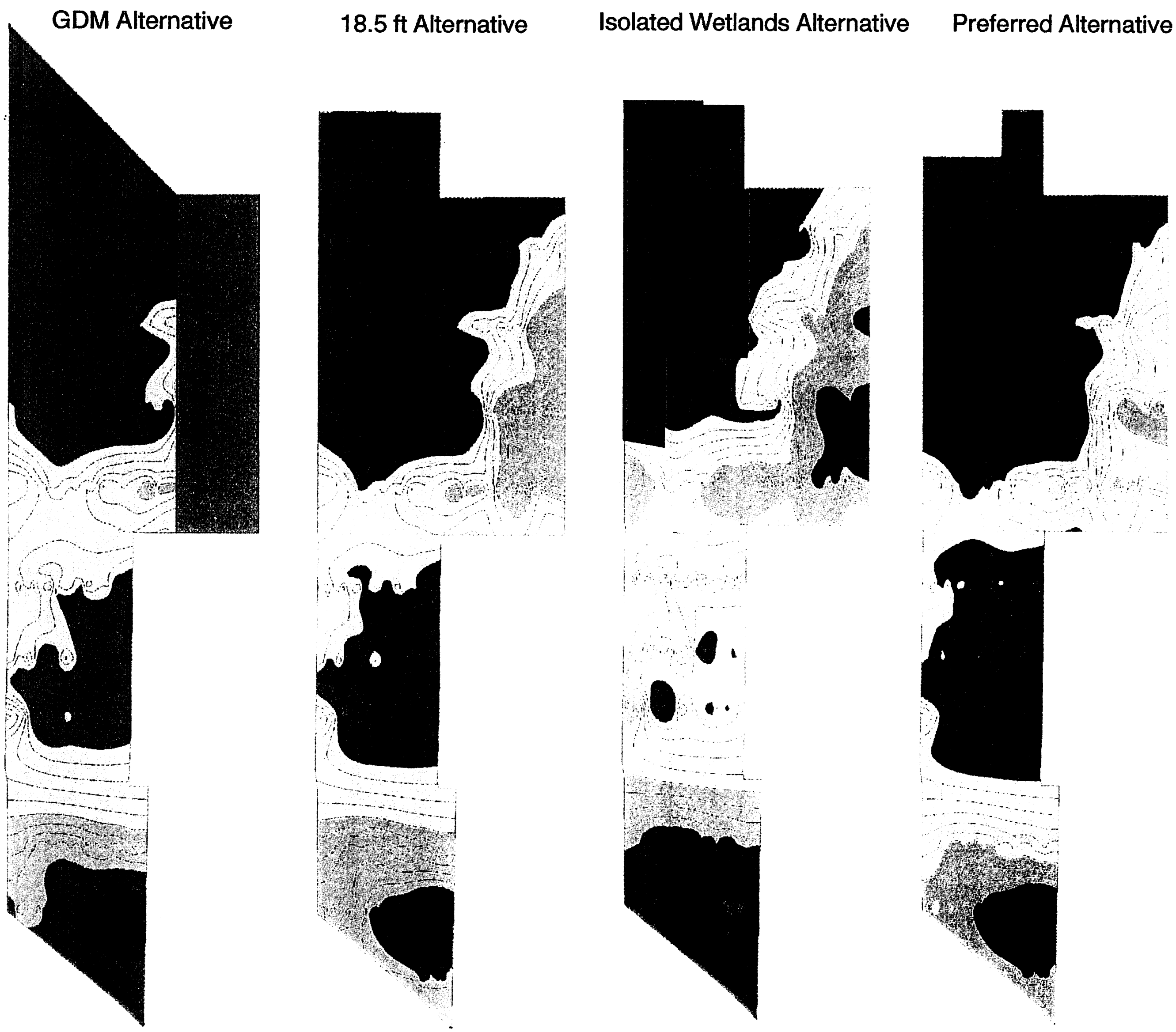
This section is the scientific and analytic basis for the comparisons of the alternatives. See table 12 in section 3.0 Alternatives, for summary of impacts. The following includes anticipated changes to the existing environment including direct, indirect, and cumulative effects.

4.1 FLOOD CONTROL AND WATER CONVEYANCE

Under the GDM Alternative Structures S-96B and S-96-C would continue to discharge into a constricted downstream channel. Without channel enlargement, or the construction of an inflow weir to the TFMCA, flood control discharges through these structures would have to continue to be staggered when water levels in both the BCMCA and the SJWMA were above their respective flood control schedules. Enlarging the C-40 canal downstream of these structures to alleviate this problem would facilitate continued overdrainage of the SJMCA adjacent to the channel. Access to the series of plugs and gaps that would connect the SJMCA and TFMCA under this Alternative would also be problematic. Under the Isolation, 18.5 ft and Preferred Alternatives tailwater conditions at S-96B and S-96-C would be independent of each other. Therefore maximum flood control benefits would be provided by any of these three alternatives. All three alternatives however would require additional levee construction and the construction of a get-away channel on the east side of the TFMCA immediately downstream of S-96B.

4.2 HYDROLOGICAL IMPACTS TO BIOLOGICAL COMMUNITIES

Environmental goals of the entire USJRBP are to restore and preserve the ecological integrity of this unique wetland/riverine ecosystem (Brooks and Lowe 1984). Specific environmental objectives are to restore or preserve the natural attributes of species diversity and abundance, community diversity, and productivity of economically important species (Miller et al. 1998). To achieve these objectives, we have concentrated on managing the spatial and temporal aspects of the natural hydrologic regime. We believe that with the appropriate hydrology, desirable soil and vegetation characteristics can be created and maintained. This, in turn, will provide other environmental benefits such as enhanced fish and wildlife habitat.
magnitude of water-level fluctuations, timing of water level fluctuations, and water level recession rates (Table 13). Using data from research conducted by the SJRWMD, topographic surveys, limited historical water level data and published literature values, hydrologic characteristics were formulated, numerically quantified, and refined into a set



Three Forks MCA
Predicted Plant Communities

Legend
- Open Water / Aquatic Bed
- Slough
- Emergent Wetland
- Transitional Wetland
- Upland
- Sawgrass and Maidencane Marsh
- Soil Oxidation

Plant Community Area (acres)

	GDM	18.5 Alt.	Isolated	Preferred
OW/AB	6,157	7,047	1,183	7,757
SL	3,513	4,277	5,015	4,123
EW	795	1,645	5,549	996
TW	1,075	765	1,962	539
UP	(2,469)	0	25	0
Total	11,540	13,734	13,734	13,415

(Values in parentheses were excluded from the No Action or GDM plan)

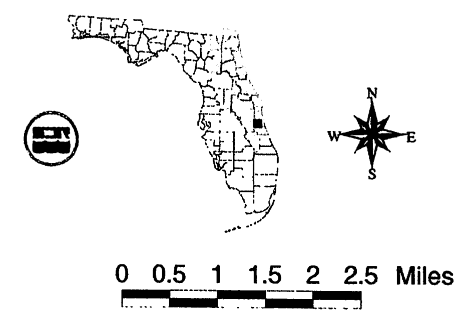


Figure 12. Predicted plant communities for TFMCA under four hydrologic alternatives.

of measurable criteria. A more detailed description of hydrologic criteria derived for both SJMCA and TFMCA is presented in Appendix D.

4.2.1 ENVIRONMENTAL ENVIRONMENTAL HYDROLOGIC CRITERIA

To develop environmental hydrologic targets or criteria to guide modeling efforts, we first identified several ecologically significant and quantifiable hydrologic characteristics of the natural marsh hydroperiod. Hydrologic characteristics selected included duration of flooding, maximum and minimum depths, hydrologic criteria are viewed as hydrologic statistics that form the boundaries of a desirable hydrologic regime for marshes. To meet environmental goals, boundaries set by the criteria should not be exceeded. In this sense, hydrologic criteria are best viewed as constraints. For the most part, criteria describe long-term (30 years or greater) hydrologic conditions. A long-term perspective is needed to account for the natural stochasticity inherent in the long-term hydrologic cycles to which the ecosystem has adapted. For example, unusually wet or unusually dry conditions occurred naturally at infrequent intervals and were important in determining overall ecosystem structure and function (DeAngelis and White1994). Our long-term perspective provides a basis for understanding the occurrence of extreme events.

4.2.1.1 Hydrologic Criteria for SJMCA

The environmental goal for SJMCA is to restore, protect, and enhance shallow marsh habitats. Because there is a significant downstream drop in elevation gradient in SJMCA, we were unable to use a single stage-area curve for setting critical elevations and conducting environmental assessments. Instead, we derived environmental hydrologic criteria separately along three east- west cross-sections in SJMCA for which the hydrologic model predicted average daily surface water levels. Cross-sections used passed near the Six mile, Mulberry Mound, and Big Bend water level gauging stations (Figure 1; Figure D-2). These cross-sections were chosen because they had been recently surveyed and, because the water level recorders will allow us to evaluate how well hydrologic criteria are met after project completion.

4.2.1.2 Hydrologic Criteria for TFMCA

Ground elevations in the TFMCA vary between 13.0 and 20.0 ft NGVD. Because of this gradient, the entire TFMCA cannot be restored to marsh if it is operated as a single hydrologic management unit. Instead, under any of the alternatives considered, deeper ponded habitat will be created in the northern half of TFMCA and marsh habitat will be created toward the southern end. The original GDM recognized that ponding in the northern half of the TFMCA would be unavoidable because of soil subsidence. Therefore, creation of dead storage was necessary to produce desirable hydrologic

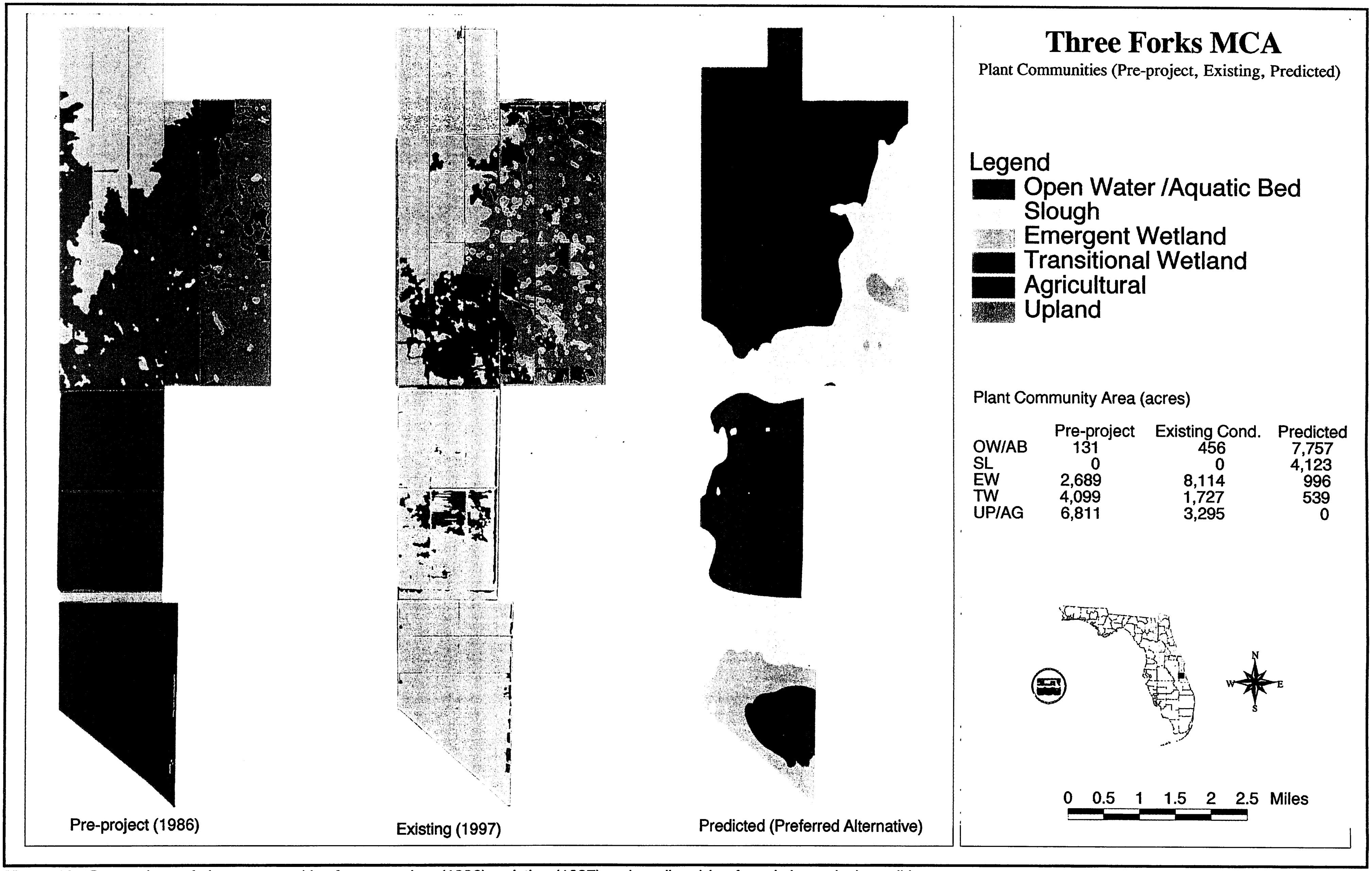


Figure 13. Comparison of plant communities for pre-project (1986), existing (1997) and predicted (preferred alternative) conditions.

regimes on other portions of the TFMCA marsh (Brooks and Lowe 1984). Ecological benefits to having a broad connection between deep and shallow water habitats were recognized. During the dry season the ponded area will provide deep-water refuge for aquatic organisms that occur in the marsh. As water levels rise during the wet season, these organisms will rapidly re-colonize re-flooded habitats. As dry season water levels recede these organisms, many which serve as prey, would be concentrated along the receding water line and shallow water habitats where optimum feeding conditions would be provided for wading birds, larger sportfish, and other wildlife.

Early in the process of developing a final design for TFMCA it was also recognized that there was a potential for a sport-fishery to develop in the permanently ponded area of the TFMCA that could have a high recreational value (D. Cox FWC, Pers. comm.). FWC fisheries biologists expressed concerns, however, that potential anoxia occurring in conjunction with extreme low water events could cause extensive fish kills. Although fish kills are not uncommon and occur naturally, if they occur too frequently they would seriously compromise the recreational value of the area. To address these concerns, we developed environmental hydrologic criteria for the TFMCA that attempt to maximize wetlands restored while minimizing the intensity and duration of extreme low water events (Appendix D). The intent of the criteria was to reach a balance that provides for minimizing short-term fluctuations in the deep open-water habitat, while still allowing drydowns of the remaining marsh to occur at the appropriate durations and frequencies needed to maintain emergent marsh vegetation (Appendix D).

Table 13. Ecologically important characteristics of natural hydrologic cycles in marshes.

Hydrologic characteristics	Ecological significance	Measured parameters	References
Mean Depth; Frequency of Inundation	Establish wetland plant communities, prevent oxidation of organic soils	Mean daily values; Percent of time water levels exceed a given ground elevation	Brooks and Lowe 1984, Lowe 1983, Stephens 1984.
Maximum water elevations	Prevent prolonged flooding from damaging marsh plant communities	Annual 14 day continuous maxima; Annual 30 day continuous maxima; Annual 60 day continuous maxima	Biagiotti-Griggs and Girardin 1980, Lowe 1983, Whitlow and Harris 1979.
Minimum range of yearly Fluctuation	Important to plant germination, plant community composition, wading birds foraging, snail kite nesting	Annual 30 day continuous maxima; Annual 30 day continuous minima; Annual range between daily high and daily low	Bancroft et al. 1990, Bennetts et al. 1988, Gunderson 1994, Kushlan et al. 1975, Kushlan 1976, Mitsch and Gosselink 1986.
Timing of fluctuation	Important to wading bird and alligator breeding cycles; fish community structure	Julian date of annual 1 day maxima and 1 day minima	Fogarty 1984, Frederick and Collopy 1989, Kushlan et al. 1975, Kushlan 1976, Loftus and Kushlan 1987.
Water level recession rates	Influences wading bird nesting; too rapid recession can cause anoxia and fish kills	Negative difference between daily means at 7 day and 30 day intervals	Frederick and Collopy 1975, Kushlan et al. 1975, Toth et al. 1990.
Minimum water levels for natural lakes	Prevent extreme drawdown events from adversely impacting sport fish communities	Annual 1 day minima	Kushlan 1974, Loftus and Kushlan 1987, Durocher et al. 1984.

4.2.2 HYDROLOGIC EVALUATION OF THE ALTERNATIVES

4.2.2.1 SJMCA

We did not attempt to quantify the extent of overdrainage that would occur in SJMCA if there was complete hydrologic reconnection with TFMCA, but accepted the GDM assumption that during low flow conditions water would drain from SJMCA to the lower elevations of TFMCA. Instead, we focused hydrologic modeling efforts on determining the percent of the total discharge downstream of S-96B and S-96C and the canal plug configuration that would be needed to assure appropriate hydrologic conditions were maintained in the SJMCA. Early modeling efforts indicated an approximate 50/50 split of the total discharge during periods of both high and low flow was needed to at least tentatively meet this goal (Miller et. al 1996). In addition, hydrologic modeling indicated that environmental hydrologic criteria established for SJMCA could only be met by installing and operating gated control structures in the C-40 canal plugs. Without canal plugs, the marsh would continue to be overdrained by the canal during the low flow periods that occur whenever Structure S9C is not making flood control discharges. However, without operable culverts in the plugs there would still be enough water during low flow conditions to permanently flood the marsh upstream of the plugs and prevent periodic drying that are needed to maintain the herbaceous marsh plant community.

We used two-dimensional modeling to determine optimal plug location and dimensions. This modeling effort indicated that that optimum plug placement would be at the current location of Canal Plug E-7 and just downstream of Canal Plug E-4 (Figure 1; Figure D-6). Culverts were designed to pass a maximum of 100 cfs downstream with optimum headwater and tailwater conditions. Hydrologic criteria were best met opening the culverts fully during the dry season months of April, May, and June and closing the culverts from July through March.

Average annual water levels predicted along three transects in SJMCA for the 18.5 ft, Isolation and Preferred Alternatives are presented in Figure 10. These values also represent the No Action Alternative, if we assume that modifications could be made that ensured a nearly 50/50 split between TFMCA and SJMCA of all discharges through S-96B andS-96C. From 75% to 100% of years for which hydrologic statistics were generated, average annual water levels exceeded the average ground elevation along the Mulberry Mound (100%) and Big Bend (79%) transects. The Sixmile transect was drier, the average annual water level exceeded the average ground elevation in 50% to 75% (72%) of the years (Figure 10). Drier conditions at Sixmile probably reflect the location of this transect in relation to the canal plugs. Since Sixmile is a considerable distance upstream of the E-4 Canal Plug, this transect is still influenced by the drainage effects of the C-40 canal.

A summary of how well all the environmental hydrologic criteria established for the SJMCA were met are presented in Table 14. Our analyses indicate that the Sixmile transect may be slightly drier than is desirable while recession rates may be somewhat excessive along the Big Bend transect. High recession rates at Big Bend reflect the impact of reduced discharges from TFMCA when water levels fall below the crest of the weir. These rates can be further reduced by operation of Structure S-257. Our analysis suggests hydrologic criteria for SJMCA can be met by any of the alternatives considered. Several modifications to the GDM design would be needed however, to ensure a 50/ 50 split of discharges between SJMCA and TFMCA. This split may be most difficult to achieve during low-flow conditions. We believe slight modifications to future operation schedules of the culvert structures may still be needed to "fine tune" strategies to meet all criteria. Given the constraints of the model, further hydrologic modeling to fine tune a discharge schedule at this point is unwarranted. We recommend operating the plugs under the schedule proposed in this plan after they have been constructed, and then adjusting the operation schedules in the future if criteria are not met.

4.2.2.2 TFMCA

Under the original GDM or No Action Alternative the predicted average water level in TFMCA was 18.6 ft NGVD. Annually, predicted water levels fluctuated approximately 2.9 ft ranging from an average one-day low of 17.1 ft NGVD to an average one-day high of 20.0 ft NGVD. For the 18.5 ft Alternative, the predicted average water level in TFMCA was slightly higher at 18.8 ft NGVD. Annually, predicted water levels also fluctuated within a similar range of 2.8 ft and ranged from an average one-day low of 17.4 ft NGVD to an average one-day high of 20.2 ft NGVD. Water levels for the Isolated Wetlands Alternative were considerably lower. The average predicted water level under this alternative was 18.0 ft NGVD. Annually, predicted water levels fluctuated similarly at 2.9 ft and ranged from an average one-day low of 16.4 ft NGVD to an average one-day high of 19.3 ft NGVD. Water levels under the Preferred Alternative were the highest of any alternative considered. Under the Preferred Alternative the predicted average annual water level was 19.1 ft NGVD. Annually water levels fluctuated approximately 2.5 ft from an average annual one-day low of 17.8 ft NGVD to an average annual one-day high of 20.3 ft NGVD.

Table 14. Assessment of how well environmental hydrologic criteria for SJMCA were met by the Preferred and Isolated Wetlands Alternatives. Checks indicate criteria were met for simulated period of record. For a more complete description of the criteria and hydrologic simulation results see Appendix D.

Hydrologic characteristics	Sixmile	Mulberry Mound	Big Bend
Mean Depth;	✓	✓	✓
Frequency of Inundation	✓	✓	✓
Maximum water elevations	✓	✓	×
Minimum range of yearly Fluctuation			
Highs	✓	✓	✓
Lows	×	×	×
Timing of fluctuation			
Monthly	✓	✓	×
One-Day	✓	✓	✓
Water level recession rates			
7 Day	×	✓	✓
30 Day	×	✓	✓

Predicted water levels for each alternative follow natural seasonal hydroperiod patterns (Figure 11). Water levels were lowest during the dry season months of April may and June and highest during the wet season months of August, September and October. Predicted water levels were highest under the Preferred Alternative and lowest under the Isolated Wetlands Alternative.

To compare alternatives, water depths and acreages were calculated for various hydrologic statistics such as average water levels and, annual 1-day and 30-day highs and lows (Table 15). These levels represent the extremes that can be expected to occur in any single year. Predicted data for one-in-four year lows are also presented. Under the Isolation Alternative nearly the entire TFMCA would be flooded by the average annual high and, more than 5,000 acres would experience depths greater than three feet. Under the GDM Alternative, the annual high would flood more than 9,600 acres to a depth of more than three feet and, nearly 4,000 acres would be flooded to depths exceeding five feet. Under the 18.5 ft Alternative, the average annual high would flood more than 11,300 acres to depths exceeding three feet and nearly 4,500 acres to depths exceeding five feet. Under the Preferred Alternative the average annual high would flood nearly 11,000 acres to a depth greater than three feet and greater than 4,100 acres would be flooded to a depth greater than five feet.

Under the Isolation Alternative, the average annual low water level would expose nearly 4,400 acres. Only a small area of the TFMCA (107 acres) would have depths exceeding three feet. Every four years the predicted one-day low would expose over 9,100 acres and only 1,450 acres would be flooded. Of the area flooded there would be no areas with depths exceeding three feet. Under the GDM Alternative, the average annual low would expose approximately 1,870 acres, however, nearly 2,700 acres would remain flooded greater than three feet deep. Every four years the predicted one-day low would expose over 2,700 acres but still greater than 1,970 acres would remain flooded at depths great than three feet. The annual low under the 18.5 ft Alternative would expose approximately 1,988 acres and greater than 3,000 acres would remain flooded to depths exceeding three feet. Every four-years the area flooded to a depth greater than three feet would be reduced to approximately 1,975 acres. The Preferred Alternative maintained the highest water levels. Under the average annual low greater than 3,000 acres of the TFMCA would be flooded to a depth greater than three feet and 371 acres would remain flooded to a depth greater than five feet. During one-in-four year lows nearly 2,327 acres of the TFMCA would remain flooded to depths greater than three feet.

4.3 TOPOGRAPHY, GEOLOGY AND SOILS

4.3.1 TOPOGRAPY AND GEOLOGY

4.3.2 SOILS

The ecological significance of two of the environmental hydrologic criteria we used (frequency of inundation and mean depth) is prevention of organic soil oxidation (Table 13). Based on frequency of inundation, the average elevation should be inundated no less than 60% or alternatively should not be exposed greater than 40% of the time. Based on mean depth, the mean water table depth should not be greater than 0.25 ft. below the ground surface. Considering both criteria, the Isolation Alternative has the greatest potential for soil oxidation (6-10%), whereas the Preferred Alternative is the least susceptible (0.8- 1.5%; Table 16). Figure 12 depicts the conservative estimates of soil oxidation using the mean depth criteria.

4.4 VEGETATION

We predicted plant communities that would develop in TFMCA for each of the alternatives. We recognized hydrology as the primary determinant of plant communities and compiled hydrologic statistics to characterize the typical hydrologic regime for the various community types (Table 17). Hydroperiod or frequency of inundation was considered as one of the fundamental factors in determining the distribution of major plant communities (Hagenbuck et al. 1974, Duever 1982). However, water depth is also a major factor controlling the distribution of aquatic plants (Duever et. al 1978, Goodrick 1984, Mason and van der Valk 1992). Long-term hydrologic variables, such as hydroperiod and average annual depth, were considered to be of primary importance for this analysis (Richardson et al. 1995). While generally it is true that distribution of plant species is highly correlated to long-term hydrologic variables, some species also show good correlation to short event variables (Richardson et al. 195). Drawdowns, even of very short duration, allow plants to germinate and perhaps set seed, which provides wildlife food, cover and nesting material and replenishes the soil seed bank (Kadlec 1974, Galinato and van der Valk 1986, Welling et al. 1988). Deep flooding events may cause intolerant plant species to die back (Millar 1973), creating openings in the marsh and providing access to marsh areas that were previously unavailable to larger predatory fish (Kushlan 1976b, Freeman 1989). Short-term variables, such as maximum and minimum depths (typical one-day values) reflect longer drawdown and flood events and are considered of secondary importance in this analysis.

Table 15. Predicted average water level statistics in TFMCA for each alternative and the estimated number of acres flooded to various depths at that given level.

Hydrologic Parameter	GDM Alternative 11,540 acres	18.5 ft Alternative 13,736 acres	Isolation Alternative 10,557 acres	Preferred Alternative 13,417 acres
Avg. Water Level	18.6 ft	18.8 ft	18.0 ft	19.1ft
Average Depth	3.2 ft	3.1 ft	1.8 ft	3.3 ft
# Acres < 3ft depth	5,618	7,207	8,717	6,488
# Acres > 3 ft Depth	5,383	6,149	7,352	6,730
# Acres Exposed	539	380	1,105	199
Avg. Annual High	20.0 ft	20.2 ft	19.3 ft	20.3 ft
Average Depth	4.5 ft	4.4 ft	2.9 ft	4.4 ft
# Acres < 3ft depth	1,870	2,423	5,407	2,422
# Acres > 3 ft Depth	9,670	11,313	5,038	10,992
#Acres > 5 ft Depth	3,985	4,490	206	4,168
# Acres Exposed	0	0	112	0
Avg. Annual Low	17.1ft	17.4 ft	16.4 ft	17.8 ft
Average Depth	2.0 ft	2.1 ft	0.8 ft	2.2 ft
# Acres < 3ft depth	7,006	8,744	6,093	8,824
# Acres > 3 ft Depth	2,664	3,004	107	3,046
#Acres > 5 ft Depth	0	4	0	371
# Acres Exposed	1,870	1,988	4,357	1,545
Avg. 30-Day Continuous High	19.7 ft	19.8 ft	19.0 ft	20.0 ft
Average Depth	4.3 ft	4.0 ft	2.6 ft	4.2 ft
# Acres < 3ft depth	2,294	1,100	6,483	2,857
# Acres > 3 ft Depth	9,233	10,128	3,875	10,560
# Acres > 5 ft Depth	3,661	3,367	116	3,411
# Acres Exposed	13	13	199	0
Avg. 30-Day Continuous Low	17.5ft	17.7 ft	16.8 ft	18.1 ft
Average Depth	2.4 ft	2.3 ft	1.0 ft	2.4 ft
# Acres < 3ft depth	6,664	8,823	6,837	8,903
# Acres > 3 ft Depth	3,336	3,367	112	3,412
#Acres > 5 ft Depth	8	455	0	741
# Acres Exposed	1,540	1,546	3,608	1,103
1 in 4 Year Lows	16.4 ft	16.6 ft	15.3 ft	17.2 ft
Average Depth	1.7 ft	1.6 ft	0.5 ft	1.9 ft
# Acres < 3ft depth	6,824	9.378	1,451	8,666
# Acres > 3 ft Depth	1,972	1,658	0	2,327
#Acres > 5 ft Depth	0	0	0	0
# Acres Exposed	2,744	4,358	9,107	2,422

Table 16. Evaluation of soil exposure and oxidation for the four hydrologic alternatives.

	No Action Alternative	18.5 ft Alternative	Isolation Alternative	Preferred Alternative
Portion of area with soil oxidation using frequency of inundation criteria	>18.25ft = 7%	>18.5 ft. = 4%	>17.75 ft. = 10%	>18.95 ft = 1.5%
Portion of area with soil oxidation using mean depth criteria	>18.75 ft. = 3%	>19.0 ft.= 2%	>18.25 ft. = 6%	>19.35 ft = 0.8%

* The area above the 17.75 NGVD contour for the Isolated Wetlands Alternative is actually 1,534 ac. but 156 ac. is mineral, rather than organic soils, and will not oxidize.

We created a simple model using four hydrologic parameters (frequency of inundation, average annual depth and typical maximum and minimum depth) to predict the distribution of five general community types: open water / aquatic bed, slough, emergent wetland, transitional wetland and upland (Appendix F). The plant species that are typically found in these communities are described in Table 18. We were unable to quantify species distribution on a finer scale because many wetland plant species can tolerate similar hydrologic conditions and other factors, such as soil type, water quality and existing vegetative cover influence which plants will colonize and eventually dominate the area. However, we qualitatively discuss the implications of each alternative with respect to a few plant species of concern, such as sawgrass, willow, cattail and primrose willow.

Table 17. Summary of hydrologic parameters derived from literature. Values in parentheses are the number of sites for which the parameter range was derived. See Appendix E for references.

Community	Frequency of Inundation	Average Annual Depth (ft.)	Maximum Water Depth (ft.)	Minimum Water Depth (ft.)
Open Water/Aquatic Bed (OW/AB)	85-100% (11)	> 1.73 (11)	>4.10	> 0.33
Slough (SL)	80-100% (35)	1.20 – 3.32 (22)	1.75 – 4.10 (11)	-3.50 – 0.33 (4)
Emergent Wetland (EW)	50-95% (99)	0.15 – 2.38 (75)	0.79 – 4.00 (35)	-3.50 – 0.25 (27)
Transitional Wetland (TW)	15-70% (18)	-0.38– 0.84 (15)	0.25 – 1.75 (13)	-4.94 – -2.14 (6)
Upland (UP)	<15%	< -0.38	< 0.25	< -4.94

4.4.1 VEGETATION WITHIN TFMCA

The predicted vegetation is composed of plant communities that are expected to be self-maintaining in the long-term, given the hydrologic conditions under each alternative. The area for each plant community under the four hydrologic alternatives is listed in Table 19 and illustrated in Figure 12.

Under the GDM Alternative, over 75% of TFMCA would be inundated greater than 95% of the time with an average annual depth of 2.0 ft. or deeper. A sizable portion or 5,383 acres would have water depths of 3.0 ft. or greater. Given these hydrologic conditions, we predict that open water / aquatic bed habitat will cover approximately 6,157 acres or 53% of TFMCA in the downstream reaches. Hydrilla and other submerged plants are expected to occur in abundance. However, we are unable to predict how much of this community will be vegetated because the distribution of Hydrilla and other submerged plants is controlled not only by hydrology but also by other factors such as water clarity and nutrients.

The establishment of open water / aquatic beds will involve the eventual conversion of nearly all the sawgrass and maidencane communities in TFMCA. However, both sawgrass and maidencane have been documented to survive under extreme hydrologic conditions, which could delay the conversion for several years. Lowe (1986) found maidencane growing in 10-year average water depths of 3.12 ft. Where there is prolonged and deep inundation, sawgrass responds by forming tussocks that are made up of leaves, rhizomes and roots of one or more sawgrass plants (Yates, 1974). This build up of plant material creates a mound that elevates the plant out of the water. Davis (1943) pointed out the importance of tussock formation in land building and concluded that it allows sawgrass to continue to grow in deeper water and peat can continue to build up even though the water is deeper than is normally thought of as being suitable for sawgrass growth. However, these are not optimum hydrologic conditions for either species and eventual die-off is almost certain.

Table 18. Description of plant community types.

Community	Description
Open Water/Aquatic Bed (OW/AB)	Habitat comprised mainly of open water with very little emersed plant cover, perhaps some free floating aquatic plants such as water lettuce, water hyacinth, duck weed, etc. Because water clarity is a major determinant as to whether submersed species will occur, aquatic bed has been combined with this category. Aquatic beds are comprised mainly of *Hydrilla*, water milfoil, *Egeria*, *Naiad*, etc.
Slough (SL)	Habitat comprised mainly of rooted, floating leafed species such as water lily, spatterdock, lotuses, floating hearts, and water shield; however, giant bulrush and spikerush were categorized as slough species due to their ability to tolerate deep inundation and their frequent distribution along the deepest portion of lake littoral zones. Some submerged species frequently occur in close association with the dominant species of sloughs, such as bladderwort and lemon *Bacopa*.
Emergent Wetland (EW)	Habitat comprised mainly of emergent species that can occur in nearly monotypic stands or in a diverse mixture of species such as sawgrass, cattail, maidencane, spikerush, arrowhead, pickerelweed, smartweed, and beakrush. Some woody species, such as buttonbush and willow, and submerged species, such as bladderwort, occur in close association with emergent plants.
Transitional Wetland (TW)	Habitat comprised of a variety of grasses, sedges and forbs that are dominated by species such as cordgrass, Muhly grass, St. Johns wort, soft rush, hatpins and broomsedge. Usually this community would be called wet prairie, due to these plants occurrence on mineral soils. However, the location that will have wet prairie hydrology in TFMCA is not underlain by mineral soils and has therefore been classified as transitional wetland (that which occurs between marshes and uplands). This community will likely support large expanses of willow.
Upland (UP)	Habitat comprised mainly of upland plant species that can tolerate very little inundation. However, wetland plants (i.e. willow) that can tolerate frequent and extended periods of drought will also occur on the peat soils that stay moist even when the water table is well below the soil surface.

Table 19. Predicted plant communities for TFMCA under four different hydrologic alternatives. The area of sawgrass isolated in the Isolated Wetlands Alternative is added to emergent wetland acreage.

Community	GDM Alternative	18.5 ft Alternative	Isolation Alternative	Preferred Alternative
(1) Open Water / Aquatic Bed	**6,157 (53%)**	**7,047 (51%)**	**1,183 (9%)**	**7,757 (58%)**
(2) Slough	**3,513 (31%)**	**4,277 (31%)**	**5,915 (37%)**	**4,123 (31%)**
(3) Emergent Wetland	**795 (7%)**	**1,645 (13%)**	**5,549 (40%)**	**996 (7%)**
(4) Transitional Wetland	**1,075 (9%)**	**765 (6%)**	**1,962 (14%)**	**539 (4%)**
(5) Upland	**0 (0%)**	**0 (0%)**	**25 (<1%)**	**0 (0%)**
Total	***11,540 Acres****	***13,734 Acres***	***13,735 Acres***	***13,415 Acres***

* Since the 1985 GDM, the realignment of L-74N resulted in the inclusion of four additional sections (2,469 acres) of semi-improved pasture east of TFMCA. Two alignment changes north of the TFMCA resulted in the exclusion of 274 acres of sawgrass marsh. Therefore, the total project area under the GDM Alternative is 84% of the total area or 2,195 acres less than the 18.5 ft and Isolation Alternatives. The Preferred Alternative is 320 acres less than the 18.5 and Isolation Alternatives because this is the acreage that has been transferred to the C-1 Project.

Overall, 5,383 acres of wetlands will be created in the remainder of TFMCA (47%) and will be dominated by slough communities in the middle reaches. Although the model indicates hydrology in this reach is conducive to the creation of slough, the existing vegetation in this area may preclude, or delay, its establishment. Primrose willow (*Ludwigia peruviana*) currently dominates much of this area and may not die under prolonged inundation. In addition, the farmed soils in this area may be unconsolidated to the extent that existing primrose willow stands may create massive floating islands. Frequent occurrence of floating islands in the marshes of the Okefenokee Swamp and littoral zones of Orange Lake have also been attributed to changes in sediment characteristics (Greening and Gerritsen 1987, Clark and Reddy 1998). The upstream reaches of TFMCA will be converted to short hydroperiod or transitional wetlands, with woody shrubs as a dominant feature. Soil oxidation in a small portion of this area (3%) will continue to enhance proliferation of disturbance loving species such as willow, cattail and primrose willow. Nearly 2,500 acres of pastureland, east of the original project area, will be maintained as such under the GDM Alternative.

Under the Isolated Wetlands Alternative, nearly 3,200 acres of sawgrass and maidencane, encompassed in the isolation area in TFMCA, will be preserved. However, the long-term maintenance of this plant community is uncertain. Management of the isolated area is a perpetual resource commitment and unexpected occurrences such as pump or levee failure may compromise acceptable hydrologic conditions. Although hydrologic inputs will occur mostly by rainfall, the internal cycling of nutrients in this formerly farmed area may convert it to high nutrient marsh. It has been well documented that cattail effectively out-competes sawgrass in enriched marshes (Urban 1993, Newman et. al. 1996, Wu 1997).

Of the remainder of the TFMCA nearly 2,200 acres (20%) will experience inundation frequencies exceeding 95%. The average annual depth of this area will be greater than 2.5 ft. Considering the hydrologic conditions, we predict that the lowest elevations adjacent to the isolation area will be converted to open water / aquatic bed habitat. The remainder of the upper and middle reaches will be converted to sloughs, emergent wetlands and transitional wetlands that will be dominated, initially, by cattail, primrose willow and Carolina willow. Overall, 12,526 acres of wetlands would be created or preserved in TFMCA under the Isolation Alternative Peripheral pasturelands will be converted to wetlands. Less than 1% of TFMCA will be uplands. Oxidation of organic soils will likely occur on approximately 6 -10% of the total area.

Under the 18.5 ft Alternative, the majority of the TFMCA will be converted to a large, shallow lake with surrounding littoral wetlands. Hydrologic modeling indicates that a majority (68%) of TFMCA will be inundated greater than 95% of the time with an average annual depth of 2.3 ft. or greater. Approximately 45% of TFMCA will experience an average annual depth of 3.0 ft. or greater. Considering these hydrologic conditions, our vegetation model predicts that open water / aquatic bed communities will occur on 51% (7,757 acres) of the area. Prolonged deep flooding will cause the loss of existing sawgrass and maidencane habitat in the downstream portion of TFMCA. Hydrilla is likely to become abundant under this alternative. Much of the upper reaches of the TFMCA (4,277 acres) would be converted to slough and emergent wetlands and transitional wetlands would be created on approximately 2,410 acres. These wetlands will likely be dominated, at least initially, by cattail, primrose willow and Carolina willow. Overall, 6,687 acres of wetlands will be created in TFMCA.

Under the Preferred Alternative, the majority of the TFMCA will also be converted to large, shallow lake. Hydrologic modeling indicates that nearly 10,500 acres of the TFMCA will be inundated greater than 95% of the time. Of this acreage, approximately 6,700 acres will experience average annual depths exceeding 3.0 ft. Considering these hydrologic conditions, our vegetation model predicts that open water / aquatic bed communities will occur on 7,757 acres. Prolonged deep flooding will cause the loss of existing sawgrass and maidencane habitat in the downstream portion of TFMCA. Hydrilla is also likely to become abundant. Nearly 4,100 acres of the TFMCA would be converted to slough and emergent wetlands and transitional wetlands would be created on approximately 1,500 acres. These wetlands will likely be dominated, at least initially, by cattail, primrose willow and Carolina willow. Overall, 5,658 acres of wetlands will be created in TFMCA. All of the peripheral pasturelands will be converted to wetlands, while a small portion of pastureland will become part of the lake. There will be no uplands. Less than 2% of the TFMCA will be subjected to inundation frequencies that will allow for soil oxidation.

Drained uplands were prevalent during Pre-project (1986) conditions in TFMCA in the southern two-thirds of the project area and along the eastern portion of the northern section (Figure 13). Agricultural operations had recently ceased in the southern and middle sections, although the fields remained drained. The northern section of TFMCA, including uplands and wetlands, were still being managed as improved pasture and native range. By 1997 (Existing conditions), all agricultural operations had ceased and the District had completed most of the major project construction. This resulted in the restoration of the southern and middle sections to wetlands, with emergent wetlands being the dominant vegetation community over 8,144 acres. Predicted conditions (Preferred Alternative) show an increase of open water/aquatic bed and slough communities from both Pre-project and Existing conditions, but a decrease of shallower wetland communities such as emergent and transitional wetlands. The uplands of Pre-project conditions will be completely converted to wetter community types.

4.4.2 VEGETATION WITHIN SJMCA

Recognizing the extreme elevation differential between SJMCA and TFMCA, the GDM admitted the likely potential for the overdrainage of SJMCA during low water periods. The GDM or No Action Alternative would cause an alteration in the hydrologic regime that would negatively impact SJMCA by contributing to a shift to drier community types and potentially loss of wetlands. Historically dominant community types, such as herbaceous marsh, may be converted to less desirable types such as willow swamp and transitional shrubs. Lower water levels and a shortened hydroperiod under No Action Alternative may exacerbate the expansion of willow in SJMCA. Dry periods that expose the soil substrate will promote willow seed germination and growth (Milleson 1987, David 1996). In addition, prolonged soil exposure will cause soil oxidation and the direct release of nutrients to the downstream lakes.

The appropriate regulation of water exchange between SJMCA and TFMCA, under the Isolation, 18.5 and Preferred Alternatives, will prevent degradation of the wetland plant community in SJMCA. A critical design component for the SJMCA under any of these alternatives involves the construction and maintenance of canal plugs in the C-40 and South Mormon canals surrounding SJMCA. Canal plugs are needed to rehydrate the SJMCA marsh floodplain so that overdrainage does not occur.

Structures within the canal plugs will allow the flexibility to maintain appropriate hydroperiods on the marsh which include seasonal drying events.

4.5 THREATENED AND ENDANGERED SPECIES

Six federal and state listed animal species and one plant species may be affected by the project. Fallow pasture habitats that currently occupy the eastern third of the TFMCA will be flooded by any alternative considered. This will reduce the potential value of this area as habitat for crested caracara and the eastern indigo snake. The greatest area of existing pasture habitat would be maintained under the GDM Alternative. Chaff seed has not been recorded in the project area so the project should not impact this species. The tremendous increase in the acreage of shallow lake, slough, and emergent and transitional wetland habitat that would be created under any alternative should provide optimal habitat conditions for wood storks. The greatest benefit would likely be provided by the Isolation Alternative, which recreates the greatest acreage of emergent wetland habitat. The Isolation Alternative would likely have the most positive affect on whooping crane habitat whereas either the 18.5 ft or the Preferred Alternative would provide the greatest acreage of potential foraging habitat for snail kites. The 18.5 ft or Preferred Alternatives would provide the greatest increase in potential foraging habitat for bald eagles.

4.6 FISH AND WILDLIFE RESOURCES

All the alternatives considered would positively impact the myriad of wetland dependent wildlife species found within the headwater region of the St. Johns River. Waterfowl and wading birds should benefit most. Identifying or quantifying which alternative would provide the most benefit to wildlife is difficult and would depend greatly on the individual species being considered. Therefore, no alternative was considered to be superior over the others. The GDM Alternative likely has the least benefit to wetland dependent species because it restores the fewest acres of flooded habitat.

There are significant differences between the alternatives with regards to projected impacts to fish populations, specifically sport-fish such as largemouth bass and black crappie. Early in the process of developing a final design for TFMCA it was also recognized that there was a potential for a sport-fishery to develop in the permanently ponded area of the TFMCA that could have a high recreational value (D. Cox FWC, Pers. comm.). FWC fisheries biologists expressed concerns, however, that potential anoxia occurring in conjunction with extreme low water events could cause extensive fish kills. Although fish kills are not uncommon and occur naturally, if they occur too frequently they would seriously compromise the recreational value of the area. To address these concerns, we developed environmental hydrologic criteria for the TFMCA that attempt to maximize wetlands restored while minimizing the intensity and duration of extreme low water events. To protect the sport-fishery, 16.0 ft NGVD was established as a minimum elevation that water levels should not fall below more frequently than once every four years. An additional criterion was that water levels should exceed 16.5ft NGVD greater than 95% of the time.

The Isolation Alternative was the only alternative that did not meet the established criteria. Under this Alternative predicted water levels fell below 16 ft NGVD once every 2.7 years and the inundation frequency of the 16.0 ft NGVD elevation was 86%. The Preferred Alternative maintained the highest water levels of the other three alternatives. In addition, during the more infrequent low-water events (e.g. one in four year lows; Table 15), this alternative maintained the highest acreage of water greater than three feet deep. Therefore, this alternative was considered to be the most likely to support and maintain a quality sport-fishery.

Under the Preferred Alternative the TFMCA will become a large shallow lake with nearly 7,800 acres of open water. During infrequent drought, water levels may still approach levels at which fish kills could occur. Unfortunately, the potential for fish kills is difficult to predict and will depend upon a number of other factors such as weather conditions, abundance of submerged vegetation (e.g. hydrilla), water temperature, etc. To minimize the risk of fish kills during low water events an aggressive program should be implemented to maintain the lowest possible level of hydrilla infestation. Dense hydrilla infestations are well known exacerbate natural seasonal declines in dissolved oxygen levels that occur during the hotter summer months.

4.7 IMPACTS TO THE INDIAN RIVER LAGOON

Under the GDM Alternative staggered discharges through S-96B and S-96-C could cause water levels in either the BCMCA or the SJWMA to exceed Flood Control schedules. Under heavy rainfall conditions this could result in an increased likelihood for freshwater discharges down the C-54 Canal to the Indian River Lagoon to alleviate potential flood risks. These releases could violate discharge goals to the Lagoon as established in the original GDM. Under the Isolation, 18.5 ft and Preferred Alternatives, the original discharge targets for the Indian River lagoon will be met since both the BCMCA and the SJWMA will be able to be regulated simultaneously to ensure water levels in both areas remain below flood control regulation schedules. In addition, under the Preferred Alternative reduction goals to the lagoon will be further enhanced without the need of high volume pumps to move water into the C-1 Retention Area.

4.8 WATER QUALITY

Alternative designs for TFMCA were analyzed for nutrient affects using simulated flows from the Upper Basin Hydrologic Model and either a wetland or lake nutrient model depending on the alternative. The wetland model is a simple first-order decay model for phosphorus toward a background concentration asymptote (Kadlec and Knight, 1997). The lake model was a time-dependant Vollenweider model using a monthly time step (Rechow and Chapra, 1983) (see Appendix G). Because the wetland model is an equilibrium model only valid for predicting long-term average behavior, the model used the predicted long-term median phosphorus concentration from S-96B. This outflow concentration from the St. Johns Water Management Area (SJWMA) through S-96B was predicted using a time-dependent Vollenweider model based on predicted removal coefficients, the redesigned flow paths in the reservoir, and expected loading from agricultural areas. The modeled outflow concentration from SJWMA is the expected concentration based on current efforts in this watershed. This concentration may need to be reduced to achieve concentration goals in TFMCA. Recent concentrations in SJWMA are in line with these goals although not all of the expected loading reductions have been achieved. However, there are few data with the newly completed redesign of SJWMA and this sampling was accomplished predominately during a drought period so it may not be representative of typical results. Additional reductions in S96-B outflow phosphorus concentrations may be needed. The flow-weighted mean phosphorus concentration was predicted to be 0.095 mg/L as P with annual monthly medians ranging from 0.035 to 0.120 mg/L.

The No Action Alternative would have outflows from S-96B flowing across wetlands in both TFMCA and SJMCA before reaching the northern deep-water area in TFMCA and the river channel in SJMCA. This alternative was evaluated using the wetland model alone. The important variables in the model were the average inflow concentration, average flow rate, the removal rate, and the background P concentration. The flow-weighted mean P concentration of 0.095 mg/L was used as the input concentration. The removal rate or settling velocity was set as 15 m/y, which is a reasonable rate for Florida wetlands. The background concentration was set at 0.015 mg/L. While this is much lower than the current background concentration, it is in the range of the potential background concentration as excess loadings are removed. Concentrations in the interior of BCMCA have achieved this concentration over long periods. The area of wetlands predicted to have a concentration above 0.045 mg/L are considered impaired and unlikely to maintain or be restored to their historic low-nutrient communities. This phosphorus value is probably higher than the long-term critical threshold concentration for the low-nutrient communities, however areas in BCMCA have experienced this level of concentration for several years without immediate changes in the vegetation. Using these values, approximately 2,830 acres of wetlands are predicted to be impaired. This level of impact may be an underestimate if the threshold concentration is lower than 0.045 mg/L as is expected or if the actual background concentration is above 0.015 mg/L. This could also be an overestimate if significant amounts of flow reach either the river channel or the deep water areas before tranversing this amount of wetland. However, the flows are expected to be forced through the wetlands under the No Action Alternative.

The Preferred, 18.5, and Isolated Wetlands Alternatives were modeled using only a time-dependent Vollenweider model because flows are planned to be routed directly to deep water areas in TFMCA under these alternatives. These designs divert all of the flow from S-96B to TFMCA and shunt the flow directly to the deep water area and from there directly into the river channel in SJMCA bypassing wetlands and therefore minimizing wetland impacts. The threshold concentration of phosphorus for negative impacts in this design is based on the expected P goal for the downstream lakes. These are highly-colored, dystrophic lakes that are relatively insensitive to nutrients. During high flow periods (July to December), their residence time is very short and algal response is suppressed because of washout downstream. Therefore, the low-flow season P concentration may be the most important in affecting the system. Currently the low-flow season goal for these lakes is expected to be in the range of 0.060 to 0.070. Early observed concentrations for these lakes are 0.050 mg/L. Average P concentrations in these lakes for 1999 range from 0.115 mg/L in Lake Poinsett to 0.159 mg/L in Lake Hell n' Blazes.

The Preferred Alternative modeling predicts a median low-flow P concentration in TFMCA of 0.041 mg/L, a median high-flow P concentration of 0.068 mg/L and a long-tem median P concentration of 0.048 mg/L. Modeling of the 18.5 Alternative predicts essentially the same P concentrations as the Preferred Alternative (Table 20). The following analysis applies to both alternatives equally. Note that these are simple medians rather than flow-weighted means. The low flow and high flow P concentrations are reasonably close to the expected goals for the Upper Basin lakes. These alternatives are expected to have beneficial nutrient effects on wetlands in TFMCA. These benefits will be achieved by preventing flow through the wetlands; primarily limiting nutrient inputs to TFMCA wetlands to direct atmospheric inputs and the small load entering the wetland from the deep water area only during rising stages. Littoral vegetation and lake fringe wetlands are expected to assimilate much of the excess nutrients from this load during rising stages and protect the more interior wetlands.

Table 20. Water quality effects of the alternatives.

	No Action	Preferred	18.5	Isolated Wetlands
Wetland impairment	Expected 5,750 acres	Minimal, restricted to fringe wetlands	Minimal, restricted to fringe wetlands	Larger area of fringe wetlands
Lake Lawton P goal	May be achieved	May be achieved	May be achieved	Not expected to be achieved
P concentration to river lakes	May be achieved	May be achieved	May be achieved	Not expected to be achieved
Low-flow period median P (mg/l)	Depends on wetland area	0.041	0.040	0.058
High-flow period median P (mg/l)	Depends on wetland area	0.068	0.068	0.086

The Isolated Wetlands Alternative greatly reduces the area and volume of deep water. With substantially the same amount of load spread over a smaller area and the reduced residence time, the predicted nutrient concentrations are much higher. The predicted, long-term, median low-flow P concentration is 0.058 mg/L, the median high-flow P concentration is 0.086 mg/L and the annual median P concentration is 0.066 mg/L. These concentrations are above the high-flow season nutrient goal for the downstream lakes. Additionally, a larger high-nutrient fringe wetland would be needed to prevent excess nutrient inputs to the southern interior wetlands in TFMCA because of the higher lake concentrations and more frequent stage fluctuations. This would reduce the area of low nutrient wetlands in TFMCA, although the magnitude of the reduction is hard to reasonably estimate. Average monthly predicted concentrations are plotted for all alternatives in Figure 14.

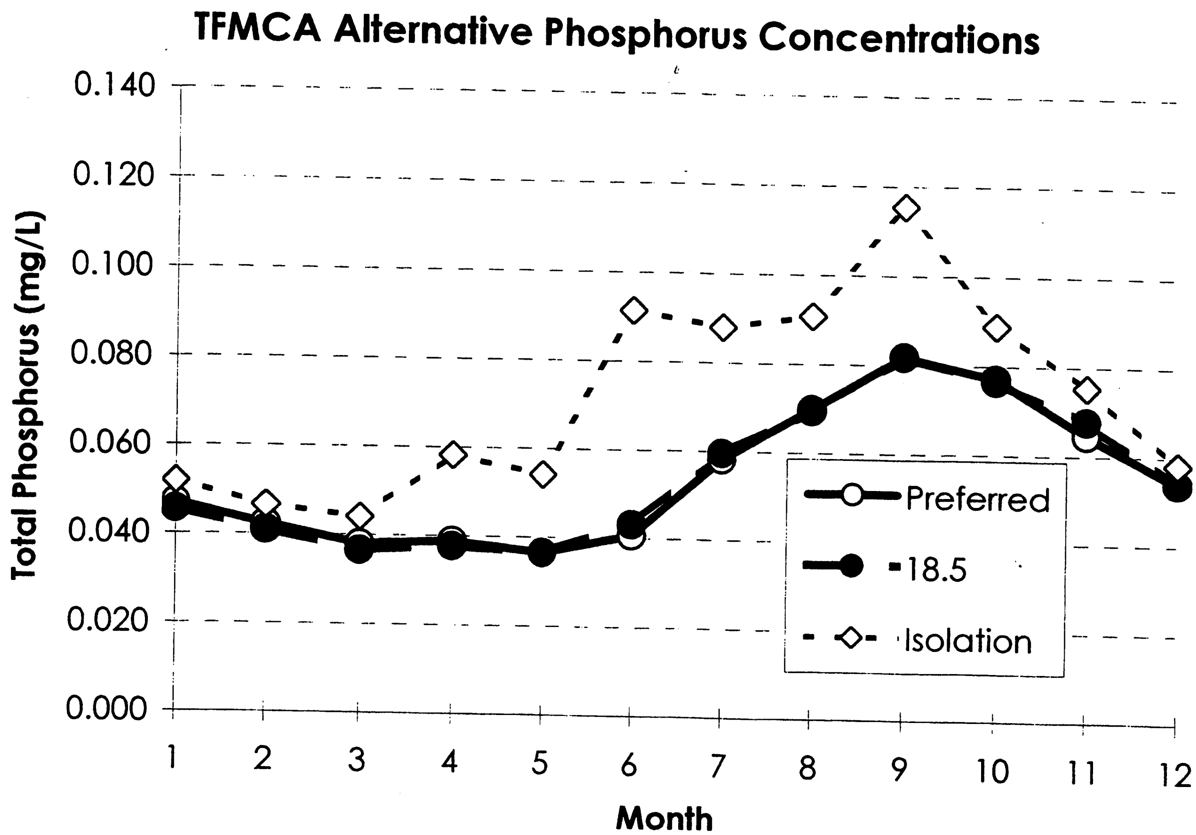


Figure 14. Average monthly total phosphorus concentrations in TFMCA for the Preferred and Isolated Wetlands Alternatives.

4.9 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

Project lands must be free of hazardous, toxic, radioactive, or other harmful substances before construction can proceed. However, if contaminants are found during property procurement or project construction, the site must be remediated.

Agricultural activities are exempt from RCRA under section 40 CFR 261.4 (b)(2)(ii), which provides an exclusion. Farm pesticide and herbicide storage and mixing sites are regulated by the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA. The lawful application of farm chemicals applied in accordance with the labels, result in significant elevated levels in the fields. The degradation of many of the organochlorine compounds may have left residues, including numerous toxic derivatives

Low level contaminants in the soil or sediment can become stressors of concern after hydration. In aquatic environments, lipophilic compounds (such as organochlorine compounds) readily adsorb into soils and sediments because of their affinity for the carbon matrix found in this material. Lipophilic chemicals preferentially partition into "carbon rich" environments, and are found in a freely dissolved state in the water column only in very low concentrations. However, because of their high lipid solubility and slow rate of metabolism and elimination, they may bio-accumulate in the food chain. These compounds are easily passed on to organisms occupying higher levels in the food web. As a result, exposure to lipophilic compounds by ecological receptors is primarily a function of bioaccumulation rather than direct contact with soils, sediments, or trace contaminants in the water column.

The Three Forks Marsh Conversation Area consists of three different parcels. The northern parcel was purchased by St Johns River Water Management District (SJRWMD) in 1988 and 1989 is referred to as Cross Triangle. This approximately 9,000 acres was historically improved and unimproved pasture. The middle 2,500 acre is the former Satori East Property. The southern 2,500 acres is part of the former Fellsmere Joint Venture and referred to as the Mary A. property. These two parcels were purchased in 1985 and were historically pasture and row crops for the few years preceding purchase by SJRWMD.

Twenty locations were sampled for potential chemicals of concern at the 14,000 acre project area. The soils was sampled due to a concern that the past activities may have left low levels of contaminants which may bio-accumulate. The estimated level of DDT in the sample was approximately one tenth of the USEPA Consensus Based Probable Effect Concentration, given the very low frequency of detection and the low levels found, additional sampling does not appear warranted at this time.

Re-dilution and mobilization of pesticide residues currently encapsulated, is a possible result of flooding part of the TFMCA. This can result in high levels of pesticide being reintroduced into the food chain.

The September 6, 2002, sampling report is reproduced in Appendix A and addressed the Florida DEP concerns as far as being within acceptable standards.

4.10 AIR QUALITY
No significant effects expected from exhaust of heavy machinery.

4.11 NOISE
No effect.

4.12 PUBLIC SAFETY
No effect.

4.13 ENERGY REQUIREMENTS AND CONSERVATION
No effect.

4.14 NATURAL OR DEPLETABLE RESOURCES
Transition of the northern quadrant of the TFMCA into open water will mean that area will cease to be marshland. However, not only will the open water provide alternate wetland habitat, it will additionally prevent further degradation by drainage of the SJMCA wetlands.

4.15 SCIENTIFIC RESOURCES
No effect.

4.16 NATIVE AMERICANS
Possible cultural/historic site would be submerged.

4.17 REUSE AND CONSERVATION POTENTIAL
Beneficial effect in creating and maintaining a longer hydroperiod for the rainwater flowing into the TFMCA and thence into the SJMCA.

4.18 URBAN QUALITY
No effect.

4.19 SOLID WASTE
No effect.

4.20 DRINKING WATER
Indirect beneficial effect in directing the flow of water into the SJMCA and into the St. Johns River.

4.21 CUMMULATIVE IMPACTS
Current conditions allow continued degradation of IRL.

4.22 COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

4.22.1 NATIONAL ENVIRONMENTAL POLICY ACT OF 1969

Environmental information on the project has been compiled and a draft Environmental Impact Statement, dated July 2002, has been prepared. At this point, the project is in compliance with the National Environmental Policy Act.

4.22.2 ENDANGERED SPECIES ACT OF 1973

Consultation was initiated with NMFS on February 22, 1999, and is ongoing. Consultation was initiated with USFWS on February 22, 1999, and is ongoing. A draft Coordination Act Report has been submitted by the USFWS pending the final report, and . So far, this project is therefore, in full compliance with the Act.

4.22.3 FISH AND WILDLIFE COORDINATION ACT OF 1958

This project has been coordinated with the U.S. Fish and Wildlife Service (USFWS). An undated draft Coordination Act Report (dCAR) was submitted by the USFWS. There has been no change in the project design or the source of beach fill material since submittal of the dCAR. This project is in full compliance with the Act.

4.22.4 NATIONAL HISTORIC PRESERVATION ACT OF 1966 (INTER ALIA)

(PL 89-665, the Archeology and Historic Preservation Act (PL 93-291), and executive order 11593). Two historic properties, the Platt mound (8BR244) and the Elder Mound (8BR245) will be affected by all of the alternatives. The effect will be created by deeply pooled water that will cover the sites at all times except for extreme drawdowns or low water events. The Corps has determined that the effect will not be adverse. The Florida State Historic Preservation Officer did not concur. A Cultural resource survey is being conducted for the project. The results of this survey will be used to make a determination of effect on historic properties. If cultural resources are identified they will be evaluated for their eligibility for listing on the National Register of Historic Places. If eligible historic properties are identified then mitigation measures will be developed. All determinations will be made in accordance with procedures identified in 36CFR800 and will be coordinated with the Florida State Historic Preservation Officer.

4.22.5 CLEAN WATER ACT OF 1972

The project is in so far in compliance with this Act. A Section 401 water quality certification is requested from the Florida Department of Environmental Protection (DEP) through the coordination process of this draft SEIS.

4.22.6 CLEAN AIR ACT OF 1972

No air quality permits would be required for this project.

4.22.7 COASTAL ZONE MANAGEMENT ACT OF 1972

State consistency review was performed during the coordination of the proposed work through the Florida State Clearinghouse. The project is consistent with the Florida Coastal Zone Management Program, by letter from the Florida Department of Community Affairs (FDCA) April 30, 1999.

4.22.8 FARMLAND PROTECTION POLICY ACT OF 1981

No prime or unique farmland would be impacted by implementation of this project. This act is not applicable.

4.22.9 WILD AND SCENIC RIVER ACT OF 1968

No designated Wild and Scenic river reaches would be affected by project related activities. This act is not applicable.

4.22.10 MARINE MAMMAL PROTECTION ACT OF 1972

Incorporation of the safe guards used to protect threatened or endangered species during dredging and disposal operations would also protect any marine mammals in the area, therefore, this project is in compliance with the Act.

4.22.11 ESTUARY PROTECTION ACT OF 1968

No designated estuary would be affected by project activities. This act is not applicable.

4.22.12 FEDERAL WATER PROJECT RECREATION ACT

The principles of the Federal Water Project Recreation Act, (Public Law 89-72) as amended, have been fulfilled by complying with the recreation cost sharing criteria as outlined in Section 2 (a), paragraph (2).

4.22.13 FISHERY CONSERVATION AND MANAGEMENT ACT OF 1976

The project is under coordination with the National Marine Fisheries Service (NMFS) and at this point is in compliance with the act.

4.22.14 SUBMERGED LANDS ACT OF 1953

The project would occur on submerged lands of the State of Florida. The project has been coordinated with the State and is in compliance with the act.

4.22.15 COASTAL BARRIER RESOURCES ACT AND COASTAL BARRIER IMPROVEMENT ACT OF 1990

There are no designated coastal barrier resources in the project area that would be affected by this project. These acts are not applicable.

4.22.16 RIVERS AND HARBORS ACT OF 1899

The proposed work would not obstruct navigable waters of the United States. The proposed action has been subject to the public notice, public hearing, and other evaluations normally conducted for activities subject to the act. The project is in full compliance.

4.22.17 ANADROMOUS FISH CONSERVATION ACT

Anadromous fish species would not be affected. The project has been coordinated with the National Marine Fisheries Service and is so far in compliance with the act.

4.22.18 MIGRATORY BIRD TREATY ACT AND MIGRATORY BIRD CONSERVATION ACT

No migratory birds would be affected by project activities. The project is in compliance with these acts.

4.22.19 MARINE PROTECTION, RESEARCH AND SANCTUARIES ACT

The Marine Protection, Research and Sanctuaries Act does not apply to this project.

4.22.20 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

Although no fisheries are known to exist at the project site or be affected by it. This act requires preparation of an Essential Fish Habitat (EFH) Assessment and coordination with the National Marine Fisheries Service (NMFS). An independent EFH Assessment is being coordination with the NMFS.

4.22.21 E.O. 11990, PROTECTION OF WETLANDS

No wetlands would be affected by project activities. This project is in compliance with the goals of this Executive Order.

4.22.22 E.O. 11988, FLOOD PLAIN MANAGEMENT

The project is in the base flood plain (100-year flood) and has been evaluated in accordance with this Executive Order. Project is in compliance.

4.22.23 E.O. 12898, ENVIRONMENTAL JUSTICE

There is no reason to believe that the proposed activity will substantially impact health or the environment or unfairly impact a minority or low income population

4.22.24 E.O. 13089, CORAL REEF PROTECTION

This EO may apply to coastal projects especially those which might directly or indirectly impact coral reef such as in beach renourishment and off-shore borrow. The EO refers to "those species, habitats, and other natural resources associated with coral reefs." Thus, it does not apply to this project.

4.22.25 E.O. 13112, INVASIVE SPECIES

The eastern half of the TFMCA is dominated by Bahia grass (Paspalum Notatum) and non-native pasture grasses. The area is also invaded by wax myrtle (Myrica cerifera), saw palmetto (Serenoa repens), and saltbush (Baccharis halimifolia). Brazilian pepper
(Schinus terebinthifolius) occurs throughout the TFMCA. The water level elevations will have the added benefit of destroying those extraneous invasive seed sources.