

SECTION 7 ENVIRONMENTAL EFFECTS

This section includes a summary of the expected beneficial and adverse effects associated with the Water Preserve Areas on resources of concern that were addressed in the Comprehensive Plan Report. The assessment of effects is based on a comparison between the recommended Comprehensive Plan with improvements to components within the Water Preserve Areas and the Without Plan Condition (2050 Base).

The Water Preserve Areas (WPA) Feasibility Study investigated concepts to capture and store excess surface waters by backpumping water from the lower east coast urban areas that is normally discharged to tide via the Central and Southern Florida (C&SF) Project canal system and to capture seepage from the natural system. The reconnaissance and feasibility phases of the C&SF Project Comprehensive Review Study demonstrated that the WPA concept is an integral part of the Comprehensive Everglades Restoration Plan (CERP).

Ecologic restoration of the Everglades will require a significant increase in water quantity. The WPA provides a critical source for this new water by 1) reducing undesirable losses from the natural system through seepage and 2) backpumping stormwater runoff that was previously discharged to tide. Further, development continues to encroach on the remaining natural areas adjacent to the Everglades. If improved, these impacted wetlands could serve a critical role in the restoration of the Everglades by protecting the overall spatial extent of natural areas. The WPA can also provide a mechanism for increased aquifer recharge and surface and subsurface water storage capacity to enhance regional water supplies for the lower east coast urban areas. This would reduce demands in an already degraded natural system. Significant environmental benefits would include:

- Improved water supply for restoring hydropatterns of the Everglades
- Improved water quality
- Preservation of wetland habitat

Environmental issues are summarized, individually, in the subsections that follow.

7.1 SOILS

An increase in Water Preserve Areas hydroperiods would result in direct beneficial effects to area soils by retarding subsidence and erosion. It would provide indirect benefits to soils in other areas of the C&SF Project. Added Water Preserve Areas storage capacity would free up other stored water for restoration of peat soils in the overdrained sloughs of the central Everglades. Measurable effects would occur over a long time scale.

7.2 GEOLOGY

No significant effect is anticipated on the geology of the study area as a result of implementation of recommended Water Preserve Areas Plan. The only geologic resource exploited in the study area is limerock, and this activity will not be affected. The construction of a seepage barrier or curtain wall within the Lake Belt area may locally affect geology and groundwater flows. A future In-Ground Reservoir Technology pilot project is planned to evaluate the feasibility and potential impacts that may result from this technology.

7.3 CLIMATE

Overall, climate is not expected to be directly or indirectly affected by implementation of the recommended Water Preserve Areas Plan or its synergism with the regional Comprehensive Everglades Restoration Plan.

7.4 AIR QUALITY

Air quality is not expected to be permanently affected by implementation of the recommended Water Preserve Areas Plan. Small to moderate localized and temporal impacts are likely to occur due to the use of earth moving equipment for levee degradation, and other construction activities over the period of project construction.

7.5 NOISE

Implementation, operation and maintenance of the proposed project will have little effect on ambient noise levels. Noise levels will be moderate in both scope and scale, and limited to construction areas. These localized impacts would likely occur

for relatively brief periods at any one location. On a regional basis however, noise impacts due to construction activities may occur for an extended period of time, as the schedule for construction activities may last up to 20-30 years prior to completion of the entire Comprehensive Everglades Restoration Plan.

7.6 WETLANDS/VEGETATION

Implementation of the Water Preserve Areas recommended plan is expected to have profound effects on native and exotic vegetation. More natural hydroperiods should assist in restoring natural plant communities. The reduction in persistent high water levels in some areas that are now “too wet”, and the provision of more and better-timed water to regions that are now “too dry”, should result in a more natural mosaic of plant communities. Restored hydroperiods, and the restoration of more natural sheet flow are changes that will benefit native vegetation to the detriment of exotic species. Native vegetation will further benefit through restored water quality conditions.

The recommended plan reduces dependence on water storage in Lake Okeechobee by increasing water storage in the regional system. In the past, this storage has resulted in extreme high lake water levels that damage the littoral zone. Restored, moderate lake levels will aid in maintaining a more healthy marsh and littoral vegetative community. Alternative storage areas, proposed under the Comprehensive Everglades Restoration Plan, also reduce the amount and improve the timing of water releases to the Caloosahatchee River Estuary, to the St. Lucie Estuary, and into the Everglades Protection Area. Regulatory flood releases, which in the past have negatively affected salinity and seagrass beds in the estuaries, will be substantially reduced. Extreme high and low water events in the central Everglades will no longer be as pervasive or as damaging to freshwater marsh vegetation. Although unnaturally long hydroperiods still remain a concern in portions of the central Everglades, their impact is less under the Comprehensive Everglades Restoration Plan than under either the Existing Condition or the Without Plan Condition. Further improvements should be addressed during detailed studies, by operational changes, monitoring, and adaptive management practices designed to address the uncertainty inherent in implementing future plans.

Specific effects resulting from the recommended Water Preserve Areas plan components is discussed below:

7.6.1 North and South Strazulla Wetlands

Hydrologic modeling indicates that very little change would occur in the Strazulla Wetlands as a result of project implementation. North Strazulla would

experience no change from the predicted future-without condition while the south portion of this component would experience a slight increase in wetland function (68.81 functional units) from improvements in cypress forest and mixed cypress and hardwood wetlands. This increase in wetland function would be due to an extended hydroperiod and improvements to hydroperiod, which, in turn, would enhance the wetland canopy. Only a very slight improvement of 3.5 functional units would benefit the marsh habitat of this component.

7.6.2 Hillsboro Impoundment

Hydrologic modeling indicates that this area would experience wide-ranging depth and duration fluctuations. However, in comparison to the fully developed future-without project condition, these hydrologic conditions would provide some limited benefits to opportunistic plants and animals that could adapt to such environmental dynamics. A total of 1,863 acres would realize improvement over the without-project condition with a WRAP score of 0.31. Water management of both north and south impoundments would result in cycles of 4-foot depths followed by drydowns within one to two month intervals. This would preclude survival of most wetland species. Except for a narrow strip along the perimeter levee, it is unlikely that significant coverage of obligate wetland species would ever establish here after project implementation. Ground cover could be improved by designing topographic shelves along the levee at optimal elevations once operations can be more accurately predicted.

7.6.3 C-9 and C-11 Impoundments

Prediction of future-with project wetland function of these areas is difficult. Hydrologic modeling for these components varies among potential conveyance scenarios related to the Lake Belt component of the Comprehensive Everglades Restoration Plan. Future hydrologic modeling will likely be necessary to further optimize design features, thereby modifying the Project Study Plan. This is especially true with respect to estimating the effectiveness of ASR, which is presently unknown. As noted in the future-without project section of this report, the C-9 and C-11 components fall within the Urban Development Boundary and are expected to experience a landscape shift throughout the life of the project under the future-without project condition. These components would lose 854 acres due to predicted development when compared to the existing condition. However, due to maximized wetland management within the mitigation areas (as per Broward County Mitigation Index assumptions), function for these components would theoretically increase by 273 functional units under the future-without condition when compared to the existing condition.

The future-with-project condition would preclude development within the C-9 and C-11 components of the project, thereby maintaining the existing acreage of buffer lands at these locations. Implementation of the C-9 component should result

in an overall loss of wetland function of 393.13 functional units across 3 wetland habitat polygons while implementation of the C-11 impoundment would result in a gain of 266.20 functional units across 4 wetland habitat polygons, when compared to the future-without condition. Generally, these impoundments are designed for short- and long-term storage of water to minimize seepage from WCA 3 and to provide some water supply and flood control benefits when appropriate. Although hydrologic modeling provides information regarding depth and duration of inundation over several years of record, unknown inputs from other Comprehensive Everglades Restoration Projects, the effects of ASR, and the multi-purpose nature of these components create significant doubt in predicting hydrologic outcomes.

Adaptive management of these components is assumed in this assessment and will be essential to maximizing wetland function. Specifically, effective and timely drawdowns will be necessary in maintaining wetland integrity in these components, which will often experience deep inundations.

7.6.4 WCA 3 Buffer Strip, with Melaleuca (North and South)

Except for the melaleuca polygon (South Cell 16-1, Miami-Dade County), this component is not expected to experience any change relative to the future-without project condition as a result of implementation of the Project Study Plan. Wetland habitats within this area would continue to be managed to minimize seepage losses from WCA 3 without any significant hydrologic improvements. As with the future-without project prediction, melaleuca will continue to invade and establish, eventually dominating the landscape where conditions are most suitable for this species. Although it is anticipated that some exotic management will occur, exotic encroachment here is rapid and will likely outpace efforts to manage it.

7.6.5 WCA 3 Buffer Strip, with Melaleuca removal (North and South)

Presently, Broward County is not implementing exotic management programs in this area. Should exotic management be implemented by the project, wetland function would dramatically improve. Appropriate exotic removal and long-term management would effectively convert the majority of the existing habitats to a native sawgrass marsh with a WRAP score (0.78), resulting in a 612 functional unit increase.

7.6.6 WCA 3 Buffer Strip South, Cell 16

This stand of mature melaleuca falls within the county's development boundary for urban zoning and is predicted to experience complete development within the life of the project under the future-without project condition. Implementation of the project would preclude development and result in a wetland function nearly equivalent to the existing condition throughout the life of the

project. A slight gain of 35 functional units would be realized when compared to the future-without condition.

7.6.7 Florida Power and Light Strip

Much of the project land within this component is a mosaic of wet prairies and dense to moderate stands of melaleuca. Only a small portion of relatively uninfested sawgrass marsh exists here. This component is limited to a canal with levees approximately 300 feet wide, which runs the length of the FP&L strip, immediately east of the Pennsuco wetlands. Implementation of the recommended Water Preserve Areas plan would result in the loss of 450 acres (185 functional units) of relatively marginal wetlands.

Table 7.6-1 below presents a Wetland Rapid Assessment Procedure (WRAP) evaluation of the future-with project condition for the Water Preserve Areas study components. The assumptions used to assess the components are presented as footnotes within the table.

TABLE 7.6-1 WRAP FUTURE WITH PROJECT CONDITION

WRAP ANALYSIS WATER PRESERVE AREA COMPONENTS															
FUTURE WITH PROJECT CONDITION															
Components	Wildlife Utilization	Wetland Canopy	Ground Cover	Buffer	Field Hydrology	WQ input & Pre-treatment	Sum V	Sum Vmax	WRAP Score	Polygon Acres	WRAP HU's	Composite Score	Delta Acres	Delta HU's	
Strazzulla Wetlands, N-North S-South	**1														
Polygon N-C1-1 - Hydric Pine Flatwoods		2.50	2.00	2.50	1.75	1.75	2.75	13.25	18.00	0.74	325.00	239.24	0.00	0.00	
Polygon N-C1-2 - Wet Prairie/Cypress/50% Melaleuca		2.75	2.50	2.75	2.00	2.25	2.75	15.00	18.00	0.83	111.00	92.50	0.00	0.00	
Polygon N-C1-3 - Cypress Forest		2.50	2.50	2.50	1.25	2.25	2.75	13.75	18.00	0.76	1216.00	928.89	0.00	0.00	
Polygon N-C1-4 - Sawgrass Marsh/ <10% Cypress		2.50	N/A	2.50	2.25	2.50	2.75	12.50	15.00	0.83	1092.00	910.00	0.00	0.00	
Polygon S-C2-1 - Mixed Cypress Hardwoods		2.00	1.50	2.00	1.75	1.00	2.75	11.00	18.00	0.61	418.00	255.44	0.00	52.25	
Polygon S-C2-2 - Cypress Forest		2.00	2.00	2.00	2.38	1.50	2.75	12.63	18.00	0.70	94.00	65.96	0.00	13.06	
Polygon S-C2-3 - Disturbed Marsh / Shrub Encroachment		2.00	1.00	2.00	2.88	1.50	2.75	12.13	18.00	0.67	100.00	67.39	0.00	3.50	
											3356.00	2559.42	0.76	0.00	68.81
Hillsboro Impoundment	**3														
Northern Impoundment		1.50	N/A	0.00	1.12	0.00	2.00	4.62	15.00	0.31	1680.00	517.44	0.31	-25.00	517.44
											1680.00	517.44		-25.00	517.44
C-11 Impoundment	**2														
Mitigation Area		2.50	N/A	2.50	1.00	2.50	2.50	11.00	15.00	0.73	205.00	150.33			
Impoundment		2.50	N/A	2.00	1.00	2.50	2.00	10.00	15.00	0.67	1430.00	953.33			
											1635.00	1103.67	0.68	704.49	266.20
WCA 3A-B Buffer Strip W/ Melaleuca, N-North S-South	**4														
Polygon N-9-1 - Sawgrass Marsh W/ Melaleuca		2.00	1.50	2.50	2.12	2.00	2.63	12.75	18.00	0.71	145.00	102.71	0.00	0.00	
Polygon N-9-2 - Sawgrass Marsh		2.50	N/A	2.50	2.12	2.00	2.63	11.75	15.00	0.78	1414.00	1107.63	0.00	0.00	
Polygon N-9-3 - Sawgrass/Cattail/Herbaceous Marsh		2.50	N/A	1.50	1.75	2.00	2.50	10.25	15.00	0.68	311.00	212.52	0.00	0.00	
Polygon S-12-1 - Disturbed Sawgrass / Wet Prairie		1.50	N/A	1.50	1.00	2.00	2.00	8.00	15.00	0.53	52.00	27.73	0.00	0.00	
Polygon S-12-2 - Melaleuca		0.50	0.50	1.00	1.25	0.50	1.44	5.19	18.00	0.29	362.00	104.38	0.00	0.00	
Polygon S-13-1 - Melaleuca w/ Sawgrass		2.50	N/A	2.50	1.00	2.00	2.10	10.10	15.00	0.67	283.00	190.55	0.00	0.00	
Polygon S-13-2 - Melaleuca		1.00	0.50	1.00	1.50	2.00	2.00	8.00	18.00	0.44	146.00	64.89	0.00	0.00	
Polygon S-14-1 - Sawgrass W/ Melaleuca		2.50	N/A	2.50	1.00	2.50	2.10	10.60	15.00	0.71	657.00	464.28	0.00	0.00	
Polygon S-14-2 - Melaleuca W/ Sawgrass		1.50	0.50	1.50	2.00	2.00	2.10	9.60	18.00	0.53	561.00	299.20	0.00	0.00	
Polygon S-15-1 - Sawgrass Prairie W/ <25% Melaleuca		2.50	N/A	2.50	1.00	2.50	2.13	10.63	15.00	0.71	130.00	92.13	0.00	0.00	
Polygon S-15-2 - Melaleuca W/ <25% Sawgrass		1.50	0.50	1.50	1.50	2.00	2.13	9.13	18.00	0.51	118.00	59.85	0.00	0.00	
Polygon S-16-1 - Melaleuca		1.00	0.50	0.50	1.00	2.00	2.75	7.75	18.00	0.43	83.00	35.74	0.00	35.74	
											4262.00	2761.61	0.65	0.00	35.74
WCA 3A-B Buffer Strip W/ Melaleuca Removal	**4														
Sawgrass Marsh		2.50	N/A	2.50	2.12	2.00	2.63	11.75	15.00	0.78	4262.00	3338.57	0.78	0.00	612.70
C-9 Impoundment	**2														
Impoundment		2.00	N/A	2.00	0.88	1.50	2.00	8.38	15.00	0.56	1650.00	921.80	0.56	-104.37	-657.13
											1650.00	921.80		-104.37	-657.13
FP&L Strip	**5														
												0.00	-450.00	-185.88	

TABLE 7.6-1 WRAP FUTURE WITH PROJECT CONDITION (CON'T)

	<p>Note - Delta Acres and Delta HU's are the predicted change from the Future without Project Condition to the Future With Project Condition.</p> <p>**1 - Future With Project Condition assumes that the north Strazzulla area will maintain same conditions as Future Without Project Conditions and WRAP scores. The southern Strazzulla area will maintain existing conditions and WRAP scores due to improved hydrology for the Future With Project Condition.</p> <p>**2 - Adaptive management for wetland functions is assumed. This will facilitate periodic wetland dry downs for seed germination. However, at this time specific adaptive management criteria are not known. Should adaptive management not be successful these impoundments would not function as wetlands and WRAP would not be the correct assessment methodology to use for a open water impoundment.</p> <p>**3 - Future With Project Condition assumes this impoundment will not function as a wetland due to the extreme fluctuations of water levels.</p> <p>**4 - Future With Project Condition assumes wetland functions will remain the same as Future Without Project Condition if Melaleuca and other exotic plant species are not removed from this component. If Melaleuca is removed wetland functions will become the same as Sawgrass marsh under Existing Project Condition.</p> <p>**5 - Future With Project Condition this project component will become a canal, with a total width of approximately 300 feet that includes levees.</p>	
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7.7 FISH AND WILDLIFE

As an indirect effect, Lake Okeechobee will function more as a natural lake, rather than as a reservoir with prolonged high lake stages. This change should benefit fish reproduction and growth. Juvenile fish and other small aquatic species depend on a healthy, vegetated littoral zone for food and cover. In conjunction with other elements of the Comprehensive Everglades Restoration Plan and the recommended Water Preserve Areas plan, the ecological conditions within the Lake marsh and littoral zone that support valuable habitat for the fishery would be enhanced. Heterogeneity of vegetation assemblages will be protected with less frequent prolonged flooding and extreme drydown events.

Within those areas proposed for above-ground reservoirs, Stormwater Treatment Areas, and regional scale Aquifer Storage and Recovery systems, a large number of acres of uplands and wetlands will be permanently altered due to the siting of these facilities in the least sensitive areas. Even though upland resources are valuable in and of themselves, particularly within the study area where wetland resources are abundant and uplands are relatively fewer, avoidance of wetlands over uplands generally receives priority in planning. Many of these uplands support wildlife habitat of limited value due to their urban nature and past disturbances. As these facilities are operated, their operation can be modified under an adaptive management framework to maximize their wetland functions and values that will in turn benefit area wildlife species.

Juvenile and adult red drum along with post larval and juvenile brown and white shrimp are common in the coastal influence of the project area and are managed under the Magnuson-Stevens Fishery Conservation and Management Act (PL 94-265).

7.8 THREATENED AND ENDANGERED SPECIES

Within the regional system, improved habitat conditions are anticipated for the West Indian manatee (*Trichechus manatus latirostris*), American crocodile (*Crocodylus acutus*), snail kite (*Rostrhamus sociabilis*), wood stork (*Mycteria americana*), Cape Sable seaside sparrow (*Ammospiza maritima mirabilis*), and the Okeechobee gourd (*Cucurbita okeechobeensis*). In the case of the manatee and crocodile, this is due to substantially enhanced freshwater flows to Florida Bay, and decreased salinities in the Florida Bay and Shark River Slough estuarine habitats relative to the Without Plan Condition. For the snail kite, wood stork, and Cape Sable seaside sparrow, improvements in restoring more natural hydroperiods, with Natural System Model-like conditions throughout much of their habitat, leads to an overall regional improvement in their populations. In some instances there may be

local, minor negative impacts to habitat, caused by vegetation shifts over time, or increased ponding depths in relatively small areas currently serving as functional foraging or breeding grounds.

The endangered Okeechobee gourd is also expected to indirectly benefit due to a reduced occurrence of high water events and flooding of its habitat on the south shore of Lake Okeechobee.

Locally, the eastern indigo snake (*Drymarchon corais couperi*) is not considered likely to be adversely affected by the Water Preserve Areas recommended plan, either during construction or operation of new water storage and treatment areas within the lower east coast urban corridor. Construction of canals and levees associated with the Water Preserve Areas components is not likely to negatively affect significant expanses of eastern indigo snake habitat or cause direct mortality of snakes, providing standard construction phase precautions are incorporated into construction specifications, as agreed upon. To further avoid effects upon the eastern indigo snake, surveys would be conducted before construction and all contractor personnel would be informed of the status of the snake and the penalties associated with harming the species.

The concurrence of the Department of Interior with the Corps assessment of “not likely to adversely affect” regarding impacts to Federally listed threatened and endangered species resulting from implementation of the recommended Water Preserve Areas Plan, is stated in the Coordination Act Report and ESA concurrence letter (see *Annex B, Biological Assessment*). The FWS letter states that the recommended Water Preserve Areas Plan is not likely to jeopardize any of the listed species or adversely affect critical habitat.

7.9 ESSENTIAL FISH HABITAT

The Water Preserve Areas restoration project would indirectly affect some coastal biological communities identified as Essential Fish Habitat (EFH) in the nearshore areas of both Biscayne and Florida Bays. Increased natural system water supply would eventually result in increased freshwater inflows to the bays.

Negative effects to submerged aquatic vegetation, intertidal marsh, and bay bottom habitats from the proposed project are expected to occur as a result of increased fresh water flows and subsequent reduction of salinity levels throughout wetland, estuarine, and bay systems. Although negative effects on the flora and fauna of these communities are anticipated, effects attributable to the Water Preserve Areas would be minimal on an individual project and cumulative affects basis, as well. The overall benefits derived from restoring the region to a more

natural hydrologic regime offset the negative effects. Because those effects are considered minor, mitigation is not being proposed.

7.10 WATER QUALITY

Five types of evaluations on the effects of components on water quality are presented in this narrative. The referenced predictive evaluations are phosphorus concentration reduction, relative dissolved oxygen (DO), hydraulic residence time, percentage of phosphorus load reduction, and parameter function comparison. The parameter function comparison is based on qualitative analyses of four project alternatives (including D13R). These analyses yielded qualitative numerical ratings of the treatment performance of each major component with regard to total nitrogen (TN), total phosphorus (TP), micro-nutrients, heavy metals, suspended solids, pathogenic organisms, and pesticides. Detailed discussion on function comparisons may be found in **Appendix H**. In some cases, not all evaluations were applied to components. Five design alternatives (including the Recommended Plan and the Comprehensive Plan) were investigated as to the ability of each design to achieve targeted water quality performance measures.

The WPA Water Quality Team (WQT), which was created to evaluate the effect of the five WPA alternatives on water quality conditions of the study elements (components), determined that the WPA-Pre-Selected Plan (PSP) was preferred over other alternatives (Alternative 1, ALT1; Alternative 2, ALT2; Alternative 3, ALT3) and the Comprehensive Plan (Alternative D13R, D13R). The WQT consisted of staff from the following agencies: SFWMD, USEPA, FDEP, USACE, ENP, LNWR, DERM, USFWS, Seminole Tribe Representative, and DRNP. During the final evaluation process, all of the WPA sub-teams met to select the optimum alternative for a given component. The WQT was faced with the need to make trade-offs in the selection of the PSP. Above all, the purpose or the designated use of the impoundment or the WPA element was the driving factor in the selection of the “winning” alternative. Although water quality improvement is desired, other variables such as water supply needs or natural area improvement features were the key considerations behind the design of the impoundment.

It should be noted that for the three major parameters being examined—TN, TP, and DO—only DO can be referenced against an actual *numerical* Florida water quality criteria for the pertinent class of surface waters. In the cases of TN and TP, only qualitative criteria requiring non-degradation of baseline conditions (62-302.300, F.A.C, 62-302.700) are applicable. In the case of DO, while numerical criteria of ≥ 3 , ≥ 4 or ≥ 5 mg/L (ppm) are required for specific water bodies, all projected inflow waters for future components exceed minimum DO levels for Class III waters. Consequently, practically all WPA stormwater facilities will store and/or treat inflow that does not meet State water quality criteria with regard to

DO. Regarding the applicability of Class III water quality criterion, Weaver et al (2001) made the following statement in the 2001 Everglades Consolidated Report:

It is widely accepted that DO concentrations are normally low in macrophyte dominated marsh environments such as the Everglades due to natural processes of photosynthesis and respiration (Belanger and Platko, 1986; MacCormick et al., 1997). Since the low DO concentrations often measured in the Everglades represent the natural variability in this type of ecosystem, the Department does not consider these excursions violations of the DO standard. Therefore, the Class III criterion of 5.0 mg/L is not believed to be appropriate for the Everglades.

Weaver et al (2001) further references the preceding statement to Paragraph 62-302.500(1)(f), F.A.C., which states that “dissolved oxygen levels that are attributable to natural background conditions or man-induced conditions which cannot be controlled or abated may be established as alternative dissolved oxygen criteria for a water body or portion of a water body.” There are only four components that are projected to release effluent with reduced DO concentrations: ACME Basin B Impoundment, Hillsboro Impoundment, and the C9 Impoundment. However, it should be noted that these projections do not include the anticipated reaeration effects of discharge pumps on flowing effluent waters. The study team projects that this reaerating effect will compensate for DO concentration losses resulting from treatment processes. The study team recognizes that it is FDEP’s responsibility to establish water quality criteria. In anticipation of the State of Florida’s eventual development of Site Specific Alternative Criterion (SSAC; 62-302.800, F.A.C.), the study team has allowed for design flexibility such that each component may be modified to produce compliant effluent.

Aquifer Storage and Recovery technology is a major sub-component of many project components of CERP for which a general discussion is provided at the end of this Environmental Effects section. Project components have been grouped geographically based on relative proximity. To a large extent, groupings fall within the boundaries of Palm Beach, Broward, and Miami-Dade counties (from north to south), respectively. Projected environmental effects are summarized on a per group basis below.

7.10.1 Strazzulla Wetlands

The Strazzulla Wetlands encompasses approximately 3,356 acres of mixed wetland communities. The WRAP analysis revealed that the area could be divided into seven discrete wetland types. These are: Hydric Pine Flatwoods (325 acres), Wet Prairie/Cypress Strand/Melaleuca (111 acres), Cypress Forest (1,216 acres), Sawgrass Marsh with ten percent Cypress (1,092 acres), Mixed Pond Cypress and

Hardwoods (418 acres), Cypress Forest (94 acres), Disturbed Marsh with Shrub Encroachment (100 acres).

The Strazzulla Wetlands component is located immediately south of the Acme Basin B Impoundment and directly adjacent to the Loxahatchee National Wildlife Refuge (LNWR). This component is intended to protect and enhance existing wetland systems along the LNWR including the Strazzulla tract. For this component, only the comparative function evaluation was used to characterize projected effects on water quality. The parameter function comparison indicates that the wetland areas will exhibit a low capacity to improve water quality in terms of heavy metals; a moderate capacity reduce total nitrogen (TN), micronutrients, and pesticides; and a high capacity to improve water quality in terms of total phosphorus (TP), suspended solids, and pathogenic organisms. It should be noted, however, that the subject wetlands are classified as rainfall driven and, as a result, do not exhibit a significant hydrological link to adjacent areas. Consequently, the influence of the Strazzulla Tract on water quality in the surrounding areas will be limited.

7.10.2 Hillsboro Impoundment

The Hillsboro Impoundment consists of six vegetative types and totals approximately 1,705 acres. The purpose of this component is to store and supply water to the Hillsboro Canal during the dry season.

The impoundment simulation for the selected alternative yielded a phosphorus concentration reduction of 5 percent (Inflow=117 ppb; Effluent=111 ppm). Correspondingly, the phosphorus load reduction is projected to be approximately 6 percent (Inflow=11,257 kg/yr; Effluent=10,543 kg/yr). Flow routing through the impoundment is expected to result in a DO concentration reduction in the effluent that is approximately 34 percent less than that of inflow waters (Inflow=4.90 mg/L; Effluent=3.09 mg/L), but slightly exceeding 3 mg/L which falls within a range typical of regional marsh systems. The projected hydraulic residence time for the impoundment is just over 22 days, a duration that will allow for limited water quality enhancement. A shortened residence time was made feasible by the selected alternative that requires that the impoundment be used in conjunction with a 150-MGD Aquifer Storage and Recovery (ASR) system. The effects on water quality of water stored in ASR wells will be determined upon the completion of the ongoing ASR pilot project (also, see final subsection of this narrative). The parameter function comparison indicates that the impoundment will exhibit a moderate capacity to improve water quality in terms of TP, suspended solids, and pathogenic organisms; and a high capacity to improve water quality in terms of TN, micro-nutrients, heavy metals, and pesticides.

7.10.3 Broward County WPAs

Broward County components are the WCA 2 flow Diversion to Central Lake Belt Storage (CLBSA), WCA 3A and 3B Levee Seepage Management, C-11 Impoundment, C-9 Impoundment, North New River Improvements, and Water Conservation Area 3 Flows to Central Lake Belt Storage Area.

7.10.3.1 Diversion of WCA 2B Flows to Central Lake Belt Storage (CLBSA)

This component encompasses the majority of the remaining Central Region (Broward County) components. No appreciable net water quality effects are expected as a result of the operation of the hydrological linkages that form this component.

7.10.3.2 WCA 3A and 3B Levee Seepage Management

The purpose of this component is to reduce seepage from WCA 3A and 3B to improve hydropatterns within the WCAs by allowing higher water levels in the borrow canals and maintaining longer inundation duration within the marsh areas that are located east of the WCAs and west of US Highway 27. The seepage from the WCAs and marshes is collected and directed south into the CLBSA. Flows from the CLBSA will be provided to Northeast Shark River Slough, WCA 3B, and Biscayne Bay. The component design assumes that seepage from the Water Conservation Areas meets the water quality standards necessary to achieve ecosystem restoration. Discussion of specific water quality parameters may be found in the section on the CLBSA component.

7.10.3.3 C-11 Impoundment

The C-11 Impoundment will be operated so as to divert untreated runoff from the western C-11 basin (presently discharged into WCA 3A through pump station S-9) into the C-11 Impoundment prior to sending it south to the C-9 Impoundment. If storage capacity is not available in the impoundment or in the C-9 Impoundment, then the S-9 pump station is used to provide flood protection for the western C-11 basin and runoff is pumped into WCA 3A.

The impoundment simulation for the selected alternative yielded a phosphorus concentration reduction of 0 percent. The lack of net phosphorus concentration reduction is projected due to the fact that the reservoir could not achieve additional TP reduction given the very low initial concentration of approximately 16 ppb. However, the corresponding phosphorus load decrease is projected to be approximately 8 percent. Incidences of an inverse relationship between the concentration and load values are a function of periodic accumulation/reentrainment cycles of the low concentration TP that enters the impoundment. The lack of TP *concentration* reduction in the impoundment has been regionally compensated for with the additional treatment that will occur in the NLBSA system. The net result of this re-routing is a 93% TP reduction

(Inflow=210,077 kg/yr; Effluent=15,000 kg/yr) in waters that flow through S-9 during times of peak flow diversion. Flow routing through the impoundment is expected to result in a DO concentration (2.78 mg/L) increase in the effluent that is approximately 31 percent more than that of inflow waters (2.12 mg/L). The projected hydraulic residence time for the impoundment is 7.3 days, which was the least number for all alternatives. The parameter function comparison indicates that the impoundment will exhibit a high capacity to improve water quality for all parameters considered. These parameters are nutrients, heavy metals, suspended solids, pathogenic organisms, and pesticides.

7.10.3.4 C-9 Impoundment

This component has been designed initially to capture diverted, untreated runoff from the western C-11 that is presently discharged into Water Conservation Area 3A through the S-9 Pump Station. When the North Lake Belt Storage Area is constructed, the C-9 Impoundment will be transformed into an STA or suitable polishing pond.

The component simulation for the selected alternative yielded a phosphorus concentration reduction of approximately 13 percent. This percentage represents less reduction than some other alternatives, however, the preliminary selected alternative provides for the capping of the nutrient reduction benefit in order to allow for increased ASR (water supply) capacity and mitigation acreage. The impoundment is less efficient due to the resulting increased dry storage conditions. Furthermore, phosphorus load reduction is projected to be approximately 49 percent. Flow routing through the impoundment is expected to result in a minimal DO concentration reduction (10 percent) that is equivalent to all other alternatives (Inflow=3.26 mg/L; Effluent=2.93 mg/L). The projected hydraulic residence time for the impoundment is 76 days, which is adequate for the design treatment level. The residence time is less than that of two other alternatives, primarily due to the fact that the impoundment is to be used in conjunction with a 125-MGD Aquifer Storage and Recovery (ASR) system. The effects on water quality of water stored in ASR wells will be determined upon the completion of the ongoing ASR pilot project. The parameter function comparison indicates that the impoundment will exhibit a relative high capacity to improve water quality in terms of nutrients, heavy metals, suspended solids, pathogenic organisms, and pesticides.

7.10.3.5 North New River Improvements

The purpose of this component is to send water supply deliveries from Lake Okeechobee to Miami-Dade County southeast through the North New River Canal in the Everglades Agricultural Area (EAA) (L-20, L-19, L-18 borrow canals), the S-150, the L-38 borrow canal, and points further south in the U.S. Highway 27 West Borrow Canal. The quality of the subject water deliveries is influenced by adjacent

areas in the EAA, WCA 2A, and WCA 3A, which are addressed in preceding sections.

This component is designed to achieve a re-routing of water supply deliveries only. No appreciable net water quality improvement or degradation is anticipated.

7.10.3.6 Water Conservation Area 3 Flows to Central Lake Belt Storage Area

This component involves the manipulation of structures for the purpose of capturing excess water in Water Conservation Areas 3A and 3B, reducing stages above target stages in Water Conservation Areas 3A and 3B, and diverting flows through modified structures at S-9 and S-31 to the CLBSA via the L-37 and L-33 borrow canals.

Pertinent effects on water quality for this operational component can be derived from narrative pertaining to the CLBSA component provided below. No appreciable net water quality effects are expected as a result of the operation of the hydrological linkages between Water Conservation Area 3 and the CLBSA.

7.10.4 Dade Broward Levee and Canal

The Dade Broward Levee and Canal components include the C-4 Structure, the Dade Broward Levee and Canal, which includes the North Lake Belt Storage Area Turnpike deliveries, and the Central Lake Belt Storage Area L-30 improvements.

7.10.4.1 C-4 Structure

The proposed (east) C-4 structure is designed to provide two separate benefits. The structure reduces regional system water supply deliveries by diverting dry season stormwater flows to the C-2 Canal to increase recharge in several nearby coastal wellfields.

7.10.4.2 Central and North Conveyance

The purpose of this component is to reduce seepage to the east from the Pennsuco wetlands and southern Water Conservation Area 3B and enhance hydroperiods in the Pennsuco. Additionally, the Dade Broward Levee improvement design enhances recharge to Miami-Dade County's Northwest Wellfield.

With-project effects on water quality in the vicinity of the Pennsuco Wetlands have been partially characterized in the above (C-4 Structures) evaluation. For this component, only the comparative function evaluation was used to characterize projected effects on water quality. The parameter function comparison indicates that the recharge area will exhibit a high capacity to improve water quality for all

parameters considered. These parameters are made up of nutrients, heavy metals, suspended solids, pathogenic organisms, and pesticides.

Finally, it should be noted that the results of the models used to evaluate the reservoirs should be interpreted with caution. The models used in the WPA analyses are of the first-level planning variety and are relatively simplistic in their ability to evaluate pollutant dynamics in reservoirs. For example, processes such as nutrient re-suspension resulting from anaerobic conditions in deep reservoirs are not modeled. Therefore, the results given for the deep reservoir should be regarded as coming from a highly simplified approach to deep reservoir pollutant dynamics.

7.10.5 Summary

In conclusion, it should be noted that, during the alternative selection process, water supply needs or Everglades Protection Area (EPA) improvement features were the driving motivations behind the design of impoundments and other WPA elements. Although water quality improvement was always an objective, the above-mentioned other variables were prioritized above those pertaining to water quality enhancement. Specifically, preference was given to the alternative that optimized the designated hydraulic and hydrodynamic functions. Consequently, the best water quality alternative was not necessarily the one selected for the Recommended Plan.

The primary water quality constituents that were used in evaluating the fate of water quality constituents in the WPA elements through the use of various water quality models were Total Phosphorus (TP) and Dissolved Oxygen (DO). These constituents were identified as the two most important in the project study areas. The concentration and load reductions of TP or the depletion of DO as water moves through the reservoirs were the key variables used as performance indicators. It is the conclusion of the WPA Water Quality Sub-team that from both the regional and component area perspectives, the implemented WPAs project will not degrade, and in numerous cases will enhance, surface and ground waters in the effected areas.

7.11 WATER SUPPLY

The Recommended Plan will improve water supplies for the Lower East Coast Service Area when compared to the future Without Plan Condition. The Recommended Plan helps to meet public water demands, minimize the duration of water supply cutbacks, and maintain saltwater intrusion stages in the primary coastal canals in this region. Compared to the Without Plan Condition, it improves the system's ability to meet public water supply demands and prevent saltwater intrusion. All of the alternative plans reduce the dependence of users on Lake Okeechobee and the Water Conservation Areas by providing regional water from the six new storage facilities.

The new impoundments provide over 47,000 acre-feet of storage in the lower east coast. These aboveground impoundments store storm water runoff from the eastern basins and release it east back to the basins to maintain primary coastal canals, recharge the aquifer and supply public wellfields. The ability to move water between impoundments optimizes available storage throughout the Water Preserve Areas and provides the initial source to meet public water supply demands. Every acre-foot of water that can be supplied by Water Preserve Area impoundments preserves at least that much in the Water Conservation Areas.

The WPA impoundments and levee seepage controls preserve water in the Water Conservation Areas two ways. On average, the impoundments provide 34,000 acre-feet of water as an initial source of water to meet public water supply needs and they raise regional groundwater levels. The elevated ground water table reduces the amount of seepage from the Water Conservation Areas to the Lower East Coast. The Natural Areas Performance Measures provide graphics that track the groundwater flow east from various locations within the study area. Additionally, Appendix I provides details on the change in groundwater seepage for components (WCA 3A and 3B Levee Seepage Management and Dade-Broward Levee and Canal) that have a main objectives of seepage reduction.

Another way to look at the benefits is in the Recommended Plan, 24,000 acre-feet less water will be delivered from the Water Conservation Areas and Lake Okeechobee through the structures to the Lower East Coast than in the Comprehensive Plan. The additional refinement of the WPA components reduces Lower East Coast demands on the regional system by an additional 17% compared to the Comprehensive Plan and 55% compared to the Without Plan Condition. The future for urban water supply shows significant problems in the Without Plan Condition even if the health of the environment were not a consideration. The urban areas will benefit from a sustainable system that supports their future water supply demands and restores the Everglades ecosystem.

7.12 LAND USE

The most significant effect on land use will be the proposed creation of approximately 10,215 acres of storage reservoirs within the Lower East Coast. It is anticipated that the majority of the storage needs will be met with agricultural lands, undeveloped lands and lands adjacent to the east coast protective levees. Therefore, implementation of these features of the recommended Water Preserve Areas Plan will likely have an effect on existing agricultural land use.

Several thousand acres of land will be needed for water management facilities in the Lower East Coast region. The lands proposed for the Water

Preserve Areas in the Lower East Coast are generally vacant or are in agricultural production. It is assumed that the majority of these lands would eventually be designated urban land, especially low density residential. These urban land uses can in general be accommodated on other vacant lands or by increasing the density of development. Seepage management should not cause changes to existing land use, as minimal land is required for the wells and physical barrier methods. Seepage control components along eastern Water Conservation Areas 3A and 3B are located on 4,262 acres of wetlands. These components will lengthen the hydroperiods of the wetlands involved. However, these lands are outside the urban development boundaries and would not be subject to the same development pressures as lands within the urban development boundary.

7.13 RECREATION RESOURCES

Some limited impacts to recreation may be assumed under both the Comprehensive Everglades Restoration Plan and the recommended Water Preserve Areas Plan. In an effort to restore a more natural regional sheet flow and reduce negative ecological and hydrologic effects wrought by interior canals, miles of canals would be filled and levees degraded. Some of these canals currently support regionally important sport fisheries. New opportunities for recreation resource growth would become available with the implementation of the Comprehensive Everglades Restoration Plan. These include the restoration of existing national and regionally significant fisheries, including Lake Okeechobee, Indian River Lagoon and others, and the creation of thousands of acres of reservoirs, which could function, in part, as recreation resources. If properly sequenced, fishery resources could be established within new project features, prior to impacting existing canals scheduled for filling in through levee degradation.

Restoration of the Everglades, a unique and internationally recognized wetland resource with huge spatial extent, and proven recreation potential in and of itself, should provide vast benefits to recreation resources. Native wildlife game and non-game populations are expected to increase in a sustained manner under improved ecological conditions resulting from the Comprehensive Everglades Restoration Plan. It is reasonable to conclude that overall, there is greater regional recreation resource potential under the Comprehensive Everglades Restoration Plan than either the Existing Condition or the Without Plan Condition.

As stated previously, the Comprehensive Everglades Restoration Plan may result in an initial localized decline in the mileage of canals available to fishermen, some of these are of state-wide importance. According to Corps design and cost estimates for the Comprehensive Everglades Restoration Plan, approximately 72 miles of canals are scheduled to be filled, while 74 miles of new canals will be constructed, and 100 miles of existing canals will be widened. The planned

construction of the Water Preserve Areas in Palm Beach, Broward, and Miami-Dade Counties offers an important potential for new water-based recreational areas.

7.14 AESTHETIC RESOURCES

Restoration of the south Florida ecosystem is expected to result in a healthier environment that will support vigorous plant communities, larger fish and aquatic animal populations, large numbers of wading birds, alligators, and sustainable populations of wide-ranging mammals, in a natural setting, in perpetuity. Viewing wildlife, wetlands and open, relatively pristine spaces are valued by people, as tourism statistics for south Florida would seem to support. In the short term the anticipated increase in native animals and native plants alone may not appreciably impact aesthetics to the casual observer. In fact, to the casual observer, the Everglades may already meet those criteria, as it is already a wilderness of fairly pristine character. In the long term, however, with the implementation of the Comprehensive Everglades Restoration Plan, wading bird communities are expected to increase dramatically, offering the public memorable viewing experiences that have not been seen for decades. While implementation of the Water Preserve Area Project itself may not improve aesthetics, it is needed to ensure that a truly healthy and aesthetically pleasing ecosystem will exist in perpetuity.

7.15 CULTURAL RESOURCES

No historically significant standing structures or engineering properties, and no recorded Seminole period or historic period archeological sites will be affected by any of the WPA components. Several pre-Columbian archeological sites, predominantly black dirt middens dating to the Archaic or Glades period, are located within the project areas. These sites and other archeological sites near the WPA's are discussed below. All site numbers and descriptions are taken from the Florida Master Site File. Site numbers follow a format instituted nationwide, combining 8, the designation for Florida, a two letter code for the Florida county, and a sequential number designation for the site.

There is one pre-Columbian archeological mound complex located within the Strazzulla Wetlands. The site, the Boynton Beach Mound complex site 8PB100 is eligible for inclusion on the National Register of Historic Places and has been subjected to extensive excavation by both advocational and professional archeologists (Iskan 1988; Jaffee 1976). The site consists of a complex of approximately 10 mounds, both midden mounds and burial mounds, and associated causeways of linear embankments. Radiocarbon dates obtained from two different strata of the site produced dates of 150 B.C. and A.D. 400±60. This very significant

site will be protected during construction of the Strazzula Wetlands and will not be adversely affected by operation of the component.

There are no recorded archeological sites within the proposed Hillsboro Impoundment. Approximately 1.5 miles south of the Hillsboro Impoundment is a very significant and National Register of Historic Places eligible site, 8BD41 (Cockrell 1991). Up to 44 human burials have been excavated from this burial mound site. Two nearby sites, 8BD2154 and 8BD2359, may be associated with 8BD41. Construction and operation of the Hillsboro Impoundment will not effect these sites.

Within the proposed C-11 impoundment are three recorded archeological sites, 8BD2130, 8BD2131 and 8BD2146. Site 8BD2130 is a knoll site dating to the Late Archaic period. Sites 8BD2131 and 8BD2146 are Glades period black dirt midden sites on remnant tree islands. These sites were recorded by AHC during the 1991 archeological survey of Broward County (Carr et. al. 1991). They are evaluated as locally significant and should not be adversely affected by construction or operation of the C-11 impoundment.

An additional eight archeological sites are located within a mile of the C-11 impoundment. North of the C-11 impoundment are four recorded sites, 8BD2115, 8BD2142, 8BD2150, and 8BD2153. These sites were investigated during a cultural resources survey of the Weston Increment of the Arvida development (Carr and Steele 1992; Carr and Davis 1993). A human burial was encountered in an excavation unit at site 8BD2142, and human remains may also be present at site 8BD2150. These sites are potentially eligible for inclusion on the National Register of Historic Places. East of the C-11 impoundment are four recorded archeological sites, 8BD109, 8BD2116, 8BD2145, and 8BD3041. These sites were investigated during a cultural resources survey of the Gulfstream Parcel (Carr et. al. 1996). One site, 8BD2145, was determined to be eligible for inclusion on the National Register of Historic Places. Creation and operation of the C-11 impoundment should not have an effect on these National Register of Historic Places sites.

There are no archeological sites recorded in the C-9 impoundment, and only one site recorded within 1.5 miles of the project, site 8BD2882, a black dirt midden located east of the project on the C-9 canal (Carr et. al. 1991). The site will not be affected by the proposed C-9 impoundment.

Within the proposed WCA 3A-3B Seepage Management Area there are two recorded archeological sites, 8BD59 and 8BD2360, both black dirt middens (Carr et. al. 1991). Neither site is National Register of Historic Places eligible. Four additional black dirt midden archeological sites are located near the project area, 8BD107, 8BD1868, 8BD2143, and 8BD2151. Project construction or operation will not affect these sites.

There are seven pre-Columbian archeological sites within the Florida Power & Light Strip. All are black dirt middens that may contain human remains. Construction or operation of the component will not adversely affect these sites.

7.16 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTES

The preliminary assessment indicated that nine State Priority-Listed Sites and two landfills were found adjacent to the proposed project areas. Hazardous, toxic, radioactive wastes (HTRW), or other harmful substances may be impacting the project area. A Phase II assessment is recommended for the project areas that border the State Priority-Listed Sites and the former landfills. Any contamination found during phase II assessment, property procurement or project construction must be remediated. The with project condition requires all HTRW to be remediated or the project area is rejected.

Contamination chemicals, if not detected during the site assessment, may be disturbed or released by increasing the water level and hydroperiod or by removing unnatural structures or features from the landscape. Past experience has shown that the highly permeable ground substrate of the project area results in rapid dilution of residual contaminants.

7.17 UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

7.17.1 Land Use (Agriculture)

Cumulatively, a significant number of acres of agricultural lands will be permanently removed from production in Palm Beach, Broward and Miami-Dade Counties due to the construction of the Water Preserve Areas. Much of these lands would have been developed under the Without Project Condition.

7.17.2 Wetlands

A limited number of acres of wetlands will be permanently altered within the boundaries of the aboveground storage impoundments and Stormwater Treatment Areas, within the Water Preserve Areas.

7.17.3 Water quality

Temporary increases in turbidity of local waters are expected from the removal of canals and levees and by the construction of raised roadways and other structures.

7.17.4 Air quality

Fugitive dust from vehicular traffic and earth moving will be unavoidable but insignificant overall.

7.17.5 Soils

Temporary disruption of soils is expected from construction activities of the recommended plan components.

7.17.6 Wildlife

Significant short-term disruption of wading bird colonies is expected from altering hydroperiods in the Water Conservation Areas. Localized disturbances to fish and wildlife are expected from construction activities of the Recommended Plan components.

7.17.7 Recreation

Limited impacts to recreation resources (canal fisheries for example) are expected. However, project features proposed under the Recommended Plan, including restoration of existing natural resources, construction of new canals, deep water storage reservoirs and Stormwater Treatment Areas, all offer potentially important recreation benefits, which should offset existing resource loss.

7.17.8 Cultural Resources

No known historic or archeological sites will be affected by implementation of the recommended plan. If a cultural resource is identified during project implementation the necessary mitigation will be developed and coordinated with the Florida State Historic Preservation Office.

7.18 RELATIONSHIP BETWEEN SHORT TERM USES AND LONG TERM PRODUCTIVITY

While regional conditions will improve, short-term or localized problems will undoubtedly occur. For example, in the process of improving wading bird nesting and foraging areas regionally, existing rookeries may be affected. Although overall restoration of the Everglades watershed is expected to improve habitat for nesting

wading birds regionally over time, the transition period might adversely affect regional wading bird populations. Proper sequencing of project features should mitigate impacts to existing wildlife resources expected to be impacted by restoration activities within their vicinity. Further study and close monitoring will be critical to recovery and maintaining viable wading bird populations during the implementation of the Comprehensive Everglades Restoration Plan.

7.19 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Construction of the proposed project will include many features considered permanent, or modifications to existing C&SF Project features, which may be deemed irreversible. This would include, for example, construction of large reservoirs, degradation of levees and filling in of canals. Construction of regional Aquifer Storage and Recovery facilities, curtain walls, large storage reservoirs, Stormwater Treatment Areas, Water Preserve Areas, and waste water reuse facilities, are all necessary for the restoration of the natural ecosystem and maintenance of the urban and agricultural system. These features on the scale proposed in the Comprehensive Everglades Restoration Plan are probably of such a magnitude that these features would represent an irreversible and irretrievable commitment of resources. Resources committed would include state and Federal funding to purchase lands and labor, energy and project materials to build, operate, and maintain the project.

Fish and wildlife habitat will be permanently altered, (converted to open water particularly in the case of storage reservoirs and Stormwater Treatment Area facilities). These features will be inundated for portions of the year.

7.20 CUMULATIVE EFFECTS

Large areas within the Upper East Coast will be used to increase water storage for the overall gain and long-term benefit of the regional system. These project features will provide important storage functions and are essential to the overall restoration of the freshwater marshes and the estuaries of the greater Everglades ecosystem. Project features will cause some adverse consequences to agricultural land use, permanently removing thousands of acres from agricultural production. These impacts may be felt locally and/or regionally as the economic base derived from agriculture is incrementally reduced relative to other sectors of the economy. The overall benefit to the regional system is expected to be far greater than the localized adverse effects. As these features occur disparately across the landscape within different hydrologic basins, and as distinct units rather than

multiple features within a single watershed, they will not likely result in a significantly detrimental cumulative effect.

Overall, the Comprehensive Everglades Restoration Plan project elements in the Water Preserve Areas may cumulatively affect the current rate of westward expansion of Lower East Coast cities and may increase the value of other residential or potentially residential lands. Recommended Water Preserve Areas project components are not expected to result in a cumulative negative effect on the human environment of the Lower East Coast. Project components in the area, especially storage, seepage control, redirection of point source canal flows to overland flow, and water reuse plants, will act to restore more natural freshwater flows to Biscayne Bay, reduce seepage losses from the Everglades, improve recharge of the Biscayne aquifer, and should result in other beneficial environmental effects.