South Florida Water Management District

Florida Forever Work Plan

May 10, 2001

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
3301 Gun Club Road, West Palm Beach, Florida 33406 • (561) 686-8800 • FL WATS 1-800-432-2045 • TDD (561) 697-2574
Mailing Address: P.O. Box 24680, West Palm Beach, FL 33416-4680 • www.sfwmd.gov

May 18, 2001

The Honorable John McKay
President of the Senate
Senate Office Building
404 S. Monroe Street, Room 416
Tallahassee, Florida 32399-1100

The Honorable Tom Feeney
Speaker of the House of Representatives
The Capital
402 S. Monroe Street, Room 414
Tallahassee, Florida 32399-1300

Secretary David B. Struhs
Florida Department of Environmental Protection
3900 Commonwealth Boulevard, MS 10
Tallahassee, Florida 32399-3000

Dear Senator McKay, Speaker Feeney and Secretary Struhs:

We are pleased to provide the President of the Senate, Speaker of the House of Representatives and Secretary of the Department of Environmental Protection with the initial South Florida Water Management District (District) Florida Forever Work Plan. This document, which covers the fiscal years 2001 – 2005, satisfies the reporting requirements of Section 373.199, Florida Statutes. This report is also available to the public through our Internet web site and our normal public distribution process.

In accordance with Section 373.139(3), F.S., the Governing Board adopted the initial five-year work plan after a public hearing on May 10, 2001. The District provided at least fourteen days advance notice of the hearing date and separately notified each county commission within our boundaries.

The District's Florida Forever Work Plan is centered on implementation of the Comprehensive Everglades Restoration Plan (CERP), since 75% of the District's share of Florida Forever funding is dedicated to its implementation. The work plan describes specific projects that will be eligible for Florida Forever funding during this period.

We are available to answer any questions you may have regarding this plan or the District's implementation of the Florida Forever program.

Sincerely,

Frank R. Finch, P.E.
Executive Director

FRF/pav

South Florida Water Management District

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May 10, 2001

Contributors

Joanne Chamberlain
Kathleen Collins
Max Day
Jenni Hiscock
Sally Kennedy
Steve Lin
Blair Littlejohn
Gregg Mallinger
Agnes McLean
Victor Mullen
Susan Olson
Steve Reel
Carmen Baez-Smith
Lou Toth
Jose Valdes
Paul Whalen
Carl Woehlcke

EXECUTIVE SUMMARY

In 1999, the Florida Forever program was created, which authorized the issuance of bonds in an amount not to exceed $3 billion for acquisitions of land and water areas. This revenue is to be used for the purposes of restoration, conservation, recreation, water resource development, historical preservation and capital improvements to such land and water areas. This program is intended to accomplish environmental restoration, enhance public access and recreational enjoyment, promote long-term management goals, and facilitate water resource development.

The requirements for developing The Florida Forever Water Management District Work Plan are contained in Section 373.199, F.S. The provision states that the water management districts are to create a five-year plan that identifies projects meeting specific criteria. In developing their project lists, each district is to integrate its surface water improvement and management plans, Save Our Rivers land acquisition lists, stormwater management projects, proposed water resource development projects, proposed water body restoration projects, and other properties or activities that would assist in meeting the goals of Florida Forever.

The initial plan is to be submitted by June 1, 2001 to the President of the Senate, Speaker of the House of Representatives, and Secretary of the Department of Environmental Protection. By January 1 of each year thereafter, each district is to submit a report of acquisitions completed during the year together with modifications or additions to its five-year work plan. The plans will also include the status of funding, staffing and resource management for every project funded for which the district is responsible.

Thirty-five percent of the Florida Forever bond proceeds are distributed annually to FDEP for land acquisition and capital expenditures in order to implement the priority lists submitted by the water management districts. A minimum of fifty percent of the funding is to be used for land acquisition. The South Florida Water Management District (SFWMD) annual net share is $33,075,000. The Everglades Restoration Investment Act, Section 373.470(5)(b), F.S., mandates that for ten consecutive years, $25M of this funding is to be used to implement the Comprehensive Everglades Restoration Plan (CERP). Since approximately 75 percent of the Florida Forever funding that the SFWMD will receive will be dedicated to CERP, CERP is a major focus of the SFWMD Florida Forever Workplan.

This work plan describes specific projects that will be eligible for Florida Forever funding in the FY2001 – 2005 period. This discussion is arranged in sections that correspond to the regions as described in the August, 2000 CERP Master Program Management Plan. Additionally, projects for which the SFWMD expects to seek reimbursement through Florida Forever in fiscal year 2001 are each explained in detail, consistent with Section 373.199(4), (5), F.S. These three projects are the Western C-11 Diversion Impoundment and Canal (Cell 11), C-43 Basin Storage Reservoir, and

Kissimmee River Restoration. Senior management planned in September 2000 to use the remaining $8M per year during this period on the Kissimmee River Restoration Project.

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LIST OF ABBREVIATIONS AND ACRONYMS

AC-FT	acre-feet
ARC	Acquisition and Restoration Council
ASR	Aquifer Storage and Recovery
BCNP	Big Cypress National Preserve
BMPs	Best Management Practices
BOD	Biochemical Oxygen Demand
BOR	Basis of Review
CARL	Conservation and Recreation Lands
C&SF Project	Central and Southern Florida Flood Control Project
CERP	Comprehensive Everglades Restoration Plan
CUP	Consumptive Use Permit
CWA	Clean Water Act
DACS	Department of Agricultural Services
District	South Florida Water Management District
EAA	Everglades Agricultural Area
EEL	Environmentally Endangered Lands
EIS	Environmental Impact Statement
EOC	Emergency Operations Center
ERP	Environmental Resource Permit
F.A.C.	Florida Administrative Code
FAS	Floridan Aquifer System
FCD	Central and Southern Florida Flood Control District
FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FDOH	Florida Department of Health
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency
FFA	Florida Forever Act
FFWCC	Florida Fish and Wildlife Conservation Commission (*now known as FWC*)
FGFWFC	Florida Game and Freshwater Fish Commission
FGS	Florida Geological Survey

FDHRS	Florida Department of Health and Rehabilitative Services (*now known as FDOH*)
FPFDD	Fort Pierce Farms Drainage District
F.S.	Florida Statutes
FWC	Florida Wildlife Commission
FY	Fiscal Year
GCSSF	Governor's Commission for a Sustainable South Florida
GIS	Geographic Information System
GPD	gallons per day
GPM	gallons per minute
IAS	Intermediate Aquifer System
IFAS	Institute of Food and Agricultural Sciences
LFA	Lower Floridan Aquifer
MCL	Maximum Contaminant Level
MFLs	Minimum Flows and Levels
mg/L	milligrams per liter
MGD	million gallons per day
MGY	million gallons per year
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MS4	Municipal Separate Sewer System
NGVD	National Geodetic Vertical Datum
NPDES	National Pollution Discharge Elimination System
NPL	National Priorities List
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NSLRDD	North St. Lucie River Drainage District
NWI	National Wetland Inventory
NWR	National Wildlife Refuge
ORV	Off-Road Vehicle
O&M	Operations and Maintenance
P2000	Preservation 2000
PCA	Project Cost Agreement
PLRG	Pollution Loading Reduction Goals
PWS	Public Water Supply

RAA	Restricted Allocation Area
Restudy	Central and Southern Florida Flood Control Project Comprehensive Review Study
RO	Reverse Osmosis
RTA	Reduced Threshold Areas
SAS	Surficial Aquifer System
SDWA	Safe Drinking Water Act
SFWMD	South Florida Water Management District
SFWMM	South Florida Water Management Model
SJRWMD	St. Johns River Water Management District
SOE	Save Our Everglades
SOR	Save Our Rivers
SOW	Statement of Work
SPF	Standard Project Flood
STA	Stormwater Treatment Area
SWCD	Soil and Water Conservation District
SWIM	Surface Water Improvement Management
TCRPC	Treasure Coast Regional Planning Council
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
UFA	Upper Floridan Aquifer
UIC	Underground Injection Control
UDB	Urban Development Boundary
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WCA	Water Conservation Area
WHPA	Wellhead Protection Area
WQC	Water Quality Certification
WRCA	Water Resource Caution Area
WRDA	Water Resources Development Act

Chapter 1
INTRODUCTION

LEGISLATION (FLORIDA FOREVER AND CERP)

Florida Forever Program

In 1999, the Florida Forever program was created, which authorized the issuance of bonds in an amount not to exceed $3 billion for acquisitions of land and water areas. This revenue is to be used for the purposes of restoration, conservation, recreation, water resource development, historical preservation and capital improvements to such land and water areas. This program is intended to accomplish environmental restoration, enhance public access and recreational enjoyment, promote long-term management goals, and facilitate water resource development.

Morever, this legislation sets forth numerous other substantive provisions, including those relating to: sovereignty of submerged land leases; use and management of state-owned lands; sale of surplus state lands; use of funds within the CARL and Water Management Lands Trust Funds; payment in lieu of taxes; the Florida Forever Advisory Council; the Acquisition and Restoration Council (ARC); procedures and guidelines for land acquisition and less than fee land acquisition alternatives; and the Florida Greenways and Trails Council. In addition, this measure sets forth the criteria for the water management districts to evaluate and recommend projects and financial assistance funding programs to local governments. The provision also provides rulemaking authority to the FDEP and the water management districts for implementation of the Florida Forever Act. This legislation has significant fiscal impacts on state and local governments and took effect on July 1, 1999.

The Florida Forever Act

The Florida Forever Act was created in Section 259.105, F.S. This section sets forth the legislative findings, declarations and intent of the Florida Forever Act, such as:

- Endorsing the Preservation 2000 (P2000) program
- Recognizing the degradation of water resources in this state
- Committing to protect, restore and preserve lands and water areas
- Providing access to public lands as important
- Providing that acquisition should be based upon an assessment of natural resources
- Changing the direction and focus of the land acquisition program to extend bonding and financing capabilities

- Stating that the bond proceeds are to be used to implement the goals and objectives developed by ARC

The Florida Forever Act also provides that bond proceeds are to be distributed annually as follows:

- 35 percent ($105 million) to the FDEP for land acquisition and capital expenditures in order to implement the priority lists submitted by the water management districts. A minimum of 50 percent of these funds shall be used for the land acquisitions.
- 35 percent ($105 million) to the FDEP for land acquisition and capital expenditures pursuant to this section. Of these proceeds, a priority is to be given to acquisitions that achieve a combination of conservation goals including protecting Florida's water resources and natural ground water recharge. Capital expenditures are not to exceed 10 percent of these funds.
- 22 percent ($72 million) to the Department of Community Affairs to provide grants to local governments through the Florida Communities Trust. From these funds, 8 percent are to be transferred annually to the Land Acquisition Trust Fund for grants awarded under the Florida Recreation Development Assistance Program in Section 375.075, F.S. 75 percent of the funds that are used for land acquisition and are available to the trust are to matched by local governments on a dollar for dollar basis. 30 percent of the total trust funds are to be used in Standard Metropolitan Statistical Areas, but one-half of the amount is to be used in localities in which the project site is located in built-up commercial, industrial or mixed-use areas and functions to intersperse open spaces within congested urban core areas. No less than 5 percent of the funds allocated to the trust are to be used to acquire lands for recreational trail systems. If the full 5 percent is not used, such funds may be expended for other purposes authorized by this section.
- 1.5 percent ($4.5 million) to each of the following: FDEP for the purchase of inholdings and additions to state parks under the jurisdiction of the Division of Recreation and Parks; the Division of Forestry at DACS to fund acquisitions and inholdings and additions pursuant to this section, along with reforestation plans or sustainable forestry management; the Fish and Wildlife Conservation Commission to fund acquisitions and inholdings and additions to land to further the conservation of fish and wildlife; the Florida Greenways and Trails Program to acquire greenways and trails, including railroad rights-of-way and the Florida National Scenic Trail.

All lands acquired pursuant to this section are to be used for "multiple-use" purposes. "Multiple-use" includes: outdoor recreational activities pursuant to Sections 253.034 and 259.032(9)(b), F.S., water resource development projects, and sustainable forestry management. Water resource or water supply projects may be allowed only if the following specified conditions are met: minimum flows and levels (MFLs) have been established for those waters which may incur significant harm to water resources, the project complies with permitting requirements, and the project is consistent with the regional water supply plan. The entity which vests title in the lands may designate the lands as single use.

Funding under the two 35 percent provisions mentioned above, is contingent upon the project contributing to the achievement of certain specified goals. Out of the first 35 percent ($105 million) funding provision mentioned above, the Secretary of Environmental Protection is to ensure that each water management district receives the following percentage of funds: 35 percent ($36.75 million) to the South Florida Water Management District (SFWMD); 25 percent to the Southwest Florida Water Management District; 25 percent to the St. John's River Water Management District; 7.5 percent to the Suwannee River Water Management District; and 7.5 percent to the Northwest Florida Water Management District. An increased priority will be given to such projects that have secured a cost-sharing agreement allocating for the cleanup of point and nonpoint sources of pollution.

According to Section 259.105(3) of the Florida Forever Act, the amount is reduced by the costs of issuing and funding reserve accounts and other expenses associated with bonds. The proceeds of the bonds are to be deposited into the Florida Forever Trust Fund. Based on historical patterns associated with the P2000 program, District staff have estimated the costs to be approximately 10 percent.

Under the second 35 percent funding provision mentioned above, ARC accepted applications for eligible project proposals beginning July 1, 2000. Project applications are to contain a minimum of two numeric performance measures that relate directly to overall goals and proof that owners within the acquisition area have been notified of their inclusion in the project. ARC is to develop a rule to competitively evaluate, select and rank projects eligible for Florida Forever funds under Section 259.105(3)(b), F.S. In developing the rule, ARC is required to give weight to certain specified criteria (e.g., the project meets multiple goals, the project is part of an ongoing governmental effort to restore, protect or develop land areas or water resources), and the project facilitates management of properties already under public ownership. ARC is to review that year's approved project lists and by the first board meeting in May, ARC is to submit the lists to the board of trustees. ARC is also required to submit to the board of trustees, with its project list, a report containing certain specified information regarding each project listed.

Under the remaining funding provisions mentioned above, the agencies are to develop their individual acquisition and restoration lists. Proposed additions may be acquired if they are within the original project boundary, management plan, or management prospectus. Proposed additions that do not meet these requirements may be submitted to ARC for approval if the additions meet two or more of the criteria listed (e.g.,

serves as a link or corridor to other publicly owned property or enhances the protection or management of the property).

The board of trustees or water management district may authorize the granting of a lease, easement, or license for the use of certain lands. Particular uses are to be reviewed by the appropriate board and shall be compatible with resource values and management objectives for the land.

The Florida Forever Act allows the board of trustees to allow lands identified or acquired under the program to be managed by a private entity in accordance with a contractual arrangement with the acquiring agency. Funding for these contracts may only originate from the documentary stamp tax revenues deposited into the CARL Trust Fund and the Water Management District Lands Trust Fund.

Save Our Everglades Trust Fund

According to the Everglades Restoration Investment Act (373.470(5)(b), F.S., for each year of the ten consecutive years beginning with fiscal year (FY) 2000-2001, the department shall deposit $25 million of the funds allocated to the District by the department (under Section 259.105(11)) into the Save Our Everglades Trust Fund. Funds are to be distributed by FDEP to implement the Comprehensive Plan, which was submitted to Congress on July 1, 1999.

The Secretary of the Department is to release monies within thirty days after receipt of a resolution adopted by the District's governing board which identifies and justifies preacquisition costs necessary for the purchase of any lands listed in the District's 5-year workplan. All funds not used for the purposes in the resolution are to be returned to the department. Similarly, the Secretary of the department is to release acquisition monies to the District after receipt of a resolution adopted by the governing board.

Comprehensive Everglades Restoration Plan (CERP)

The South Florida ecosystem is in serious ecological decline, having been severely impacted by human activities for over a hundred years. The Central and Southern Florida Project (C&SF Project) Comprehensive Review Study, Final Integrated Feasibility Report and Programmatic Environmental Impact Statement (USACE and SFWMD, 1999) is the framework and guide for the $7.8 billion plan for the restoration, protection, and preservation of the water resources of the central and southern Florida ecosystem. It also provides for other water-related needs of the region such as water supply and flood protection. The comprehensive plan includes over 60 projects/separable elements that involve either structural or operational changes to modify the C&SF Project. These projects will increase storage and water supply for the natural system, as well as for urban and agricultural needs. The goals are to restore the quantity, quality, timing, and distribution of water.

The recommended Comprehensive Plan identifies and discusses the plan's proposed project components, its beneficial effects, and potential impacts on existing resources. The basic approach to the plan is to capture most of the 1.7 billion gallons of water per day that on average is discharged through project canals to the ocean and the gulf. Principal features of the plan are the creation of approximately 217,900 acres of new reservoirs and wetland-based water treatment areas. These components increase the dynamic storage capability and water supply for the natural system, as well as for urban and agricultural needs, which maintaining current C&SF Project purposes.

Implementation of the Comprehensive Plan will achieve the restoration of more natural flows of water, including sheetflow, improved water quality, and more natural hydroperiods in the South Florida ecosystem. It is predicted that native flora and fauna, including threatened and endangered species, will rebound as a result of the restoration of hydrologic conditions. It is also predicted that the frequency of water restrictions for agricultural and urban users will be significantly reduced. The ability to sustain the region's natural resources, economy, and quality of life depends, to a great extent, on the success of the efforts to enhance, protect, and better manage the regions water resources.

Florida Forever Water Management District Work Plan

The requirements for developing the Florida Forever Water Management District Work Plan are contained in Section 373.199, F.S. This provision states that in order to further the goals of the Florida Forever Act, the water management districts are to create a five-year plan which identifies projects that meet certain criteria.

In developing their project lists, each water management district is to integrate its surface water improvement and management plans, Save Our Rivers land acquisition lists, stormwater management projects, proposed water resource development projects, proposed water body restoration projects, and other properties or activities that would assist in meeting the goals of Florida Forever. In their December 1, 2000 letter to the Secretary of the FDEP, the executive directors of the state's five water management districts wrote, (see Florida Forever Performance Measures section):

> Each district is designing its Florida Forever Work Plan to meet the needs most pressing within that region of the state. Emphases vary between the districts, but all program expenditures will be designed to meet as many of the overall statewide goals (as practicable).

The districts' lists are to include, where applicable, specific information for each project, according to Section 373.199(4),(5), F.S., including: a description of the water body system; an identification of all governmental agencies having jurisdiction over the water body; a description of the land uses within the project area's drainage basin; a description of strategies for restoring the water body; a listing and synopsis of studies; a description of measures needed to maintain the water body once it has been restored; a schedule for restoration; an estimate of the funding needed to carry out the project; numeric performance measures; a discussion of permitting and regulatory issues; an identification of the proposed public access for projects with land acquisition components;

an identification of lands requiring a full fee simple interest; and an identification of lands necessary to protect or recharge ground water. The lists are also to indicate the relative significance of each project, the schedule of activities, the sums of monies earmarked, and rankings as much as possible over a five-year planning period.

The initial plan is to be submitted by June 1, 2001 to the President of the Senate, Speaker of the House of Representatives and Secretary of the FDEP. The initial five-year work plan and any subsequent modifications are to be adopted by each water management district after a public hearing, in accordance with Section 373.139(3), F.S. Each district is to provide at least fourteen days advance notice of the hearing date and is to separately notify each county commission within which a proposed work plan project, project modification or addition is located of the hearing date.

By January 1 of each year thereafter, each district is to submit a report of acquisitions completed during the year together with modifications or additions to its five-year work plan. The plans are to also include the status of funding, staffing and resource management for every project funded under Sections 259.101, 259.105, or 373.59, F.S., for which the district is responsible. Also included in the report is a description of land management activity for each property owned by the district and and a list of any lands surplused. Each district is to include in their work plan any proposed capital improvement projects necessary to promote reuse of reclaimed water. The Secretary is to submit this report along with the ARC project list as required under Section 259.105, F.S. Each district is to remove the property of an unwilling seller from its five-year plan at the next scheduled update of the plan.

The District's Florida Forever Work Plan is centered on the ten volume, 4,033 page Comprehensive Review Study, due to the fact that approximately 75 percent of the Florida Forever funding that the District will receive in order to accomplish its priority list has been allocated by the Everglades Restoration Investment Act to implement the Comprehensive Plan. The work plan document is arranged in sections providing detail on each of the regions that comprise the nearly 18,000 square miles of the study area. The Comprehensive Everglades Restoration Plan Master Program Management Plan (MPMP) (USACE and SFWMD, 2000) identifies the following regions within the study area:

1. Kissimmee River and Lake Okeechobee Region
2. Caloosahatchee River/Southwest Florida Region
3. Upper East Coast Region
4. Everglades Agricultural Area (EAA)
5. Big Cypress Region
6. Water Conservation Areas (WCAs) and Everglades Region
7. Lower East Coast Region
8. Florida Bay and Keys Region

The work plan addresses the information requirements listed in the statute for the District's project list, primarily by study region. The Comprehensive Plan describes this information through applicable subsections described by the following:

1. Physical Condition
2. Existing Conditions
3. Water Quality (future without condition)
4. Physical Facilities and Operations (future without condition)
5. Water Quality Problems and Opportunities
6. Land Use

The work plan briefly describes specific projects that will be eligible for Florida Forever funding in the FY 2001 – 2005 period, as outlined in Appendix A of the MPMP (**Table 1**). Prior studies, reports and projects, March 2001 implementation schedule, financial schedule, and project descriptions are explained separately.

To put the importance of the CERP projects into perspective, **Table 1** summarizes estimated District real estate expenditures for FY01 to FY05 based on a real estate acquisition strategy, which is being developed to support the CERP implementation schedule. The CERP implementation schedule is currently undergoing an annual revision as is called for in the MPMP and the information used reflects the draft schedule as of March 2001. Only real estate costs are presented in **Table 1** because, in the 2001-2005 time frame, the District anticipates that Save Our Everglades (SOE) Trust Fund resources will be exclusively used to support real estate acquisitions. The estimated total real estate expenditures for this period is $730.43 million.

The $25 million annual contribution of Florida Forever funds to the SOE trust fund, while a significant contribution, will not be largest source of funds to support CERP. $75 million of general revenue funds will also go to the SOE Trust Fund. District ad valorem funds of $48.2 million are the next largest contribution. These funds will support both real estate and non-real estate funding obligations. Other funding sources will mostly or exclusively support real estate acquisition. These include special state appropriations, CARL funds and credits for lands owned by or purchased utilizing local government funds.

Table 1. Estimated Five-Year District Real Estate Expenditures for Eligible CERP Projects.[a]

Project Title	Cost (FY01 - 05)
P6- Wastewater Reuse Technology – Pilot Project	$591,000
1a- North of Lake Okeechobee Storage Reservoir (A)	$144,076,793
1b- Taylor Creek/Nubbin Slough Storage and Treatment Area (W)	$28,800,090
1c- Lake Okeechobee Watershed Water Quality Treatment Facilities (OPE)	$11,159,346
1d- Lake Okeechobee Tributary Sediment Dredging (OPE)	$844,921
4- C-43 Basin Storage Reservoir Project Part 1 (D – Part 1)	$102,714,722
7a- C-44 Basin Storage Reservoir (B)	$54,578,706
7b- C-23 and C-24 Storage Reservoirs (UU – Part 1)	$115,408,782
7c- C-25 and North Fork and South Fork Storage Reservoirs (UU – Part 2)	$10,420,588
12- Water Conservation Area 3 Decompartmentalization and Sheetflow Enhancement Project Part 1 (QQ – Part 1 and SS – Part 2)	$191,856
14- Loxahatchee National Wildlife Refuge Internal Canal Structures Project (KK)	$254,990
17a- Pal-Mar and J.W. Corbett Wildlife Management Area Hydropattern Restoration (OPE)	$3,984,775
17b- C-51 and Southern L-8 Reservoir (K - Part 1 and GGG)	$28,450,900
17e- C-51 Back-pumping and Treatment (Y)	$13,421,100
19a- Acme Basin B Discharge (OPE)	$4,280,720
19b- Protect and Enhance Existing Wetland Systems along Loxahatchee National Wildlife Refuge including the Strazzulla Tract (OPE)	$12,231,981
19c- Hillsboro Site 1 Impoundment (M – Part 1)	$8,367,489
19d- Western C-11 Diversion Impoundment and Canal and Water Conservation Areas 3A and 3B Levee Seepage Management and North New River Conveyance Improvements (Q, O and SS Part 1)	$115,452,566
19e- C-9 Stormwater Treatment Area/Impoundment (R)	$4,700,119
19f- Dade-Broward Levee/Pennsuco Wetlands (BB)	$7,416,244
19g- Eastern C-4 Control Structure (T)	$405,009
19h- Bird Drive Recharge Area (U)	$9,000,000
20- Palm Beach County Agricultural Reserve Reservoir Project (VV – Part 1)	$47,590,060
24- Broward County Secondary Canal System Project (CC)	$1,502,412
29- C-111N Spreader Canal Project (WW)	$4,551,538
31- Florida Keys Tidal Restoration Project (OPE)	$32,023

a. Reflects real estate acquisition strategy developed to support draft Implementation Schedule update (March 2001). Annual Implementation Schedule update is being prepared per MPMP.

Additionally, projects for which the SFWMD expects to seek reimbursement through Florida Forever in fiscal year 2001 are each explained in a manner consistent with the fourteen items listed in Section 373.199(4),(5), F.S. These three projects are the Western C-11 Diversion Impoundment and Canal (Cell 11), C-43 Basin Storage Reservoir, and Kissimmee River Restoration. They are also reflected in the financial schedule presented in this chapter (**Figure 1**). The distribution of Florida Forever funds to CERP projects has not been specified in **Figure 1** because Florida Forever represents only about 17 percent ($125 million of $730 million) of planned real estate expenditures.

FLORIDA FOREVER PERFORMANCE MEASURES

The water management districts were mandated with jointly providing a report by December 15, 2000 to the Secretary of the FDEP, which establishes goals and performance measures that may be used to analyze activities under Section 259.105(3)(a). In accordance with Section 373.1995, F.S., the Secretary shall forward the report for approval to the Board of Trustees of the Internal Improvement Trust Fund, the President of the Senate, and the Speaker of the House prior to the beginning of the 2001 Regular Legislative Session. The legislature may reject, modify, or take no action regarding the goals and performance measures established by the report. If no action is taken, the goals and performance measures reflected in the report shall be implemented.

On December 1, 2000, the districts jointly submitted their Florida Forever Goals and Performance Measures to Secretary Struhs. The transmittal letter and document are located in Appendix A. The goals and performance measures were developed in collaboration with the Florida Forever Advisory Council. It is based on a careful review of the goals and measures included in the original Florida Forever legislation and an evaluation of the outstanding priorities of the five districts for use of Florida Forever funds.

The document takes special note of the unique situation at the SFWMD (see Save Our Everglades Trust Fund section). It is understood that most of the Florida Forever revenues will be dedicated to implementing elements of the Comprehensive Everglades Restoration Plan (CERP). This will affect the distribution of Florida Forever funds for intended program purposes and the extent to which program performance measures are met.

PROJECT RANKINGS, SCHEDULE, AND RESOURCES

Funding and Manpower Resources

The cost to implement the current schedule falls within the revenues expected under the Comprehensive Plan funding legislation adopted by the Florida Legislature during the 2000 legislative session. This legislation proposes specific amounts from a variety of sources to fund the plan through 2001. The USACE funding for implementing the plan will be obtained through the federal budgeting and appropriations process on an

Florida Forever Water Management District Work Plan
Fiscal Years 2001-2005
South Florida Water Management District

Project Title	2001	2002	2003	2004	2005	Total 2001 - 2005
Comprehensive Everglades Restoration Plan Projects						
Kissimmee River and Lake Okeechobee Region						
Kissimmee River/Lake Okeechobee	$0	TBD	TBD	TBD	TBD	TBD
Caloosahatchee River/Southwest Florida Region						
C-43 Basin Storage Reservior	TBD	TBD	TBD	TBD	TBD	TBD
Total - Caloosahatchee/S.W. Florida	TBD	TBD	TBD	TBD	TBD	TBD
Upper East Coast Region						
Upper East Coast	$0	TBD	TBD	TBD	TBD	TBD
Everglades Agricultural Area						
Everglades Agricultural Area	$0	$0	$0	$0	$0	$0
Big Cypress Region						
Big Cypress Region	$0	$0	$0	$0	$0	$0
Water Conservation Areas and Everglades Region						
WCAs and Everglades Region	$0	TBD	TBD	TBD	TBD	TBD
Lower East Coast Region						
Western C-11 Div. Imp. and Canal	TBD	TBD	TBD	TBD	TBD	TBD
Total - Lower East Coast Region	TBD	TBD	TBD	TBD	TBD	TBD
Florida Bay and Keys Region						
Florida Bay and Keys Region	$0	TBD	TBD	TBD	TBD	TBD
Priority 1 - CERP Totals	**$25,000,000**	**$25,000,000**	**$25,000,000**	**$25,000,000**	**$25,000,000**	**$125,000,000**
Water Body Restoration Projects						
Kissimmee River & Lake Okeechobee Region						
Kissimmee River Restoration Project	$8,075,000	$8,075,000	$8,075,000	$8,075,000	$8,075,000	$40,375,000
Priority 2 - Restoration Totals	**$8,075,000**	**$8,075,000**	**$8,075,000**	**$8,075,000**	**$8,075,000**	**$40,375,000**
FLORIDA FOREVER TOTALS	**$33,075,000**	**$33,075,000**	**$33,075,000**	**$33,075,000**	**$33,075,000**	**$165,375,000**

Figure 1. Five-Year Florida Forever Water Management District Work Plan Expenditures Schedule.

annual basis and will be coordinated with what is being made available in Florida. It is anticipated that adequate manpower resources, both at the USACE and the SFWMD, will be available at planned funding levels.

Implementation Schedule

When the Comprehensive Plan was sent to Congress in 1999 it contained an implementation schedule that was, at the time, the best professional judgement of the Implementation Plan Team as to how the plan could be implemented. In 2000, the Implementation Plan Team began to revise the schedule to take into account new information regarding the projects themselves, the available funding and the nature of the SFWMD-USACE working relationship. As of this writing, the update of the Implementation Schedule is not complete. A final revised Implementation Schedule will be published as part of the revised Master Program Management Plan, Volume II.

The March 30, 2001 version of the Implementation Schedule depicted in **Figure 2** can best be thought of as a master sequencing of the projects as they currently stand. The Comprehensive Plan is conceptual in nature, consequently any schedule that is developed from that plan will also be conceptual. It is fully expected that the Comprehensive Plan adaptive assessment process will make changes to both the sequence and the nature of the projects themselves in the future. As those changes are defined, they will be incorporated into the Implementation Schedule. Changes that are likely to affect the schedule may include, but are not limited to, changes in funding levels, changes in performance targets for some projects and changes in planned locations for some projects. The schedule will be continually monitored to ensure that the proposed dates are both realistic and are being achieved.

COMPREHENSIVE EVERGLADES RESTORATION PLAN

DRAFT - SFWMD - DRAFT

ID	T 1.1	TASK	Cost	DUR	ES	EF	P
80		**PILOT PROJECTS**	**$97,000,000**	**3420d**	**8/10/00**	**9/18/13**	
82	**P1**	**LAKE OKEECHOBEE ASR PILOT PROJECT**	**$19,000,000**	**2378d**	**8/10/00**	**9/21/09**	
91	**P2**	**CALOOSAHATCHEE RIVER ASR PILOT PROJECT**	**$6,000,000**	**1925d**	**4/2/01**	**8/15/08**	
99	**P3**	**HILLSBORO IMPOUNDMENT & ASR PILOT PROJECT**	**$9,000,000**	**2250d**	**8/10/00**	**3/25/09**	
107	**P4**	**LAKEBELT IN-GROUND RESERVOIR TECHNOLOGY PILOT PROJECT**	**$23,000,000**	**2755d**	**2/13/01**	**9/5/11**	
116	**P5**	**L-31N SEEPAGE MANAGEMENT PILOT PROJECT**	**$10,000,000**	**1400d**	**1/30/01**	**6/12/06**	
126	**P6**	**WASTEWATER REUSE TECHNOLOGY PILOT PROJECT**	**$30,000,000**	**3383d**	**10/2/00**	**9/18/13**	
147	**1**	**LAKE OKEECHOBEE WATERSHED PROJECT (A, W, LOWQTF, LOTSD)**	**$455,728,000**	**2492d**	**11/29/00**	**6/17/10**	
148		PMP Development A, W, LOWQTF, LOTSD	$100,000	152d	11/29/00	6/28/01	32
149		PIR A, W, LOWQTF, LOTSD	$8,712,000	520d	6/29/01	6/26/03	148
150	**1a**	**NORTH OF LAKE OKEECHOBEE STORAGE RESERVOIR (A)**	**$280,983,000**	**1885d**	**3/28/03**	**6/17/10**	
156	**1b**	**TAYLOR CREEK / NUBBIN SLOUGH STORAGE AND TREATMENT AREA (W)**	**$101,013,000**	**1625d**	**3/28/03**	**6/18/09**	
162	**1c**	**LAKE OKEECHOBEE WATERSHED WATER QUALITY TREATMENT FACILITIES**	**$60,327,000**	**1885d**	**3/28/03**	**6/17/10**	
168	**1d**	**LAKE OKEECHOBEE TRIBUTARY SEDIMENT DREDGING (OPE)**	**$4,593,000**	**715d**	**3/28/03**	**12/22/05**	
175	**2**	**LAKE ISTOKPOGA REGULATION SCHEDULE PROJECT (OPE)**	**$150,000**	**520d**	**4/2/01**	**3/28/03**	
176		PMP Development LIB	$25,000	65d	4/2/01	6/29/01	32FS+167d
177		Regulation Schedule Report LIB	$125,000	455d	7/2/01	3/28/03	176
179	**3**	**LAKE OKEECHOBEE AQUIFER STORAGE & RECOVERY PROJECT (GG)**	**$1,097,311,000**	**4420d**	**9/22/09**	**8/31/26**	
199	**4**	**PART 1 - C-43 BASIN STORAGE RESERVOIR PROJECT (D Pt1)**	**$201,234,000**	**2630d**	**3/12/01**	**4/8/11**	
207	**5**	**PART 2 - C-43 BASIN AUIFER STORAGE & RECOVERY PROJECT (D Pt2)**	**$238,960,000**	**2470d**	**8/18/08**	**2/2/18**	
215	**6**	**CALOOSAHATCHEE BACKPUMPING WITH STORMWATER TREATMENT PROJECT (**	**$82,895,000**	**2600d**	**8/2/04**	**7/18/14**	
223	**7**	**INDIAN RIVER LAGOON PROJECT (B, UU)**	**$822,785,001**	**2315d**	**7/16/01**	**5/28/10**	
224	**7a**	**C-44 BASIN STORAGE RESERVOIR (B)**	**$151,226,449**	**1625d**	**7/16/01**	**10/5/07**	
231	**7b**	**PHASE 1 - C-23, C-24 STORAGE RESERVOIRS (UU Ph1)**	**$525,520,097**	**1885d**	**3/4/02**	**5/22/09**	
238	**7c**	**PHASE 2 - C25, NORTH & SOUTH FORK STORAGE RESERVOIRS (UU Ph2)**	**$146,038,455**	**1885d**	**3/10/03**	**5/28/10**	
246	**8**	**PART 1 - EVERGLADES AGRICULTURAL STORAGE RESERVOIR PROJECT (G Pt1)**	**$233,109,000**	**2375d**	**1/31/01**	**3/9/10**	
255	**9**	**PART 2 - EVERGLADES AGRICULTURAL STORAGE RESERVOIR PROJECT (G Pt2)**	**$203,240,000**	**2600d**	**3/16/05**	**3/3/15**	
263	**10**	**BIG CYPRESS / L-28 INTERCEPTOR MODIFICATIONS PROJECT (CCC)**	**$42,751,000**	**2600d**	**3/30/05**	**3/17/15**	
271	**11**	**FLOW TO NW & CENTRAL WCA 3A PROJECT**	**$30,877,000**	**2275d**	**10/3/02**	**6/22/11**	
272		PMP Development (RR,II)	$100,000	65d	10/3/02	1/1/03	32,275FS-260d
273		PIR (RR, II)	$1,173,000	390d	1/2/03	6/30/04	272
274		**G-404 PUMP STATION MODIFICATIONS (II)**	**$9,720,000**	**1235d**	**10/1/03**	**6/25/08**	

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Figure 2. March 2001 Implementation Schedule of Components Contained in the Comprehensive Plan.

COMPREHENSIVE EVERGLADES RESTORATION PLAN

DRAFT - SFWMD - DRAFT

ID	T 1.1	TASK	Cost	DUR	ES	EF	P
280		**FLOWS TO NW & CENTRAL WCA 3A (RR)**	**$19,884,000**	**1820d**	**7/1/04**	**6/22/11**	
286	**12**	**PART 1 - WCA 3 DECOMP & SHEETFLOW ENHANCEMENT PROJECT (QQ Pt1, SSP2**	**$61,243,000**	**2535d**	**1/30/01**	**10/18/10**	
287		PMP Development QQ P1, SS Pt2	$100,000	130d	1/30/01	7/30/01	32FS+123d
288		PIR QQ Pt1, SSP2	$2,415,000	455d	7/31/01	4/28/03	287
289		**PHASE 1 - WCA-3 DECOMP PART 1 (QQ Ph1)**	**$25,616,000**	**1950d**	**4/29/03**	**10/18/10**	**288**
294		**PHASE 2 - NORTH NEW RIVER IMPROVEMENTS (from EAA to NNR) (SS Ph2)**	**$33,112,000**	**1820d**	**4/29/03**	**4/19/10**	
300	**13**	**PART 2 - WCA 3 DECOMP & SHEETFLOW ENHANCEMENT PROJECT (AA, QQ Pt2)**	**$107,894,000**	**2340d**	**10/25/05**	**10/13/14**	
301		PMP Development QQ Pt2, AA	$100,000	130d	10/25/05	4/24/06	32,292
302		PIR QQ Pt2, AA	$4,337,000	520d	4/25/06	4/21/08	301
303		**ADDITIONAL S-345 STRUCTURES (AA)**	**$46,453,000**	**1690d**	**4/22/08**	**10/13/14**	
308		**PART 2 - WCA-3 DECOMP PH 2 (QQ Pt2)**	**$57,004,000**	**1690d**	**4/22/08**	**10/13/14**	
314	**14**	**LOXAHATCHEE NATIONAL WILDLIFE REFUGE INTERNAL CANAL STRUCTURES PR(**	**$7,669,000**	**1170d**	**3/17/03**	**9/7/07**	
322	**15**	**MODIFY HOLEY LAND WILDLIFE MANAGEMENT AREA OPERATION PLAN PROJECT**	**$150,000**	**1170d**	**10/2/03**	**3/26/08**	
331	**16**	**MODIFY ROTENBERGER WILDLIFE MANAGEMENT AREA OPERATION PLAN PROJEC**	**$150,000**	**675d**	**10/2/03**	**5/3/06**	
338	**17**	**PART 1 - NORTH PALM BEACH COUNTY PROJECT (X,Y,GGG, Pal Mar, LWL, KPh1)**	**$425,079,000**	**4030d**	**4/2/01**	**9/9/16**	
339		PMP Development X,Y,K Ph1,GGG, Pal Mar, Lake Worth Lagoon	$100,000	130d	4/2/01	9/28/01	32FS+167d
340		PIR X,Y,K Ph1,GGG, Pal Mar, Lake Worth Lagoon	$14,543,000	650d	10/1/01	3/26/04	339
341	**17a**	**PAL-MAR AND J.W. CORBETT WILDLIFE MANAGEMENT AREA HYDROPATTERI**	**$10,447,000**	**1430d**	**9/29/03**	**3/20/09**	
347	**17b**	**C-51 & L-8 BASIN MODIFICATIONS AND RESERVOIR PHASE 2 (K Ph1, GGG)**	**$345,994,000**	**2730d**	**3/29/04**	**9/12/14**	
348		PMP Development K Ph1, GGG	$50,000	130d	3/29/04	9/24/04	340
349		**PHASE 2 - L-8 BASIN (K Ph1)**	**$17,888,000**	**1820d**	**9/27/04**	**9/16/11**	
354		**PHASE 1 - C-51 & SOUTHERN L-8 RESERVOIR (GGG)**	**$328,056,000**	**2600d**	**9/27/04**	**9/12/14**	
359	**17c**	**LAKE WORTH LAGOON RESTORATION PHASE 3 (OPE)**	**$2,268,000**	**1105d**	**6/18/12**	**9/9/16**	
365	**17d**	**C-17 BACKPUMPING & TREATMENT PHASE 4 (X)**	**$19,835,000**	**1690d**	**9/29/03**	**3/19/10**	
371	**17e**	**C-51 BACKPUMPING & TREATMENT PHASE 5 (Y)**	**$31,892,000**	**1690d**	**9/29/03**	**3/19/10**	
378	**18**	**PART 2 - NORTH PALM BEACH COUNTY PROJECT (K Ph2, LL)**	**$188,061,000**	**3120d**	**3/26/09**	**3/10/21**	
379		PMP Development K Ph2,LL	$100,000	130d	3/26/09	9/23/09	32,106
380		PIR K Ph2,LL	$7,142,000	650d	9/24/09	3/21/12	379
381	**18a**	**C-51 REGIONAL GROUNDWATER AQUIFER STORAGE & RECOVERY (LL)**	**$127,341,000**	**2340d**	**3/22/12**	**3/10/21**	
387	**18b**	**L-8 BASIN AQUIFER STORAGE & RECOVERY (K Ph2)**	**$53,478,000**	**1755d**	**3/22/12**	**12/12/18**	
394	**19**	**WATER PRESERVE AREA PROJECT (ACME, STRAZULLA, M P1, O, Q, SS P1, R, YY,**	**$613,467,000**	**3426d**	**7/16/01**	**9/1/14**	
395	**19a**	**ACME BASIN B DISCHARGE PROJECT (OPE)**	**$20,100,000**	**1365d**	**7/16/01**	**10/6/06**	

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Figure 2. March 2001 Implementation Schedule of Components Contained in the Comprehensive Plan.

COMPREHENSIVE EVERGLADES RESTORATION PLAN

DRAFT - SFWMD - DRAFT

ID	T 1.1	TASK	Cost	DUR	ES	EF	P
401	19b	PROTECT & ENHANCE EXISTING WETLAND SYSTEMS ALONG LNWR INCLUDI	$52,772,000	1365d	7/16/01	10/6/06	
408	19c	PART 1 - HILLSBORO IMPOUNDMENT PROJECT (M P1)	$38,535,000	1625d	7/16/01	10/5/07	
414	19d	WESTERN C-11 DIVERSION IMPOUNDMENT AND CANAL & WCA 3A&B LEVEE :	$267,722,000	1885d	7/16/01	10/3/08	
415		PMP Q, O, SS P1	$100,000	65d	7/16/01	10/12/01	47FS-55d
416		WCA-3A & 3B LEVEE SEEPAGE MANAGEMENT (O)	$100,301,000	1820d	10/15/01	10/3/08	
421		C-11 IMPOUNDMENT DIVERSION & CANAL (Q)	$124,804,000	1110d	10/15/01	1/13/06	
426		PART 1 - NORTH NEW RIVER IMPROVEMENTS (NNR to C-11) (SS P1)	$42,517,000	1820d	10/15/01	10/3/08	
431	19e	C-9 STA / IMPOUNDMENT (R)	$89,146,000	1175d	7/16/01	1/13/06	
438	19f	DADE-BROWARD LEVEE / PENSUCCO WETLANDS PROJECT(BB)	$18,779,000	1885d	7/16/01	10/3/08	
444	19g	C-4 CONTROL STRUCTURES PROJECT (T)	$2,329,000	1105d	7/16/01	10/7/05	
450	19h	BIRD DRIVE RECHARGE AREA PROJECT (U)	$124,084,000	2145d	6/13/06	9/1/14	
457	20	PART 1 - PBC AGRICULTURE RESERVE RESERVOIR PROJECT (VV P1)	$79,434,000	2665d	9/1/05	11/18/15	
465	21	PART 2 - PBC AGRICULTURE RESERVE AQUIFER STORAGE & RECOVERY PROJEC	$44,666,000	2600d	3/26/09	3/13/19	
472	22	PART 2 - HILLSBORO AQUIFER STORAGE & RECOVERY PROJECT PH 2 (M Pt2)	$92,845,000	2080d	3/26/09	3/15/17	
479	23	DIVERTING WCA TO CLB TO DOWNSTREAM NATURAL AREAS PROJECT (EEE,YY,	$86,481,000	2340d	3/23/09	3/9/18	
480		PMP EEE,ZZ,YY	$100,000	130d	3/23/09	9/18/09	47FS+1950d
481		PIR EEE,ZZ,YY	$2,916,000	650d	9/21/09	3/16/12	480
482		WCA-2B FLOWS TO CLB (YY)	$76,156,000	1560d	3/19/12	3/9/18	
487		WCA-3A & 3B FLOWS TO CLB (ZZ)	$765,000	1300d	3/19/12	3/10/17	
492		FLOWS FROM CLB TO WCA-3B (EEE)	$6,544,000	1170d	3/19/12	9/9/16	
498	24	BROWARD CO. SECONDARY CANAL SYSTEM PROJECT (CC)	$12,898,000	1950d	8/9/01	1/28/09	
506	25	NORTH LAKEBELT STORAGE AREA PROJECT (XX)	$524,562,000	6600d	3/8/11	6/23/36	
522	26	CENTRAL LAKEBELT STORAGE PROJECT (S)	$484,537,000	6704d	3/8/11	11/14/36	
538	27	EVERGLADES NATIONAL PARK SEEPAGE MANAGEMENT PROJECT (V, FF)	$179,196,000	1820d	6/13/06	6/3/13	
539		PMP Development V, FF	$100,000	65d	6/13/06	9/11/06	32,123
540		PIR V, FF	$3,384,000	455d	9/12/06	6/9/08	539
541		L-31N SEEPAGE Management (V)	$60,966,000	1300d	6/10/08	6/3/13	
546		S-356 STRUCTURE (FF)	$114,746,000	1300d	6/10/08	6/3/13	
552	28	BISCAYNE BAY COASTAL WETLANDS PROJECT (FFF/OPE)	$299,583,000	4485d	3/30/01	6/7/18	
563	29	C-111N SPREADER CANAL PROJECT (WW)	$94,035,000	2188d	10/18/00	3/6/09	
572	30	SOUTHERN GOLDEN GATE ESTATES RESTORATION PROJECT	$15,550,000	1560d	1/4/01	12/27/06	
580	31	FLORIDA KEYS TIDAL RESTORATION PROJECT	$1,251,000	1430d	4/2/01	9/22/06	

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Figure 2. March 2001 Implementation Schedule of Components Contained in the Comprehensive Plan.

Chapter 2
REGIONAL STUDY AREA

The study area encompasses approximately 18,000 square miles from Orlando to the Florida Reef Tract with at least 11 major physiographic provinces: Everglades, Big Cypress, Lake Okeechobee, Florida Bay, Biscayne Bay, Florida Reef Tract, nearshore coastal waters, Atlantic Coastal Ridge, Florida Keys, Immokalee Rise, and the Kissimmee River Valley. The Kissimmee River, Lake Okeechobee and the Everglades are the dominant watersheds that connect a mosaic of wetlands, uplands, coastal areas, and marine areas. The study area includes all or part of the following 16 counties: Monroe, Miami-Dade, Broward, Collier, Palm Beach, Hendry, Martin, St. Lucie, Glades, Lee, Charlotte, Highlands, Okeechobee, Osceola, Orange, and Polk.

The Central and Southern Florida Project (C&SF) Project, which was first authorized by Congress in 1948, is a multipurpose project that provides flood control; water supply for municipal, industrial, and agricultural uses; prevention of saltwater intrusion; water supply for Everglades National Park; and protection of fish and wildlife resources throughout the study area. The primary system includes about 1,000 miles each of levees and canals, 150 water control structures, and 16 major pump stations. The C&SF Project study area is shown on **Figure 3.**

The Upper St. Johns River Basin has been excluded from this study because it is a separate hydrologic basin which is not a part of the Everglades and South Florida ecosystems. C&SF Project works in the Upper St. Johns River Basin which are expected to meet the water resources needs of that basin are nearing completion.

The following sections provide details on each of the regions that comprise this large study area. The Comprehensive Everglades Restoration Plan Master Program Management Plan (USACE and SFWMD, 2000) identifies the following regions within the study area:

1. Kissimmee River and Lake Okeechobee Region
2. Caloosahatchee River/Southwest Florida Region
3. Upper East Coast Region
4. Everglades Agricultural Area (EAA)
5. Big Cypress Region
6. Water Conservation Areas (WCAs) and Everglades Region
7. Lower East Coast Region
8. Florida Bay and Keys Region

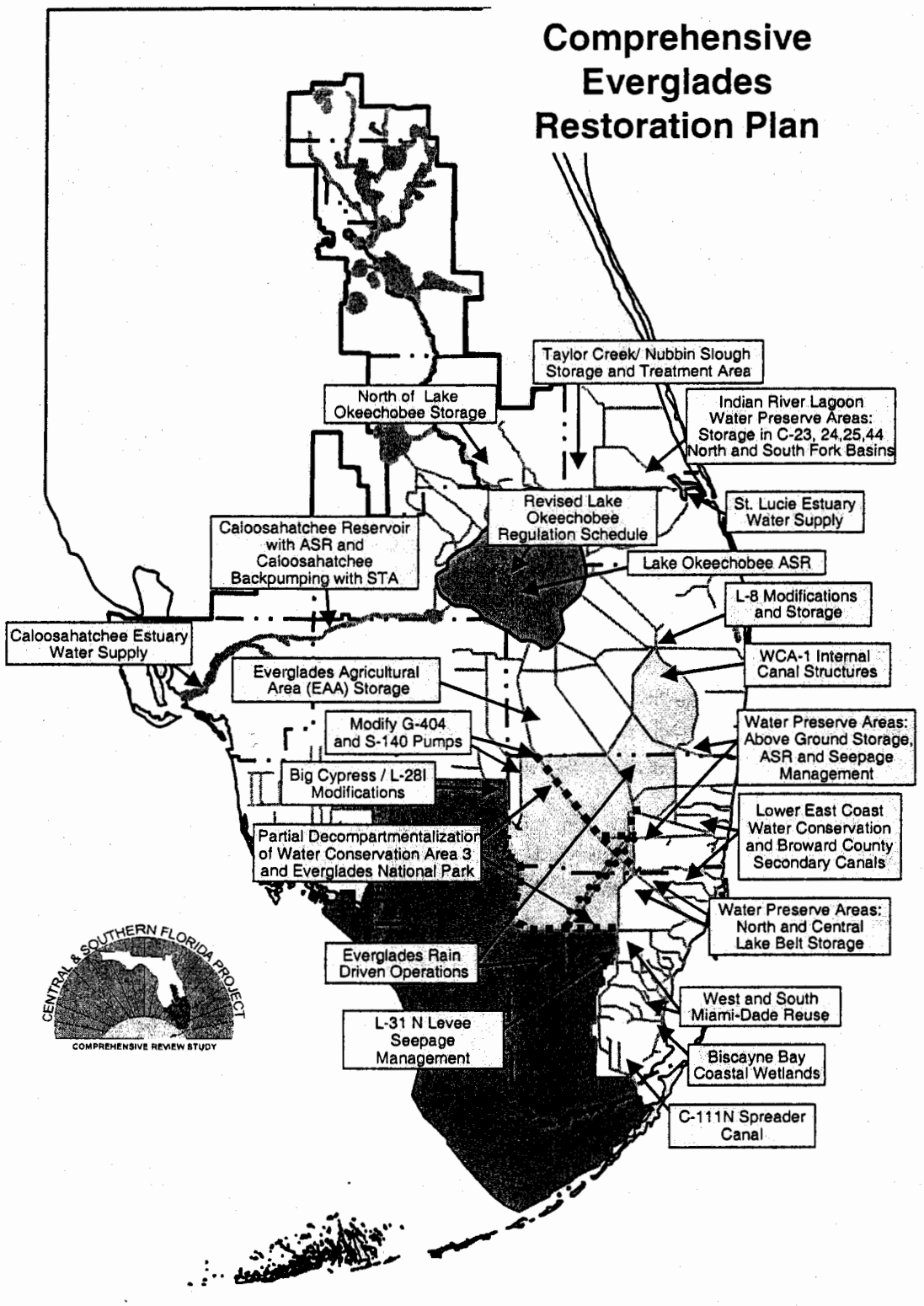

Figure 3. C&SF Project Area.

FUTURE WITHOUT PLAN CONDITION - PHYSICAL FACILITIES AND OPERATIONS - C&SF PROJECT MODIFICATIONS

The C&SF Project was authorized by the Flood Control Act of 1948 and modified by subsequent acts, as a plan of improvement for flood control, drainage, and other purposes covering a 18,000 square mile area of both Central and southern Florida. A number of efforts are currently underway by the U.S. Army Corps of Engineers (USACE) to modify the project for environmental improvement. The following is an inventory of C&SF Project modifications either in the planning, design, or construction phase. For the purpose of evaluating effects of alternative plans, they are included in the future without plan condition.

WATER QUALITY PROBLEMS AND OPPORTUNITIES - REGIONAL OVERVIEW

Many of the regulatory and environmental restoration programs, which are assumed to be in place in 2050 are projected to result in a net improvement in water quality in South Florida. In addition to those assumptions, water quality improvement actions undertaken to comply with the requirements of the Federal Clean Water Act (P.L. 92-500) as implemented by the U.S. Environmental Protection Agency (USEPA), the Florida Department of Environmental Protection (FDEP), the South Florida Water Management District (SFWMD), the Seminole and Miccosukee Tribes, and local governments are expected to result in improvements in regional water quality necessary to comply with state, tribal, and local water quality standards. Examples of these programs include: Municipal Separate Storm Sewer Systems (MS4) and other National Pollutant Discharge Elimination System (NPDES) point and nonpoint source pollution reduction permitting requirements, Total Maximum Daily Loads (TMDLs) established under Section 303(d) of the Clean Water Act., and Pollutant Load Reduction Goals (PLRGs) established pursuant to the state of Florida's Surface Water Improvement and Management (SWIM) Act for designated priority water bodies.

From a regional perspective, the most comprehensive of these programs is the TMDL program implemented by FDEP and the Seminole and Miccosukee Tribes. Under Section 303(d) of the Clean Water Act, states and tribes are required to identify water bodies within their jurisdictions not meeting water quality standards and rank those water bodies in terms of the severity of the pollution and designated and actual uses of the water bodies. The 303(d)-listed water bodies are to be reported to the USEPA in accordance with Section 305(b) of the Clean Water Act. TMDLs are to be developed for 303(d)-listed water bodies consistent with the priority ranking and are to be established "at a level necessary to implement the applicable water quality standards with seasonal variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality." However, the TMDL program, for the most part, has not been implemented in the study area.

In its 1998 report to the USEPA, FDEP identified approximately 160 impaired water bodies in the study area in accordance with the requirements of Section 303(d) of the Federal Clean Water Act. FDEP has developed a strategy for assessing watersheds (basins) and developing TMDLs and remediation plans for pollutants causing impairment of 303(d)-listed water bodies (FDEP, 1996a and FDEP, 1996b). It should be noted that excessive nutrient loads were typically identified as the most common pollutant causing impairment. FDEP's statewide strategy for implementing TMDLs involves five-year cycles for basin assessment, monitoring, data analysis and TMDL development, development of basin management plans, and implementation of basin management plans. However, it should be noted that this strategy has not yet been approved by the USEPA, and would take up to 15 years to complete (statewide) once approved. It should be further noted that the FDEP's strategy for TMDLs does not give regional priority to South Florida; rather, the strategy was developed from a statewide perspective. Nevertheless, several key water bodies in South Florida will receive priority for TMDL development, including Lake Okeechobee and the Indian River Lagoon.

Development and implementation of TMDLs is an essential step for achieving overall ecosystem restoration in South Florida. Water quality restoration targets are necessary for detailed design of Restudy recommended plan components to achieve water quality restoration performance objectives. Further, implementation of basin management plans developed under the TMDL program is necessary to achieve ecological restoration in watersheds "downstream" of recommended plan components.

The triennial review of state and tribal water quality standards performed under Section 303(c) of the Clean Water Act is another essential step for achieving ecosystem restoration in South Florida. States and tribes are required to periodically review their water quality standards to ensure that standards are adequate to protect designated uses of waters. Within the study area, there are no specific numeric water quality criteria for many pollutants (e.g., nutrients and several pesticides) detected in ongoing water quality monitoring activities. The extent of the contribution of such pollutants to overall "impairment" levels in 303(d)-listed water bodies is also unknown. As part of the triennial review process, FDEP and the Seminole and Miccosukee Tribes may propose modifications to existing water quality criteria and propose additional water quality criteria (as appropriate) to protect water resources. Modified and additional water quality criteria should be integrated with future detailed planning and design activities to assure that recommended plan components are operated consistent with water quality restoration targets.

The SFWMD is also developing pollution load reduction goals (PLRGs) for SWIM-listed water bodies. In South Florida, SWIM-listed water bodies include Lake Okeechobee, the Indian River Lagoon, and Biscayne Bay. PLRGs are similar to TMDLs in that numeric water quality targets are promulgated and remediation programs are developed. TMDLs and PLRGs are essential water quality restoration targets to be integrated into future detailed planning and design activities for recommended plan components during the implementation period.

Several larger municipalities within the study area are required to apply to the USEPA for "Municipal Separate Storm Sewer System" (MS4) permits to address nonpoint source pollution sources within their jurisdictional boundaries. MS4 permit requirements apply to master drainage systems of local governments with populations greater than 100,000. The USEPA has generally implemented the MS4 permitting program on a countywide basis, incorporating cities, Chapter 298 Drainage Districts, and the Florida Department of Transportation (FDOT) where appropriate. Cities with populations greater than 100,000 are permitted separately. The following municipal governments in the study area are currently subject to MS4 permitting: Reedy Creek Improvement District, Broward County (25 copermittees), city of Fort Lauderdale, city of Hollywood, Palm Beach County (39 copermittees), city of Hialeah, Miami-Dade County (20 copermittees), city of Miami, and Lee County (12 copermittees). Local government regulatory programs to control smaller point and nonpoint sources of pollution will compliment state and tribal water quality regulatory and remediation programs.

The following sections summarize projected water quality problems and opportunities in study area subregions. Accurately projecting future water quality conditions in the Restudy area is difficult, due to the vast scope of the study area, uncertainty in future growth and land use changes, and in part to the lack of comprehensive water quality data indicative of statistically reliable trends (FDEP, 1996a). The following subsections predict water quality changes expected to occur within each of the C&SF Project subregions based on current water quality data and descriptions of existing conditions, available trend data, future population growth projections and the assumed implementation of certain specific regulatory and environmental restoration and water supply projects. Actual improvements in water quality conditions, where projected to occur, depend in large degree upon the successful implementation of the programs and projects included in the future without plan assumptions. For mercury, conditions are projected for the regional system as a whole.

WATER QUALITY PROBLEMS AND OPPORTUNITIES - MERCURY

There is much uncertainty about the sources of mercury in South Florida and the Everglades marsh mercury cycling processes that control mercury bioaccumulation. Controlling mercury contamination of the Everglades ecosystem depends on actions that are beyond the scope of the Restudy. The major external source of mercury for the Everglades ecosystem is atmospheric deposition. Some estimate that a high percentage of the mercury deposited into the Everglades could be contributed from local atmospheric emission sources in the urban area (Dvonch, 1998). Others estimate that most of the mercury deposited on the Everglades originates from outside Florida. Research indicates that mercury deposition rates in portions of North America have greatly increased since the turn of the century (Swain, et. al., 1992). Some of this historically accumulated mercury is being recycled by the ecosystem; however, this historical mercury could also be buried beneath the recycling zone by accumulating peat if new sources are shut off.

The effect of this burial process hypothesis has been estimated with a mercury cycling model (Ambrose et al., in press). The model predicts that as little as a 50 percent reduction in atmospheric mercury deposition over the next 50 years (2050) will decrease methylmercury concentrations in Everglades water and fish. Recent and potential future regulatory emission controls may be needed to reduce the atmospheric loading to the system from local sources; however, the significant global atmospheric mercury component is much more difficult to control and will require international agreements.

If control of atmospheric mercury deposition can be affected by decreasing local emission sources in concert with the implementation of the 44,000 acres of stormwater treatment areas (STAs) constructed as part of the Everglades Construction Project (ECP), additional benefits may accrue. However, the complex interactive modeling predictions have not yet been done. The long-term efficiency of the STAs in removing phosphorus and other water quality constituents is presently uncertain, as is the effect of these water quality changes on mercury cycling downstream. Among the key factors that are thought to influence mercury cycling within the Everglades are complex interrelationships involving phosphorus, sulfur, oxygen, carbon, periphyton, peat accretion, and sediment redox conditions. There is no scientific consensus as to which of these factors will dominate, and whether the driving factors will be the same throughout all portions of the 4,000 square mile Everglades ecosystem. Given the 80 percent reduction in total phosphorus obtained in the Everglades Nutrient Removal Project during the early years of operation, it is possible that a decrease in the methylation of mercury could occur downstream due to the declining nutrient concentrations to the marsh and the reduced stimulation of both producers and decomposers. However, it is unclear what effect changes in sulfur forms will have on mercury methylation, and which influence will dominate.

LAND USE

The existing use of land within the study boundaries varies widely from agriculture to high-density multifamily and industrial urban uses. A large portion of South Florida remains natural, although much of it is disturbed land. The dominant natural features are the federally protected Everglades National Park and Big Cypress National Preserve at the southernmost tip of the peninsula, Lake Okeechobee, and the state protected WCAs in the westernmost reaches of the Lower East Coast counties. Generally, urban development is concentrated along the Lower East Coast from Palm Beach County to Miami-Dade County, in the Central Florida/Orlando area, and on the Lower West Coast from Fort Myers to Naples.

Most of the interior of the study area is in agricultural use, which includes sugarcane (the dominant crop) and vegetable farms in the EAA of western Palm Beach County and Hendry County; the Agricultural Reserve Area of Palm Beach County; and the south Miami-Dade agricultural area where vegetable crops dominate, especially tropical varieties. There are citrus groves in every county, but citrus is concentrated in St. Lucie and Martin counties on the east coast and Hendry, Highlands, Collier, and Glades

counties on the west. Cattle and dairy farms predominate in Glades, Highlands, and Okeechobee counties.

In the northern portion of the system, around Orlando, tourism and its attendant service-oriented land uses (for example, hotels, motels, convenience stores, and souvenir shops) make up a significant portion of the landscape. Agriculture, however, continues to play an important role in the region, with over two million acres being farmed, half of which is pasture land. The area surrounding Lake Okeechobee is largely rural, with agriculture the prevailing land use. There are over 580,000 acres of irrigated farmland in the EAA (B. Boyd, pers. comm.). Farm products produced there include sugarcane, the predominant crop, rice, row crops, and sod. There is also extensive pasture land both west and north of the lake. Directly south of the EAA lie the WCAs. The conservation areas cover 1,372 square miles and consist mainly of sawgrass marshes and tree islands. The 1948 C&SF Project created the WCAs for the conservation of water supplies for the Lower East Coast.

The Upper East Coast is comprised of St. Lucie and Martin counties; the landscape is dominated by agricultural uses. Significant natural resources, the St. Lucie Estuary and Indian River Lagoon, are also contained within this area. Urban land use, which makes up 17 percent of the Upper East Coast, is mainly concentrated along the seaboard coastal and lagoon shorelines. The Lower East Coast extends approximately 100 miles through the coastal portions of Palm Beach, Broward, and Miami-Dade counties. Being the most densely populated area in the state, the Lower East Coast is home to one third of the state's population, more than 4.5 million people. The area is primarily an urban megalopolis, but it also contains substantial agricultural acreage, particularly in southwestern Miami-Dade County (90,000 acres) and western Palm Beach County (29,000 acres). Rapid population growth and land development practices have resulted in notable western urban sprawl; the predominant land use is single-family residential. The once significant rural population in the western areas of the counties, especially in Miami-Dade and Broward, has practically disappeared, resulting in an urbanized makeup in population. Palm Beach County is not far behind.

The Florida Keys are made up of over 1,700 islands that encompass approximately 100 square miles and contains the largest reef system in the United States. While a majority of the county is designated as conservation land, due to the land falling within either Everglades National Park, the Big Cypress National Preserve, or the National Key Deer Refuge, land use is primarily either residential or geared towards supporting the region's main industry (tourism). The county's fragile natural resources and vulnerability caused the state of Florida to designate the area as an Area of Critical State Concern in 1975; such designation is intended to protect such resources from degradation by strictly regulating development.

The southwestern counties of Collier and Lee are the fastest growing in terms of population in the state. Population growth is mainly due to the inmigration of retirees, not a high birthrate. The coast has become highly urbanized, with development spreading eastward into agricultural and natural lands. Agriculture is however, a major industry, especially in Lee County where citrus predominates.

STUDY PURPOSE

The purpose of the Restudy was to reexamine the C&SF Project to determine the feasibility of structural or operational modifications to the project essential to the restoration of the Everglades and the South Florida ecosystem, while providing for other water-related needs such as urban and agricultural water supply and flood protection in those areas served by the project. The intent of the study is to evaluate conditions within the study area and make recommendations to modify the project to restore important functions and values of the Everglades and South Florida ecosystem and plan for the water resources needs of the people of South Florida for the next 50 years.

Planning by the USACE for water resources projects is accomplished in two phases: a reconnaissance phase and a feasibility phase. The reconnaissance phase is conducted at full federal expense, while the cost of the feasibility phase is shared between the federal government and the nonfederal sponsor. The nonfederal sponsor for this study is the SFWMD.

The reconnaissance phase defines problems and opportunities, identifies potential solutions, and determines if planning should proceed further into the feasibility phase based on federal interest and identification of a nonfederal sponsor willing to support further study. The reconnaissance phase of this study was initiated in June 1993 and the reconnaissance report was completed in November 1994. The objective of the reconnaissance study was to identify problems and opportunities, formulate alternative plans, evaluate conceptual alternative plans, and recommend, if feasible, further detailed studies. The reconnaissance study helped to frame issues and set the direction for further detailed studies carried out in partnership with the local sponsor during the feasibility study.

Feasibility studies further develop the most promising alternatives and recommend a plan for authorization by Congress. The feasibility phase for this study was initiated in August 1995 following approval of the Project Study Plan by the USACE headquarters and the Governing Board of the SFWMD. As a result of the passage of the Water Resources Development Act of 1996, a revised Project Study Plan was approved in May 1997.

The recommended plan is designed in greater detail during the preconstruction engineering and design phase, necessary real estate is then acquired, and then the project is constructed.

STUDY SCOPE

The purpose of the Restudy was to develop a Comprehensive Plan for the overall regional C&SF system and the tools necessary to evaluate the Comprehensive Plan as well as separable and incremental portions of the project. This study represents the first thorough, systemwide update since the project's original inception. The Comprehensive Plan will include such features as are necessary to provide for the regional water-related

needs of the region; including flood control, the enhancement of water supplies, and other objectives served by the C&SF Project. This feasibility study included hydrologic modeling, environmental modeling, water quality analyses, and water supply studies that refined the information developed in the reconnaissance study. The feasibility study was conducted to identify a Comprehensive Plan for the C&SF Project and an adaptive implementation and operational strategy based on monitoring, evaluation, and modeling.

The Comprehensive Plan presented in this report is similar in scope to that contained in the 1948 Comprehensive Report for the C&SF Project (House Document 80-643). This feasibility report does not include the normal level of detail that is expected from much smaller projects, such as the identification of specific sites for proposed project facilities. The Comprehensive Plan identifies components needed to restore the South Florida ecosystem, which includes the needs of all users, and the formulation process that produced them, from the viewpoint of hydrologic impacts of the regional water management system. This report also documents the uncertainties in plan selection and future tasks that will be needed to minimize these uncertainties. Engineering and real estate cost estimates are based on the analyses and assumptions made during the process of formulating and developing the components of the Comprehensive Plan. Uncertainties in design details and uncertainties in the exact location of components could impact future alternative analyses and subsequent design and cost estimates.

OTHER STUDIES

There are a number of ongoing studies being conducted by the USACE and other agencies that may contribute to restoration of the South Florida ecosystem. Some of the major efforts are discussed in this section.

The USACE is currently conducting a feasibility study of Biscayne Bay in order to investigate effects on water circulation, biological communities, and water quality of dredging and filling, spoil islands, and freshwater inputs in northern Biscayne Bay from existing federal canals. The study would propose solutions to alleviate adverse factors affecting the bay and help to develop guidelines for future management of Biscayne Bay's natural resources. The nonfederal sponsor is Miami-Dade County.

The South Florida Ecosystem Restoration Task Force observed that the restoration effort needed to be founded on scientific information and mandated that it take an ecosystem approach. In support of this effort, the Science Subgroup completed a report in 1996 entitled South Florida Ecosystem Restoration Scientific Information Needs (Science Subgroup, 1996), which provides information in support of the ecosystem approach. It was the first step in the development of an ecosystem-based South Florida Comprehensive Science Plan that includes monitoring and modeling. The Science Coordination Team (formerly the Science Subgroup) is in the process of developing a science plan to supply the information needs for ecosystem restoration.

The science plan developed by the Florida Bay Interagency Working Group, initiated by Everglades National Park in January 1993, focused upon the research,

monitoring, and modeling objectives that must be addressed to guide the restoration of Florida Bay. It represents a synthesis of research plans prepared over past years by several federal and state agencies.

The SFWMD has undertaken the development of regional and subregional level water supply plans to provide for better management of South Florida's water resources. The Lower West Coast Water Supply Plan was completed in April 2000 (SFWMD, 2000). The Lower East Coast Regional Water Supply Plan, which addresses water-related needs and concerns of southeastern Florida through the year 2020 was completed in April 2000 (SFWMD, 2000). The Upper East Coast Water Supply Plan (SFWMD, 1998b), which evaluates future 2020 water demands and supplies for the Upper East Coast of Florida was completed in 1998.

PERMITS AND AUTHORIZATIONS

The timely processing and approval of permits and other regulatory authorizations is critical to completing design and construction on schedule and being able to operate a project once construction has been completed. To ensure that all required authorizations are processed and approved in a coordinated and timely manner, the USACE and SFWMD project managers will include staff, as necessary, from their respective regulatory/ permitting divisions and a representative from the FDEP on the Project Delivery Team. During development of the Project Management Plan for each project, the Project Delivery Team will identify a list of all permits and authorizations that are required for design, construction and operation of the project. This list, along with a schedule, milestones and agency responsibilities for obtaining the required permits, will be included in the Project Management Plan.

The USACE and the SFWMD project managers will maintain close communication and coordination to identify and address any required permit or water quality certification applications and negotiations as well as any conditions included in these authorizations. Where appropriate, final conditions on a permit or authorization will be approved by both the USACE and the SFWMD project managers prior to issuance of a draft permit or certification.

During the implementation of the Comprehensive Plan, certain general principles shall be observed:

- The USACE and the SFWMD will be jointly responsible for ensuring that projects will deliver design benefits, including flood control, water supply, water quality, environmental restoration, and other authorized project purposes.
- Operating criteria to ensure delivery of project benefits will be developed, to the greatest extent possible, during the Project Implementation Report phase of each project.
- If, for any reason, a project appears to fail to deliver the designed benefits, as identified through the RECOVER process, the

USACE and SFWMD will both work to address the problem and take such action as necessary to ensure that the project benefits are attained.

- In as much as this is a federal project, the USACE will not be issuing 404 permits for this effort. As is usually done for federal projects, a 404(b)(1) evaluation will be performed.
- Transfer to Operations and Maintenance (O&M) Authority will occur upon completion of the interim operational testing and monitoring period.

Chapter 3
KISSIMMEE RIVER AND LAKE OKEECHOBEE REGION

PHYSICAL CONDITIONS - KISSIMMEE RIVER REGION

The Kissimmee River Basin is comprised of 3,013 square miles, and extends from Orlando southward to Lake Okeechobee. The watershed, which is the largest source of surface water to the lake, is about 105 miles long and has a maximum width of 35 miles.

Project works in the basin for flood control and navigation were constructed by the U.S. Army Corps of Engineers (USACE) as part of the C&SF Project. Upper Basin works consist of channels and structures that control water flows through 18 natural lakes into Lake Kissimmee. The Lower Basin includes the channelized Kissimmee River (C-38) as a 56-mile earthen canal extending from Lake Kissimmee to Lake Okeechobee.

The northern portion of the basin is comprised of many lakes, some of which have been interconnected by canals. This large subbasin, often termed the "Upper Basin" or "Chain of Lakes", is bounded on the southern end by State Road 60, where the largest of the lakes, Lake Kissimmee, empties into the Kissimmee River.

The Upper Basin is 1,633 square miles and includes Lake Kissimmee and the east and west Chain of Lakes area in Orange and Osceola counties. A 758-square-mile Lower Basin includes the tributary watersheds of the Kissimmee River between the outlet in Lake Kissimmee and Lake Okeechobee. The 622-square-mile Lake Istokpoga area provides tributary inflow to the Lower Basin.

EXISTING CONDITIONS - KISSIMMEE RIVER REGION WATER MANAGEMENT

The system of water control works now in place in the Kissimmee Basin conforms closely with the general plan outlined in the 1948 report to Congress and authorized for construction in 1954. The project was designed to provide flood damage prevention for 30 percent of the standard project flood (SPF). This equates to protection against a five-year flood event. Water levels within the basin are controlled by a complex system of canals and control structures that are managed by the South Florida Water Management District (SFWMD) in accordance with regulations prescribed by the Secretary of the Army.

The major lakes of the "Headwaters" area, (the Upper Basin) are connected by channels. Most of the channels were excavated by private interests in the 1880's and subsequently enlarged to varying degrees under the congressionally authorized plan. Nine control structures regulate water levels and flows in the lake system. For more details on the existing flood control project, refer to the USACE Kissimmee River, Florida – Final

Feasibility Report and Environmental Impact Statement (1985). Operational criteria for both basins can be found in the Water Control Plan for the Kissimmee River-Lake Istokpoga Basin (1991). From time to time, operations may temporarily deviate from the water control plan. These temporary deviations may be conducted for various purposes such as control of nuisance aquatic vegetation, lake drawdowns, or construction.

Prior to the project, lake outlets within the "Headwaters" region had been dredged for drainage and navigation, but were uncontrolled, and over-drainage often occurred. Dredged outlets did not provide adequate flood control and the Upper Basin did not have enough outlet capacity (sometimes termed "get away" capacity) to remove flood waters within a "reasonable" time frame to avoid flood impacts.

To provide adequate outlet capacity from the Upper Basin, approximately 15 miles of canal, the outlet channel, was required immediately downstream of Lake Kissimmee. This length is a function of canal size, the size of the Lake Kissimmee outlet structure size (S-65), and the very flat terrain immediately downstream of the lake.

An earlier project, the Herbert Hoover Dike around Lake Okeechobee, had modified the original lower end of the Kissimmee River with a borrow area immediately upstream of Lake Okeechobee. This eight mile section of canal, known as Government Cut, was modified and enlarged during construction of C-38, and is inside the Lake Okeechobee containment levee. This section of the canal diverted flow from a downstream portion of the Kissimmee River, creating an isolated remnant of the river known as Paradise Run. Paradise Run, immediately west of Government Cut, retains most of its original topography; however, diversion of natural flows has lowered water levels and former wetland areas have been converted to grazing and pasture land.

Between the outlet channel at the upper end of the Kissimmee River (C-38), and Government Cut at the lower end, approximately 33 miles of the river and floodplain, referred to as the central reach, also was provided flood control. Some consideration was given to nonstructural approaches (e.g., levee the uplands from the floodplain); however, channelization was determined to be more cost effective at that time. Combined with Government Cut, the new canal provided complete channelization of the entire 56-mile river-floodplain from Lake Kissimmee to Lake Okeechobee.

The natural fall of the land from Lake Kissimmee to Lake Okeechobee is about 36 feet. Construction of Canal 38 (known as C-38) included six water control structures, S-65, 65A, 65B, 65C, 65D, and 65E from north to south, which form a series of five pools between S-65 and Lake Okeechobee.

The S-65 structures act as dams, and were located to step the canal water level down in increments of about six feet. In doing so, the natural slope of the river was removed, and flat pools (impoundments) resembling stair-steps were created. The water level of each pool generally is held constant, with little fluctuation or slope. This action has lowered water in the northern reach of each pool, and has created flooded marsh in the southern or lower end of each pool. A water surface area of approximately 7,600 acres is included within these pool areas under the existing regulation schedules.

The C-38 is generally 30 feet in depth, but varies in bottom width from 90 feet near Lake Kissimmee to 300 feet above S-65D. The canal's length, width, and water level vary in each pool. The head, or difference in water level above and below each structure, varies from structure to structure and with rate of discharge, but is typically about six feet.

During construction of C-38, a temporary easement was used to obtain areas adjacent to the canal for deposition of dredged material. The material was hydraulically deposited in linear alignments covering some 8,000 acres along the canal, with elevations averaging 15 feet above preproject topography. The material consisted of hydraulically sifted subsoil sands and clays with limited organic fraction, and high percolation rates. The material became part of the property upon which it was deposited. A number of landowners subsequently used the material to fill low areas on their property; and, at two locations in Okeechobee County, flood free, fly-in, residential subdivisions were built on the material. Where material was left undisturbed, xeric vegetation emerged on many of these deposits.

The CS&F Project works improved navigation opportunities originally provided in the Congressional Act of 1902. Each water control structure along C-38 includes a 30-foot by 90-foot navigation lock, which can accommodate boats with drafts up to 5.5 feet. The canal provides continuous navigation; however, interpool navigation is limited to daylight hours of lock operations.

The approximately 68 miles of river oxbows that exist within the five C-38 pools represent secondary channels of widely varying water depths. Many of these channels are very shallow, but only those that receive tributary inflows have any substantial baseflow. Culverts within the tieback levees at structures S-65B, 65C, and 65D provide modest amounts of circulation flow in the existing river channels below the levees.

Approximately 50 tributaries provide inflow into the Lower Kissimmee Basin. These tributaries are characterized by relatively constricted central channels with pasture lands usually extending along the channel. Most channels are covered with vegetation.

FUTURE WITHOUT PLAN CONDITION - WATER QUALITY - KISSIMMEE RIVER REGION

Several planned and ongoing environmental restoration projects are expected to be completed which would beneficially affect water quality in the Kissimmee River Watershed. Of particular importance is the Kissimmee River Restoration Project (including the Headwaters Revitalization and Modified Level II Backfilling projects). The Kissimmee River Restoration Project is expected to result in the restoration of approximately 26,500 acres of former wetlands in the vicinity of the Kissimmee Chain of Lakes (USACE, 1996) and at least 24,000 acres of former (drained) wetlands south of Lake Kissimmee (USACE, 1991).

FUTURE WITHOUT PLAN CONDITION - PHYSICAL FACILITIES AND OPERATIONS - KISSIMMEE RIVER RESTORATION

In the future without plan condition, the Kissimmee River Restoration Project will be in place and functioning. The restoration project, authorized by the Water Resources Development Act of 1992, will create a more natural physical environment in the lower Kissimmee River Basin. The major components of the project include: (1) reestablishment of inflows from Lake Kissimmee that will be similar to historical discharge characteristics (headwaters component), (2) acquisition of approximately 85,000 acres of land in the lower Kissimmee Chain of Lakes and river valley, (3) continuous backfilling of 22 miles of canal, (4) removal of two water control structures, and (5) recarving of nine miles of former river channel. The Kissimmee River Basin contributes about 30 percent of the water input to Lake Okeechobee. The supply of water to Lake Okeechobee is anticipated to be reduced by about 1.60 percent due to the implementation of this project.

As a component to the Kissimmee River Restoration project, the modification of the Upper Chain of Lakes regulation schedules and associated canal and water control structure modifications, known as the Headwaters Revitalization Project, will restore the ability to simulate the historic seasonal flow from Lake Kissimmee to the Lower Basin, and provide higher fluctuations of water levels in the lakes. The project will result in the expansion of the lakes' littoral zones by up to 18,500 acres, and improved habitat to fish and wildlife on lakes Kissimmee, Hatchineha, Cypress, Tiger, and Jackson. The project will also increase spatial and temporal dynamics produced through long-term fluctuations of seasonal water levels.

The Headwaters Revitalization Project will meet two hydrologic conditions (criteria) that must be reestablished to restore the Lower Basin ecosystem. These conditions are; the reestablishment of continuous flow with duration and variability characteristics comparable to prechannelization records; and reestablishment of stage hydrographs that result in floodplain inundation frequencies comparable to prechannelization hydroperiods, including seasonal and long-term variability characteristics.

WATER QUALITY PROBLEMS AND OPPORTUNITIES - KISSIMMEE RIVER REGION

By 2050, water quality conditions in the Kissimmee River Watershed south of urbanized Orange County are expected to be improved overall compared to existing conditions due to ongoing and planned ecological restoration programs in the drainage basin. In its 1998 303(d) list, the FDEP identified approximately 25 water bodies or segments of water bodies within the Kissimmee River Watershed where water quality was not adequate to sustain designated uses. Several of the 303(d) listed water bodies are actually reaches of the Kissimmee River. Most of the watershed is classified as Class III ("fishable–swimmable") waters; several water bodies within the watershed are designated Outstanding Florida Waters by the state of Florida. Pollutants and/or water quality criteria

identified contributing to impairment of designated use include: low levels of dissolved oxygen (DO), excessive nutrients, coliform bactieria, high biochemical oxygen demand (BOD), several trace metals including mercury (based on fish-consumption advisories), turbidity, and un-ionized ammonia.

Kissimmee River restoration projects are expected to reduce net pollution loading to the Kissimmee River and in downstream Lake Okeechobee through the restoration of remnant wetlands presently used as agricultural lands currently contributing pollutants to wetlands. Restored wetlands will also have a pollutant assimilation function, resulting in improved water quality in downstream water bodies (tributaries and oxbows). Additional ongoing land acquisition activities by the SFWMD will supplement ongoing environmental restoration projects (SFWMD, 1997a).

The extent of urbanization in the vicinity of the cities of Orlando and Kissimmee, north of the Kissimmee River Chain of Lakes is expected to increase. While new developments must comply with water quality treatment requirements for stormwater runoff, the net load of pollutants, particularly those typically associated with urban stormwater runoff contributed to the watershed north of the Kissimmee Chain of Lakes is expected to increase. Most of this increased pollution load would be expected to be retained in the Kissimmee Chain of Lakes and not enter the Kissimmee River – Lake Okeechobee system. Urbanization and attendant pollution loads in the region are not expected to increase significantly south of Lake Kissimmee.

LAND USE - KISSIMMEE RIVER REGION

Orlando, at the headwaters of the Kissimmee River Basin, is the primary economic and transportation center in the study area. Once the center of the state's orange production, the local economy of Orlando and the surrounding area now focuses on tourism. Kissimmee, located in Osceola County, is located eight miles east of Disney World and seventeen miles south of Orlando, and is influenced largely by tourism activities in the Orlando area. The other major incorporated area of Osceola County, the city of St. Cloud, is primarily a retirement community.

Land uses in the Upper Basin around the perimeters of Lakes Kissimmee, Hatchineha, Cypress, Rosalie, Tiger and Jackson are primarily pasture, some agriculture, and a large amount of wetlands. Marinas, fish camps, and various public facilities, such as boat launching sites and picnic areas, are located around the lakes. Lake Kissimmee State Park is on the extreme northwestern periphery of Lake Kissimmee, and the Three Lakes Wildlife Management Area and Prairie Lakes Preserve border the southeastern half of Lake Kissimmee. The 45,000 acre Kissimmee Prairie State Reserve is directly east of Avon Park in Pool B. Small residential and commercial areas are also scattered around most of the lakes. Development is more intense upstream of Cypress Lake, particularly in the Lake Tohopekaliga –East Lake Tohopekaliga (Toho) chain.

Agriculture continues to play an important role in the region. In the Lower Basin, most of the area between Lake Kissimmee and Lake Okeechobee is in fewer than fifty

large, private land holdings and several hundred subdivided property holdings. Agriculture remains the primary land use activity within the Lower Basin, being dominated by extensive beef cattle production and dairy activities.

The Avon Park Air Force Bombing Range is located within the Highlands County portion of the Lower Basin. This 107,000-acre federal facility is used both as a training facility for Armed Forces personnel, and as a management area for wetlands adjacent to the Kissimmee River.

Lower Basin lands have undergone substantial change over the last twenty years. Most notable is the conversion of unimproved pasture land to improved pasture at an accelerated pace during the period 1958 to 1972.

In the Upper Basin, most of the development susceptible to flood damage is urban, where damage is primarily a function of the depths of flooding inside structures or the stage of flooding. Single family residential land use is the primary type of development affected by flooding in the Upper Basin. Major affected areas are located around the towns of Kissimmee and St. Cloud, which cover only six percent of the damage susceptible flood-prone area but account for almost half of the basin's standard project flood damage. Other affected areas include Lake Hart, Lake Mary Jane, Pells Cove, Hidden Lake, Lake Hatchineha, Lake Alligator, Lake Rosalie, and the area west of the southern part of Lake Kissimmee. Existing average annual equivalent flood damages in the Upper Basin are estimated to be $1,226,100 (8 ¾ percent rate).

In the Lower Basin, mobile homes located around Pool E are the primary areas that would be affected by flooding. Although this land use would account for most of the damages from a standard project flood and 100-year event, it is not susceptible to damage during smaller floods. Other damages occur due to the duration of flooding on pasture land. Although agricultural use is the primary land use in the Lower Basin, flood damages are relatively minor for this activity due to the short duration of flooding, a result of the existing project works. Existing average annual equivalent damages in the Lower Basin are estimated to be $97,700 (8 ¾ percent rate).

Agriculture

Osceola, Polk, Highlands, and Okeechobee counties were included in this region. More than two million acres in these counties are farmed, with more than half of this area devoted to pasture land (UFBEBR, 1995). Much of this acreage is likely categorized as unique farmland based upon its location, growing season, and high value crops, including citrus. Almost a quarter of a million acres in the Kissimmee River Basin are irrigated (UFBEBR, 1995), requiring a dependable water supply. This region is characterized by large farms with relatively low productivity per acre. These four counties are among the top five counties in Florida for cattle production, both beef and dairy (FASS, 1996a). More than 200,000 acres are used for citrus production. Approximately 11,000 people are employed in agricultural production and services representing a payroll of approximately

$21 million (UFBEBR, 1995). The market value of all agricultural products in this region totals approximately $575 million (UFBEBR, 1995).

PHYSICAL CONDITIONS - LAKE OKEECHOBEE REGION

Lake Okeechobee lies 30 miles west from the Atlantic coast and 60 miles east from the Gulf of Mexico in the central part of the peninsula. Lake Okeechobee is abroad shallow lake occurring as a bedrock depression. The large, roughly circular lake, with a surface area of approximately 730 square miles, is the principal natural reservoir in southern Florida.

The lake's largest outlets include the St. Lucie Canal eastward to the Atlantic Ocean and the Caloosahatchee Canal and River to the Gulf of Mexico. The four major agricultural canals – the West Palm Beach, Hillsboro, North New River, and Miami canals - have a smaller capacity, but are used whenever possible to release excess water to the Water Conservation Areas (WCAs), south of the lake, when storage and discharge capacity are available. When regulatory releases from the lake are required, excess water can be passed to the three WCAs up to the capacity of the pumping stations and agricultural canals, with the remainder going to the Atlantic Ocean and Gulf of Mexico.

The waters of the lake are impounded by a system of encircling levees, which form a multi-purpose reservoir for navigation, water supply, flood control, and recreation. Pumping stations and control structures in the levee along Lake Okeechobee are designed to move water either into or out of the lake as needed.

Other surface water bodies include the Kissimmee River, Fisheating Creek, and Taylor Creek that flow into the lake from the north; the Caloosahatchee River that flows out of the lake to the west; the St. Lucie and West Palm Beach canals that flow out of the lake to the east; and the Hillsboro, North New River, and Miami canals that flow out of the lake to the south. The hydroperiod of the lake is partially controlled, permitting water levels to fluctuate with flood and drought conditions and the demand for water supply.

EXISTING CONDITIONS - LAKE OKEECHOBEE WATER MANAGEMENT

Historically, water levels in Lake Okeechobee were probably much higher than they are today (Brooks, 1974), perhaps as high as 6.1 meters (20 feet) NGVD (National Geodetic Vertical Datum). Prior to large scale development, and construction of the Herbert Hoover Dike, the lake had no channeled outflows, and water overflowed the lake as sheet flow to the south and east. This resulted in a much larger and broader littoral zone and marsh ecosystem to the north and west than the existing one. Today, as the primary reservoir of the Central and Southern Florida Flood Control Project, Lake Okeechobee is capable of storing 2.7 million acre-feet of water between stages of 3.2 meters (10.5 feet) above msl and the top of the regulation schedule at 5.3 meters (17.5 feet) above msl.

Water levels in the lake are managed according to a regulation schedule that was developed by the SFWMD and the USACE. The schedule is designed to maintain a low level of 4.7 meters (15.5 feet) during the wet season in order to provide storage capacity for excessive amounts of rainfall and to prevent flooding in surrounding areas. The stage at the end of the wet season is regulated at a maximum of 5.3 meters (17.5 feet) in order to store water for the dry season. The Caloosahatchee and St. Lucie canals are the primary outlets for release of flood waters when the lake is above regulation stages.

A series of structures are situated around the lake, which provide flood protection, control drainage, and facilitate navigation. The USACE operates the primary structures and navigation locks around the lake and is responsible for maintenance of the schedule. The SFWMD operates and maintains the secondary water control structures and pump stations.

Historically Lake Okeechobee's regulation schedule was developed primarily to meet flood control and water supply objectives, the primary purposes for construction of the C&SF Project. The environmental concerns for the lake's littoral zone and wildlife habitat and the downstream estuaries have generally been compromised in order to meet the water supply needs of South Florida.

Trimble and Marban (1988) performed an analysis of the Lake Okeechobee regulation schedule which incorporated a trade off analysis framework and resulted in the recommendation of an improved schedule known as "Run 25", which is the regulation schedule now in use This recommended schedule reduced the water quality impacts associated with regulatory discharges to the St. Lucie and Caloosahatchee estuaries by reducing the need to discharge large volumes of freshwater from the lake, without significantly impacting existing flood control, water supply and environmental benefits provided by the previous Run (15.5-17.5 feet) schedule approved in 1978. This schedule was approved by the District's Governing Board in December 1991 and approved on a two year interim basis by the USACE in May of 1992. Regulatory releases are to occur at lower lake stage and at lower and more environmentally sensitive rates of discharge than the previous schedule. The lower rates of discharge are made in a "pulse" fashion, which simulates a natural rainstorm event within the St. Lucie (C-44) Basin. Each pulse takes 10 days to complete. This method is designed to allow estuarine biota to tolerate changes in salinity and the discharges to remain within the natural range of freshwater flow to the estuary.

Water Quality

Lake Okeechobee may be considered a naturally eutrophic water body that is tending to become hypereutrophic, due primarily from nutrient inputs from the Kissimmee River and the Taylor Creek basins. Water quality conditions in the upper Kissimmee River appear to be improving, primarily due to rerouting of wastewater flows from the river to reuse and ground-water discharge sites. However, large quantities of nutrients are still discharged from Lake Toho to Lake Kissimmee and other downstream areas. Water quality improves from Lake Kissimmee to near Lake Okeechobee, where the channel

flows mostly through unimproved rangeland; however, pollutant loadings increase as cattle and dairies grow more numerous near the lake. Because the lake's phosphorus is internally recycled and a vast reservoir of the nutrient is stored in ground water as well as wetland and canal sediments, phosphorus within the lake may not reach acceptable levels for many decades or even a century.

According to the 1996 305(b) report (FDEP, 1996) for Lake Okeechobee, the major pollution sources for the lake include runoff from ranch and dairy operations in the north where pollution has elevated phosphorus and coliform bacteria concentrations and created a continuous algal bloom. In the south, historic backpumping of runoff from row crops and sugarcane has elevated nutrient and pesticide levels. The backpumping has mostly ceased but still occurs when water in the primary canal of the Everglades Agricultural Area (EAA) reaches 13 feet (flood-control levels). As a result, depending on location and seasonal rainfall or drought, the lake receives varying amounts of nutrients, substances creating high biological oxygen demand (BOD), bacteria, and toxic materials. Other pollutants include high levels of total dissolved solids, unionized ammonia, chloride, color, and dissolved organic chemicals.

Biological sampling indicated variable but generally eutrophic conditions. In recent years, several widespread algal blooms (one covering about 100 square miles) and at least one major fish kill (all of which were widely publicized) launched the environmental community and governmental agencies into intense investigation and analysis of the lake's problems. The Lake Okeechobee Technical Advisory Committee, formed to assess the situation and recommend solutions, determined that phosphorus from dairies and agriculture was a major cause of the noxious algal blooms and that levels should be reduced by 40 percent. A few others contended that the secondary cause of increased phosphorus is the flooding of hundreds of acres of perimeter wetlands after the SFWMD decided in the late 1970's to raise the lake's water level. The higher level also reduced valuable fish-spawning grounds and waterfowl feeding and nesting habitat.

In general, the water quality trends for the lake are stable at six sites, improved at two sites, and degraded at two sites. The best water quality observations were noted for the flow entering Fisheating Creek and along the west near wetlands, while the worst water quality conditions occurred in the south by agricultural areas, and to the northeast by Taylor Creek, Nubbin Slough and the St. Lucie Canal. The reported major pollution sources in this basin were dairies and agriculture. A generalized assessment of the lake shows the lake as having fair water quality conditions, except for Myrtle Slough which was shown to have poor water quality, and the extreme south-southwest section of the lake where good water quality conditions are described by the 305(b) report (FDEP, 1996).

FUTURE WITHOUT PLAN CONDITION - WATER QUALITY - LAKE OKEECHOBEE

Several watershed and in-lake cleanup projects are currently proposed (flow diversion projects for four Florida Statutes Chapter 298 Water Control Districts, diversion of flows from the 715 Farms area, and a critical project authorized pursuant to Section 528

of the Water Resources Development Act of 1996 – the Lake Okeechobee Water Retention/Phosphorus Removal Critical Project) to incrementally reduce inputs of nutrients to the lake. However, to sustain water quality improvements brought about by in-lake cleanup projects, pollutant source reduction programs, via agricultural land acquisition, and implementation of best management practices (BMPs) in the lake watershed must be implemented concurrently. The Florida Department of Environmental Protection (FDEP) is at present developing a Total Daily Maximum Load pollutant loading program which is expected to result in additional pollutant load reduction activities in watersheds flowing to Lake Okeechobee.

FUTURE WITHOUT PLAN CONDITION - PHYSICAL FACILITIES AND OPERATIONS - MANATEE PROTECTION

The West Indian manatee (*Trichechus manatus*) is listed as a federally endangered species and is one of the most endangered species in Florida. As a response to recent manatee mortality trends associated with water control structures, this project will provide operational changes and implement the installation of a manatee protection system at seven sector gates at navigational locks near Lake Okeechobee. The beneficial outcome of this project will be the reduction of risk, injury, and mortality of the manatee. The seven sector gates include S-193 at Okeechobee and S-310 at Clewiston on Lake Okeechobee; St. Lucie Lock and Port Mayaca Lock on the St. Lucie Canal; and Moore Haven Lock, Ortona Lock, and W. P. Franklin Lock on the Caloosahatchee River. The mechanism proposed would use hydroacoustic and pressure sensitive devices that will immediately stop the gates when an object is detected between the closing gates. These systems will transmit an alarm and signal to stop the gate movement when a manatee is detected. When an object or manatee activates the gate sensors, the gate will stop and open approximately six inches to release a manatee. As a result, a manatee will be able to travel between the open gates. After the gate opens, the operator can fully close the gate unless an object remains between the gates. Then the opening process will repeat the cycle as the sensors are activated again. Due to these structural modifications, manatees will be at a significantly less risk as they encounter locks with a sector gate. The future without plan condition assumes that the automatic gate sensor devices are installed on these lock sector gates.

FUTURE WITHOUT PLAN CONDITION - PHYSICAL FACILITIES AND OPERATIONS - LAKE OKEECHOBEE REGULATION SCHEDULE

Lake Okeechobee has undergone numerous changes since the initial construction of Herbert Hoover Dike. Today, the Lake Okeechobee's water level is managed to provide a range of desired purposes including, flood protection, water supply and environmental protection using "regulation schedules." In 1995, the SFWMD requested the USACE to study a range of regulation schedules intended to be more responsive to lake ecosystem, down stream users and receiving water bodies. Those studies are currently underway. Due to the uncertainty of the recommendation that will result from that study, the Restudy

assumed the current schedule, known as Run 25, for hydrologic modeling of the future without plan condition.

FUTURE WITHOUT PLAN CONDITION - PHYSICAL FACILITIES AND OPERATIONS - CRITICAL RESTORATION PROJECTS

Lake Okeechobee Water Retention/Phosphorus Removal

The project consists of design and construction of stormwater treatment areas (STAs) in the Taylor Creek Basin (200 acres) and in the Nubbin Slough Basin (1,100 acres) and the restoration of isolated wetland sites on ten agricultural parcels in the Okeechobee watershed. The purpose of the project is to capture and attenuate peak flows from portions of the watershed and to improve water quality. The total project cost is estimated to be $16.3 million.

WATER QUALITY PROBLEMS AND OPPORTUNITIES - LAKE OKEECHOBEE

Lake Okeechobee is a Class I water body (potable water supply) according to Florida Administrative Code rule. Class I water bodies generally have the most stringent surface water quality and pollution control criteria in Florida. However, water quality data for Lake Okeechobee indicate that the lake is in a eutrophic condition, primarily due to excessive nutrient loads from agricultural sources both north and south of the lake.

The main tributary to Lake Okeechobee is the Kissimmee River. As stated above, several water bodies within the Kissimmee River Watershed, including segments of the river itself, are impaired to various levels. Degradation of water quality in the Kissimmee River Watershed contributes to downstream degradation in Lake Okeechobee. Lower reaches of the Kissimmee River contribute high levels of nutrient loading to Lake Okeechobee.

Another important tributary to the lake is the Taylor Creek/Nubbin Slough Basin. The Taylor Creek/Nubbin Slough Basin contributes high levels of nutrient loading, low levels of DO, and elevated coliform bacteria and turbidity levels to the lake. The Taylor Creek/Nubbin Slough Basin contributes only 4 percent of the total volume of inflows to Lake Okeechobee, but accounts for approximately 29 percent of the total phosphorus inflow loads.

Eight segments of Lake Okeechobee are also included on the Section 303(d) list. Water quality parameters/criteria causing impairment at eight different monitoring locations in Lake Okeechobee include: excessive nutrients, low levels of DO, and high concentrations of unionized ammonia, iron, chlorides, and coliform bacteria. The Fisheating Creek and C-41 basins on the northwest side of the lake also contributes pollutants causing impairment in Lake Okeechobee.

Water quality in Lake Okeechobee is expected to slowly improve between 1999 and 2050. Field and laboratory studies of phosphorus stored in lake sediments indicate that sediment bound phosphorus is a dominant pollutant affecting lake water quality (Reddy et al., 1995). Currently, the average cumulative phosphorus load to the lake exceeds the Surface Water Improvement and Management Plan target by approximately 100 tons per year (SFWMD, 1997f). Phosphorus loads to the lake eventually become sequestered in lake sediments. The phosphorus in these sediments, which has accumulated over time from excessive external loads, is frequently resuspended (primarily by wind-aided mixing: Havens, 1997) and will tend to maintain a high phosphorus concentration in the water column, even if all sources of phosphorus in the contributing watershed are controlled consistent with regulatory and watershed management programs. Although short-term water quality conditions in Lake Okeechobee are not expected to improve, in place pollutant reduction programs in the lower Kissimmee River and Taylor Creek/Nubbin Slough basins are expected to result in long-term reduction in Lake Okeechobee water column nutrient concentrations.

Urban development in the Lake Okeechobee Watershed and nonpoint source pollution loading associated with urban stormwater runoff is not expected to increase significantly by 2050.

LAND USE - LAKE OKEECHOBEE REGION

Lake Okeechobee has traditionally been a key source of water supply for irrigated crops around the lake including the EAA, the Caloosahatchee River Basin, and Martin and St. Lucie counties (Upper East Coast). Continued access to this source of water is considered vital to sustaining agriculture in the surrounding regions.

Agriculture

The area is rural in character, with most lands dedicated to agriculture, very generally sugarcane is the predominant crop in the south, row crops and sugarcane in the east and pasture land with dairy production in the north. Urban areas, which are generally few and modest in population, service the agriculture sector, as well as the tourists who come to the lake to fish, hunt, and enjoy other recreational pursuits.

Urban

A significant use of land outside the agricultural context is for urban development. Six incorporated communities are situated around the lake and range in population from approximately 1,400 to 16,000.

The Brighton Seminole Indian Reservation occupies a large area of land west of the lake in Glades County. The southern end of this reservation is near the Herbert Hoover Dike just north of Lakeport.

Major transportation corridors around the perimeter of Lake Okeechobee include several highways and railroads. County Road 78 parallels the lake along its western and northern shores from Moore Haven to Okeechobee. From Okeechobee, State Highway 98/ 441 follows the northern and eastern portion of the lake to Pahokee. County Road 715 then follows the Herbert Hoover Dike from Pahokee to Belle Glade, where State Highway 27 follows the southern lake area back to Moore Haven and County Road 78. In many cases, these highways are within 1.6 kilometers (one mile) of the Herbert Hoover Dike, and are often within 15 meters (50 feet).

Railroad corridors in the Lake Okeechobee area include the Florida East Coast Railway and the South Central Florida Railroad. The East Coast Railway is located along the eastern part of the lake where it comes very near to the Herbert Hoover Dike. The South Central Florida Railroad travels along the southern end of the lake, where it comes within 1.6 kilometers (one mile) of the Herbert Hoover Dike.

CURRENT PROJECTS - THE KISSIMMEE RIVER RESTORATION PROJECT

The Kissimmee River Basin covers about 3,000 square miles of south-central Florida. In the 1960's the Kissimmee River was channelized as part of the comprehensive Control and Southern Florida (C&SF) flood control project. The 103 miles meandering Kissimmee River was channelized into a 56 miles, 250 feet wide canal (C-38). The C-38 project worked as designed for flood control. However, the C-38 project also drained over 14,000 acres of wetlands and severely eliminated wading birds, waterfouls and fisheries within the River Basin. The purpose of the Kissimmee River Restoration Project is restoration of the ecosystem that was affected by construction of the flood control project in the Lower Kissimmee River Basin and restoration of the Upper Basin. The restoration project will provide the necessary flows for the restoration of the Kissimmee River ecosystem and maintenance of the existing level of flood control within the basin, while backfilling the middle portion (22 miles) of the C-38 Canal, and will re-create the river's physical form and flows.

The restoration program has involved years of extensive work by the USACE and the SFWMD, as well as continuing participation by a variety of interests in Florida and throughout the nation.

In 1992 the Water Resources Development Act (WRDA), congress jointly authorized the ecosystem restoration of the Kissimmee River and the Kissimmee River Headwaters Revitalization Project. The cost-sharing requirements applicable to this project were established as 50 percent federal and 50 percent nonfederal. On March 22, 1994, a Project Cooperation Agreement was executed between the Department of the Army and the SFWMD, which combined the two authorized construction segments into one project, the Kissimmee River, Florida Project.

The Kissimmee River Project consists of both structural and nonstructural modifications within the upper Basin. Acquisition of approximately 85,000 acres of land

is required to provide the necessary storage requirements for Kissimmee River restoration and reestablishment of the floodplain.

The cost of the entire project has been estimated to be approximately $500,000,000.

Description of Water Body

The River's name "Kissimmee" is derived from a Calusa Indian word that means "long water". The Kissimmee River Basin is located in south-central Florida between the city of Orlando and Lake Okeechobee and covers an area of approximately 3,013 square miles (**Figure 4**). The watershed, which is the largest source of surface water to Lake Okeechobee, is about 105 miles long and has a maximum width of 35 miles (**Figure 5**). Lake Okeechobee is the major source of fresh water to the residents of South Florida.

The Kissimmee River Project area covers Orange, Osceola, Polk, Highlands, and Okeechobee counties. The Kissimmee River Basin is divided into two parts:

1. The Upper Basin, which covers 1,633 square miles includes Lake Kissimmee and the East and West chain of lakes areas in Orange and Osceola counties.
2. The Lower Basin covers 758 square mile, which includes the tributary watershed of the Kissimmee River between the outlet in Lake Kissimmee and Lake Okeechobee.

The Upper Basin includes the Kissimmee Chain of Lakes (KCOL), as shown in **Figure 6**. The KCOL consists of Lakes Tohopekaliga, East Tohopekaliga, Hart, Mary Jane, Myrtle, Preston, Alligator, and Gentry in the upper region.

The lower region of the chain includes Lake Cypress, Hatchineha, Kissimmee, Pierce, Marion, Rosalie, Weohyakapka, Tiger, Jackson, and Marian. These lakes range in size from a few acres to 55.5 square miles. The lower portion of the chain is also known as the Headwaters, since it forms the headwaters of the Kissimmee River (**Figure 7**).

The Kissimmee River Restoration Project covers the Headwaters portion of the Upper Basin and the Kissimmee River in the Lower Basin.

Water Use in the Kissimmee Basin

Water use is divided into urban and agriculture (**Table 2**). Agriculture is the largest existing and largest projected water user within the basin.

Hydrology

The Upper Basin Headwaters Revitalization Project will provide flows to the restored Kissimmee River approaching the duration and variability of discharges which

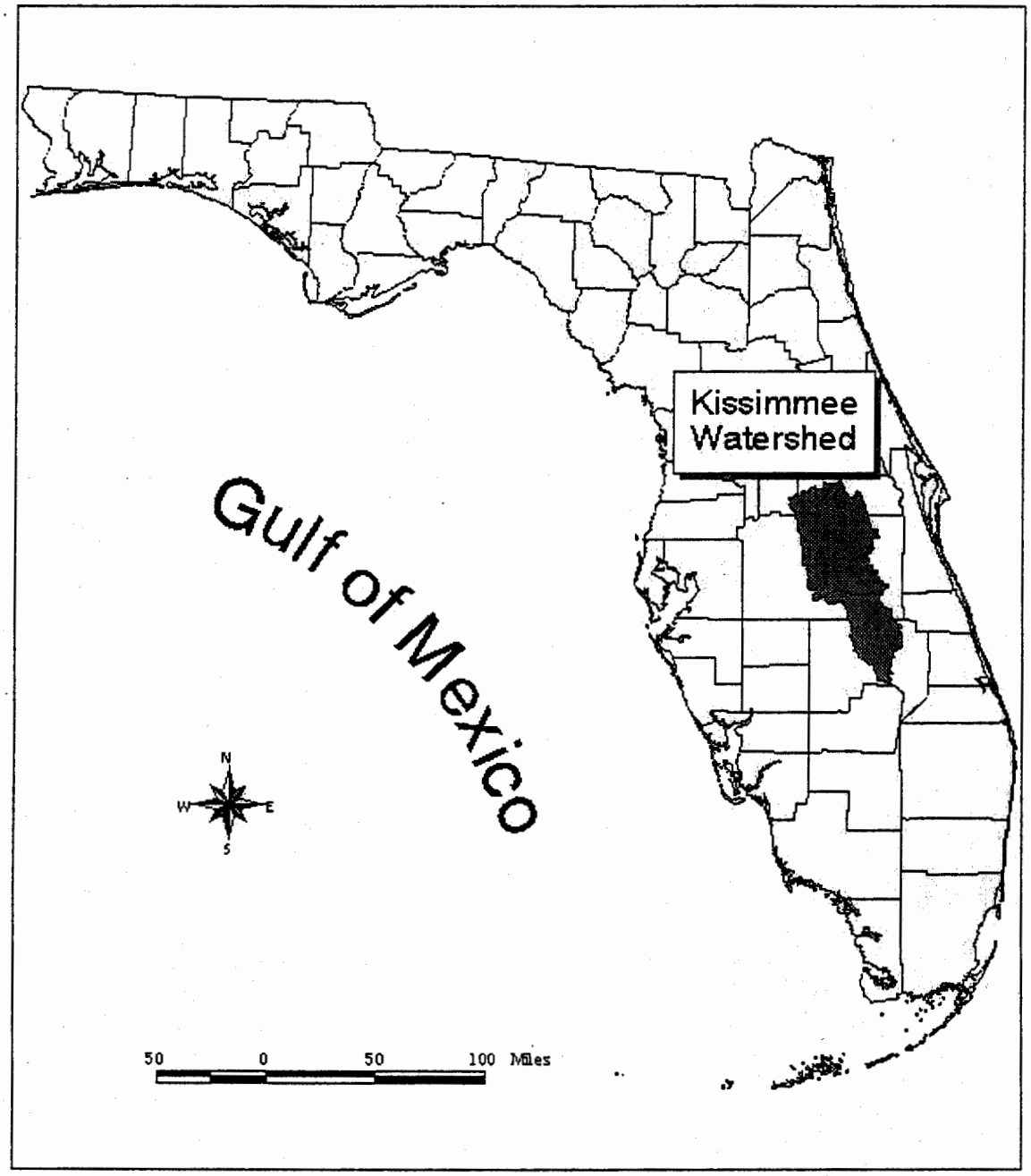

Figure 4. Kissimmee Location Map.

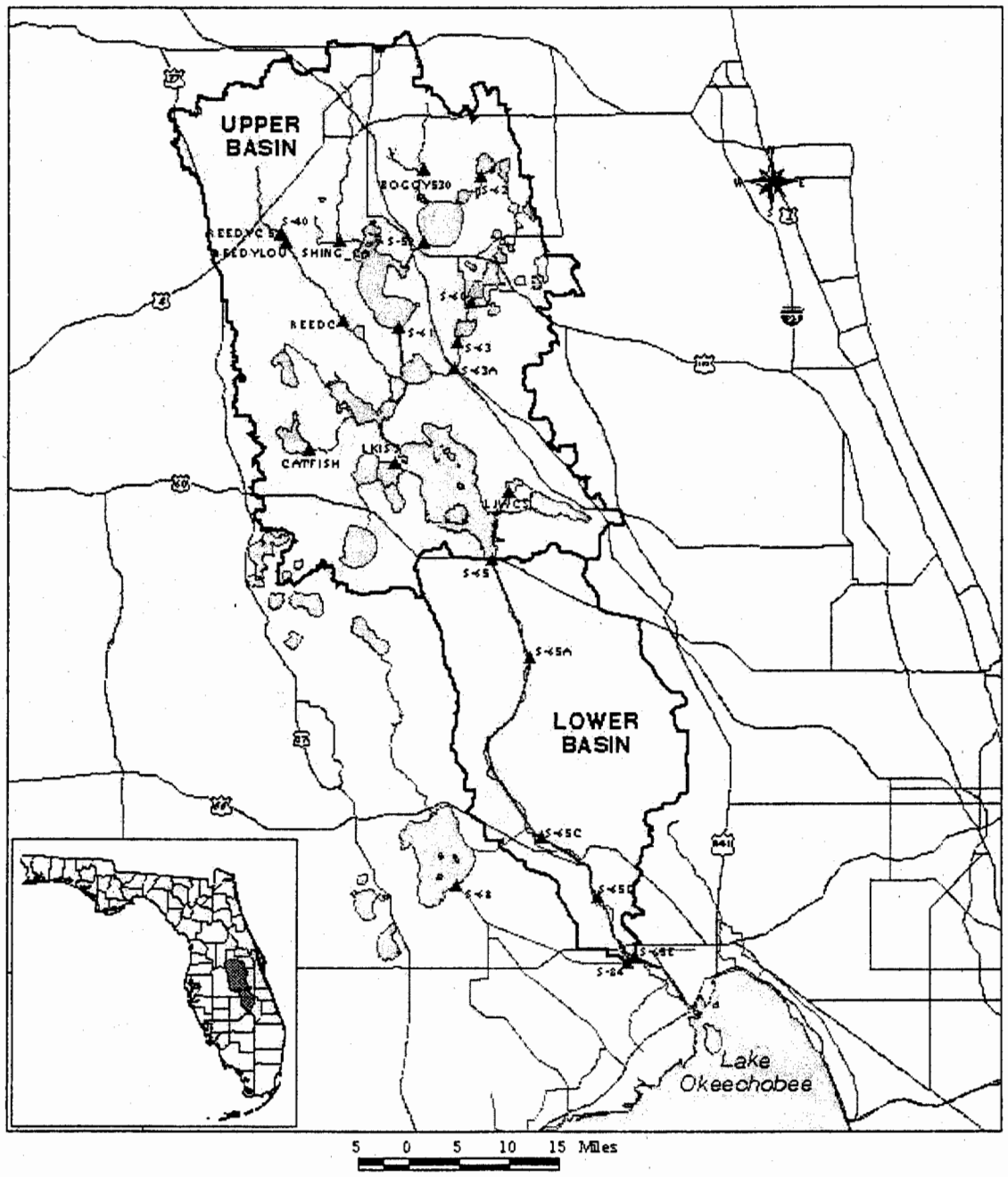

Figure 5. Kissimmee Watershed.

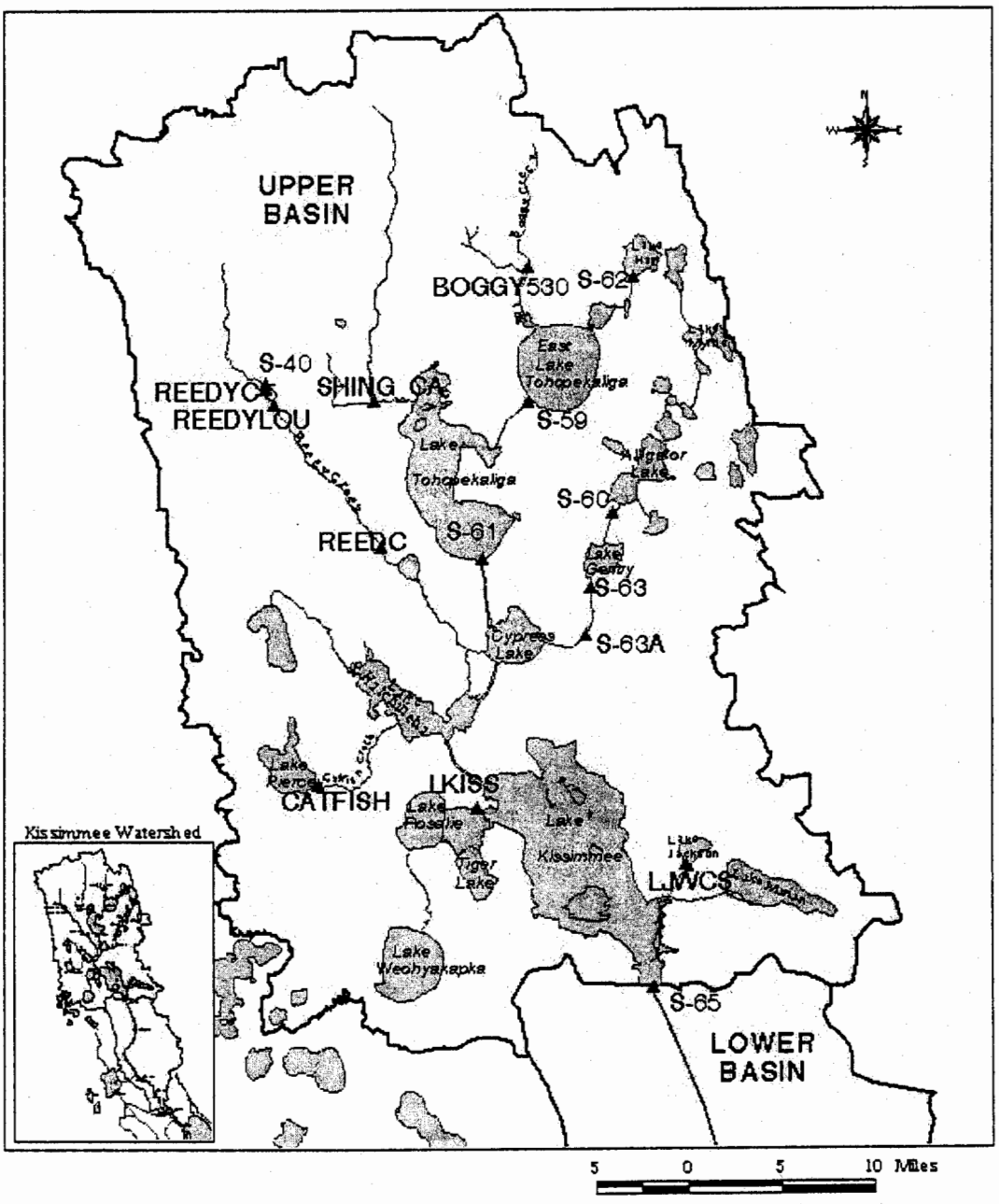

Figure 6. Kissimmee Chain of Lakes.

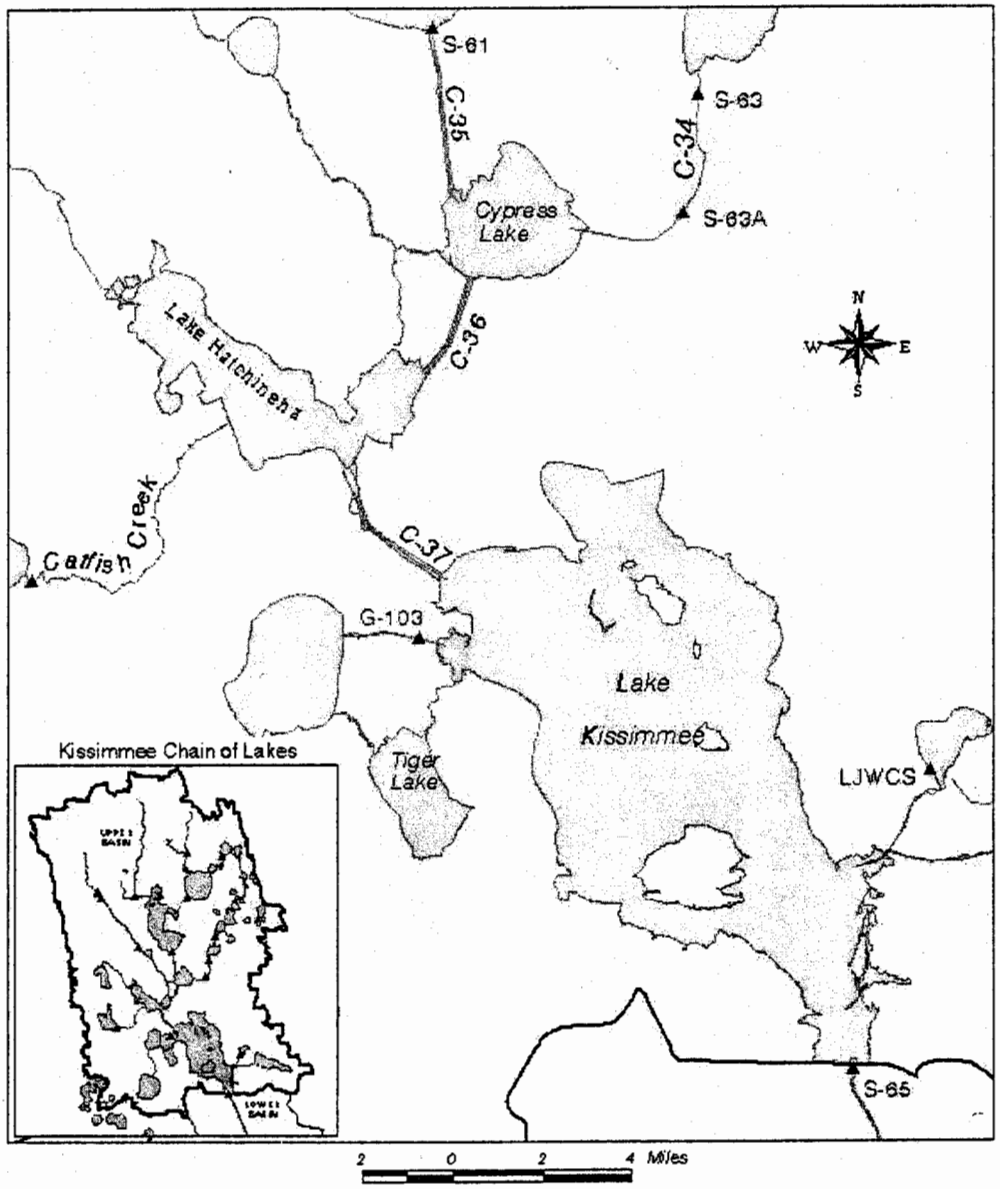

Figure 7. Kissimmee Headwaters Section.

Table 2. Kissimmee Basin Water Demands.

Land Use	1995	2020	Percent Change
Urban	35,602	68,153	76
Agricultural	112,668	173,995	54
Total Water Demand	148,270	242,148	63

occurred before the river was channelized. Minimum flows are expected to exceed 250 cubic feet per second (cfs) about 95 percent of the time, compared to the current flows which are less than 30 cfs 50 percent of the time. Maximum velocities for the restored channel will be between 0.8 and 1.8 feet per second during bankfull stage. The stage recession rate should rarely exceed one foot per month. Overbank flooding will occur within the restored area when discharges exceed 1,400 - 2,000 cfs. Average floodplain velocities will be on the order of 0.2 to 0.4 feet per second.

Based on historic stage-duration hydrologic data and expected future flows from Lake Kissimmee, overbank flooding of the river valley in a typical year will start in July or August, and reach a peak from September through November and gradually recede from December through June. Very wet or dry years and storm events will vary this pattern.

Historic Conditions

Historically, the Kissimmee River meandered approximately 103 miles within a one to two mile wide floodplain. The floodplain, approximately 56 miles long, sloped gradually to the south from an elevation of about 51 feet at Lake Kissimmee to about 15 feet at Lake Okeechobee.

Under historic conditions, river flows generally exceeded 250 cfs 95 percent of the time. The river moved very slowly, with normal river velocities averaging less than two feet per second. Wetland, wildlife, waterfowl, fisheries, and other biological components were once part of an integrated and resilient river floodplain ecosystem that provided and estimated 340,000 habitat units. A fluctuating hydroperiod, along with the ondulating topography of the floodplain, a meandering river channel, oxbows, and natural discontinuous levees, enhanced and maintained habitat diversity, including a mosaic of intermixed vegetation and other complex physical, chemical, and biological interactions and processes.

Early flooding conditions in the Kissimmee River Basin were the result of runoff accumulation on the flat lands of the basin and the subsequent rise of lake levels within the Upper Basin, which remained at high levels because of poor outlet capacity.

The drought of 1944-1945 and a major hurricane in 1947, which caused extensive flooding in the Kissimmee Basin, illustrated the inadequacy of the basin's water control system. In 1948, Congress authorized the USACE to undertake construction of the

Central & Southern Florida (C&SF) Project for flood control and other purposes. Work within the Lower Basin, which was initiated in 1962 and completed in 1971, included channelization of the Kissimmee River.

The C-38 Canal provided complete channelization of the river between Lakes Kissimmee and Okeechobee, a linear distance of 56 miles. Construction of the C-38 Canal reduced the threat of floods in the Lower Kissimmee River Basin, enabling more intensive land uses to occur. However, it also led to a number of environmental impacts, such as a loss of fish and wildlife habitat, a reduction in the nutrient assimilative capacity of the river's floodplain, and loss of aesthetic qualities inherent in a natural meandering river system.

Over 35,000 acres of wetlands that existed prior to channelization are estimated to have declined to about 14,000 acres today.

A major concern following completion of the Kissimmee River channelization was decreased water quality due to low dissolved oxygen (DO) conditions that are the main effects of channelization.

Restoration Efforts

In 1992, the Water Resources Development Act (WRDA) and Congress jointly authorized the ecosystem restoration of the Kissimmee River and the Kissimmee River Headwaters Revitalization Project. The cost-sharing requirements applicable to this project were established as 50 percent federal and 50 percent nonfederal. On March 22, 1994, a Project Cooperation Agreement was executed between the Department of the Army and the SFWMD, which combined the two authorized construction segments into one project, the Kissimmee River, Florida Project. The major components of the restoration project include the following:

1. Reestablishment of inflows from Lake Kissimmee that will be similar to historical discharge characteristic
2. Acquisition of approximately 85,000 acres of land in the lower Kissimmee Chain of Lakes and river valley
3. Continuous backfilling of 22 miles of canal
4. Removal of two water control structures
5. Recarving of nine miles of former river channel

Restoration Project Status

Planning, engineering, design and construction have been initiated. A test backfilling project was initiated in 1994 and completed in September 1994. The restoration project is divided into the following five restoration elements:

1. The Restoration Evaluation Program

2. Projects Needed to Implement the Revised Headwaters Regulation Schedule
3. Phase I Backfilling Projects
4. Phase II Backfilling Projects
5. Phase IV Backfilling Projects

The Phase I Backfilling was completed in February 2001. The restoration project is underway and expected to continue until 2011. The Restoration Evaluation Program is designed to evaluate the success of the project in meeting the established restoration goals, to provide for continuous, scientifically informed fine-tuning of the construction and adaptive management of the recovering and restored ecosystem.

Agency Jurisdictions

Federal Jurisdiction on the Kissimmee River Basin involves the regulatory responsibilities of the USACE, the United States Environmental Protection Agency (USEPA), and the U.S. Fish and Wildlife Service (USFWS). The USACE is responsible for prescribing the operational criteria and the regulation schedules for the Central and Southern Florida Flood Control Project (D&SF Project). Their primary regulatory functions include operation and maintenance of the levees and major outlet works, dredge and fill activities, maintaining navigable waters, cleanup of pollution spills and the protection of endangered species.

The USEPA is responsible for protection of the environmental resources of the Kissimmee River Basin.

State agencies involved with the management and regulation of the Kissimmee River Basin are primarily, the Florida Department of Environmental Protection (FDEP) and the Florida Game and Fresh Water Fish Commission (FGFWFC). Their jurisdictions include the protection of water quality, wetland resources, fisheries and wildlife resources.

At the regional level, the SFWMD and three regional planning councils have jurisdiction within the Kissimmee River Basin planning area. The SFWMD's authority is to manage and protect the water resources in a 16-county region, which includes the Kissimmee River Basin Surface Water Improvement Management, (SWIM) Planning Area. Regional Planning Council jurisdictions are assigned by county. The Southwest Florida Regional Planning Council has jurisdiction within Glades and Hendry counties. The Central Florida Regional Planning Council has jurisdiction within Okeechobee and Highland counties. The East Central Florida Regional Planning Council has jurisdiction within Polk and Osceola counties. Regional Planning Councils have responsibilities to develop regional comprehensive policy plans for protection of water resources within the planning area and provide technical assistance to local governments and evaluate the impacts anticipated from development of regional on regional resources.

The local governments listed below have the authority to control land use in the Kissimmee River Basin through their comprehensive plans and land development regulations. Sectors that exist at the local government level include planning, building, zoning and regulatory departments, water and sewer utilities, city and police departments, and soil, water and conservation districts.

Local counties in the Kissimmee River Basin include: Highlands, Okeechobee, Osceola, Polk and Orange.

Land Use in the Kissimmee River Basin

The existing land use in the Kissimmee Basin planning area is generally more urban in the north than in the south, as shown in **Table 3**. Continued urbanization is anticipated in the north, while in the south, agricultural acreage is projected to increase.

Table 3. Acreage and Percentage of Land Use by County Area.

Land Use	Orange	Osceola	Polk	Highlands	Okeechobee	Glades	Kissimmee Basin
Agriculture	31,513 (17%)	218,656 (35%)	44,243 (16%)	259,362 (53%)	189,625 (52%)	139,470 (47%)	882,869 (40%)
Urban	60,243 (32%)	52,212 (8%)	51,449 (19%)	42,194 (9%)	21,928 (6%)	2,760 (1%)	230,788 (10%)
Wetlands	36,338 (20%)	164,355 (27%)	59,571 (22%)	76,821 (16%)	66,800 (18%)	59,678 (20%)	463,563 (21%)
Forest	30,264 (16%)	74,857 (12%)	65,136 (24%)	41,586 (9%)	32,591 (9%)	68,578 (23%)	313,012 (14%)
Rangeland	2005 (1%)	26,012 (4%)	25,270 (9%)	33,489 (7%)	48,284 (13%)	20,223 (7%)	155,283 (7%)
Barren	3,419 (2%)	2,842 (1%)	1,420 (1%)	3,733 (0%)	3,588 (1%)	2,471 (1%)	17,473 (1%)
Water	21,796 (12%)	81,082 (13%)	23,885 (9%)	30,022 (6%)	4,299 (1%)	1,492 (1%)	162,576 (7%)
Total	185,578 (100%)	620,016 (100%)	270,974 (100%)	487,207 (100%)	367,115 (100%)	294,672 (100%)	2,225,562 (100%)

Point and Nonpoint Sources of Pollution in the Watershed

Point sources of pollution are defined as discharges to surface and ground waters where discrete measures of water flow and water quality may be taken. In the Kissimmee River Basin planning area, domestic wastewater treatment and Industrial waste facility discharges are considered point sources, as shown in **Table 4**. Domestic wastewater and industrial waste facilities in the planning area are regulated by the FDEP.

Nonpoint source pollution is usually associated with land use activities that do not have a single discrete discharge point. These pollution sources are usually delineated into

Table 4. Permits in the Kissimmee River Basin.

Permit Type	Permit Agency	Total Sources	Permit Activity
Point Sources			
Industrial Wastewater	FDEP	95	Industrial Treatment Systems
Domestic Wastewater	FDEP	130	Private and Municipal Wastewater Facilities
Petroleum Contaminate Sites	FDEP	841	Gas Stations and Storage Tanks
Nonpoint Sources			
Dairies	FDEP	15	Dairy Farms BMPs
Works of the District Permits	SFWMD	442	Agricultural, Industrial, Commercial, NPS BMPs
Surface Water Management Permits	SFWMD	2,183	Storm Water Management Systems
Waste Disposal Sites	FDEP	47	Landfills

rural and urban. Rural nonpoint sources include storm water runoff and are associated with agricultural activities. Urban nonpoint sources are also primarily conveyed by storm water and contain pollutants associated with urban land use.

Management Strategies for Restoration and Protection of the Water Body to Class III or Better Surface Water Quality Status

Most of the watershed is classified as Class III (fishable, swimmable) waters and several waterbodies within the watershed are designated Outstanding Florida Waters by the State of Florida.

Water management planning efforts in the Kissimmee Basin Planning area include a variety of interrelated studies and activities, in both the public and private sectors. Each plan or study addresses unique water management issues while maintaining close relationships with water supply planning, as shown in **Table 5**. The related efforts with the most significant influence on the implementation of the Kissimmee Basin Water Supply Plan include the establishment of Minimum Flows and Levels (MFLs) to several lakes in the Kissimmee Basin. Another ongoing effort that will help to preserve the water body is the establishment of Total Maximum Daily Loads on the river and several lakes in the Kissimmee Basin.

Restoration Studies on the Water Body

Degradation of the Kissimmee River's ecosystem, wetlands and water quality due to channelization in the lower Kissimmee River Valley has been the subject of numerous federal, state and local studies over the past thirty years.

Table 5. Kissimmee Basin Related Water Management Planning Efforts.

Study	Scope/Primary Goal	Relationship to KB Water Supply Plan	Timeframes
KB Water Supply Plan	Adequate and reliable water supply	N/A	2000
Kissimmee River Restoration Project	Environmental restoration of Kissimmee River floodplain, improved surface water quality.	Changing deliveries to Lake Okeechobee	2015
Lake Okeechobee SWIM Plan	Protection and enhancement of Lake Okeechobee and its watershed (water quality)	Discharge water quality and nutrient loading from the Kissimmee River	Update completed 1997, Next update 2000
Lake Okeechobee Regulation Schedule Environmental Impact Study	Evaluates environmental and economic impacts associated with proposed Lake Okeechobee Regulation Schedules (quantity)	Discharge quantity from the Kissimmee River	1999
C&SF Project Restudy	Comprehensive review of environmental Impacts of C&SF Project	Lake Okeechobee storage and treatment, including reservoirs and aquifer storage and recovery	1995-1999
Comprehensive Everglades Restoration Plan (CERP)	Implementation of C&SF Project Restudy	Lake Istokpoga Regulation Schedule, potential construction of reservoirs and ASR system north of Lake Okeechobee	2000-2050
Kissimmee Basin Minimum Flows and Levels (MFLs)	Prevent significant harm to the water resources and ecology of surface water resources in the Kissimmee Basin	MFLs will more clearly define the quantity of water available for consumptive uses. Recovery or prevention strategy has potential to alter future water management activities, including use of water resources in the Kissimmee Basin	2004-2006
Kissimmee Basin Total Maximum Daily Loads (TMDLs)	Prevent significant harm to the water quality and ecology of surface water resources in the Kissimmee Basin	TMDLs will set the maximum pollutants loads that the water body can take to achieve water quality standards	2005-2011

Local involvement in environmental restoration of the Kissimmee River began in the early 1970's. After several years of public debate, the Florida Legislature, in 1976, passed the Kissimmee River Restoration Act. Since 1984, the SFWMD has been the lead agency for the state of Florida in promoting the Kissimmee River Restoration initiative.

Nonfederal Studies

In 1984-1985, a demonstration project was constructed by SFWMD. The results of the $1.4 million project indicated that restored flow would revitalize abandoned river channels. Former wetlands, which had been converted to pasture, would quickly revert to wetland ecosystems with the reestablishment of an appropriate water pattern.

In October 1988, the SFWMD conducted the Kissimmee River Restoration Symposium, where the state's Kissimmee River Environmental Restoration goals were formulated. The symposium ecological review panel concurred with participating scientist that reestablishment of lost ecological values would be achieved only with a holistic, ecosystem restoration perspective.

In a report dated June 1990, the SFWMD proposed a plan to restore the ecological integrity of the Kissimmee River using an ecosystem approach. This plan was called the SFWMD's Alternative Plan Evaluation and Preliminary Design Report. The objective of the plan was to achieve environmental restoration goals while meeting flood control, navigation, water supply, and water quality needs. The restoration goal was to reestablish an ecosystem capable of supporting and maintaining species diversity, distribution, and quantity representative of the natural habitat of the river basin. The report establishes system hydrology and floodplain hydraulics as key factors in environmental restoration. Four basic alternatives were considered in the report: Weiring, plugging, and Level I and Level II backfilling. Only the Level II Backfilling Plan was adequate as meeting the minimum restoration criteria, by restoring 24,000 acres of floodplain and 52 miles of river channel, resulting in a restored 35 square miles of river/floodplain ecosystem. The Level II Backfilling Plan was SFWMD's recommended restoration alternative for the Kissimmee River.

Federal Studies

In response to resolutions by the Committee on Public Works and Transportation of the U.S. House of Representatives, and the Committee on Environment and Public Works of the United States Senate (dated April 25, 1978), the USACE studied alternative plans for restoration of the Kissimmee River. The study report was submitted to the Assistant Secretary of The Army for Civil Work in 1985. The study concluded that although project modifications responsive to environmental concerns could be constructed, none provided positive net contributions to the nation's economic development. Accordingly, the Chief of Engineers recommended that no federal action be undertaken and that report information be used by nonfederal interests in determining long-range solutions to water and related land resource problems in the basin.

Under authority of section 1135 of the Water Resources Development Act of 1986, the Jacksonville District Engineer initiated feasibility studies of the plan for revitalization of the Upper Kissimmee Basin. The study was later called the Headwaters Revitalization Project and would consist of changes in lake operation schedules, channel enlargements, modification of existing water control structures, and as a result of higher lake water levels, acquisition of 18,500 acres of land by the local sponsor, SFWMD.

A second federal feasibility study, which was authorized in the Water Resources Development Act of 1990, was also assembled by the USACE. The feasibility study was also an Environmental Impact Statement (EIS). The congressional authority directed that the study be based on implementing the SFWMD's Level II Backfilling Plan. Therefore there was no need to develop new planning objectives or alternative plans.

As a result of these and other studies, two restoration plans were developed which, when implemented together will restore environmental values throughout the Kissimmee River Basin. The two components are the Upper Basin Headwaters Revitalization and the Lower Basin restoration of the Kissimmee River.

Maintenance of the Water Body after Restoration

A basic premise of the Kissimmee River Restoration Project is to reestablish the natural hydrologic processes that shaped and maintained the ecological integrity of the historical river and floodplain ecosystem. The reestablishment of historical hydrologic characteristics is expected to drive the restoration process, and ensure the return and preservation of the system's environmental values. Thus, the restored ecosystem is expected to be largely self-managing by natural hydrologic processes. However, there are at least two potential management concerns for the restored system, invasive/exotic vegetation and public use. Although existing invasive and exotic plant species in the Kissimmee River system, including water lettuce, water hyacinth, and Brazilian pepper are expected to be largely eliminated or at least controlled by the reestablishment of historical discharge characteristics and hydroperiods, some minor control efforts will likely be needed. Of greater concern is the Old World climbing fern (*Lygodium microphyllum*) which is a recent invader of the system and seems capable of persisting in the restored system. Efforts to eradicate or control this species are underway and may be critical for achievement of restoration. The other potential management issue relates to the use/exploitation of the restored system and associated resources. The need for management of public use, such as airboating and hunting pressure will be based on information derived from the projects ongoing ecological evaluation program.

Project Schedule

Kissimmee River Restoration efforts began in 1991 with specific project tasks in the Upper Basin and Phase I portions of the project. In 1993, the Scientific Restoration Evaluation Program began and is scheduled to continue for four years past the completion of the final construction project. Actual construction of features are anticipated to be fully completed by 2010. The major project phases for the Kissimmee River Restoration Project are reflected in **Figure 8**.

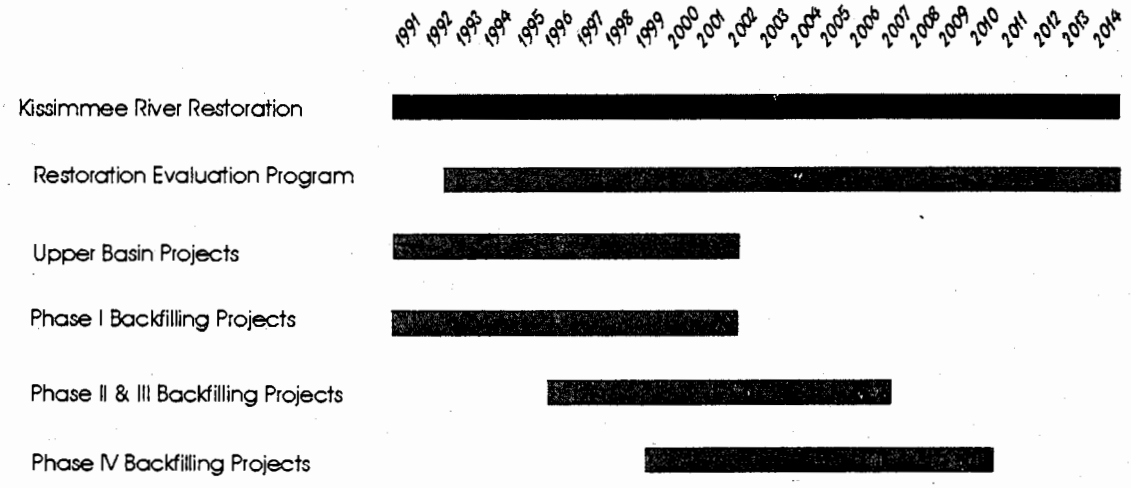

Figure 8. Kissimmee River Restoration Project Schedule.

Funding Needed

The total project cost for the Kissimmee River Restoration is approximately $500 million. The SFWMD is responsible, per the cost share provisions of the Project Cost Agreement (PCA) between the Department of the Army and the SFWMD (dated March 22, 1994), for 50 percent of the total project cost, approximately $250 million. Through fiscal year 2000, the SFWMD has spent a cumulative total of $96.8 million. This leaves a remainder of approximately $153.2 million of funding needed by the SFWMD to complete the project and fulfill obligations outlined in the PCA.

Figure 9 depicts the remaining funding that the SFWMD will need to fulfill project obligations directly associated with the Kissimmee River Restoration.

Goals and Performance Measures

The goals and performance measures will be analyzed according to the two major components of the Kissimmee River Restoration Project: The Kissimmee River Restoration Project in the Lower Basin and the Headwaters Revitalization Project in the Upper Basin.

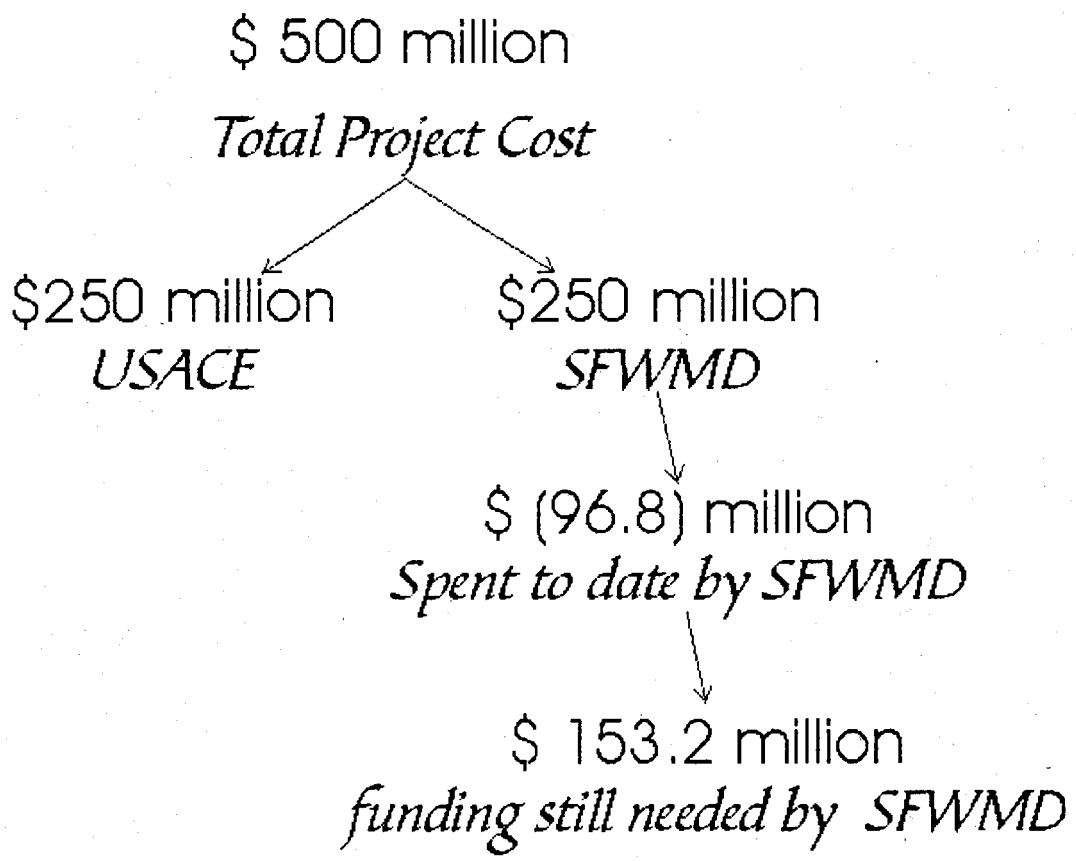

Figure 9. Kissimmee River Restoration Project Cost Needs.

Kissimmee River Restoration Project

Baseline Condition

River channelization, drainage and other modifications to wetland plant communities within the floodplain have wide-ranging ecological consequences, including loss of fish and wildlife habitat and virtual destruction of a complex food network that the floodplain wetlands once supported. The 35,000 acres of wetlands that existed prior to channelization are estimated to have declined to about 14,000 acres in today's conditions.

Goal

The main goal of the restoration project is restoration of the Kissimmee Basin wetlands and ecosystem.

Performance Measure

The Kissimmee River Restoration Project will restore over 40 square miles of the existing channelized system, including 43 continuous miles of river channel and about

27,000 acres of wetlands. The project is expected to benefit over 320 fish and wildlife species (Toth et al, 1998). In the Lower Basin, the land acquisition for the restoration project is as shown in **Table 6**.

Table 6. Land Acquisition for Kissimmee River Restoration Purposes.

	Total Acres	Percent of Total
5-Year Return Frequency Floodplain (Fee Simple)	58,487	86
100-Year Return Frequency Floodplain (Flowage Easement)	9,143	14
Misc. Easements	213	<1

In the Lower Basin, the project is expected to achieve the following objectives:

- Restore river meanders and oxbows
- Maintain flood protection
- Maintain navigation
- Meet recreational demands

Headwaters Revitalization Project

Baseline Condition

Hydrologic conditions have been modified in the Upper Kissimmee Basin as a result of the Kissimmee River Flood Control Project. Water levels in Lakes Kissimmee, Cypress and Hatchineha are presently regulated between 48.5 and 52.5 feet NGVD. When required for flood protection of the Upper Basin, water is released to the Lower Basin, sometime, in sudden pulses. A result of the existing narrow regulatory range and little flood or conservation pool storage. regulatory operations often cause rapid changes in water levels in the lakes. No releases to the Lower Basin are made during dry periods. Modifications of the regulation schedules for the Upper Chain of Lakes would provide for greater and more natural fluctuations of water levels in the lakes, as well as the capability to simulate the historic seasonal flow from Lake Kissimmee to the Lower Basin. This capability is a prerequisite for restoration of the Lower Basin ecosystem.

Goal

A goal for the Headwaters Revitalization Project is to revise the existing regulation schedule for Lakes Kissimmee, Hatchineha and Cypress. The upper level of the existing schedule would be increased from elevation 52.5 feet to elevation 54.0 feet NGVD. The schedule would be zoned to provide varying discharges based on season and water levels. The revised schedule would seasonally re-flood land between elevations 52.5 and 54.0

feet NGVD in Lakes Kissimmee, Hatchineha, and Cypress. Approximately 17,300 acres bordering the three affected lakes must be acquired.

Performance Measure

Beneficial environmental effects in the Upper Basin resulting from the Headwaters Project include expansion of lake littoral zones by up to 17,300 acres and associated benefits to fish and wildlife on Lakes Kissimmee, Hatchineha, Cypress, Tiger and Jackson. Additional benefits are expected due to increased spatial and temporal dynamics produced by long-term fluctuations of seasonal water levels. These dynamics are expected to increase the overall quality and productivity of littoral habitat and create significant wetlands areas. The U.S. Fish and Wildlife Service have determined that Headwaters Revitalization will benefit the endangered Bald Eagle, Snail Kite, and Wood Stork.

The Headwaters Revitalization Project will meet two hydrologic conditions (criteria) that must be reestablished in order to restore the Lower Basin ecosystem. These conditions are: The reestablishment of continuous flow with duration and variability characteristics comparable to prechannelization records and reestablishment of stage hydrographs that result in floodplain inundation frequencies comparable to prechannelization hydroperiods, including seasonal and long-term variability characteristics.

Kissimmee River Restoration Permitting

Section 401 of the Clean Water Act (CWA) requires that the USACE obtain certification from the state that a proposed water resources project is in compliance with State Water Quality Standards. In Florida, the USACE obtains Water Quality Certification (WQC) by applying for and receiving an Environmental Resource Permit (ERP) issued by the Department of Environmental Protection. The USACE is required by the National Pollution Discharge Elimination System (NPDES) regulations to obtain a stormwater discharge permit for any construction activity that disturbs five acres or more of land. Activities that are regulated by Section 404 of the CWA do not require permits under the NPDES program. USACE projects that have state WQC are considered to be automatically covered under the NPDES program.

Given the large scale of the Kissimmee River Restoration Project and the extended timeframe for implementation, several WQC permits have and will be required. In 1994, the first permit for the Kissimmee River Restoration Project was issued to the USACE and SFWMD for the test fill project in the C-38 Canal. In July of 1997, the FDEP issued a Noticed General Permit to the SFWMD for the Modified Level II Backfilling Plan, Phase One.

Two of the largest project elements that currently have a WQC from FDEP are the Kissimmee River Headwaters permit, and the Reach 1 (Contract 7) permit. The Headwaters permit covers project features that are located north of S-65. This permit was issued in March 1997 and is periodically modified to include additional project features.

The Reach 1 permit, issued in April 1999, covers a section of the C-38 Canal just north of S-65B to just north of S-65C. Most of the construction covered under this permit has been physically completed as of February 2001.

In November of 2000, the USACE obtained a WQC for the C-41A Canal Spillway additions. This permit includes the expansion of the S-68, S-83, and S-84 structures. These features are scheduled for construction in the fall of 2001. The FDEP is expected to issue a WQC for the US Highway 98 culverts in March of 2001. Construction should follow within the year.

The WQC applications for the Istokpoga Canal and CSX Railroad Bridge Project features are scheduled for submission to FDEP by September of 2001. The CSX Railroad Bridge Project also requires a navigation permit from the United States Coast Guard. This permit is obtained concurrently with the FDEP permit. The WQC application process for the Reach 2 Backfill features has not been initiated because no plans and specs have been prepared to date.

Although the USACE has primary responsibility for Kissimmee River Restoration Project permitting, some project features such as the Contract 15 Pool D Residential Area Flood Proofing and the Lykes Brothers Features are being permitted outside of the WQC process. Responsibility for preparing the applications, reviewing them, and issuing permits for these features will be coordinated between the USACE, SFWMD, and FDEP.

Public Access for Kissimmee Project Lands

The Kissimmee River Save Our Rivers (SOR) Project includes lands in the Kissimmee Chain of Lakes and lands along the Kissimmee River. The SOR Project contains the Kissimmee River Restoration Project, which encompasses land in the Upper and Lower basins, and covers an estimated 88,000 acres. This acreage is divided into two major management areas: The Lake Kissimmee Management Area and the Kissimmee River Management Area. Extensive areas within the Chain of Lakes and Kissimmee River are open for public use. A few isolated tracts are temporarily closed to public use due to cattle leases, however most of the lands are open to a wide variety of public uses, including hiking, hunting, and fishing.

The Lake Kissimmee Management Area comprises 12,902 acres, and consists of the following units:

- Gardner-Cobb Marsh Unit
- Drasdo Unit
- Kissimmee Island Unit
- Lightsey Unit (Tiger Creek and West Short subunits)

Figure 10 illustrates the Lake Kissimmee Management Area.

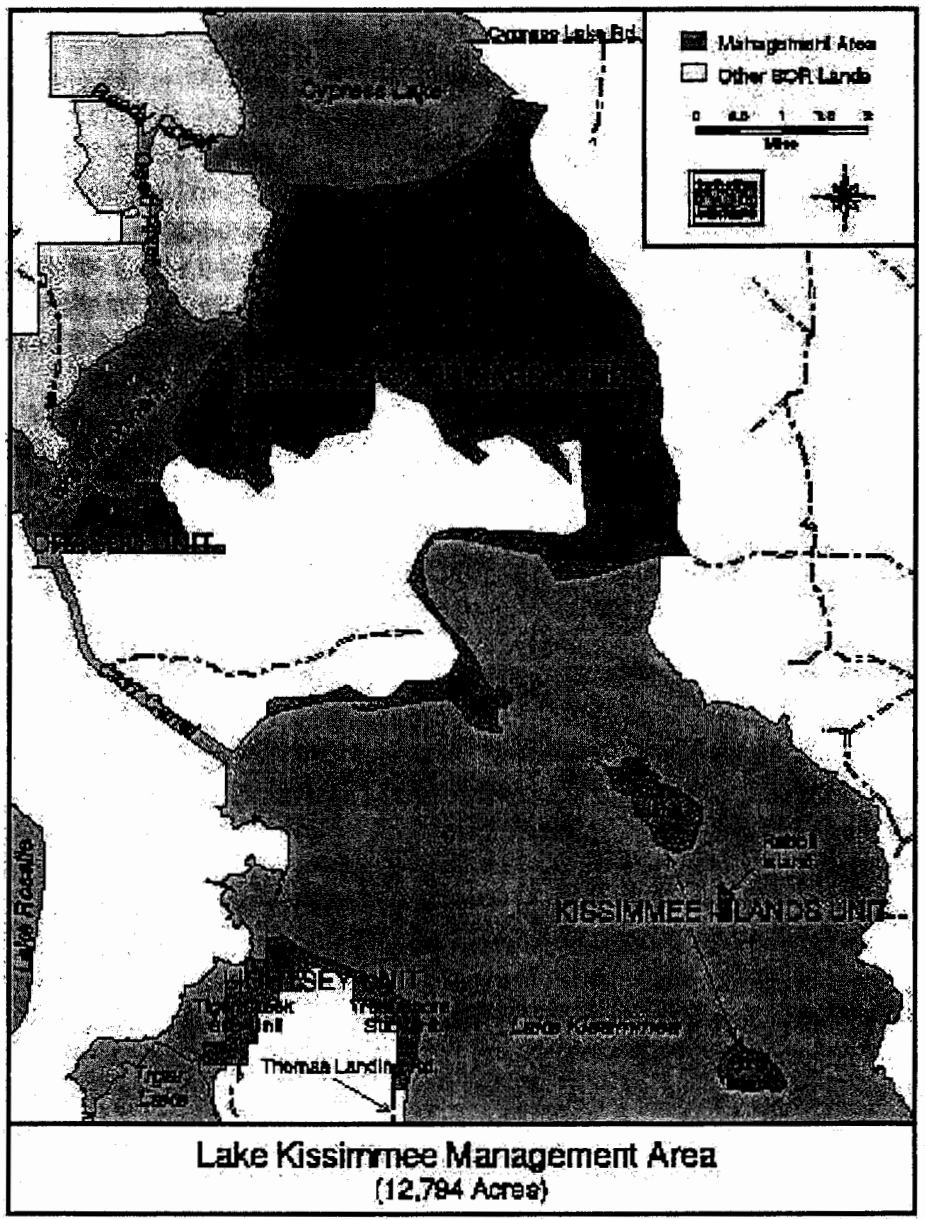

Figure 10. Lake Kissimmee Management Area.

The Kissimmee River Management Area consist of Pool C Management Area, Pool D Management Area, Pool E Management Area and Paradise Run Management Area, as shown in **Figure 11**.

Management assistance in the Kissimmee River Management Areas is provided by the Florida Fish and Wildlife Conservation Commission (FFWCC), pursuant to agreements with the SFWMD. Public use in areas designated as FFWCC Management Units is governed primarily by FFWCC rules. SFWMD Rules are supplemental to FFWCC rules. Hunting in areas opened for such use is also governed by FFWCC rules. Special use licenses issued by the SFWMD at no cost, may be required for some activities.

Land Acquisition for Kissimmee River Restoration

The SFWMD has been purchasing lands for the Kissimmee Restoration Project since the mid-1980s. Lands have been purchased in the Kissimmee Chain of Lakes in order to facilitate the implementation of the new regulation schedules in the lakes. Raising the lake regulation schedules will allow the SFWMD to store more water in the lakes, making it available for release to the Kissimmee River. The additional water is necessary in order to provide a year round flow when the river is restored. Lands have been purchased in the lower Basin as a requirement for the restoration of the floodplain and re-establishment of the remnant river segments.

On average, 75 percent of all the lands needed for the Kissimmee Restoration Project are required as a fee title acquisition. That leaves 25 percent of the lands that are required needing temporary, construction or access easements. The USACE set the defining criteria for fee versus easement acquisition at the inception of the project. That criterion is a function of the topographic elevation of the land parcel. Properties measuring at or below the 5-year flood line must be acquired in fee. Properties measuring between the 5 and 100-year flood line can be acquired via a flowage easement. Temporary, construction and access easements are self-explanatory. **Table 7** shows the pertinent statistics for land acquisition for the Kissimmee Restoration Project.

Table 7. Kissimmee River Restoration Real Estate Acquisition Information.

Area	Acreage Needed	Acreage Obtained	Remaining Acreage	Needed in Fee	Needed as Easement
Upper Basin	33,919	27,256	6,663	5,205	1,458
Lower Basin	62,628	54,724	7,904	5,798	2,106
Total	96,547	81,980	14,567	11,003	3,564
Percent of Total	N/A	84.9	15.1	75.5	24.5

There are no lands that have been acquired for the Kissimmee Restoration Project as a function of the need to protect or recharge ground water.

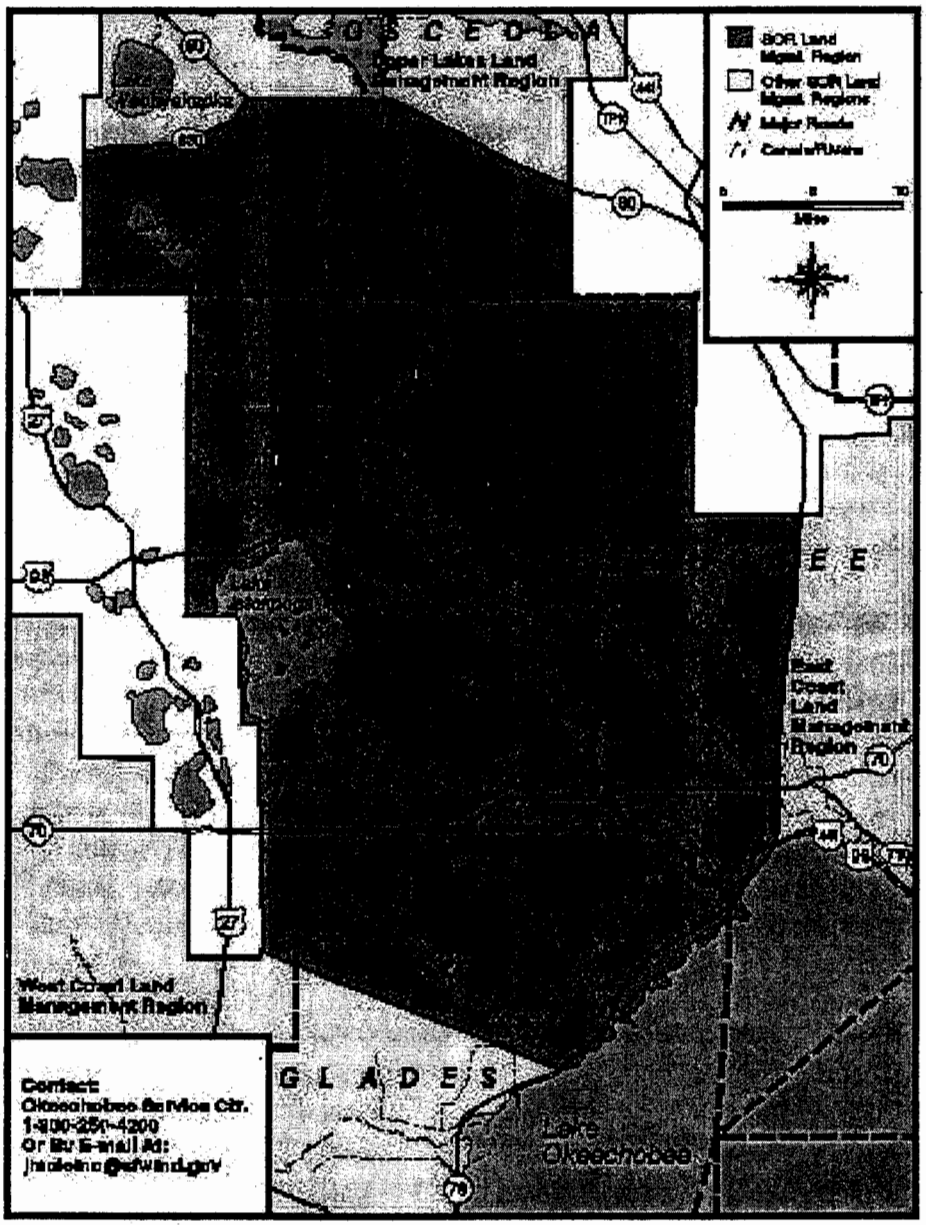

Figure 11. Kissimmee River Management Area.

CONCLUSIONS

The Kissimmee River Restoration Project is a monumental project in many ways. It is the first attempt at restoring a river ecosystem. It is the culmination of cooperative efforts between many, state, federal and local organizations that have worked together for over three decades to make this project happen. This momentous occasion represents the culmination of more than 25 years of research, design and public activism. The scientific approach towards the comprehensive evaluation of the restoration program sets the Kissimmee River Project apart from all other restoration efforts. Restoration benefits are expected to begin immediately and continue for many generations to come.

ELIGIBLE CERP PROJECTS

1a - North of Lake Okeechobee Storage Reservoir (A)

This separable element includes an above ground reservoir and a 2,500-acre stormwater treatment area. The total storage capacity of the reservoir is approximately 200,000 acre-feet and is located in the Kissimmee River Region, north of Lake Okeechobee. The specific location of this facility has not been identified, however, it is anticipated that the facility will be located in Glades, Highlands, or Okeechobee counties. The initial design of this separable element assumed a 20,000-acre facility (17,500-acre reservoir and 2,500-acre treatment area) with water levels in the reservoir fluctuating up to 11.5 feet above grade. The final size, depth and configuration of this facility will be determined through more detailed planning, land suitability analyses, and design. Future detailed planning and design activities will also include an evaluation of degraded water bodies within the watersheds of the storage/treatment facility to determine appropriate pollution load reduction targets, and other water quality restoration targets for the watershed.

The purpose of this facility is to detain water during wet periods for later use during dry periods and reduce nutrient loads flowing to the lower Kissimmee River and Lake Okeechobee. This increased storage capacity will reduce the duration and frequency of both high and low water levels in Lake Okeechobee that are stressful to the Lake's littoral ecosystems and cause large discharges from the Lake that are damaging to the downstream estuary ecosystems. Depending upon the proposed location(s) of this water storage/treatment facility and pollutant loading conditions in the watershed(s), the facility could be designed to achieve significant water quality improvements, consistent with appropriate pollution load reduction targets.

The operation of this separable element assumes that water from Lake Okeechobee, the Kissimmee River or the S-65E Drainage Basin will be pumped into the storage reservoir/stormwater treatment area when the climate-based inflow model forecasts that the lake water levels will rise significantly above desirable levels for the lake littoral zone. Water held in the reservoir and stormwater treatment area will not be released until the lake levels decline to ecologically acceptable levels.

1b - Taylor Creek/Nubbin Slough Storage and Treatment Area (W)

This separable element includes an aboveground reservoir with a total storage capacity of approximately 50,000 acre-feet and a stormwater treatment area with a capacity of approximately 20,000 acre-feet in the Taylor Creek/Nubbin Slough Basin. The initial design of this separable element assumed a reservoir of 5,000 acres with water levels fluctuating up to 10 feet above grade and a stormwater treatment facility of approximately 5,000 acres. The final size, depth and configuration of this separable element will be determined through more detailed planning, land suitability analysis and design.

The purpose of this separable element is to attenuate flows to Lake Okeechobee and reduce the amount of nutrients flowing to the Lake. The separable element is designed to capture, store, and treat basin runoff during periods when levels in Lake Okeechobee are high or increasing. The water quality treatment element of this separable element is consistent with the recommendations of the South Florida Ecosystem Restoration Working Group's Lake Okeechobee Issue Team and the Pollution Load Reduction Goals for Lake Okeechobee developed for the Lake Okeechobee Surface Water Improvement and Management Plan (SFWMD, 1997f). The water held in the reservoir would be released to Lake Okeechobee when lake levels decline to ecologically acceptable levels.

1c - Lake Okeechobee Watershed Water Quality Treatment Facilities (OPE)

This separable element includes two reservoir-assisted stormwater treatment areas and plugging of select local drainage ditches. The initial design of these reservoir-assisted stormwater treatment areas assumes a 1,775-acre facility in the S-154 Basin in Okeechobee County and a 2,600-acre facility in the S-65D subbasin of the Kissimmee River Basin in Highlands and Okeechobee counties. The plugged drainage ditches will result in restoration of approximately 3,500 acres of wetlands throughout the Lake Okeechobee basin. This separable element is also consistent with the recommendations of the South Florida Ecosystem Restoration Working Group's Lake Okeechobee Issue Team for achieving water quality restoration objectives in the Lake and should provide significant long-term water quality benefits for the Lake.

The other portion of this separable element includes the purchase of conservation easements within four key basins of Lake Okeechobee to restore the hydrology of isolated wetlands by plugging the connection to drainage ditches and the diversion of canal flows to adjacent wetlands. The sites range in size from an individual wetland to an entire subbasin and are located within the lower Kissimmee River Basins (S-65D, S-65E, and S-154) and Taylor Creek/Nubbin Slough Basin (S-191).

The purpose of this separable element is to attenuate peak flows and retain phosphorus before flowing into Lake Okeechobee. Further, many of the wetlands in the Lake Okeechobee watershed have been ditched and drained for agriculture water supply

and flood control. This separable element will restore the hydrology of selected isolated and riverine wetlands in the region by plugging these drainage ditches.

The South Florida Ecosystem Restoration Working Group's Lake Okeechobee Issue Team identified six primary tributary basins (C-41 Basin, Fisheating Creek, Taylor Creek/Nubbin Slough, S-154 Basin, S-65D (Pool D) Basin, S-65E (Pool E) Basin) contributing significant phosphorus loads to the Lake. In order to further reduce nutrient loading to Lake Okeechobee in support of the water quality goals for the Lake, articulated in the Lake Okeechobee Surface Water Improvement Management Plan, there are potentially other. reservoir-assisted stormwater treatment area facilities needed in the Lake Okeechobee watershed (such as in the C-41 and Fisheating Creek Basins) that are not included in this construction separable element. Therefore, it is proposed that a comprehensive plan for the Lake Okeechobee watershed is developed before the final configuration of this construction separable element is implemented. A comprehensive Lake Okeechobee watershed plan would include elements of the Lake Okeechobee Surface Water Management Plan and remediation programs developed to achieve appropriate pollution reduction targets established for the lake.

1d - Lake Okeechobee Tributary Sediment Dredging (OPE)

This separable element includes the dredging of sediments from 10 miles of primary canals within an eight-basin area in the northern watershed of Lake Okeechobee. The initial design assumes that the dredged material will contain approximately 150 tons of phosphorus.

The purpose of this separable element is to remove phosphorous in canals located in areas of the most intense agriculture in the Lake Okeechobee watershed. These sediments presently contribute to the excessive phosphorus loading to Lake Okeechobee. Under separate funding, the SFWMD is planning a demonstration project consisting of sedimentation traps to determine the feasibility of phosphorous removal by this method. The project will be a two-year demonstration with construction starting in FY2000. Upon completion in 2001, the traps will be operated and monitored to determine effectiveness. If feasible, findings from this demonstration will be incorporated into the design for this separable element. This separable element is also consistent with the water quality restoration goals for the lake included in the Lake Okeechobee Surface Water Management Plan and subsequently developed by the Lake Okeechobee Issue Team. Implementation of this separable element will also complement other activities associated with pollution reduction for the lake.

Chapter 4
CALOOSAHATCHEE RIVER/SOUTHWEST FLORIDA REGION

PHYSICAL CONDITIONS - CALOOSAHATCHEE RIVER/ SOUTHWEST FLORIDA REGION

The Caloosahatchee River/Southwest Florida Region covers approximately 4,000 square miles in Lee, Hendry, Glades, and Collier counties and a portion of Charlotte County. This area is generally bounded by Charlotte County to the north, Lake Okeechobee and the Everglades Agricultural Area (EAA) to the east, the Big Cypress National Preserve to the south, and the Gulf of Mexico to the west. The area is characterized by the sandy flatlands region of Lee County, which give way to sandy though more rolling terrain in Hendry County; and the coastal marshes and mangrove swamps of Collier County.

The Caloosahatchee River Basin includes an area of 550,900 acres in parts of Lee, Glades, Charlotte, and Hendry counties. From a hurricane gate on the southwest shore of Lake Okeechobee at Moore Haven, the Caloosahatchee Canal drains westerly for about five miles through a very flat terrain into Lake Hicpochee. From there the canal joins the upper reach of the Caloosahatchee River. On its way to the Gulf of Mexico, the river is controlled by navigation locks at Ortona (15 miles downstream from Moore Haven) and at Olga near Fort Myers. Downstream from Ortona Lock, many tributaries join the river along its course to the gulf. The Caloosahatchee River serves as a portion of the cross-state Okeechobee Waterway, which extends from Stuart on the east coast via the St. Lucie Canal, through Lake Okeechobee and the Caloosahatchee River to Fort Myers on the Gulf of Mexico. The river has been straightened by channelization through most of its 65-mile course from the Moore Haven Lock to Fort Myers.

The J. N. "Ding" Darling National Wildlife Refuge (NWR) Complex includes Pine Island NWR, Island Bay NWR, Matlacha Pass NWR, and Caloosahatchee NWR, all located on the lower west coast. The health of the estuarine ecosystem they embody is directly tied to the water quality, quantity and timing of flows from the Caloosahatchee Watershed and those watersheds which drain into the Caloosahatchee River (i.e., Kissimmee River and Lake Okeechobee watersheds).

EXISTING CONDITIONS - CALOOSAHATCHEE RIVER REGION WATER MANAGEMENT

Inflows from Lake Okeechobee and runoff from within its own basin supply the Caloosahatchee River. The freshwater portion of the river (C-43 Canal) extends westward from Moore Haven, on Lake Okeechobee, through LaBelle, to the Franklin Lock and Dam (S-79). The C-43 Canal is part of the Lake Okeechobee Waterway, providing navigation

between the east and west coasts of Florida. West of S-79, the river mixes freely with estuarine water as it empties into the Gulf of Mexico (SFWMD, 1995; SFWMD, 1997). C-43 is 45 miles long, averages 20 to 30 feet deep and ranges from 150 to 450 feet wide. The Ortona Lock and Dam (S-78), located approximately 27 miles upstream of S-79, separates the freshwater portion of the river into the East and West Caloosahatchee basins. Roughly 40 percent of the drainage area is in the east basin, and the remaining 60 percent is in the west basin. The total drainage area to the river between S-77 and S-79 is about 880 square miles (CDM, 1991).

The Caloosahatchee River Region is part of the Lake Okeechobee Service Area. The Lake Okeechobee Service Area subbasins lie at critical intermediary points in the water management system of South Florida. The needs of the Okeechobee subbasin for flood protection and drainage services affect inflows to the Caloosahatchee Estuary. Excessive discharges of fresh water to the Caloosahatchee Estuary are caused by regulatory releases from Lake Okeechobee and runoff from each local watershed (SFWMD, 1997).

The Lake Okeechobee regulation schedule determines the timing and quantity of water that is released from the lake into the Caloosahatchee River, depending on lake water surface elevation and season. The current lake regulation schedule allows the lake to peak at 16.75 feet on September 30th. The stored water is intended for water supply during the dry season. The lake regulation schedule is often called a 15.65 to 16.75 feet regulation schedule because of these key low and high lake stages. When lake levels exceed the highest allowable elevation (generally during flooding rainfall events), rapid releases of large volumes of water occur down both the Caloosahatchee River and St. Lucie Canal. At intermediate elevations, lower continuous releases of water occur. Timing and duration of releases are set by a targeted discharge volume from Lake Okeechobee, which in turn is set according to the lake level. Maximum water releases through the Caloosahatchee may be up to 9,300 cfs. Lake Okeechobee regulatory releases are made after the peak of the local inflow has passed. Lower, but continuous flows occur under "Zone B" or "Zone C" conditions. Minor rainfall events lead to smaller, pulsed discharges, intended to mimic natural rainfall events.

Continuous discharges to the Caloosahatchee and St. Lucie estuaries have caused documented negative effects on estuarine ecology (Chamberlain et al., 1995; Haunert and Startzman, 1985; Chamberlain and Hayward, 1996). Research has shown that prolonged releases, even at the modest Zone C rates, transform the estuarine systems into freshwater habitats within three to four weeks. The dramatic and rapid changes in salinity, and associated siltation caused by the release of suspended solids and precipitation of dissolved organic matter at the freshwater/saltwater interface, can produce long-term negative effects on these estuaries. In addition, continuous flow releases at these levels tend to create critically low benthic oxygen concentrations at the transitional zone between fresh water and the ocean or gulf. High, continuous releases generate even more problems, because of greater potential for environmental disruption and associated public concern. Even with a thorough understanding of these major environmental concerns, flood control remains a major purpose of the man-made structures, and regulatory

discharges are sometimes necessary because of the high risk of loss of life and property associated with high lake stages and hurricane generated waves and tides.

Problems Related to Water Management

During the annual November to April dry season, little water is released into the river from the lake, resulting in low flows and low water levels in the upper Caloosahatchee. Two problems may develop as a consequence: First, low flow may lead to development of an occasional severe algal bloom in the river above Franklin Lock (S-79) and Dam. The city of Fort Myers and Lee County both have municipal water intakes in this area. Short-term high rates of discharge from Lake Okeechobee are used to break up the blooms by the U.S. Army Corps of Engineers (USACE) whenever requested by the South Florida Water Management District (SFWMD) (USACE, 1991). During the extreme driest months (April-May) river flow may drop to near zero. When this occurs, navigation lockages through the W. P. Franklin Lock (S-79) allow a saltwater wedge to move upstream. If salt intrusion is too severe, the SFWMD requests the USACE to flush out the salt water with a short-term high rate of discharge from Lake Okeechobee. During a declared water shortage period, the SFWMD requests the USACE to go to reduced hours of lockages (USACE, 1991).

FUTURE WITHOUT PLAN CONDITION - PHYSICAL FACILITIES AND OPERATIONS - CRITICAL RESTORATION PROJECTS

Lake Trafford Restoration

Lake Trafford is located in north Collier County and is the largest lake south of Lake Okeechobee with a surface area of approximately 1,500 acres. It is the headwaters of the Corkscrew Swamp Sanctuary to the southwest, the Corkscrew Regional Ecosystem Watershed (CREW) to the west, and the Florida Panther National Wildlife Refuge to the south. Lake Trafford has poor water quality, extensive muck accumulations, loss of native submergent plant communities, and numerous fish kills. The project involves removal of approximately 8.5 million cubic yards of loose, flocculent organic sediments that blanket the bottom of the lake, and transport of these sediments to a sediment disposal site through a temporary pipeline. The total project cost is $17.5 million.

Southern CREW/Imperial River Flowway

The project is located in southern Lee County bordering the western boundary of the Corkscrew Regional Ecosystem Watershed (CREW). The environmentally sensitive area east of Bonita Springs has been altered by the construction of roads, house pads, agricultural berms and ditches. These alterations have resulted in restriction of historical sheetflow, unnatural water impoundment and flooding, increased pollutant loading to the Imperial River and Estero River, and disruption of natural wetland functions. The project involves acquisition of approximately 4,670 acres and restoration of historic sheetflow by

removal of canal and road berms, home pads and ditches. The project also involves replacement of the Imperial Bonita Estates Bridge and modifications to the Kehl Canal Weir.

The project is divided into the following 3 phases: Phase I consists of construction of the Kehl Canal Weir Modification. Phase II consists of land acquisition and restoration of historic flows over Sections 25, 26, 35, 36 and the SE 1/4 of Section 24, T47S, R26E, approximately 2,720 acres. Phase III consists of land acquisition and restoration of historic flows over Sections 32, 33 and 34, T47S, R26E and the flowway starting at Section 32 downstream to Matheson Street, approximately 2,040 acres. The estimated project cost is $26.1 Million, of which $12.1 million will be cost-shared under a PCA with the USACE and the remaining $14 million for land acquisition will be cost-shared under a separate agreement with the U.S. Department of the Interior (USDOI).

FUTURE WITHOUT PLAN CONDITION - WATER QUALITY - CALOOSAHATCHEE RIVER/SOUTHWEST FLORIDA REGION

The SFWMD's Caloosahatchee Water Management Plan is the main watershed management program that is likely to result in water quality improvement activities in the basin (SFWMD, 2001). In the future, although implementation of new Lake Okeechobee regulation schedules and the Caloosahatchee Water Management Plan will reduce pollutant loading to the Caloosahatchee River/Estuary, in general, water quality conditions throuhout the basin in the future without plan condition are expected to be similar to current water quality conditions.

WATER QUALITY PROBLEMS AND OPPORTUNITIES - CALOOSAHATCHEE RIVER/SOUTHWEST FLORIDA REGION

The Florida Department of Environmental Protection (FDEP) listed approximately 14 water body segments in the Caloosahatchee River Basin and in downstream coastal waters on its 1998 303(d) list. Water quality parameters of concern include excessive nutrients, coliform bacteria, biochemical oxygen demand (BOD), and depressed levels of dissolved oxygen (DO). As with the Big Cypress Basin, the number of monitoring locations in coastal waters of the region used to prepare the 305(b) Report is probably inadequate to accurately characterize the extent of water quality degradation in coastal areas. Extensive urban development (Fort Myers and vicinity, Cape Coral) at the mouth of the Caloosahatchee River contributes significant point and nonpoint source pollution loads into coastal canals and downstream into the Caloosahatchee Estuary.

In 2050, water quality conditions in the upper (eastern) and central portions of the watershed are expected to be unchanged compared to existing conditions. Water quality in downstream coastal areas is expected to decline as a result of increased population growth and urban and agricultural development. Water quality impacts from increased agricultural development are expected to be most readily observed in downstream areas of the watershed. The projected increase in population growth in urban areas of the

Caloosahatchee River Basin is expected to exacerbate existing water quality problems in coastal waters, particularly those associated with wastewater discharges. Offsetting the coastal development and inland agricultural development water quality impacts is the implementation of a different regulatory schedule for Lake Okeechobee, which is expected to improve water quality conditions in the Caloosahatchee River and estuary by reducing the frequency and volume of large quantities of nutrient/sediment laden Lake Okeechobee flood regulation waters.

LAND USE - CALOOSAHATCHEE RIVER/SOUTHWEST FLORIDA REGION

The Caloosahatchee River Region has 169,660 acres of urban land, largely fixed single family units (69,172 acres) and an almost equal number of acres in some stage of construction. There are 355,125 acres of agriculture with improved and unimproved pastures (163,348 acres), citrus groves (92,410 acres), and sugarcane (67,628 acres) predominant. Various types of rangeland make up 51,663 acres of land use. The category of barren land has 10,000 acres. This includes spoil and borrow areas (7,090 acres) and rural land in transition (2,377 acres). Transportation, communication, and utilities comprise 16,280 acres.

Rangeland and agriculture dominate land use in the basin, particularly the upper portion (FDEP, 1996). The freshwater portion of the Caloosahatchee River Region is mostly agricultural. The only urban areas are the cities of LaBelle, Alva, and Moore Haven (CDM, 1991). Land use adjacent to the Caloosahatchee River Estuary is largely residential and urban with the city of Cape Coral on its northern bank and the highly urbanized city of Fort Myers on its south bank. Both of these communities have experienced rapid growth, with even more growth anticipated in the near future (SFWMD, 1997).

Agriculture

Glades and Lee counties are included in this region. Almost one-half million acres are farmed in the Caloosahatchee River Basin, and approximately three-fourths of that area is pasture land (UFBEBR, 1995). The region is characterized by large farms averaging 1,800 acres, with relatively low productivity per acre (UFBEBR, 1995). Glades County ranks eighth in the state of Florida for cattle production (FASS, 1996a). Citrus production in the Caloosahatchee River Basin covers more than 20,000 acres (FASS, 1996b) and is currently increasing. Much of this acreage is likely categorized as unique farmland based upon its location, growing season, and high value citrus crops.

Almost 5,000 people are employed in agricultural production and services, and the payroll totals approximately $5 million (UFBEBR, 1995). Agricultural products in this region have a total market value of more than $135 million (UFBEBR, 1995).

More than 77,000 acres of farmland are irrigated in the Caloosahatchee River Basin (UFBEBR, 1995). Reliable water supply is a big concern in this region which has

traditionally relied upon water deliveries through the Caloosahatchee River from Lake Okeechobee. Irrigation demands can be expected to increase as additional land is used for citrus production.

CURRENT CERP PROJECTS - C-43 BASIN STORAGE RESERVOIR

Description of the Water Body, Water Usage, and Hydrology

The C-43 Basin Storage Reservoir is a feature of the Comprehensive Everglades Restoration Plan which includes above-ground reservoir(s) with a total storage capacity of approximately 160,000 acre-feet located in the C-43 Basin in Hendry, Glades, or Lee counties. The initial design of the reservoir(s) assumes 20,000 acres with water levels fluctuating up to 8 feet above grade. At this time, 9,000 acres have been acquired for use in the project. The final size, depth, and configuration of this facility will be determined through more detailed planning and design.

The Caloosahatchee River once had an undistinguishable connection to Lake Okeechobee and probably received overflow from the Lake only in abnormally wet years. The river was shallow and had numerous oxbows. Flooding along the river was common. A viable connection to the Lake was made in the early 1900's and Lake Okeechobee experienced its first major drainage and lowering of its water levels. As flood control was developed in the river basin, high flows to the estuaries were increased while low flows to the estuary diminished. The magnitude of the flood flows from the local basin easily exceeds the magnitude of the regulatory releases from Lake Okeechobee. However, regulatory releases from the Lake increase flows to the estuary and become a part of the salinity-balance problem. The need for dry-season water supply increased with agricultural development in the basin. The diminished low flows of the basin, coupled with the increase in the agricultural water supply demand causes the basin to be highly dependent on water supply releases from Lake Okeechobee in dry seasons.

The primary goals of storage in the Caloosahatchee Basin are to reduce peak flood flows to the estuary; capture excess runoff and help meet dry-season water demand; and provide for minimum flows to the estuary.

Agency Juristictions

The USACE, SFWMD and the FDEP are the federal and state agencies that have jurisdiction over the reservoir and its facilities. Once the final configuration of this facility is determined through detailed planning and design, local jurisdiction will be determined.

Land Use

The predominant land use within the project area's drainage basin is agriculture, with citrus and sugarcane being the dominant crops. The major drainage canals within the

project area's drainage basin are the Townsend Canal, the Roberts Canal, and the Header Canal. Each of these canals and the Caloosahatchee River will provide flows to the project upon completion. Agricultural and residential discharge activities are permitted within the project's drainage basin.

Management Strategies for Restoration and Protection of the Water Body

The purpose of the reservoir is to capture C-43 Basin runoff and releases from Lake Okeechobee. The facilities will be designed for water supply benefits, some flood attenuation, to provide environmental water supply deliveries to the Caloosahatchee Estuary, and water quality benefits to reduce salinity and nutrient impacts of runoff to the estuary. It is assumed that, depending upon the size of the facility and pollutant loading conditions in the watershed, the facility could be designed to achieve significant water quality improvements, consistent with appropriate pollution load reduction targets.

Studies

This project was initially included in the Lower East Coast Regional Water Supply Plan and has been subsequently been included in the Comprehensive Everglades Restoration Plan, the Caloosahatchee Water Management Plan, and the Southwest Florida Water Management Plan.

Maintainence of the Water Body after Restoration

A maintenance and operation plan will be developed during the detailed planning and design phase of the project that will address the management and maintenance of the water resource development project.

Project Schedule

The draft schedule for the implementation of C-43 Basin Storage Reservoir is as follows:

- Project Management Plan Development - March 12, 2001 – September 30, 2001
- Project Implementation Report - December 1, 2001 – March 5, 2004
- Real Estate Acquisition - March 8, 2004 – February 2, 2007
- Detailed Design - March 8, 2004 – March 3, 2006
- Plans and Specifications - March 6, 2006 – March 2, 2007
- Construction - March 5, 2007 – August 27, 2010

Funding Needed

Preliminary estimates for the project total $201,234,000 (1999 dollars) for planning, design, construction, land acquisition and project management.

Goals and Performance Measures

Numeric performances for the C-43 Basin Storage Reservoir will be developed during the detailed planning and design phase of the project. They may include the following performance measures:

- Flood control through flood flow attenuation and storage
- Decreased salt water intrusion into the Caloosahatchee River from the estuary
- Water supply benefits by providing dry season flows to assist in meeting environmental and urban water supply demands

Permitting and Regulatory Issues Related to the Project

During the development of the Comprehensive Everglades Restoration Plan (Restudy) and its associated Programmatic Environmental Impact Statement the entire program, including this project, were evaluated for compliance with the following regulations:

- National Environmental Policy Act of 1969, Final PEIS included in Appendix N of the Restudy
- Fish and Wildlife Coordination Act of 1958, Final Fish and Wildlife Coordination Act Report by U.S. Fish and Wildlife Service and Final Fish and Wildlife Coordination Act Reports (Part II and Part III) by the Florida Game and Fresh Water Fish Commission are included in Annex A of the Restudy
- Endangered Species Act of 1973, programmatic biological opinion from U.S. Fish and Wildlife Service is contained in Annex B of the Restudy and states that the project (CERP) is in full compliance with the Act
- National Historic Preservation Act of 1966, the Restudy is in partial compliance, cultural resource investigations are ongoing to determine effects to historic properties on a program level
- Clean Water Act (CWA) of 1972, the Restudy is in partial compliance and will obtain full compliance upon the issuance of a Section 401 permit from the State of Florida (See Section 404(b) Evaluation in Annex C of the Restudy)

- Clean Air Act of 1972, the Restudy will be in full compliance upon receipt of comments on the Final PEIS from the U.S. Environmental Protection Agency (USEPA)
- Coastal Zone Management Act of 1972, the Restudy is in partial compliance and will achieve full compliance upon receipt of comments from the Florida State Clearinghouse (A federal consistency determination in accordance with 15 CFR 930 Subpart C is included in the Restudy, Annex D)
- Wild and Scenic River Act of 1968, not applicable to the Caloosahatchee River
- Estuary Protection Act of 1968, the Restudy is in full compliance
- Resource Conservation and Recovery Act of 1976, not applicable to the Restudy
- Toxic Substances Control Act of 1976, not applicable to the Restudy
- Marine Protection, Research, and Sanctuaries Act of 1972, not applicable to the Restudy
- Rivers and Harbors Appropriation Act of 1899, the Restudy is in full compliance
- Coastal Barrier Resources Act, not applicable to the Restudy
- Section 904 of the 1986 Water Resources Development Act, the Restudy is in full compliance
- Section 307 of the 1990 Water Resources Development Act, the Restudy is in full compliance
- E.O. 11988, Floodplain Management, the Restudy is in full compliance
- E.O. 11990, Protection of Wetlands, the Restudy is in full compliance
- E.O. 12114, Environmental Effects Abroad of Major Federal Actions, not applicable to the Restudy

This project will require further evaluation during detailed planning and design to determine compliance with the following regulations:

- Farmland Protection Policy Act of 1981, the detailed design will provide information that will aid in the determination of the acres of unique farmland that will be affected by this project
- Federal Water Project Recreation Act of 1965, recreation planning will be preformed during the detailed project engineering and design

- E.O. 12898, Environmental Justice, further analysis of community impacts will be undertaken when more specific site information is obtained during detailed planning and design
- An analysis will be performed during the detailed planning and design of the project to identify the state of Florida Consumptive Use, Surface Water Drainage, and construction permits required for the project

Public Access for Project Lands

During the detailed planning and design phase of the project, an evaluation will be performed that will identify potential public access and recreational activities.

Acquisition for Project Lands

The final land requirements for this project will be established during the early stages of the detailed design phase. Further geotechnical investigations must be performed to make a determination. The SFWMD has obtained 9,000 acres of citrus grove property via full fee simple interest. Due to the nature of the project any additional property requirements will have to be met in the same manner. All lands referenced above will assist in recharging of ground water.

Chapter 5
UPPER EAST COAST REGION

PHYSICAL CONDITIONS - UPPER EAST COAST REGION

The Upper East Coast Region encompasses approximately 1,139 square miles and includes most of Martin and St. Lucie counties as well as a portion of eastern Okeechobee County. Martin and St. Lucie counties are bounded to the east by the Atlantic Ocean, and a substantial portion of Martin County borders Lake Okeechobee. Urban development is primarily located along the coastal areas while the central and western portions are used primarily for agriculture where the main products are citrus, truck crops, sugarcane, and beef and dairy products.

The land is generally flat, ranging in elevation from 15 to 60 feet NGVD (National Geodetic Vertical Datum) in the western portion with an average elevation of 28 feet. The coastal area ranges from sea level to 25 feet. The coastal sand hills adjacent to the Atlantic Intracoastal Waterway are higher than most parts of the county and reach a maximum elevation of 60 feet. This feature is known as the Atlantic Coastal Ridge.

The natural drainage has been significantly altered by the construction of canals, drainage ditches and numerous water control structures which predominately direct stormwater discharge to the east coast. The area contains the C&SF Project canals C-23, C-24, and C-25 drainage basins and the drainage area served by C-44 (St. Lucie Canal).

The St. Lucie Canal is Lake Okeechobee's eastern outlet, extending 25.5 miles from Port Mayaca to the city of Stuart, where it terminates at the South Fork of the St. Lucie River. The St. Lucie River Basin is part of a much larger southeastern Florida basin that drains over 8,000 square miles. The St. Lucie River, composed of the North and South forks, lies in Martin and St. Lucie counties in the northeastern portion of the basin. The South Fork is a relatively short stretch of river. The North Fork, designated as an aquatic preserve by the state of Florida, begins south of Fort Pierce and flows past the city of Port St. Lucie to the St. Lucie River Estuary.

The St. Lucie Estuary is part of a larger estuarine system known as the Indian River Lagoon. The Indian River Lagoon has been designated an estuary of national significance and is a component of the U.S. Environmental Protection Agency (USEPA) sponsored National Estuary program. The Indian River Lagoon is also designated as a state priority water body for protection and restoration under the state's Surface Water Improvement and Management (SWIM) Act. The SWIM Act Plan identifies excessive freshwater runoff from the St. Lucie Estuary Watershed as a problem within the St. Lucie Estuary.

Much of the St. Lucie River has been channelized and many drainage canals empty into the river, particularly the St. Lucie Canal, C-23, and C-24. The St. Lucie Canal, the largest overflow canal for Lake Okeechobee, is a navigation channel 8 feet deep and 100

feet wide connecting the Atlantic Intracoastal Waterway in Stuart with Lake Okeechobee at Port Mayaca.

EXISTING CONDITIONS - UPPER EAST COAST/INDIAN RIVER LAGOON WATER MANAGEMENT

The St. Lucie Estuary is located on the southeast coast of Florida, encompassing portions of both Martin and St. Lucie counties within the watershed. The two forks of the St. Lucie Estuary, the North Fork and South Fork, flow together near the Roosevelt Bridge at the city of Stuart, and then flow eastward approximately six miles to the Indian River Lagoon and Atlantic Ocean at the St. Lucie Inlet. Tidal influences in the North Fork reach 15 miles north of Stuart in Five-Mile Creek, and to a water control structure on Ten-Mile Creek just west of the Florida Turnpike at Gordy Road. Tidal influences in the South Fork extend about eight miles south of Stuart to the St. Lucie Lock and Dam on the St. Lucie Canal. Tidal influence also extends into the extremes of the nearby Old South Fork tributary (Morris, 1987).

The estuary is divided into three major areas, the inner estuary, composed of the North and South forks; the midestuary, consisting of the area from the juncture of the North and South forks to Hell Gate, and the outer estuary extending from Hell Gate to the St. Lucie Inlet. The main body of the North Fork is about four miles long, with a surface area of approximately 4.5 square miles and a total volume of 998.5 x 10^6 cubic feet at mean sea level. The South Fork is approximately half the size of the North Fork with a surface area of about 1.9 square miles and a volume of 468.7 x 10^6 cubic feet. The midestuary extends approximately five miles from the Roosevelt Bridge to Hell Gate and has an area and volume similar to the North Fork (4.7 square miles and 972.7 x 10^6 cubic feet) (Haunert and Startzman, 1985).

Surface sediment composition within the estuary has been mapped by the District (Haunert, 1988). Sediment composition within the St. Lucie Estuary is influenced by hydrodynamics and is somewhat correlated to depth. Sand substrates, with little organic content, are found along the shallow shorelines of the estuary and in the St. Lucie Canal. This reflects the impacts of wave turbulence and rapid currents. Substrates comprised of mud and moderate quantities of sand are present in areas that are more typically low energy environments, but subjected to occasional high energy events. Mud substrates are found in low energy areas such as dredged areas and the deeper portions of the estuary. These mud sediments often contain high concentrations of organic materials.

While the estuary encompasses about eight square miles, the watershed covers an area of almost 775 square miles. The watershed is divided into eight basins; five major basins and three minor ones. Three of these major basins, the C-23, C-24, and C-44, represent basins now linked to the estuary by components of the Central and South Florida Flood Control Project. In addition to drainage from within the C-44 Basin, the C-44 Canal (St. Lucie Canal) also conveys flood control discharges from Lake Okeechobee to the St. Lucie Estuary. The other two major basins, the North Fork, and Tidal Basin, include numerous connections to the St. Lucie Estuary.

Agricultural drainage and residential development have extensively modified the watershed of the entire St. Lucie Estuary. One major effect of these man-made alterations in the landscape and water management practices is increased drainage, manifested by a lowered ground water table and dramatic changes in how stormwater runoff is introduced to the estuary. Typically, when a watershed is highly drained like the St. Lucie Estuary Watershed, all three runoff factors (quality, quantity, and timing) are negatively affected. From a yearly cycle perspective, the quantity of water drained to the estuary is increased, the water quality is degraded and the seasonal distribution of runoff is altered such that dry season flows are of less magnitude and frequency and wet season flows are of greater magnitude and more frequent. The vast majority of runoff occurs within the first three days after a rainfall event rather than over an extended period of time. Water quality is degraded, especially by increased amounts of nutrients and suspended solids. The increased nutrients in the St. Lucie Estuary have increased primary productivity within the system to the point where unhealthy levels of dissolved oxygen (DO) occur on a regular basis in the inner estuary. The dramatic increase in sediment load has contributed significantly to the build-up of muck throughout the system. The sandy sediment loads like those that build up in the Palm City area are from primarily high discharge events. However, it is the increased organics coming from high levels of chlorophyll a and floating aquatics introduced from the canals combining with highly organic fine suspended sediments that flocculate out at the fresh-salt interface that lead to the formation of muck. As a result, the benthic environment of the estuary is a favorable habitat for mostly pollution tolerant organisms. In addition, the rapid introduction of fresh water causes salinity fluctuations that are not conducive to developing or maintaining a healthy estuarine plant and animal community. The overall result of these changes is the loss of important habitats.

The St. Lucie Estuary has received increased inflows over the last 100 years because of these modifications to the watershed. Extreme salinity fluctuations and ever-increasing inflows have contributed to major changes in the structure of the communities within the estuary such as seagrass and oyster losses. Phillips (1961) described the marine plants in the St. Lucie Estuary. At the time, mangroves were abundant in the North and South forks and seagrasses, although stressed, were still found in many areas of the estuary. Today, the presence of seagrasses is severely limited and ephemeral. Oyster populations in the estuary are virtually nonexistent due to the continual exposure to low salinities and lack of suitable substrate (clean hard objects) for larval recolonization (Haunert and Startzman, 1980 and 1985).

Regulatory discharges from the C-44 Canal have been documented to adversely impact the St. Lucie Estuary by depressing the salinity range far below the normal range, and by transporting large quantities of suspended materials into the estuary. Sedimentation problems in relation to C-44 Canal discharges were recognized as early as the 1950's (Gunter and Hall, 1963). While current monthly average flows from the watershed to the St. Lucie Estuary seldom exceed 2,500 cfs, regulatory releases from the C-44 Canal alone have produced flows in excess of 7,000 cfs. The quantity of suspended solid material passing Structure S-80 has reached a peak of 8,000 tons a day when daily discharges reached near 7,000 cfs in 1983. Much of this material passes through the estuary and into the Indian River Lagoon or Atlantic Ocean (Haunert, 1988). It was recognized then that

these discharges transported sand as well as very fine, organic rich suspended material to the estuary.

Surface Water Resources

Prior to development, most of the Upper East Coast Planning Area was characterized by nearly level, poorly drained lands subject to frequent flooding. The natural surface drainage systems included large expanses of sloughs and marshes such as St. Johns Marsh, Allapattah Slough (also referred to as Allapattah Flats), and Cane Slough. Drainage systems with higher conveyance included the North and South forks of the St. Lucie River, Ten Mile Creek, Five Mile Creek, the Loxahatchee River, and Bessey Creek. Minor creeks include Danforth, Fraiser, Hidden River, Willoughby, Krueger, Mapps, and Warner. Most of these surface water systems, especially those with poor drainage, have been altered to make the land suitable for development and to provide flood control.

Since the early 1900s, numerous water control facilities have been constructed to make this region suitable for agricultural, industrial, and residential use. The St. Lucie Canal (C-44) was constructed between 1916 and 1924 to provide an improved outlet for Lake Okeechobee floodwaters. From 1918 to 1919, the Fort Pierce Farms Drainage District (FPFDD) and the North St. Lucie River Drainage District (NSLRDD) were formed to provide flood control and drainage for citrus production in eastern and northeastern St. Lucie County. The C-25 Canal (also known as Belcher Canal) provided a drainage outlet for the FPFDD, as well as limited flood protection for western areas of the basin. The C-24 Canal (also known as the Diversion Canal) provided drainage and limited flood protection west of the NSLRDD protection levee. The C-23 Canal provided water control in Allapattah Flats during the dry season. However, large areas continued to be under water for months at a time during the wet season.

Although the primary function of the C&SF Project was for flood control and drainage, the drainage network formed by the C&SF Project canals and the secondary canals and ditches has become an important source of irrigation water and frost protection for agriculture. In general, water stored in the canals is replenished by rainfall, ground water inflow, and withdrawals from the FAS when needed.

Prior to the large-scale expansion of citrus in the 1960s, storage in the drainage network in St. Lucie County was adequate to meet irrigation demands. However, the drainage and development of the large marsh areas in western St. Lucie County have depleted much of the surface water storage. The lowering of water tables also reduced the amount of water in ground water storage. The reduction of surface and ground water storage coupled with increased acreages of citrus have resulted in inadequate supplies of surface water to meet demands during droughts. Therefore, an equitable distribution of the available surface water in the C-23, C-24, and C-25 basins is maintained by limiting the invert elevation of irrigation culverts and the intake elevation of pumps to a minimum of 14.0 feet NGVD. Artesian well water from the FAS is used as an irrigation supplement when surface water supplies become limited. Due to the high mineral content of the

Floridan aquifer, this water is generally blended with surface water before it is used as irrigation water.

Surface Water Inflow and Outflow

Within the Upper East Coast Planning Area basins, essentially all surface water inflows and outflows are derived from rainfall. The exception to this is the St. Lucie Canal (C-44), which also receives water from Lake Okeechobee. In addition, most of the flows and stages in the region's canals are regulated for water use and flood protection. The amount of stored water is of critical importance to both the natural ecosystems and the developed areas in the Upper East Coast Planning Area. Management of surface water storage capacity involves balancing two conflicting conditions. When there is little water in storage, drought conditions may occur during periods of insufficient rainfall. Conversely, when storage is at capacity, flooding may occur due to excessive rainfall, especially during the wet season. Management of surface water systems is one of the main factors affecting movement of water through the regional hydrologic cycle.

Ground Water Resources

A distinctive feature of South Florida's hydrologic system is the aquifer system and its use for water supply. Two vast aquifer systems, the Surficial Aquifer System (SAS) and the Floridan Aquifer System (FAS), underlie the Upper East Coast Planning Area. Ground water inflows from outside the planning area form an insignificant portion of recharge to the SAS. Rainfall is the main source of recharge, and because of this, long-term utilization of this source must be governed by local and regional recharge rates. The FAS, on the other hand, receives most of its recharge from outside of the Upper East Coast Planning Area. This fact must also be incorporated into long-term planning decisions. Within an individual aquifer, hydraulic properties and water quality may vary both vertically and horizontally. Ground water supply potential varies greatly from one place to another.

FUTURE WITHOUT PLAN CONDITION - PHYSICAL FACILITIES AND OPERATIONS - CRITICAL RESTORATION PROJECTS

Ten Mile Creek Water Preserve Area

The project is located just south of Ten Mile Creek in St. Lucie County. Ten Mile Creek is the largest subbasin delivering water to the North Fork of the St. Lucie River Estuary (SLE). The SLE discharges into the Indian River Lagoon (IRL) which is the most biologically diverse estuary in North America and has been designated as an Outstanding Florida Water. The entire lagoon is endangered from increased runoff from watershed drainage fluctuations. Excess stormwater due to drainage improvements is causing radical fluctuations of the salinity of the SLE resulting in elimination of viable habitat suitable for oysters, seagrasses and marine fish spawning.

The project involves acquisition of approximately 920 acres of land and construction of a water preserve area to attenuate flows and improve water quality discharge to the SLE/IRL. The project features a two-stage detention system consisting of a Water Preserve Area (WPA) and polishing cell. A series of large pumps will deliver water from Ten Mile Creek into the WPA during high water at a rate of 380 cfs. Water will be stored in the 550 acre WPA and then metered out through a 40 cfs spillway into a polishing cell of 134 acres. The deep-water storage cell will allow for storage of up to 5,000 acre-feet. The total estimated project cost is $29.1 million.

FUTURE WITHOUT PLAN CONDITION - WATER QUALITY - UPPER EAST COAST

Several ongoing watershed management/planning programs in the Upper East Coast and Indian River Lagoon area are expected to be completed which would beneficially affect water quality conditions in the St. Lucie River and Estuary, Indian River Lagoon and other freshwater water bodies in the area. The South Florida Water Management District (SFWMD) Indian River Lagoon SWIM has developed numerous programs and objectives to improve water quality conditions in the area. Many of the water quality remediation activities being implemented by the SWIM Plan focus on reducing agricultural pollutant loads in the Indian River Lagoon Watershed and urban/ suburban pollutant loads in the rapidly developing coastal region surrounding the St. Lucie Estuary and Indian River Lagoon. Implementation of more environmentally sensitive Lake Okeechobee regulation schedules should also reduce pollutant loading to the St. Lucie Estuary/Indian River Lagoon systems. The Indian River Lagoon National Estuary Program, jointly administered by the USEPA and the state of Florida will also result in water quality improvement activities and a reduction of pollutant loads to the Indian River Lagoon in the future. In summary, as a result of these ongoing watershed management programs, water quality in the Upper East Coast is expected to improve in the future.

WATER QUALITY PROBLEMS AND OPPORTUNITIES - UPPER EAST COAST AND INDIAN RIVER LAGOON

The Upper East Coast Region includes Martin and St. Lucie counties and a small portion of Okeechobee County. The principal water body is the Indian River Lagoon, which includes the St. Lucie River. The Upper East Coast is hydrologically connected to the Everglades and Florida Bay ecosystems through the C-44 (St. Lucie) Canal. The Indian River Lagoon is a SWIM priority water body. Most of the Upper East Coast Watershed consists of Class III waters; however, there are small areas of Class II waters (shellfish propagation or harvesting) within the watershed. Class II waters are generally afforded greater protection than Class III waters. Currently, nine locations in the St. Lucie (C-44) Canal, the North and South forks of the St. Lucie River, and several subbasins draining to the Indian River Lagoon are listed by the Florida Department of Environmental Protection (FDEP) on the 1998 303(d) list of impaired water bodies. Pollutants/constituents causing impairment include: low levels of DO, excessive nutrients,

high levels of total suspended solids (TSS), high biochemical oxygen demand (BOD), coliform bacteria, and mercury (based on fish consumption advisories). There are an additional eight monitoring locations in the southern Indian River Lagoon area also included on the 1998 303(d) list. In addition to the above-listed constituents, copper and turbidity were identified to be causing use impairment at some of the monitoring sites.

Overall, water quality conditions in the Upper East Coast and the Indian River Lagoon are expected to be somewhat improved by 2050, compared to existing conditions. Lake Okeechobee freshwater discharges via the St. Lucie Canal (C-44) alter ambient salinity levels and deliver nutrients and other pollutants contained in Lake Okeechobee water and runoff from localized sources (agricultural and urban) to the estuary. The C-23/ C-24/C-25 Canal system in St. Lucie County facilitates drainage to sustain agricultural (primarily citrus groves) and urban development in the vicinity of those canals. Implementation of a different regulation schedule for Lake Okeechobee is also expected to improve water quality conditions in the Indian River Lagoon Estuary by reducing the frequency and volume of fresh water delivered to the estuary. It is also expected that agricultural nonpoint source pollution loads delivered to the estuary via secondary and tertiary canals connected to C&SF Project canals will be reduced compared to existing conditions through the implementation of agricultural best management practices (BMPs) and the conversion of some agricultural lands to other uses (e.g., conservation, urban/ suburban development). The efforts of the Indian River Lagoon Save Our Rivers (SOR) project and St. Lucie County Mosquito Control have significantly improved water quality in the eastern lagoon through the use of mosquito impoundments.

The extent of urbanization in the watershed is expected to increase by 2050. New growth and development in the watershed will be regulated to comply with water quality regulations governing point and nonpoint source discharges; however, the net pollution load contributed to the St. Lucie River and the Indian River Lagoon system from these sources is expected to increase compared to existing conditions. Ongoing and planned pollutant load reduction activities in the Upper East Coast Region should help offset additional pollutant loads expected to occur from future urbanization.

LAND USE

Upper East Coast and Indian River Lagoon

The record of human existence in the Upper East Coast Region spans approximately 8,000 years. The lagoon system provided the Indians and early settlers with food, materials for tools and their major means of transportation. In the late 1800s, the Indian River Lagoon Region was already established as a major area of commerce (tourism, fisheries, shipping and agriculture). The lagoon was used for safe harbor and transportation of cargo, especially citrus.

At present, the dominant land use in the basin is agriculture (covering approximately 45 percent of the basin). Agricultural activities include 228,000 acres of (NRCS, 1994). The present urban land use (17 percent of the basin) is concentrated along

the coast and the lagoon shorelines. Urban growth is rapidly extending westward, replacing agricultural land. Future land use patterns indicate that this trend will continue as urbanization intensifies along the coast, especially in the southern counties (Swain and Bolohassen, 1987). Present forested uplands and wetlands comprise 11 and 18.8 percent of the basin, respectively.

Agriculture - Upper East Coast

Martin and St. Lucie counties are included in this region. Almost one half million acres are farmed (UFBEBR, 1995). St. Lucie and Martin counties rank first and eighth, respectively, among Florida counties for number of acres of citrus (FASS, 1996b). Although this area is known primarily for its citrus production, many acres are used for pasture land. Farms average 600 acres in size with moderate productivity per acre (UFBEBR, 1995). More than 7,500 people are employed in agricultural production and services with a payroll of approximately $9.5 million (UFBEBR, 1995). The market value of all agricultural products in this region totals approximately $362 million (UFBEBR, 1995). Approximately 200,000 acres are irrigated (UFBEBR, 1995) requiring a dependable water supply. Lake Okeechobee has traditionally been the water source for this region.

ELIGIBLE CERP PROJECTS

The Indian River Lagoon Project includes three separable elements including the C-44 Basin Storage Reservoir, the C-23 and C-24 basin storage reservoirs, and the C-25 and the North and South Fork storage reservoirs. These separable elements are all included in the ongoing Indian River Lagoon Feasibility Study.

7a - C-44 Basin Storage Reservoir (B)

This separable element includes an above ground reservoir with a total storage capacity of approximately 40,000 acre-feet located in the C-44 Basin in Martin County. The initial design of the reservoir assumed 10,000 acres with water levels fluctuating up to 4 feet above grade. The final location, size, depth and configuration of this facility will be determined through more detailed analysis to be completed as a part of the ongoing Indian River Lagoon Feasibility Study.

The purpose of this separable element is to capture local runoff from the C-44 Basin, then return the stored water to the C-44 when there is a water supply demand. The reservoir will be designed for flood flow attenuation to the estuary; water supply benefits including environmental water supply deliveries to the estuary; and water quality benefits to control salinity and reduce loading of nutrients, pesticides, and other pollutants contained in runoff presently discharged to the estuary.

7b - C-23 and C-24 Storage Reservoirs (UU - Part 1)

This separable element includes above ground reservoirs with a total storage capacity of approximately 115,200 acre-feet located in the C-23 and C-24 Basins in Martin and St. Lucie Counties. The initial design of the reservoirs assumed 14,400 acres with water levels fluctuating up to 8 feet above grade. The final location, size, depth and configuration of these facilities will be determined through more detailed analysis to be completed as a part of the Indian River Lagoon Feasibility Study. It is noted that experience from the Upper St. Johns Project reveals that greater variability of water levels are more desirable for the ecology and water quality.

The purpose of this separable element is to capture local runoff from the C-23 and C-24 Basins for flood flow attenuation to the St. Lucie River Estuary. It is assumed that these facilities can be designed to provide significant water quality improvement benefits to the Indian River Lagoon and St. Lucie River Estuary in terms of reduced loading of nutrients, pesticides, and suspended materials in stormwater runoff which is presently conveyed to those waterbodies. This water will then be used to provide both water supply and environmental water supply benefits.

7c - C-25 and North Fork and South Fork Storage Reservoirs (UU - Part 2)

This separable element includes above ground reservoirs with a total storage capacity of approximately 234,000 acre-feet located in the C-25 and the North Fork and South Fork Basins in St. Lucie and Martin Counties. The initial design of the reservoirs assumed 24,600 acres with water levels fluctuating up to 8 feet above grade and 9,350 acres with water levels fluctuating up to 4 feet above grade. The final location, size, depth and configuration of these facilities will be determined through more detailed analysis to be completed as a part of the Indian River Lagoon Feasibility Study. It is noted that experience from the Upper St. Johns Project reveals that greater variability of water levels are more desirable for the ecology and water quality.

The purpose of this separable element is to capture local runoff from the C-25 and the North Fork and South Fork Basins for flood flow attenuation to the St. Lucie River Estuary. It is assumed that these facilities can be designed to provide significant water quality improvement benefits to the Indian River Lagoon and St. Lucie River Estuary in terms of reduced loading of nutrients, pesticides, and suspended materials in stormwater runoff which is presently conveyed to those waterbodies. This water will then be used to provide both water supply and environmental water supply benefits.

Chapter 6
EVERGLADES AGRICULTURAL AREA

PHYSICAL CONDITIONS - EVERGLADES AGRICULTURAL AREA

The lands located immediately south and southeast of the Lake Okeechobee in the South Florida Water Management District (SFWMD) are known as the Everglades Agricultural Area (EAA). This area of about 700,000 acres consists of rich, fertile agricultural land. A large portion of the EAA is devoted to the production of sugarcane. The average ground elevation is about 12 feet. The occurrence of surface water in the area is now a direct result of the construction of the numerous conveyance and drainage canals. The primary canals consist of the Miami, the North New River, the Hillsboro, and the West Palm Beach canals, which traverse the area north to south, and the Bolles and Cross canals, which extend east to west. Water levels and flows are stringently manipulated in the canals to achieve optimum crop growth. Major surface impoundments in the area are nonexistent.

EXISTING CONDITIONS - EVERGLADES AGRICULTURAL AREA (EAA) WATER MANAGEMENT

The existing drainage/irrigation system within the EAA is a complicated network of canals, levees, control structures and pumps. The original six major canals, (West Palm Beach, Hillsboro, Miami, North New River, Cross and Bolles canals), built in the 1920s, still serve to drain the EAA although each canal underwent major improvements during the 1960s. Historically the EAA has depended upon the flood storage capacity of Lake Okeechobee to the north and the Everglades Water Conservation Areas (WCAs) to the south as a means of removing excess drainage water from the EAA. Prior to adoption of the IAP in 1979, the northern one-third of the EAA was routinely backpumped directly into Lake Okeechobee through the S-2, S-3, and S-4 pump stations located on the south shore of the lake. The eastern and southern two-thirds of the EAA drained water south to the WCAs via pump stations S-5A, S-6, S-7, and S-8.

Under the current IAP, drainage frrm the S-2 and S-3 basins is now also routed south to the WCAs. Approximately 82 percent of the EAA land area (i.e., S-2, S-3, S-5A, S-6, S-7, and S-8 basins) now pump excess drainage waters into the three WCAs via pump stations S-5A, S-6, S-7, and S-8. Nine much smaller Chapter 298 Drainage Districts also currently discharge surface water runoff into Lake Okeechobee. As a result, the EAA depends on the flood storage capacity of the WCAs, and to a lesser extent, on Lake Okeechobee, as a means to remove water from the basin.

The growers remove runoff water from their lands by pumping to the six C&SF Project canals serving the EAA. Growers in general are allowed a maximum removal rate that is determined by a runoff formula and is almost always in excess of the basinwide

design rate of three-quarters of an inch of runoff per day (Cooper, 1989). This amount was based on the following three considerations:

1. Not all land in the basin would be in agricultural production at one time.
2. Some of the land would be planted to water tolerant crops.
3. The canals in the basin have some storage capacity.

Although the capacity of the canal system is not large enough to handle all the water discharged from the EAA at one time, it was assumed that not all of the growers' pump stations would be pumping or pumping to capacity at any given time (Cooper, 1989).

FUTURE WITHOUT PLAN CONDITION - WATER QUALITY - EVERGLADES AGRICULTURAL AREA (EAA)

Recent monitoring results indicate that phosphorus loads in EAA runoff have declined approximately 51 percent (three year average, SFWMD, 1997b). The current average concentration of total phosphorus contained in EAA runoff is approximately 100 parts per billion (Havens, 1997). Construction of the Everglades Construction Project (ECP) involves converting approximately 44,000 acres of existing agricultural land. The construction project is explained in more detail in the below section.

Everglades Forever Act

The Everglades Forever Act's principal water quality treatment strategy for improving water quality in the Everglades Protection Area centers around five requirements: the ECP, EAA best management practice (BMP) programs, Everglades research and monitoring program, evaluation of water quality standards and long-term compliance permits.

The ECP consists of six large wetlands treatment facilities deemed stormwater treatment areas (STAs) containing approximately 44,000 acres of land previously used for agricultural purposes. These areas are designed to treat EAA runoff prior to discharge into the Everglades Protection Areas.

The ECP is designed to treat EAA runoff to meet an interim phosphorus concentration target of 50 parts per billion in discharges to the Everglades Protection Area (Burns and McDonnell, 1994). STAs 1 East and 1 West will discharge into the L-7 and L-40 borrow canals in the Loxahatchee National Wildlife Refuge (WCA-1). STA 2 will discharge to WCA-2A via the L-6 Borrow Canal. STA 3/4 will discharge to WCA-3A via the L-5 Borrow Canal. Stormwater Treat Area 5 will discharge to Rotenberger and Holey Land Wildlife Management Areas and WCA-3A along the L-4 Borrow Canal. STA 6 discharges to WCA-3A through the L-4 Borrow Canal. STA 6 Section 2 will discharge to Rotenberger Wildlife Management Area. The future base condition assumes all of the

treatment areas are completed and operational with the exception of STA 6 Section 2. STA 6 Section 2 was not included in hydrologic regional modeling since the conceptual design for the STA did not include this element (Burns and McDonnell, 1994).

Another component of the ECP targeted for completion in 2003 is the diversion of runoff from five special districts (four chapter 298 districts and the 715 Farms Area established under Florida Statutes). These special districts are located adjacent to Lake Okeechobee north of the EAA. Currently, the districts discharge directly to Lake Okeechobee. According to the Everglades Forever Act, approximately 80 percent of the historic flow volumes and total phosphorus loads are to be diverted away from the lake. The future base condition assumes that the diversion of flows and loads has been completed.

According to the Everglades Forever Act, based upon research, field-tests and expert review, the EAA BMPs are determined to be the most effective and practicable on-farm means of improving water quality to a level that balances water quality improvements and agricultural productivity. The act establishes monitoring programs, permit requirements, research, field-testing and evaluation programs designed to improve water quality prior to discharge into conveyance canals in the EAA. The act provides a tax incentive for phosphorus concentration reductions of 25 percent or more. As a consequence, the future base condition assumes a 25 percent phosphorus concentration reduction from BMPs.

In addition to the ECP and BMPs, the Everglades Forever Act directs that an Everglades Research and Modeling program shall seek means of optimizing the design and operation of the STAs. This program shall include research to reduce outflow concentrations and identify other treatment and management methods and regulatory programs that are superior to STAs in achieving the intent and purposes of the Everglades Forever Act. The research and monitoring program is also directed toward development of a permanent (threshold) phosphorus criterion in the Everglades Protection Area by the Florida Department of Environmental Protection (FDEP) and evaluation of existing state water quality standards applicable to the Everglades area. The criterion is to be adopted by December 31, 2003 or a default criterion of 10 parts per billion total phosphorus will be established. Currently, research efforts have not drawn any conclusions that affect treatment area designs, planned operations, or the threshold phosphorus criterion. Research to determine superior or supplemental technologies and the threshold phosphorus standard is on-going.

The Everglades Forever Act does specify that compliance with water quality standards shall be based upon a long-term geometric mean of concentration levels to be measured at sampling stations reasonably representative of receiving waters in the Everglades Protection Area. Discharges to the Everglades Protection Area from outside the EAA (non-ECP structures) also require evaluation to determine appropriate strategies. The Everglades Forever Act requires the SFWMD and the FDEP to take such action as may be necessary so that water meets state water quality standards in all parts of the Everglades Protection Area.

The Everglades Forever Act further directs that long-term compliance permit requirements shall be modified to achieve compliance with the phosphorus criterion cited in the above paragraph. If the FDEP has not adopted this criterion by rule prior to December 31, 2003, then the phosphorus criterion shall be 10 parts per billion in the Everglades Protection Area. This default criterion or the criterion adopted by the Department (Phase II) is to be imposed by 2006. The Everglades Forever Act specifies that as of December 31, 2006, no permittee's discharges shall cause or contribute to any violation of water quality standards in the Everglades Protection Area. In view of the fact that the Phase II phosphorus criterion has not been established, the future base condition assumes that the default standard of 10 parts per billion has been attained.

Design of the ECP was initiated in 1995 and began construction in 1997. STA 6 Section 1 was completed in October 1997 and operation was initiated in December 1997. Construction is currently underway at STAs 1 West, 2, and 5 with completion scheduled on or before September, November, and July 1999 respectively. Scheduled construction completion for STA 1 East and 3/4 is set for July 1, 2002 and October 1, 2003 respectively.

A demonstration-scale wetlands treatment area project of nearly 3,800 acres has been operating adjacent to WCA-1 (Loxahatchee National Wildlife Preserve) on the same site as future STA 1 West since 1994. STA 1 West will encompass the demonstration project when completed. The Everglades Nutrient Removal Project (ENRP) was designed to reduce phosphorus from an inflow concentration of 190 parts per billion to an outflow concentration of 50 parts per billion. The settling rate constant for the demonstration project was set at 10.2 meters per year. These were the same parameters established for the ECP STA design. Three years of cumulative data from the demonstration project reflects that these criteria have been significantly exceeded. Additionally, on-farm BMPs have averaged 51 percent, considerably higher than the projected 25 percent contained in the future base condition for the EAA.

It is too early to predict what conclusions research and analyses will drive with regard to the above findings. An optimistic scenerio is that the BMPs reduction in phosphorus concentrations will increase STA operations such that concentrations lower than the interim criterion will be achieved. Also, the higher settling rate constant and low phosphorus concentration outflows could significantly improve performance of the STAs and thus reduce Phase II treatment needs. Only time and further operations of the treatment areas will judge whether the long-term findings will be supportive of the optimism suggested by current BMPs and ENRP findings. The current findings certainly should affect the research into what supplemental technologies may be necessary to achieve the Phase II phosphorus criterion.

During the alternative development and evaluation phase of the Restudy, a preliminary study was conducted by Walker (Walker, 1998) to evaluate the performance of the STAs based upon Restudy generated flows from the South Florida Water Management model in the future base condition and the preferred alternative. A phosphorus removal model developed by Walker was used in the study. Modeling results indicated that some of the STAs did not meet the interim phosphorus criteria of the Everglades Forever Act under

either the future base condition or the preferred alternative. A closer examination reveals some of the reasons for the apparent underachievement. First, the periods of records differ. The ECP used a 10-year period of record from 1979 to 1988. The Restudy uses the 31-year period from 1965 to 1995. Second, the operational concepts differ. The Restudy uses rain-driven operational procedures whereas the ECP uses the current calendar-based regulation schedule. Third, because STA 6 Section 2 was not modeled in the Restudy, the treatment area was not considered in the phosphorus modeling. Therefore, a treatment area totaling nearly 2,000 acres was not considered and the inflows scheduled for this area were all routed through STA 5. Finally, although the period of record was changed from ten years to 31 years, the fixed parameters of the settling rate of 10.2 meters per year and targeted outflow concentration of 50 parts per billion remained unchanged from the ECP.

These two parameters (settling rate constant and outflow phosphorus concentration target) are two of the three most significant factors in determining the required area of treatment cells. Walker's study did indicate that when the 51 percent BMP phosphorus reduction rate experienced over a three-year period was used in lieu of the 25 percent estimate, all STAs met or bettered the interim phosphorus criterion with the exception of STA 5. STA 5 did not meet the criteria in the modeling outcome due to the third reason cited in the preceding paragraph.

At first blush, the reasons cited above appear to mitigate the Walker findings of STA underachievement. Although only time and continued operation of the treatment areas will provide proof, the findings should, in any case, direct research efforts toward ensuring that Phase II treatment technologies are sufficient to meet the adopted threshold standard. Regardless of the Walker study or the demonstration project findings, the fact remains that the Phase II (threshold) phosphorus standard must be met by 2006. The default criterion of 10 parts per billion is the target assumed in the 2050 future base condition. At that point, the interim standard becomes obsolete. When research efforts determine the optimal method of operation and supplemental technologies needed to meet the Everglades Forever Act permanent (Phase II) phosphorus criterion, both the ECP and treatment elements of the Restudy components must be modified to attain the designated water quality standard.

WATER QUALITY PROBLEMS AND OPPORTUNITIES - EVERGLADES AGRICULTURAL AREA (EAA)

According to the FDEP 1998 303(d) list of use-impaired water bodies, there are approximately 10 canal segments within the EAA not meeting designated uses for Class III waters. For the most part, these include canal segments affected by operation of the primary pump stations and canals discharging water from the EAA to downstream areas (e.g., S-7, and S-8 pump stations; North New River, Hillsboro, and West Palm Beach canals). In addition to excessive nutrient loads, low dissolved oxygen (DO) levels and high levels of mercury (based on fish consumption advisories), coliform bacteria, total suspended solids (TSS), turbidity, and unionized ammonia contributed to use impairment in Class III waters within the EAA. It should be noted that within the EAA, there are many agricultural canals or ditches in agricultural water management systems controlled by

water control structures permitted by the SFWMD. Such water bodies are classified as Class IV waters (agricultural water supply) pursuant to Rule 62-302.600(3)(a), Florida Administrative Code. Generally, the water quality criteria for Class IV waters are less stringent than those for Class III waters. None of the 303(d)-listed segments within the EAA are in Class IV waters.

Water quality conditions within the EAA are expected to improve in 2050 compared to existing conditions. It is important to note that the existing conditions for the EAA demonstrate significant water quality improvements compared with recent past conditions. Recent water quality improvements in the area have occurred as a result of the implementation of the EAA regulatory program (Florida Administrative Code Rule 40E-63) beginning in 1993. The regulatory program requires BMPs and monitoring to achieve a 25 percent reduction in phosphorus loading from the EAA to the Everglades Protection Area. Recent monitoring results indicate that phosphorus loads in area runoff have declined approximately 51 percent (three year average, SFWMD, 1997b). The current average concentration of total phosphorus contained in EAA runoff is approximately 100 parts per billion (Havens, 1997). BMPs are also expected to have resulted in a net reduction of other pollutants contained in agricultural runoff, although the extent of load reduction for other pollutants has not been fully quantified since the implementation of the program; nor is it a specific objective of that program.

LAND USE - EVERGLADES AGRICULTURAL AREA (EAA)

Agriculture

The EAA contains all or parts of Palm Beach and Hendry counties. Most of Hendry County lies within the Big Cypress Region, so it was discussed in that section of the report. More than 600,000 acres are farmed in Palm Beach County (UFBEBR, 1995), and sugarcane was harvested from about half of that acreage in 1996 (FASS, 1996d). Sugarcane receipts accounted for 68 percent of total field crop sales in Florida in 1996 (FASS, 1996c). The EAA is known for its sugarcane production and sugar processing, but Palm Beach County also ranks fifteen among Florida counties for acres of citrus (FASS, 1996b). This region is characterized by midsize farms averaging 690 acres each with high productivity of more than $1,300 per acre (UFBEBR, 1995). More than 18,000 people are employed in agricultural production and services representing a payroll of more than $26 million (UFBEBR, 1995). Total market value of agricultural products in Palm Beach County is almost $900 million, ranking it first among counties in the state of Florida (UFBEBR, 1995) and third among U.S. counties (FDACS, 1994).

The EAA is highly dependent upon the system of canals running through the region to provide necessary drainage of excess water during the wet season as well as supplemental water supplies for irrigation during the dry season. Approximately two thirds of the land farmed in the EAA is irrigated, totaling more than 580,000 acres (B. Boyd, pers. comm.). The EAA has traditionally relied upon Lake Okeechobee for its water supply, and looked to the WCAs to the south to receive their excess drainage.

Continued agricultural production in the EAA has become increasingly controversial. Some of the factors that may affect EAA agriculture include water quality concerns, soil subsidence, and encroachment of urbanization. The water quality concerns, particularly phosphorus loading, are being addressed through implementation of BMPs, construction of STAs, the growing use of organic farming practices, and rice cultivation in rotation with sugarcane production.

Palm Beach County is included in this region. A portion of Hendry County also lies in the EAA. Palm Beach County is not entirely within the EAA, but it is assumed that the majority of agricultural production is within the EAA because the remaining portion of the county is primarily urbanized.

Although sugarcane cultivation in the EAA has come under some sharp criticism in recent years, sugarcane is recognized as the most appropriate crop for this region. Sugarcane requires less phosphorus fertilizer than other crops grown in the EAA (Sanchez, 1990), and sugarcane has been found to remove 1.79 times more phosphorus than was applied as fertilizer (Coale et al., 1993). Florida sugarcane only requires small amounts of pesticides due to disease resistant and tolerant cultivars, and cultivation instead of herbicides for weed control. Sugarcane also tolerates greater variability in water table levels, allowing for more flexible water management strategies (Glaz, 1995).

Soil subsidence has become a potential threat to long-term crop production in the EAA. The average historic rate of subsidence of 1 inch per year has slowed to 0.56 inches per year since 1978 (Shih et al., 1997). They attributed the lower rate to several factors including higher water tables and an increased proportion of land planted to sugarcane. Surveys conducted by Shih et al. (1997) in 1997 found an average of 1.62 feet to 4.36 feet of soil remaining over 11 transects. Prevention of continued soil subsidence will depend on maintaining high ground water levels to prevent further oxidation of the soil profile. This, in turn, will require development of more water-tolerant sugarcane varieties and/or increased rice cultivation. This research is currently underway and showing promising results (Glaz, 1997). A strong agricultural economy in the EAA based on profitable crop production is the best defense against conversion of agricultural land to urban land.

Rotenberger and Holey Land Wildlife Management Areas

The Holey Land Tract (35,026 acres) is managed by the Florida Wildlife Commission (FWC) as a state wildlife management area. The SFWMD as been managing the hydroperiod since completion of a perimeter levee and pump station in 1990. The Rotenberger Tract (23,970 acres) and Brown's Farm Tract (4,460 acres) are also managed by the FWC as state wildlife management areas. Lake Harbor Waterfowl Management Area is operated by FWC for management of waterfowl. The land is under rice production for both harvest and wildlife habitat.

Urban

The remaining five percent of the EAA includes the communities of Pahokee, Belle Glade, South Bay, and Clewiston, along with several sugar mills, roads, canals, and water control features.

C-139 Basin

Land use within the C-139 Basin of eastern Hendry County is predominantly agricultural. The land use in the basin is approximately 62 percent agricultural, 4 percent urban, and 34 percent native land cover. This rural area is primarily pasture land for cattle grazing, with increasing amounts of land being converted to citrus groves. Agricultural land uses include vegetable farms, citrus groves, improved pasture, and unimproved pasture (Mock Roos, 1993).

ELIGIBLE CERP PROJECTS

8 - Everglades Agricultural Storage Reservoir Project (G - Part 1)

This project is the first part of the of the Everglades Agricultural Storage Reservoir component. It includes two aboveground reservoirs with a total storage capacity of approximately 240,000 acre-feet located on land associated with the Talisman Land purchase in the EAA. Conveyance capacity increases for the Miami, North New River, Bolles, and Cross Canals are also included in the design of this project. The initial design for the reservoir(s) assumed 40,000 acres, divided into two, equally sized compartments with water levels fluctuating up to 6 feet above grade in each compartment. However, actual design and construction of this first phase may result in multiple reservoirs by maximizing the use of the land acquired through the Farm Bill land acquisition agreements which encompasses up to 50,000 acres.

This project is located in the EAA in western Palm Beach County on lands purchased with Department of Interior Farm Bill funds, with SFWMD funds, and on lands gained through a series of exchanges for lands being purchased with these funds. The area presently consists of land that is mostly under sugarcane cultivation. Implementation of this project will be consistent with the Farm Bill land acquisition agreements. This project will improve timing of environmental deliveries to the WCAs by reducing damaging flood releases from the EAA to the WCAs, reducing Lake Okeechobee regulatory releases to estuaries, meeting supplemental agricultural irrigation demands, and increasing flood protection within the EAA.

Compartment 1 of the reservoir would be used to meet EAA irrigation demands. The source of water is excess EAA runoff. Overflows to Compartment 2 could occur when Compartment 1 reaches capacity and Lake Okeechobee regulatory discharges are not occurring or impending. Compartment 2 would be used to meet environmental demands as a priority, but could supply a portion of EAA irrigation demands if

environmental demands equal zero. Flows will be delivered to the WCAs through STAs 3 and 4. The sources of water are overflow from Compartment 1 and Lake Okeechobee regulatory releases. Compartment 2 will be operated as a dry storage reservoir and discharges made down to 18 inches below ground level.

No land acquisition requirements and associated expenses are anticipated during the FY01-FY05 period. Therefore, no funds are listed in **Figure 1** in Chapter 1 for the EAA.

Chapter 7
BIG CYPRESS REGION

PHYSICAL CONDITIONS - BIG CYPRESS REGION

Big Cypress Swamp spans approximately 1,205 square miles (771,000 acres) from southwest of Lake Okeechobee to the Ten Thousand Islands in the Gulf of Mexico. The 570,000-acre Big Cypress National Preserve (BCNP) was established by Public Law 93-440 in 1974 to protect natural and recreational values of the Big Cypress Watershed and to allow for continued traditional uses such as hunting, fishing, and oil and gas production. It was also established to provide an ecological buffer zone and protect Everglades National Park's water supply. In 1988, Congress passed the Big Cypress National Preserve Addition Act which added 146,000 acres to the preserve.

EXISTING CONDITIONS - BIG CYPRESS REGION WATER MANAGEMENT

The Big Cypress Swamp is a recognized physiographic province in southwestern Florida. It is a source of recharge for the shallow aquifers of South Florida and is important to the integrity of the water resources in the western part of Everglades National Park. The hydrological features of the swamp were recognized by Congress when it established BCNP. The water regimen of the area largely determines the patterns in which temperate and tropical vegetative communities and their related wildlife species occur. During the wet season (summer and fall) when heavy rains lead to widespread surface inundation, the almost imperceptible slope of the land creates an overland sheetflow. During the dry season (winter and spring) natural surface water flows are confined to the lower elevations of strands, swamps, and sloughs. The BCNP has been mapped by the USFWS as part of the national wetlands inventory. The majority of BCNP lands are classified as wetlands; exceptions are scattered hardwood hammocks, some pinelands, and artificially filled areas. The Big Cypress Region is essentially a rain-driven hydrologic unit, and for the most part it is not dependent on adjacent land for water flow. Only three small areas (approximately five percent of the BCNP) receive flows from external drainages. These areas include less than five square miles in the Okaloacoochee Slough, about 30 square miles in the Mullet Slough component of the Everglades drainage, and approximately 40 square miles in the southeastern corner of the BCNP along the western boundary of the Shark River Slough.

FUTURE WITHOUT PLAN CONDITION - PHYSICAL FACILITIES AND OPERATIONS - CRITICAL RESTORATION PROJECTS

Western Tamiami Trail Culverts

The project is located on the Tamiami Trail (US 41) in Collier County between State Road 92 and 50 Mile Bend (a distance of approximately 43 miles). In 1928, the Tamiami Trail was completed between Miami and Naples. To obtain fill material for the roadbed, a borrow canal was excavated on the northern side of the road alignment. The effect of the Tamiami Trail and adjacent borrow canal has been to intercept existing north-south flowways to the Big Cypress National Preserve and channels flows through a few bridges/culverts. The purpose of this project is to increase the number of north-south floodways by adding culverts in locations that will restore natural hydropatterns. The installation of approximately 80 culverts under Tamiami Trail and Loop Road will improve sheetflow of surface water within Ten Thousand Islands National Wildlife Refuge, Big Cypress National Preserve and Everglades National Park. The total project cost of the restoration elements is estimated at $7.57 million. A highway resurfacing betterment is estimated at $8.03 million.

FUTURE WITHOUT PLAN CONDITION - WATER QUALITY - BIG CYPRESS BASIN

The South Florida Water Management District (SFWMD) has identified the S-190 Structure (a gated culvert at the confluence of the North and West feeder canals) as a water control structure discharging into the Everglades Protection Area that requires an assessment of pollution loads and the development of a water quality improvement strategy in accordance with the non-Everglades Construction Project (ECP) structures requirement of the Everglades Forever Act. SFWMD water quality data (SFWMD, 1998a) indicate that agricultural areas upstream of the Seminole Reservation contribute significant nutrient loads (particularly phosphorus) into the canal system that drains into the North and West feeder canals and ultimately across the northeast corner of Big Cypress National Preserve. Water quality improvements required under the Everglades Forever Act are to be completed by December 31, 2006, to assure that all water quality standards are met in the Everglades Protection Area.

WATER QUALITY PROBLEMS AND OPPORTUNITIES - BIG CYPRESS BASIN

The Big Cypress Basin (the watershed of Big Cypress National Preserve) includes agricultural areas west of the Everglades Agricultural Area (EAA), the Seminole Tribe's Big Cypress Reservation, most of the Miccosukee Tribe of Indians' reservation lands, and developed areas of the west coast including Naples and Marco Island. Five water body segments within the Big Cypress Basin were included on the Florida Department of Environmental Protection (FDEP) 1998 303(d) list. Pollutants/constituents of concern

include excessive nutrients, coliform bacteria, biochemical oxygen demand (BOD), mercury (based on fish consumption advisories), and low levels of dissolved oxygen (DO). It should be noted that none of the 303(d) list sites are within the Big Cypress National Preserve. However, the L-28 Interceptor Canal, on the east side of the Big Cypress Basin was listed as use-impaired due to elevated nutrient levels and low levels of DO. It should be further noted that due to the scarcity of ambient monitoring sites in coastal waters of the basin, actual water quality problems are likely to be more severe in coastal waters than as described in the FDEP 1996 305(b) Report due to development pressure and point and nonpoint source pollution loading in developing areas.

Water quality in interior areas of the Big Cypress Basin is not expected to be significantly changed in 2050 compared to existing conditions. However, the rapidly expanding extent of agricultural (citrus) development in the north-central area of the region (Immokalee, southwestern Hendry County) could create an increase in nonpoint source pollution associated with agricultural activities in Mullet Slough and East Hinson Marsh. Water quality in coastal areas is expected to decline consistent with projected population growth.

Excessive drainage and the introduction of water of poor quality into Big Cypress National Preserve via the existing canal system constitutes the most significant existing and future water quality problem for Big Cypress National Preserve. It should be noted that the canals contributing pollutants into Big Cypress National Preserve are not part of the C&SF Project. Existing pollution loads entering the Big Cypress National Preserve from northwestern areas of the watershed (Big Cypress Seminole Indian Reservation, C-139 Basin and C-139 Annex agricultural areas) are expected to be reduced in 2050 through the implementation of planned and ongoing water quality improvement projects.

LAND USE - BIG CYPRESS REGION

Land use is organized into major public and private lands and their principal uses, including preservation, recreation, urban, agriculture and water supply.

Big Cypress National Preserve

Roadways in South Florida often obtain necessary roadfill from excavation of a parallel canal, resulting in both an elevated obstruction to natural drainage patterns and rerouting of flow in open canals. Such drainage alterations in the BCNP include the Tamiami Trail (U.S. 41), Interstate 75 (Alligator Alley), County Route 839 (Turner River Road), County Route 841 (Birdon Road), County Route 94 (Loop Road) and numerous smaller roads. State Route 29, a north-south road, parallels the western boundary just outside of the BCNP, although its borrow canal is just within the boundary of the BCNP. Extending northward from the Tamiami Trail along the eastern boundary of the BCNP, the L-28 Levee forms the boundary between the Everglades and Big Cypress drainage. Although the levee is located immediately outside of the BCNP boundary, it is significant to the hydrology of the BCNP. The L-28 Interceptor Canal cuts through the extreme

northeastern corner of the BCNP. This canal rapidly drains the agriculturally active lands north of the BCNP.

Oil and gas are currently produced from two active fields in the BCNP. A portion of the Bear Island field lies within the Okaloacoochee Slough in the northwestern corner of the BCNP. The Raccoon Point field is located in the northeastern corner of the original BCNP and north of the Jetport site.

The Miami-Dade-Collier Transition and Training Airport, popularly known as the Jetport, occupies a 32-square mile site just north of the Tamiami Trail and adjacent to the eastern boundary of the BCNP. Although originally intended as an international airport, it is currently used only for limited training activities. Construction required 3 million cubic yards of fill excavated from 7 pits, ranging from 30 to 40 feet deep and covering 65 acres of surface area just west and south of the Jetport runways. Since all structures must be elevated above the seasonal high water levels, fill material must be excavated from borrow pits. Numerous such pits exist within the BCNP, ranging in size and depth, depending upon the extent of the development.

Off-road vehicle (ORV) usage in the BCNP is regulated by the National Park Service and is permitted by the enabling legislation to the extent that it does not significantly harm the environment. About two-thirds of the original preserve is currently open for ORV use. Permits are required, a maximum of 2,500 per year have been established, and areas open to use are designated. The Bear Island Unit, located in the northwestern corner of the BCNP, is restricted to designated trails. Other areas are open to either full or limited use, and two are closed to all ORV use. Airboat and swamp buggy use is mostly during October through March. There has been a general trend toward an increased number of permits annually since 1987.

Some 38,700 acres, totaling six percent of the BCNP's original boundary, are nonfederal lands. These nonfederal lands consist of 12,236 acres of School Board lands consisting of one section in each township set aside for schools, 23,488 acres of Jetport Authority lands, 1,514 acres of county roads, and 1,271 acres of private lands. Nonfederal lands within the Additions have not yet been completely defined.

Agriculture within the original boundary of the BCNP is minimal. Farming is known to be more extensive within the Additions, but until the lands are formally transferred to the federal government, these agriculturally-impacted areas will not be completely defined.

Five active "life" leases, cover grazing rights on approximately 29,000 acres in the northwestern corner of the original preserve. All leases are located north of Alligator Alley. The leases can only be renewed by the permittee or spouse and are not transferable. These are gradually being phased out as lessees curtail operations or leases are relinquished.

Public Law 93-440 provides that members of the Miccosukee Tribe of Indians of Florida and members of the Seminole Tribe of Florida shall be permitted, subject to

reasonable regulations established by the Secretary, to continue their usual and customary use and occupancy of federal or federally acquired lands and waters within the BCNP, including hunting, fishing, trapping on a subsistence basis and traditional tribal ceremonies.

Urban Areas

Naples, Marco Island, and Everglades City comprise the three largest urban areas within the Big Cypress Region. All three cities are on the west coast, and Naples is among the fastest growing urban areas in the United States. It has developed into a significant retirement destination with extensive residential and business center construction. Water supply demands to meet this fast growing and developing urban area are rapidly increasing.

Fakahatchee Strand State Preserve

The Fakahatchee Strand, located just west of the BCNP, is included in the area designated by the state of Florida as an Area of Critical State Concern. It is the recipient of the flow of the Okaloacoochee Slough which cuts across the extreme northwestern corner of the BCNP and crosses under State Route 29 into the strand.

Southern Golden Gate Estates

West of the Fakahatchee Strand State Preserve and south of Interstate 75 is the Southern Golden Gate Estates. The area was planned as a large residential subdivision and construction began in the 1960's. The building of roads and several drainage canals in this 94 square-mile area has affected the areas environmental quality, by over-draining the watershed, sending harmful freshwater discharges to the estuaries, increasing frequency of forest fires, and reducing aquifer storage (SFWMD, 1996).

Water Conservation Areas (WCAs)

The BCNP is bounded on the east by WCA-3A which, is managed by the SFWMD. Water is impounded in the Conservation Area and released to Everglades National Park and BCNP on predetermined schedules. The L-28 Levee forms the boundary between WCA-3A and the BCNP.

Everglades National Park

The southern and portions of the eastern boundary of the BCNP abut Everglades National Park. The BCNP's southern boundary forms a "stair-step" pattern that distinguishes the wetland environment of the BCNP and the estuarine environment of the Everglades National Park. The Stair-Step area receives flows from the BCNP enroute to the estuarine environment of the Everglades National Park.

American Indian Reservations

Two American Indian reservations abut the BCNP. The Seminole Tribe is along the eastern part of the BCNP's northern boundary, and the Miccosukee Tribe is along the eastern boundary of the BCNP.

Agriculture

A persistent southward progression of agricultural development presents an external threat to the water quality and quantity of the Okaloacoochee Slough and Mullet Slough drainages. Expanding agricultural development is now located along the BCNP's northern boundary.

Hendry and Collier counties are included in this region. More than 800,000 acres are farmed in the Big Cypress Region, and almost half of that area is pasture land. The region is characterized by moderate to large farms producing more than $600 per acre in market value (UFBEBR, 1995). Hendry County ranks third in the state of Florida for cattle production (FASS, 1996a). Approximately 70,000 acres of sugar were harvested in 1996 (FASS, 1996d). Hendry County ranks third in the state for acres of citrus with over 100,000 acres, while Collier County is ninth with over 36,000 acres (FASS, 1996b). Citrus production in the Big Cypress Region is currently increasing. The Big Cypress Seminole Indian Reservation is located in this region along the northern boundary of the BCNP. The reservation includes some citrus groves and row crops as well as pasture land.

More than 17,000 people are employed in agricultural production and services, and the payroll totals approximately $16 million. Agricultural products in this region have a total market value of more than $525 million. Hendry and Collier counties rank third and fourth in Florida for market value of agricultural products (UFBEBR, 1995).

Chapter 8
WATER CONSERVATION AREAS AND EVERGLADES REGION

PHYSICAL CONDITIONS - WATER CONSERVATION AREAS AND EVERGLADES REGIONS

The Water Conservation Areas (WCAs) are an integral component of the Everglades and freshwater supplies for South Florida. The WCAs, located south and east of the Everglades Agricultural Area (EAA), comprise an area of about 1,350 square miles, including 1,337 square miles of the original Everglades, which averaged some 40 miles in width and extended approximately 100 miles southward from Lake Okeechobee to the sea.

The WCAs provide a detention reservoir for excess water from the agricultural area and parts of the Lower East Coast Region, and for flood discharge from Lake Okeechobee. The WCAs also provide levees needed to prevent Everglades floodwaters from inundating the Lower East Coast, while providing water supply for Lower East Coast agricultural lands and Everglades National Park; improving water supply for east coast communities by recharging the Biscayne Aquifer (the sole source of drinking water for southern Palm Beach, Broward, Miami-Dade, and Monroe counties); retarding salt water intrusion in coastal wellfields; and benefiting fish and wildlife in the Everglades.

WCA-1 is designated as the Arthur R. Marshall Loxahatchee National Wildlife Refuge (NWR), managed by the U.S. Fish and Wildlife Service (USFWS). WCA-2 and WCA-3 are public hunting and fishing areas comprising the Everglades Wildlife Management Area maintained by the Florida Game and Fresh Water Fish Commission. The Seminole and Miccosukee Tribes each have reserved rights within WCA-3.

Water Conservation Area 1 (WCA-1)

WCA-1 (Loxahatchee NWR) is about 21 miles long from north to south and comprises an area of 221 square miles. The West Palm Beach Canal lies at the extreme northern boundary, and on the south the Hillsboro Canal separates WCA-1 from WCA-2. Ground elevations slope about five feet in 10 miles, both to the north and to the south from the west center of the area, varying from over 16 feet in the northwest to less than 12 feet in the south. The area, which is enclosed by about 58 miles of levee (approximately 13 miles of which are common to WCA-2), provides storage for excess rainfall, excess runoff from agricultural drainage areas of the West Palm Beach Canal (230 square miles) and the Hillsboro Canal (146 square miles), and excess water from Lake Okeechobee. Inflow comes from rainfall and runoff from the EAA through canals at the northern end. Release of water for dry-season use is controlled by structures in the West Palm Beach Canal, the Hillsboro Canal, and in the north-south levee which forms the eastern boundary of the

area. When stages exceed the regulation schedule, excess water in WCA-1 is discharged to WCA-2.

Water Conservation Area 2 (WCA-2)

WCA-2 is comprised of two areas, 2A and 2B, measures about 25 miles from north to south, and covers an area of 210 square miles. It is separated from the other WCAs by the Hillsboro Canal on the north and the North New River Canal on the south. Ground elevations slope southward about two to three feet in 10 miles, ranging from over 13 feet NGVD (National Geodetic Vertical Datum) in the northwest to less than seven feet NGVD in the south. The area is enclosed by about 61 miles of levee, of which approximately 13 miles are common to WCA-1 and 15 miles to WCA-3. An interior levee across the southern portion of the area reduces water losses due to seepage into an extremely pervious aquifer at the southern end of the pool and prevents overtopping of the southern exterior levee by hurricane waves.

The upper pool, WCA-2A, provides a 173-square-mile reservoir for storage of excess water from WCA-1 and a 125-square-mile agricultural drainage area of the North New River Canal. Storage in WCA-2A provides water supply to the east coast urban areas of Broward County. Water enters the area from WCA-1 and the Hillsboro Canal on the northeast side, and from the North New River Canal on the northwest side. Water in excess of that required for efficient operation of WCA-2A is discharged to WCA-3 via structures into C-14, the North New River Canal, and WCA-2B.

WCA-2B has ground elevations ranging from 9.5 feet NGVD in the northern portions down to 7.0 feet NGVD in the southern portions of the area. The area experiences a high seepage rate, which does not allow for long-term storage of water, and as a result, water is not normally released from the area.

Water Conservation Area 3 (WCA-3)

WCA-3 is also divided into two parts, 3A and 3B. It is about 40 miles long from north to south and comprises about 915 square miles, making it the largest of the conservation areas. Ground elevations, which slope southeasterly 1 to 3 feet in 10 miles, range from over 13 feet NGVD in the northwest to 6 feet NGVD in the southeast. The Miami Canal traverses the area from northwest to southeast, and the North New River Canal separates it from WCA-2. The area is enclosed by about 111 miles of levee, of which 15 miles are common to WCA-2. An interior levee system across the southeastern corner of the area reduces seepage into an extremely pervious aquifer.

The upper pool, WCA-3A, provides a 752-square-mile area for storage of excess water from WCA-2A; rainfall excess from approximately 750 square miles in Collier and Hendry counties and from 71 square miles of the former Davie agricultural area lying east of Pumping Station S-9 in Broward County; and excess water from a 208-square-mile agricultural drainage area of the Miami Canal and other adjacent areas to the north. Water enters WCA-3A from various sources on the northern and eastern sides. The storage is

used to meet the principal water supply needs of adjacent areas, including urban water supply and salinity control requirements for Miami-Dade and Monroe County, irrigation requirements, and water supply for Everglades National Park.

EXISTING CONDITIONS - WATER CONSERVATION AREAS (WCAS) WATER MANAGEMENT

WCA-1 is encircled by 56 miles of levees and canals. A network of pump stations, levees and water control structures, controls water levels. WCA-1 is the only conservation area completely encircled by canals. The water management facilities hydrologically are connected with Lake Okeechobee, the EAA, WCA-2, WCA-3, and the Atlantic Ocean. Rainfall represents the major source of water inflow into WCA-1, accounting for about 54 percent of the refuge's water budget. Pump Station S-5A, located at the northern tip of the refuge near 20-Mile Bend, moves water into the refuge from the West Palm Beach Canal, accounting for approximately 30 percent of the inflow water. Pump Station S-6, located on the refuge's western border, pumps water from the Hillsboro Canal into the southwest portion of the refuge, accounting for about 15 percent of WCA-1 inflow water. Approximately 45 percent of the WCA-1 water inflow originates as drainage from agricultural land located north and west of WCA-1. Two small pumps operated by the Acme Improvement District are located in the L-40 Levee on the northeastern boundary of the refuge. These pumps drain primarily residential/urban lands (Wellington) and can move water in and out of the refuge. Acme represents only a minor fraction (<1 percent) of the refuge's water budget. Four water control structures (S-10A, S-10C, S-10D, and S-10E) exist along WCA-1 on the southern levee of L-39 (Hillsboro Canal). The S-10 structures allow water to flow southward out of the Hillsboro Canal and WCA-1 into WCA-2A if so desired. The Hillsboro Canal (L-39), located in the extreme southeast corner of the refuge, drains WCA-1 to the east through S-39, which provides water supply to urban areas and discharges drainage waters to tide water. To the north, the S-5A Structure can be used to move water north out of the refuge into the L-8 Canal. There are four other small privately operated structures in the L-40 levees; one of these is operated by the USFWS. These structures constitute less than one percent of the refuge's annual water budget. Water management operations for WCA-1 are governed by a water regulation schedule adopted in 1994.

Major developments in the WCAs have been the construction of canals, levees, water control structures and roads. WCAs-2 and 3 are almost completely enclosed by a levee and canal system that is approximately 150 miles in length. The only portion of the area not completely enclosed by the levee system is WCA-3A where a seven-mile section of the western border remains hydrologically connected to the Big Cypress Preserve. Four canals and their associated levees pass through the WCAs: the Miami Canal, L-35B Canal, L-67A Canal, and L-67C Canal.

Many water control structures have been constructed to move water throughout the WCAs. Facilities designed to provide flow into the area include the S-6, S-7, S-8, S-9, and S-140 pump stations, and a series of gated spillways referred to collectively as the S-10 structures. Water is moved from WCA-2A to WCA-3A via the S-11 structures and

through WCA-3A via the Miami Canal and a series of bridged openings under Alligator Alley (I-75). Water is released from WCA-3A through the S-12 and S-333 structures and the Pompano and North New River canals. The canals, levees, and water control structures were constructed and are currently operated by the U.S. Army Corps of Engineers (USACE) and the South Florida Water Management District (SFWMD). The WCAs were constructed primarily to provide flood protection to adjacent agricultural and urban areas, and to serve as a source of fresh water for the heavily populated Lower East Coast. Secondary considerations were the need to manage the areas to benefit fish and wildlife, and to provide public recreation.

Water regulation schedules represent water level targets that govern the operations to store and release water from the WCAs. The water regulation schedule for WCA-2A was originally set too high to support Everglades habitat, and has been the subject of extensive research and experimentation. The original 1961 schedule called for water levels to fluctuate from 12 to 14.5 feet. The schedule was revised even higher in 1970 to a range of 13 to 14.5 feet with only a 30-day period at the lower end. Observed changes in the ecology of WCA-2A caused scientists in the early 1970s to initiate efforts to lower the water schedule and provide for annual drying of the interior marsh. Extended high water killed significant stands of trees, eroded islands, and caused other undesirable vegetation changes in the area (Dineen, 1972, 1974; Worth, 1988). In 1980, the schedule was revised to an interim plan of 9.5 to 12.5 feet, an extreme drawdown that was in place for eight years. Extensive research during this time led to an interim schedule of 11 to 13 feet, which was adopted in 1989.

The regulation schedule for WCA-3A is perhaps the most complicated and difficult schedule to describe or implement. The schedule ranges from 9.5 to 10.5 feet, but includes a series of five zones to modify discharges to Everglades National Park when water levels are above or below the optimum target. The size of WCA-3A and the number of inflow and discharge points preclude intensive management of water levels in the area. Discharges at the southern end of the area flow directly into Everglades National Park. These discharges were modified three times in the past decade to alleviate problems resulting from too little discharge in the early years, and heavy flood discharges during the dry season, which impacted nesting wading birds and other wildlife during the 1970s and early 1980s. The original schedule was set shortly after Everglades National Park and the SFWMD's predecessor agency was created. In 1970, Congress adopted an Everglades National Park-backed plan to establish a minimum monthly volume of water to be delivered to Everglades National Park. This resulted in significant flood damages from dry-season floodwaters, which were discharged from WCA-3A when the water schedule was exceeded. In 1983, Congress authorized an Experimental Program of Water Deliveries to Everglades National Park, which allowed an experiment with water releases based on rainfall and evaporation over the Everglades. This rainfall-based plan distributes water over a broader area than the original operating schedule whenever possible.

Other problems within WCA-3A, primarily overdrainage in the northern end, are not due to the schedule but instead are caused by the design of water-control facilities. These regulation schedules are open to review and change if the agencies involved find better ways of regulating the water levels.

Currently, Holey Land Wildlife Management Area's water regulation schedule is based upon the initial operating plan agreed to by the SFWMD and the Florida Game and Fresh Water Fish Commission 28 June 1990. This schedule dictates that water stages in Holey Land Wildlife Management Area vary between a low of 11.5 feet MSL on May 16 to a high of 13.5 feet on November 1. When direct rainfall is unable to provide enough water to meet the schedule, water is pumped onto the area from the Miami Canal at the G-200 Pump Station in the northwest corner of the area. Other water enters the area from the G-201 Pump Station, which returns water to Holey Land from the exterior seepage canal. Outflow is through three set of culverts along Holey Land's south boundary. In accordance with the 1990 Operational Agreement, after cattail coverage exceeded 2,000 acres, flashboards were placed in the outflow culverts and were set at 13.5 feet in order to retain water in the area as long as possible to reduce the need for pumping untreated water from the Miami Canal. Detailed topographic data on Holey Land Wildlife Management Area, collected after restoration began, found that average ground elevation was approximately 0.5 feet lower than previously thought and a verbal agreement was made between SFWMD and Florida Game and Fresh Water Fish Commission in July, 1993 to change the operational schedule to one that lies between 11-13 feet. Additional research conducted by Florida Game and Fresh Water Fish Commission and the SFWMD staffs indicated that high water levels in Holey Land Wildlife Management Area contributed to the explosive growth of cattails in the area after restoration began, and that water levels above 12.5 feet drove deer from the marsh onto surrounding levees. In response to this information, on January 20, 1995, the Florida Game and Fresh Water Fish Commission proposed that the water schedule be again lowered, to 10.5-12.0 feet, a level that has since been used as a guideline by the SFWMD. A similar (10.75-12.0 feet) schedule was proposed by the Florida Game and Fresh Water Fish Commission on June 11, 1997, and discussions are currently underway to finalize an agreement recognizing this proposed level. The water management plan is designed to simulate a natural hydroperiod for the purpose of restoring and preserving natural Everglades habitat.

The Rotenberger Wildlife Management Area is located in the north end of the Everglades ecosystem, in an area that has historically been dominated by nearly monospecific plains of dense sawgrass. Since drainage efforts began in the late 1800s, 74 percent of these sawgrass plains have been lost to agriculture. The Rotenberger Wildlife Management Area represents nearly 18 percent of the remainder of this important component of the Everglades. Because of development and drainage of surrounding areas, the hydropattern in the Rotenberger Wildlife Management Area has shortened, causing a shift away from its historically sawgrass-dominated community. The distribution, timing, and depths (hydropattern) of water in the Rotenberger Wildlife Management Area have been dramatically changed by drainage to the north and west, as well as in several parcels inside the boundaries. This development, along with construction of canals and levees, has blocked the sheetflow of water southward from Lake Okeechobee; a process which will probably not be reversed. The Rotenberger Wildlife Management Area itself is drained by a series of culverts linked to the L-4 Canal. Several sets of culverts drain farmland on existing inholdings while two sets drain abandoned farms on the eastern border into the Miami Canal.

While the current hydropattern in the Rotenberger Wildlife Management Area does mimic the natural rise and fall associated with the wet and dry seasons, it does not receive enough rainfall to reach historic water levels during the wet season and dries much more quickly than normal due to the culverts mentioned above. The 1983 agreement between the Florida Game and Fresh Water Fish Commission, SFWMD and the Department of Environmental Regulation calls for the restoration of 0-1 feet water levels in the area. As part of the Everglades Construction Project (ECP), these levels have been used as initial goals of hydropattern restoration within the Rotenberger Wildlife Management Area. Achievement of this goal will be a two stage process. First, all drainage culverts will be closed and the effects of this upon the hydropattern will be assessed. This information will be used to devise an operational schedule for the area which will become effective upon completion of STA 5, and installation of the pumps allowing inflow into the Rotenberger Wildlife Management Area.

FUTURE WITHOUT PLAN CONDITION - WATER QUALITY - NATURAL AREAS

The natural areas of the study area include the Rotenberger and Holey Land Wildlife Management Areas, the Loxahatchee NWR, WCAs 2 and 3, Big Cypress National Preserve, and Everglades National Park. The Rotenberger and Holey Land Wildlife Management Areas are adjacent to the EAA and are contained within the same hydrologic basin. The ECP, which is part of the future without plan condition, is designed to achieve hydrologic restoration objectives for the Rotenberger and Holey Land tracts by redirecting EAA runoff through stormwater treatment areas (STAs) into those areas to create preferred hydropatterns.

A fundamental underlying assumption for the Restudy is the full implementation of the state of Florida's Everglades Program contained in the Everglades Forever Act (F.S. 373.4592) by December 31, 2006. Implementation of the Everglades Forever Act includes completion of construction of the STAs as described in the conceptual design for the ECP (Burns and McDonnell, 1994; scheduled to be completed in 2003), setting of a numeric phosphorus criterion for the Everglades Protection Area, by December 31, 2003, and compliance with that criterion by December 31, 2006.

In addition to the ECP and water quality treatment facilities developed as a result of the non-ECP requirements of the Everglades Forever Act, the currently authorized C-111 Project and the Modified Water Deliveries to Everglades National Park Project are assumed to be implemented in 2050.

FUTURE WITHOUT PLAN CONDITION - PHYSICAL FACILITIES AND OPERATIONS - WATER CONSERVATION AREAS (WCAS) AND EVERGLADES NATIONAL PARK RAINFALL-BASED RAINFALL WATER DELIVERY PLANS

In the future without plan condition, the rainfall delivery plan, as defined in the LEC Interim Plan is based on antecedent rainfall and natural system hydropatterns for WCA-2A and 3A and Everglades National Park, with quantities to approximate best management practices (BMPs) Replacement water quantities.

WATER QUALITY PROBLEMS AND OPPORTUNITIES - NATURAL AREAS

Approximately 18 water body segments within Loxahatchee NWR (WCA-1), and WCAs 2 and 3 were listed as use-impaired on the Florida Department of Environmental Protection (FDEP) 1998 303(d) list. Pollutants/water quality parameters contributing to use-impaired conditions include: excessive nutrient loads, low dissolved oxygen (DO) levels, high levels of mercury (based on fish consumption advisories), un-ionized ammonia, coliform bacteria, total suspended solids (TSS) and certain trace metals. There are also four water body segments in Everglades National Park on the 303(d) list. Those water body segments include: ENP Shark Slough, ENP L67 Culvert at US 41, Taylor Slough, and the Tamiami Canal. Problem constituents in Everglades National Park waters include low levels of DO, and high levels of nutrients, mercury (based on fish consumption advisories), iron, other trace metals. Many of the water body segments in the WCAs and Everglades National Park may eventually be removed from subsequent 303(d) lists because the Everglades Forever Act includes schedules and strategies for achieving compliance with water quality standards, consistent with the requirements of the Clean Water Act.

Water quality conditions in the Rotenberger and Holey Land Wildlife Management Areas, Loxahatchee NWR, the WCAs and in downstream Everglades National Park are expected to be significantly improved in 2050 compared to current (without the ECP) conditions.

In the southern Everglades, implementation of the C-111 and Modified Water Deliveries Projects may also involve developing water quality treatment features necessary to assure that regulatory requirements are met. Minimally, implementation of the C-111 Project involves acquisition of the Frog Pond agricultural area adjacent to the C-111/L-31W levee/borrow canal system, which will result in a net reduction of pollution loading (nutrients, pesticides) into Everglades National Park via the existing canal system from nonpoint source agricultural runoff.

LAND USE - WATER CONSERVATION AREAS (WCAS)

The WCAs are located in western and southwestern Palm Beach, western Broward and northwestern Miami-Dade counties, Florida. They consist of WCAs 1, 2, and 3 and encompass approximately 878,000 acres. For management purposes, the area has been subdivided into several units: WCA-1, WCA-2A, WCA-2B, WCA-3A, and WCA-3B. The WCAs are bordered on the east by the Sawgrass Expressway, U.S. Highway 27, and Krome Avenue; on the south by U.S. Highway 41, on the west by Levee 28 (L-28) and the Miccosukee Tribe of Indians of Florida Federal Reservation; and to the north by L-4, L-5, and L-6.

The WCAs are located near several state and federal land and water resources. Lake Okeechobee is approximately 25 miles north. State and federal lands that border the WCAs includes Holey Land Wildlife Management Area, Rotenberger Wildlife Management Area, Miccosukee Tribe of Indians of Florida Federal Indian Reservation, Big Cypress Indian Reservation (Seminoles), Big Cypress National Preserve, and Everglades National Park. The Big Cypress Area of Critical State Concern is adjacent the southwest boundary of WCA-3A. As part of the Central and Southern Florida Project (C&SF), land and flowage easements were obtained for the construction of the three WCAs. Construction of the required levees and canals began in 1949 and the WCAs became functional in 1962. The USACE designed, constructed, and currently participates in the management of the WCAs and the water resource.

The SFWMD serves as the local management agent under the direction of the USACE. WCA-1 became the Loxahatchee NWR in 1961, and is managed by the USFWS. WCAs 2 and 3 were designated as the Everglades Wildlife Management Area in 1952, and are operated by the Florida Game and Fresh Water Fish Commission under the terms of a cooperative management agreement with SFWMD (formerly Central and Southern Florida Flood Control District). The agreement became effective on 1 March 1952 with an initial term of 25 years and three automatically successive terms of 15 years each. The SFWMD holds fee title to approximately 27 percent of the WCAs, and has flowage easements over the remainder. The Board of Trustees owns approximately 55 percent, with other public agencies owning approximately 4 percent. Approximately 14 percent of the area is owned by private landowners. The identity of the private landowners and the location of the inholdings are, for the most part, unknown; Palm Beach, Broward and Miami-Dade counties have little or no land records for lands in the Everglades Water Management Area.

In 1982, an agreement between the Board of Trustees of the Internal Improvement Trust Fund, the Florida Game and Fresh Water Fish Commission, the SFWMD and the Miccosukees was prepared to clarify the documentation and respective rights and responsibilities of the state and the Miccosukees in the 189,000 acres of reservation lands within WCA-3.

The SFWMD has used "Save Our Rivers" (SOR) funds since 1982 to purchase land in the Everglades Water Management Area. Section 373.59, Florida Statutes, created the SOR program, and established the Water Management Lands Trust Fund that contains

monies designated for the purchase of environmentally sensitive riverine lands. Funds for SOR are provided by a portion of documentary stamp tax on properties purchased in Florida. Save Our Rivers legislation calls for the management and maintenance of lands acquired with SOR funds in an "environmentally acceptable manner, and to the extent practicable, in such a way as to restore and protect their natural state and condition." The legislation encourages the use of SOR lands for public outdoor recreational activities compatible with the primary goal of environmental protection and enhancement.

Governor Bob Graham initiated the "Save Our Everglades" program on 9 August 1983. This program was designed to improve environmental conditions in the Everglades system. Two of the seven program initiatives directly affected the management of the Everglades Water Management Area. Initiative 4 required the Florida Game and Fresh Water Fish Commission to manage the Everglades Water Management Area deer herd at a level that could survive moderate flooding conditions. Initiative 5 incorporated hydrological improvements in the conversion of State Road 84 to Interstate 75 (Alligator Alley). The five remaining program initiatives provided secondary benefits to the Everglades Water Management Area by providing for land acquisition and hydrological improvements that enhanced water quality and delivery to the area.

In 1989, 14,720 acres in WCA-3A were purchased from the Seminole Indian Tribe of Florida with funds from the SFWMD and the CARL Program. This tract was added as an amendment to the Rotenberger Wildlife Management Area lease, which names the Florida Game and Fresh Water Fish Commission as lead managing agency. This amendment has a perpetual flowage easement granted to the SFWMD. The Seminole Tribe has retained nonexclusive use rights in parts of WCA-3A.

The state of Florida passed the "Everglades Forever Act" in 1994. The legislation was written to address environmental concerns related to the quality, quantity, and timing of waters entering the Everglades system. The act provided for the creation of STAs, set water quality standards for water entering the Everglades system, and required the agricultural community to implement BMPs to reduce phosphorous inputs into the Everglades drainage basin.

The three major roadways that affect the WCAs are U.S. Highway 27, which separates WCA-2 from WCA-3, U.S. Highway 41 (Tamiami Trail) which borders WCA-3 to the south, and Interstate 75, which bisects WCA-3. The roadways, in combination with the existing levee and water delivery systems, have altered the natural hydroperiod of the area and disrupted sheetflow throughout the Everglades Water Management Area. In the past, there has been substantial environmental damage to the WCAs due to severe flooding and drought caused by these alterations.

The Holey Land Wildlife Management Area is a tract of Everglades marsh comprising 35,350 acres, located in the southwest corner of Palm Beach County. It is located immediately north of WCA-3, on the east side of the Miami Canal. It is 17 miles south of Lake Okeechobee and approximately 43 miles north of Everglades National Park. A large portion of the property came to the Trustees of the Internal Improvement Trust Fund (Trustees) through statehood as part of the Federal Swamp and Overflowed Lands

Act of 1850. Some of the property may have been acquired under the Environmentally Endangered Lands (EEL) acquisition fund in the early 1970s. The remainder of the property was purchased in order to facilitate restoration of the hydroperiod for the area, possibly through the Save our Everglades Program. Lease #2343, dated July 30, 1968 and issued by the Trustees, leased the area to the Florida Game and Fresh Water Fish Commission for fish and wildlife management purposes. Since that time, the Florida Game and Fresh Water Fish Commission has managed the area for public hunting, fishing and recreational use. From 1968 until 1975, the area was apparently included as part of the Everglades Wildlife Management Area. In 1975, it was established by the Game and Fresh Water Fish Commission as the Holey Land Wildlife Management Area. Past uses, prior to 1968, are unknown.

Man-made structures include levees associated with the Miami Canal and the L-5 canal. A series of canals and borrow pits enclose the area's northern and eastern boundaries. Boat ramps are located at the northwest (G-200) and southwest (G-201) pump stations. There are three water gauges (Holey G, Holey 1, Holey 2) within the marsh, with another located in the eastern boundary levee (G-203D). These structures are operated by the SFWMD in accordance with a management agreement with the Florida Game and Fresh Water Fish Commission. The SFWMD also maintains public roads associated with the Miami Canal and L-5 levees. The road along the crest of the northern and eastern boundary levee is closed to the public because it is too narrow to accommodate two-way public vehicular use. Florida Power and Light maintains high-tension power lines and support pads on the southern boundary of the Water Management Area, and a small electrical transmission line along the Miami Canal levee. A series of 54 artificial islands were constructed in the south- and east-central portions of the area in 1974 and 1975.

The Rotenberger Wildlife Management Area is an area of Everglades marsh comprising 27,810 acres located in the southwest corner of Palm Beach County. The Rotenberger Wildlife Management Area is located immediately north of WCA-3 on the west side of the Miami Canal. It is 17 miles south of Lake Okeechobee and approximately 43 miles north of Everglades National Park. Holey Land Wildlife Management Area is immediately along the east boundary of the Rotenberger Wildlife Management Area. The area was named for Ray Rotenberger, who constructed a small camp and airfield in the area during the late 1950s or early 1960s. Approximately 6,300 acres of the original Environmentally Endangered Lands (EEL) project were purchased by the state on February 17, 1975. Since that time all but about 3,500 acres have been acquired. Although biologists were performing surveys and checking harvests in the Rotenberger area as early as 1970, and it may have been part of the Sawgrass Hunt Area at this time, the area was not included in the Florida Game and Fresh Water Fish Commission wildlife management area system until August 26, 1975. The Rotenberger Wildlife Management Area has been operated under lease # 3,581 dated November 13, 1979 from the Board of Trustees of the Internal Improvement Trust Fund (Trustees) since that time, with 6 major lease amendments (1987, 1989, 1990, 1994). This lease also includes some lands on the east side of the Miami Canal that are managed as part of the Holey Land Wildlife Management Area and some 14,000 acres south of the L-4 Canal in Broward County that are operated as part of the Everglades and Francis S. Taylor Wildlife Management Area (known as the Seminole Indian Lands).

Man-made structures include levees associated with the Miami Canal, Manley Ditch, L-4 Canal, the Florida Power and Light Powerline, the Guerry Sugarcane Farm (834 acres), and the abandoned Cousin's Ranch (940 acres) and Holper (100 acres) Properties. An airstrip (formerly known as the Matthews Airfield) was built in the late 1950s or early 1960s by Ray Rotenberger, and there are several cabins and other structures associated with that camp. There used to be a cabin on Wall's Head, but it was abandoned and fell apart some years ago. Another cabin on Cousin's Ranch near the Miami Canal (Wildlife Officer's Camp) has also been abandoned, but is still standing. Several sets of culverts drain from Rotenberger Wildlife Management Area into the Miami Canal and L-4 Canal, and there are a series of culverts underneath the Powerline Road. There are two SFWMD water gauges in Rotenberger Wildlife Management Area (Rotenberger North and South). Sometime in the late 1950s or early 1960s an exploratory oil well was drilled near the south-central boundary. Using shellrock and material dredged from the wetlands a 2-acre support pad and access road to the L-4 North and Powerline levees was constructed, but this site was soon abandoned.

ELIGIBLE CERP PROJECTS

12 - Water Conservation Area 3 Decompartmentalization and Sheetflow Enhancement Project Part 1 (QQ - Part 1 and SS -Part 2)

Part 1 of the Water Conservation Area 3 Decompartmentalization and Sheetflow Enhancement Project includes the modification or removal of levees, canals, and water control structures in Water Conservation Area 3A and B located in western Broward County. This project includes backfilling the Miami Canal in Water Conservation Area 3 from one to two miles south of the S-8 Pump Station down to the East Coast Protective Levee. To make up for the loss of water supply conveyance to the Lower East Coast urban areas from the Miami Canal, the capacity of the North New River Canal within Water Conservation Area 3A will be doubled to convey water supply deliveries to Miami-Dade County as necessary. Modifications will also be made to the eastern section of Tamiami Trail which includes elevating the roadway through the installation of a series of bridges between L-31N Levee and the L-67 Levees. The eastern portion of L-29 Levee and Canal will also be degraded in the same area as the Tamiami Trail modifications.

The purpose of this project is to restore sheetflow and reduce unnatural discontinuities in the Everglades landscape. The project includes raising and bridging portions of Tamiami Trail and filling in portions of the Miami Canal within Water Conservation Area 3. Due to the dependencies of components, this project would be implemented with the Water Preserve Areas. Project that would create a bypass for water supply deliveries to Miami Canal using the North New River Canal.

14 - Loxahatchee National Wildlife Refuge Internal Canal Structures Project (KK)

This project includes two water control structures in the northern ends of the perimeter canals encircling the Loxahatchee National Wildlife Refuge (Water Conservation Area 1) located in Palm Beach County.

The purpose of this project is to improve the timing and location of water depths within the Refuge. It is assumed that these structures will remain closed except to pass Stormwater Treatment Area 1 East and Stormwater Treatment Area 1 West outflows and water supply deliveries to the coastal canals.

Chapter 9
LOWER EAST COAST REGION

PHYSICAL CONDITIONS - LOWER EAST COAST REGION

The Lower East Coast area, which consists of the coastal ridge section in Palm Beach, Broward, and Miami-Dade counties, is a strip of sandy land which lies east of part of the Water Conservation Areas (WCAs). The ground surface of the flatlands in the west ranges from about 25 feet NGVD (National Geodetic Vertical Datum) in the upper part of the region to about five feet NGVD in lower Miami-Dade County. The Atlantic Coastal Ridge is comprised of broad, low dunes and ridges with elevations ranging from 10 to 25 feet NGVD. This ridge area ranges from two to four miles in width at its northern edge to its southern edge in Miami. South of Miami the ridge becomes less pronounced but significantly wider.

The Lower East Coast area is the most densely populated part of the state. The largest population centers are near the coast and include the cities of Miami, Fort Lauderdale, Hollywood, and West Palm Beach. Water levels in coastal canals are controlled near the coastal shoreline to prevent overdrainage and to prevent salt water intrusion. Low water levels in these canals may enable salt water to migrate into the ground water, wellfields, and natural freshwater systems upon which the urban areas depend for a potable water supply.

This area is characterized by sandy flatlands to the west, the sandy coastal ridge, and the coastal marsh and mangrove swamp areas along the Atlantic seaboard. The northern portion, generally that part north of Miami-Dade County, marks the shore of a higher Pleistocene sea and occurs as one or more relict beach ridges. The southern portion appears to be marine deposited sands or marine limestones.

Extensive development has resulted in nearly complete urbanization of the coastal region from West Palm Beach southward through Miami, and physiographical characteristics of the region have been greatly overshadowed. South of Miami, in Miami-Dade County, this coastal area widens as the Everglades bends to the west to include urban areas and agricultural areas that extend almost to the southern coast. Miami-Dade County's agricultural industry covers more than 83,000 acres in the southwest of the coastal metropolitan area. Vegetables, tropical fruits, and nursery plants are grown in this area.

Biscayne Bay is a shallow, tidal sound located near the extreme southeastern part of Florida. Biscayne Bay, its tributaries and Card Sound are designated by the state of Florida as aquatic preserves, while Card and Barnes sounds are part of the Florida Keys National Marine Sanctuary. A significant portion of the central and southern portions of Biscayne Bay comprise Biscayne National Park.

The original areal extent of Biscayne Bay approximated 300 square miles, but it has since undergone major areal modifications, particularly in its northern portions, as a result of development. The bay extends about 55 miles in a south-southwesterly direction from Dumfoundling Bay on the north to Barnes Sound on the south. It varies in width from less than 1 mile in the vicinity of the Atlantic Intracoastal Waterway passage to Dumfoundling Bay, to about 10 miles between the mainland and the Safety Valve Shoals to the east.

While there has been extensive dredging and filling within northern Biscayne Bay, the area still supports a productive and healthy seagrass bed and a few tracts of natural shoreline remain. Northern Biscayne Bay's headwaters are now considered to include dredged areas known as Maule Lake and Dumfoundling Bay, near the northern boundary of Miami-Dade County.

Central and, in particular, southern Biscayne Bay have been impacted less by development than northern bay. For instance, mangrove-lined coastal wetlands extend from Matheson Hammock Park south along the entire shoreline of Biscayne National Park, Card and Barnes Sounds, a distance of approximately 30 miles. These coastal wetlands are the largest tract of undeveloped wetlands remaining in South Florida outside of Everglades National Park, the Big Cypress Preserve, and the WCAs.

Biscayne National Park, in southern Biscayne Bay was established in 1980 to protect and preserve this nationally significant marine ecosystem consisting of mangrove shorelines, a shallow bay, undeveloped islands, and living coral reefs. The park is 180,000 acres in size and 95 percent water. The shoreline of southern Biscayne Bay is lined with a forest of mangroves and the bay bottom is covered with dense seagrass beds. The park has been designated a sanctuary for the Florida spiny lobster. Biscayne Bay and Biscayne National Park support a multitude of marine wildlife such as lobster, shrimp, fish, sea turtles, and manatees. The coral reefs within the Biscayne National Park support a diverse community of marine plant and wildlife.

Depending upon the flood stages reached, all C&SF Project canals in adjacent Miami-Dade County can carry floodwaters to Biscayne Bay. However, much of the time, discharges from project canals represent primarily runoff or seepage from within the flood protected area of the county. These flows originate in the extensive networks of secondary drainage canals and storm sewers that discharge into the project canals. Supplementing the complex system of project canals and secondary drainage systems are many hundreds of other stormwater drainage canals and storm sewer outfalls within Miami-Dade County that discharge fresh water directly into Biscayne Bay.

EXISTING CONDITIONS - LOWER EAST COAST

The Lower East Coast Region functions as a multipurpose canal system with several objectives including: Flood control, urban water supply, industrial water supply, agriculture water use, protection and enhancement of wetland and estuarine systems, prevention of saltwater intrusion, and recreation. The Lower East Coast system is capable

of moving vast quantities of water during the wet season as well as supplying water (if available) during the dry season or as needed. Important freshwater canals are, from north to south, C-44, C-18, C-17, C-51, Hillsboro Canal, North New River Canal, Miami Canal, New River Canal, C-9, C-8, C-7, C-4, C-100, C-100c, C-1, C-102, C-103, C-109, C-110, C-111, and the South Miami-Dade Conveyance System.

Approximately half of the acreage farmed in the Lower East Coast is irrigated (UFBEBR, 1995). This region is highly dependent on the system of canals, levees, and other structures for flood control in the wet season and water supply in the dry season. Providing adequate drainage and flood control to the South Miami-Dade County agricultural area is a serious challenge because the farmland is directly adjacent to Everglades National Park. Evidence suggests that efforts to provide flood control to agriculture have resulted in over-drying the eastern portions of Everglades National Park and adversely affecting park ecology. Agricultural land does, however, provide a buffer between urbanization and Everglades National Park. Farmland is recognized as the preferred neighbor to natural areas because of its minimal impervious areas, open green space, and low population density. A strong agricultural economy in the Lower East Coast Region based on profitable crop production is the best defense against conversion of agricultural land to urban land.

The major estuaries in the Lower East Coast Region are Lake Worth Lagoon in Palm Beach County, West Lake in Broward County, and Biscayne Bay in Miami-Dade County. Lake Worth Lagoon was predominantly a freshwater system as recent as 100 years ago but was converted into a marine system with construction of permanent inlets to the ocean. West Lake is 1,400 acres of coastal wetland and mangroves in Hollywood along the Intracoastal Waterway. Biscayne Bay is a subtropical lagoon about 40 miles long that extends the length of Miami-Dade County.

Prior to urban development, freshwater discharge to Biscayne Bay consisted of flows through natural drainageways, overland flow, and ground water discharge from the Biscayne aquifer. However, the flow has changed from short bursts of rainy season flow through low drainageways, to regulated releases through drainage canals and decreased periods of ground water discharge (SFWMD, 1995). The construction of the canal system lowered the regional water table and subsequently reduced the amount of ground water flow into the bay. Ground water discharge into Biscayne Bay is believed to occur through both seepage and flow through subsurface leakage channels. A zone of seepage occurs around the perimeter of the bay where the water table elevation is higher than sea level. Subsurface flow occurs through natural leakage channels in the rock formations. Prior to the construction of drainage canals, springs flowed along the shore and emanated from the bottom of the bay. However, present day rates of ground water discharge into the bay are insufficient to produce such flowing springs (SFWMD, 1995).

Surface water flows into Biscayne Bay and Lake Worth Lagoon are primarily controlled by the system of canals, levees, and control structures built as part of the Central and South Florida Flood Control Project. Biscayne Bay receives freshwater surface flows from 17 surface water basins through 12 major coastal structures (SFWMD, 1995). Lake Worth Lagoon's fresh water input is principally from the C-51 Canal. The

mechanism of surface water flow into Biscayne Bay and Lake Worth Lagoon are short intense pulses of fresh water discharged at discrete locations. This flow has replaced the historic sheetflow through the wetlands adjacent to the bay that existed before development of the canal system. Dry season flows into these water bodies are much lower than predrainage levels because most of the discharge into the bay is from stormwater releases from the canals. The canal discharge can bring sediments, heavy metals, pesticides, fertilizers, herbicides, nutrients, and low salinity plumes, which can all adversely affect the biota (SFWMD, 1995).

FUTURE WITHOUT PLAN CONDITION - WATER QUALITY - LOWER EAST COAST

The major watershed management/planning program ongoing in the Lower East Coast Region that will beneficially effect future water quality conditions is the state's Biscayne Bay Surface Water Improvement and Management (SWIM) Plan (SFWMD, 1995). The Biscayne Bay SWIM Plan has developed numerous water quality improvement related strategies and projects to reduce pollutant loading in Biscayne Bay and its tributaries. The extent to which this program is implemented, however, is limited due to funding constraints. Also, the Lake Worth Lagoon Management Plan will result in water quality improvement projects being implemented in the area. Although implementation of these water quality improvement activities will result in beneficial effects to Lower East Coast water bodies, the net future condition of water bodies in this region is not expected to improve due to the dramatic additional urban development, and associated additional pollutant loads, projected to occur in this region.

FUTURE WITHOUT PLAN CONDITION - PHYSICAL FACILITIES AND OPERATIONS - PROJECTS

C-51

The current Design Memorandum was completed in February 1998 and submitted for review and approval and contains the same National Economic Development plan as the June 1992 Detailed Design Memorandum but references an "authorized" plan, which includes the replacement of the 2.5-square-mile detention area with Stormwater Treatment Area (STA) 1E from the Everglades Construction Project (ECP). The "authorized" plan is also a product of the Technical Mediated Plan, which has been agreed to by Department of Justice, Department of Interior, Department of Army, the state of Florida, and the South Florida Water Management District (SFWMD). The state of Florida's Everglades Forever Act is based, in part, on the Technical Mediated Plan. The current "authorized" plan was authorized by the Water Resources and Development Act of 1996. The Act included language for the Western C-51 Project that additional work, as described in the ECP, shall be accomplished at full federal cost.

The authorized plan is recommended in the C-51 Design Memorandum and has many of the same physical features proposed in the 1992 Detailed Design Memorandum

(described below). The project will provide 10-year flood protection for the western basin of C-51. The major physical difference between the 1992 Detailed Design Memorandum National Economic Development plan and the authorized plan is the replacement of the 1,600 acre detention area with the 5,350 acre "locally preferred" STA 1 East. The most significant modification will be the reduction of discharges to Lake Worth, with C-51 West Basin runoff directed instead to WCA-1 (Arthur R. Marshall Loxahatchee Wildlife Refuge). Runoff from the C-51 West Basin will pass through STA 1 East for water quality improvement prior to its discharge to WCA-1. In addition to the flood damage reduction benefits provided by the 1992 plan, the authorized plan would provide water quality improvement, reduction of damaging freshwater discharges to Lake Worth, and increased water supply for the Everglades and other users.

Northwest Dade Lake Belt Area

This component assumes that the conditions caused by the currently permitted mining exist and that the affects of any future mining are fully mitigated by the mining industry.

C-111 Project

Plan 6a, recommended in the U.S. Army Corps of Engineers (USACE) General Reevaluation Report (dated May 1994), will create the operational capability and flexibility to provide restoration of the ecological integrity of Taylor Slough and the eastern panhandle areas of the Everglades and maintain flood protection to the agricultural interests adjacent to C-111.

In the future without plan condition, C-111 Plan 6a will protect the natural values of a portion of Everglades National Park, and will maintain flood damage prevention within the C-111 Basin, east of L-31N and C-111. The project, which consists of both structural and nonstructural modifications to the existing project works within the C-111 Basin, will restore the hydrology in 128 square miles of Taylor Slough and its headwaters in the Rocky Glades. In addition, the hydroperiod and depths in 1,027 square miles of Shark River Slough are beneficially impacted by the higher stages in the Rocky Glades, resulting in a net increase in water volume within Shark River Slough. The project will provide adequate operational flexibility to incorporate management strategies that will evolve as a result of continued monitoring and studies.

Modified Water Deliveries to Everglades National Park

The Modified Water Deliveries to Everglades National Park Project was authorized by the Everglades National Park Protection and Expansion Act (Public Law 101-229). The purpose of the project is to provide for structural modifications to the C&SF Project to enable the restoration of more natural water flows to Shark River Slough in Everglades National Park. The project is being implemented by the USACE in conjunction with the acquisition of about 107,600 acres of land by the U.S. Department of

the Interior. Land acquisition for the levee, canal, and pump station for the flood mitigation system in the 8.5-Square-Mile Area is underway.

This project is presently in the design and construction phase. Project construction is scheduled for completion in 2003. In the future without plan condition, the Modified Water Deliveries Project will provide more natural flows to Shark River Slough in Everglades National Park. Water flows will be spread across a broader section of Shark River Slough to include the east Everglades between L-67 Extension and L-31N.

The addition of water control structures and culverts will help to reestablish the natural distribution of water from WCA-3A into WCA-3B. Outlets from WCA-3B (S-355A & B) will be constructed to discharge into Northeast Shark River Slough. An existing levee and canal (L-67 Extension) along the eastern edge of the existing Everglades National Park boundary will also be removed. A Miccosukee Indian camp has been flood-proofed to avoid periodic flooding that would otherwise be caused by the project.

In order to prevent adverse flood impacts to the 8.5-Square-Mile Area, the authorized project includes the construction of a seepage levee and canal around the western and northern edges of the area and a pump station (S-357) to remove excess seepage water. These project features are designed to maintain the existing level of flood protection in the residential area after the Modified Water Deliveries to Everglades National Park project returns water levels in Northeast Shark Slough to higher levels. A second pump station (S-356) will be constructed to pump excess seepage water from the L-31N Borrow Canal and residential area into the L-29 Borrow Canal. This water will then flow through culverts under US Highway 41 into Northeast Shark River Slough. A locally preferred option which would modify the project features in the 8.5-Square-Mile Area is currently under consideration.

The structural modifications were designed to provide for maximum operational flexibility so that as more is learned through the continued iterative testing program, the operation of the project can be adjusted accordingly.

East Cape and Homestead Canals

The East Cape and Homestead canals, located within Everglades National Park, were constructed by local interests in the early 1900s to assist in the drainage of the Everglades prior to authorization of the park in 1936. After the Everglades National Park was established, the canals were plugged to prevent overdrainage of upstream freshwater systems and saltwater intrusion during high tides in the dry season. The passage of Hurricane Andrew resulted in extensive damage to both plugs. The project repaired the plugs in August 1997.

Interim Plan for Lower East Coast Regional Water Supply

The Interim Plan for Lower East Coast Regional Water Supply, produced by the SFWMD, identified water resources and water supply development projects, both structural and nonstructural, that should be initiated before 2000 to help meet the growing needs of the region (SFWMD, 1998d). The Interim Plan also identified local basin planning and other analytical programs to support the Lower East Coast 2020 Plan development and the Restudy.

The analyses conducted during the Lower East Coast Regional Water supply planning process demonstrated the need for increased storage capabilities throughout the system to help meet the increasing agricultural, environmental, and urban demands.

Wellfield Expansion in Service Areas 1 and 2

This component provides for relocation of future and some existing withdrawals from existing (1995) wellfields. Demands of the following utilities were evaluated assuming new wellfield locations: Lake Worth, Manalapan, Lantana, Boca Raton, Fort Lauderdale, Hollywood, and Hallandale. The evaluations assumed that, for these utilities, demands shifted to new wellfields were the same as those identified in the Draft Lower East Coast Regional Water Supply Plan (SFWMD, 1997g). Generally this means that 1995 levels of demands continued to be met from existing facilities while the portion of new demands beyond 1995 levels were met from the newly expanded wellfields. The new wellfields were generally evaluated as being located along the western boundary of each utility's service area.

Northeastern Broward Secondary Canal Recharge Network

This component includes pump stations and structures that would maintain higher levels in secondary canals in eastern Broward County between the Hillsboro and the North New River canals during the dry season. The control of seasonally higher canal elevations along the coast could help recharge the aquifers being used by local public water supply wellfields, and further reduce saline encroachment into the coastal freshwater aquifers. The selected canals are located where recharge from the canals would help to hold back the salt water front and protect the production capability of wellfields to the east.

Miami-Dade County Utility Aquifer Storage and Recovery (ASR)

This component includes ASR wells and related facilities that would be installed associated with wellfields of the Miami-Dade Water and Sewer Authority Department. These facilities would be operated to store water in the Floridan aquifer in the wet season and recover this water in the dry season. For the future without project condition, the evaluations were for a daily injection and recovery capacity of approximately 150 million gallons per day (MGD), a maximum recovery percentage of injected water of 90 percent, an annual injection period of seven months and an annual recovery period of five months.

Selected Elements of L-8 Project

The goal of the selected elements of the L-8 project is to redirect runoff from the southern L-8 Basin away from WCA-1 and the C-51 Canal to the West Palm Beach Water Catchment Area and the Loxahatchee Slough via the M Canal and the C-18 Canal. Subsequently, this water may be used to meet urban water supply demands for West Palm Beach, to meet environmental water demands of the West Palm Beach Catchment Area and Loxahatchee Slough, and may provide recharge for the Jupiter and Seacoast Utilities Authority wellfields. In addition, this project would be expected to reduce the incident and volume of harmful freshwater releases into Lake Worth Lagoon via the C-51 Canal. The project includes: an improved structural connection from the West Palm Beach Water Catchment Area to the Loxahatchee Slough ASR wells at the West Palm Beach Water Catchment Area or the Indian Trails Improvement District impoundment and a coastal recharge delivery system.

Minimum Flows and Levels (MFLs)

This component involves operational adjustments associated with the establishment of minimum flows and levels (MFLs) for the Biscayne aquifer and the Everglades. Minimum levels for the Biscayne aquifer involves maintaining water levels in coastal canals to prevent saltwater intrusion. MFLs for the Everglades focuses on preservation of hydric soils. No net outflow from WCAs are allowed if water levels are less than minimum level marsh triggers or less than minimum operating criteria in the canals of the Loxahatchee National Wildlife Refuge (WCA-1): 14 feet, WCA-2A: 10.5 feet, WCA-3A: 7.5 feet. Marsh level triggers will be those used in the Interim Plan for Lower East Coast Regional Water Supply.

FUTURE WITHOUT PLAN CONDITION - PHYSICAL FACILITIES AND OPERATIONS - CRITICAL RESTORATION PROJECTS

C-4 Water Control Structure

This project involves construction of a gated control structure (S-380) in the C-4 canal at the congruence with the Dade-Broward Levee. A large volume of seepage is lost from WCA-3B to the coast because the existing water management system cannot raise surface and ground water levels high enough to prevent seepage. Construction of a gated control structure with five 72-inch diameter culverts with remotely operated slide gates will increase aquifer recharge and surface and subsurface storage of water to reduce seepage as well as enhance habitat for plants and animals. The total cost is estimated at $2.05 million.

Western C-11 Water Quality Improvement

The purpose of this project is to improve the quality and timing of stormwater discharges from the Western C-11 Basin to the Everglades Protection Area. The S-9 Pump Station currently pumps urban and agricultural stormwater runoff from the Western C-11 Basin directly into Water Conservation Area (WCA) 3A. This project will be completed in two phases. Phase 1 will involve installation of four new seepage return pumps adjacent to the S-9 Pump Station. Phase 2 will involve construction of a new divide structure in the C-11 canal, approximately 0.5 miles east of US Highway 27. Seepage return pumps will include two 75-cfs electric pumps and two 175-cfs diesel pumps. The divide structure will be a gated concrete spillway with a discharge capacity of 2,880 cfs. During non-flood conditions, the new structure is intended to separate seepage from stormwater runoff, allowing return of relatively clean seepage waters to WCA-3A using the new seepage return pumps. The estimated cost of the project is $9.6 million.

WATER QUALITY PROBLEMS AND OPPORTUNITIES

For Restudy planning purposes, the Lower East Coast consists of Palm Beach, Broward, and Miami-Dade counties, including Biscayne Bay and Lake Worth Lagoon. According to the Florida Department of Environmental Protection's (FDEP) 1998 303(d) list, approximately 42 water body segments (both fresh and marine water bodies) within the Lower East Coast are use-impaired. Pollutants/water quality constituents causing impairment include low levels of dissolved oxygen (DO), high levels of mercury (based on fish consumption advisories) and other trace metals, and high levels of coliform bacteria, total suspended solids (TSS), biochemical oxygen demand (BOD), and un-ionized ammonia.

Four of the main C&SF Project canals delivering flows from Lake Okeechobee and the WCAs (the West Palm Beach, Hillsboro, New River, and Miami canals) traverse the Lower East Coast. In addition to conveying Lake Okeechobee and WCA flows, the C&SF Project canals and a network of connecting secondary and tertiary canals provide drainage in the Lower East Coast, which conveys stormwater runoff and attendant pollution loads to estuarine waters. Management of stormwater runoff and flooding via the existing canal system has been implicated as the chief cause of water quality degradation in the region, particularly in the northern portion of Biscayne Bay.

Improving water quality in the Lower East Coast to meet water quality standards in all impaired water bodies will likely be difficult, considering the extent of urban development, minimal or nonexistent water quality treatment for nonpoint source runoff, and other direct (point source) and indirect discharges adversely affecting water quality in the Lower East Coast. Water quality conditions are expected to worsen in the Lower East Coast (central and southern Palm Beach, Broward, and Miami-Dade counties) by 2050 compared to current conditions. FDEP's 1996 Section 305(b) report to the U.S. Environmental Protection Agency (USEPA) describing water quality conditions in the region indicates that most of the region exhibits "fair" or "good" water quality. The report goes on to state that most pollution (in the region) comes from stormwater, although

bacteriological contamination from wastewater discharges and septic tanks is also a significant problem, particularly in the Miami River, downstream in Biscayne Bay, and urban areas west of the intracoastal waterway in Broward County and north of the New River. Water quality conditions in receiving water bodies in 2050 are expected to be further degraded, due to the developed condition of the watershed and the continued accumulation of pollutants in sediments in receiving water bodies.

Nearly all of this heavily urbanized watershed drains to estuarine waters. Net pollution loads, especially from nonpoint sources, to receiving waters in the Lower East Coast are expected to increase as a result of projected population increases. The expected increase in net pollution loads may not be directly proportional to population growth. New growth and urban/suburban development in the Lower East Coast must comply with water quality treatment requirements for nonpoint source runoff, whereas much of the existing development in the Lower East Coast does not include facilities for treatment of nonpoint pollution sources. Nevertheless, the projected addition of approximately 2.7 million people to the region is expected to cause water quality conditions to be further degraded, especially in those basins which are already stressed by existing pollution loads.

In Palm Beach County, the Lake Worth Lagoon Estuary is the receiving water body for most of that urban watershed. There are approximately eight use-impaired water bodies in Palm Beach County on the FDEP 1998 303(d) list. Listed water body segments include coastal canals and freshwater areas further inland. Water quality conditions are expected to improve (in terms of estuarine salinity targets) as a result the C-51 (STA 1 East) Project, which will divert freshwater discharges to Lake Worth Lagoon to a treatment area prior to discharge to WCA-1. However, net nonpoint source pollution loads to Lake Worth Lagoon may increase commensurate with increases in population and development.

Although there are no extensive estuarine water bodies in Broward County, remaining mangroves in southern Broward County canals and along the Intracoastal Waterway provide similar habitat. There are approximately 21 303(d)-listed use-impaired water body segments in Broward County. These water body segements are primarily coastal canals providing drainage. Due to the extent of existing urban development in the watersheds of those canals, it is not likely that there will be a significant increase in future nonpoint source pollution loads into these water bodies. However, it is also unlikely that basinwide stormwater best management practices (BMPs), e.g., retention/detention facilities, and filtration, can be implemented effectively in heavily urbanized watersheds, due to the lack of available land for such facilities. Future basin planning efforts during TMDL development and implementation may result in more effective controls of other direct (point source) and indirect discharges of pollutants (e.g., car washes and other industrial facilities). At best, the long-term prognosis for improving all use-impaired water bodies in coastal areas of Broward County is uncertain.

In Miami-Dade County, approximately 13 water body segments were identified as use-impaired on the FDEP's 1998 303(d) list. Most are coastal canals providing drainage of runoff to Biscayne Bay. Biscayne Bay is the largest estuarine water body in the Lower East Coast, and is the receiving water body for most of the developed area of Miami-Dade

County. Most of Biscayne National Park is located within the central and southern portion of the Biscayne Bay Estuary. As with some of the Broward County canals, controlling nonpoint sources of runoff in heavily urbanized areas in Miami will be difficult, due to the lack of available land for basinwide BMPs. Some incremental improvement of nonpoint source pollution loads may be realized through the basin management plans to be developed by the FDEP. Point sources and other direct discharges of pollutants to Biscayne Bay and tributary canals should be significantly improved if basin management plans are fully implemented. However, overall, it is not expected that water quality in coastal canals draining to Biscayne Bay will be improved to the point that all surface water quality standards will be achieved. Furthermore, any water quality benefits achieved as a result of the Biscayne Bay SWIM Plan may be offset by increases in nonpoint source pollution loads associated with projected population increases.

LAND USE - LOWER EAST COAST

Agriculture

Broward and Miami-Dade counties are included in this region. Although Palm Beach County is also a part of this region physiographically, agriculture issues for Palm Beach County were addressed within the Everglades Agriculture Area Region. More than 100,000 acres are farmed in Broward and Miami-Dade counties (UFBEBR, 1995). This region is characterized by small farms averaging less than 50 acres, with very high productivity of more than $3,500 per acre (UFBEBR, 1995). A variety of crops are produced including vegetables, tropical fruits, and nursery plants. Hurricane Andrew, which struck southern Miami-Dade County in 1992, caused significant damage to agricultural areas. Many fruit tree orchards were damaged or destroyed. Statistics from 1996 indicate that avocado production had recovered, but mango and lime orchards had not yet recovered from the hurricane damage (FASS, 1997b). Total acres of tropical fruit production in Miami-Dade County remain approximately 7,000 less than prehurricane levels (FASS, 1996e). Foliage plant production is also a major business in Broward and Miami-Dade counties. More than 120 million square feet were devoted to the foliage crop in Broward, Miami-Dade, and Palm Beach counties in 1996 (FASS, 1997a).

Agricultural production and services employ approximately 18,000 people in this region representing a $23 million payroll (UFBEBR, 1995). The total market value of agricultural products from this region is almost $400 million (UFBEBR, 1995). Miami-Dade County ranks second in the state for total market value of agricultural products (UFBEBR, 1995).

Approximately half of the acreage farmed in the Lower East Coast is irrigated (UFBEBR, 1995). This region is highly dependent on the system of canals, levees, and other structures for flood control in the wet season and water supply in the dry season. Providing adequate drainage and flood control to the south Miami-Dade County agricultural area is a serious challenge because the farmland is directly adjacent to Everglades National Park. Evidence suggests that efforts to provide flood control to agriculture have resulted in over-drying the eastern portions of Everglades National Park

adversely affecting Park ecology. Agricultural land does, however, provide a buffer between urbanization and Everglades National Park. Farmland is recognized as the preferred neighbor to natural areas because of its minimal impervious areas, open green space, and low population density. A strong agricultural economy in the Lower East Coast Region based on profitable crop production is the best defense against conversion of agricultural land to urban land.

Urban

The Lower East Coast supports the densest population in the state of Florida. Population in the Lower East Coast is expected to increase by 35 percent, from 4,518,401 in 1995 to 6,086,700 in 2020. Land use in the Lower East Coast is primarily related to urban activities and the infrastructure (such as transportation and utilities) needed to support this large number of people. Urban demands are expected to increase by 39 percent by 2020. If however, the Lower East Coast experiences a 1-in-10 year drought during the planning period, than the projected urban and agricultural demand will increase about 43 percent.

South Miami-Dade County is defined as the area south of SW 184th St. (Eureka Drive). US Highway 1 bisects the area. West of US 1, land uses are primarily estate and low-density residential uses within the Urban Development Boundary (UDB). Other higher density residential uses, business/office, and industrial uses are found in Homestead and Florida City. The Redlands and other agricultural areas are west across the UDB and make up most of the approximately 55,000 acres of agricultural lands that remain in south Miami-Dade County. The Urban Expansion Area designation identifies agricultural lands in south Miami-Dade County as the next place for development.

Miami-Dade and Broward counties have the most pronounced sprawl patterns. The SFRPC describes the change:

> Essentially rural areas in the western extremes of Broward and Miami-Dade counties have given way to sprawling suburban residential development and shopping centers. Indeed, these have been an important component of the economic growth that has taken place in the region. During the process, the once significant rural population has virtually disappeared, resulting in the emergence of a distinctly urban character to the region. Miami-Dade County was already 94 percent urban in 1950, and 77 percent of Broward County's population lived in urban areas. By 1980, both counties were 99 percent urban. Only in Monroe County did a significant portion of the population still live outside of urban areas in 1990 (27 percent), consistent with the special characteristics of that county's political geography (SFRPC, 1996).

Palm Beach County is experiencing a similar change. The Treasure Coast Regional Planning Council (TCRPC) reports that while the coastal area of Palm Beach County from Riveria Beach to Boca Raton, is heavily urbanized, much of the recent population growth has occurred in the western unincorporated areas (TCRPC, 1996). This sprawling urbanization tended to push agricultural land uses off of prime farmlands into the less suitable wetlands fringing the coastal ridge. As the development continues to expand it is

expected that it will consume the remaining agricultural lands (both historic and recent) and eventually make its way into the remaining unprotected wetlands of the counties. The SFRPC explains that the region, in the response to the pressure of continued population growth, is likely to yield to the pressure to continue to urbanize.

Additional Lower East Coast urban-related land uses include the Florida Power and Light nuclear power plant at Turkey Point, landfills, rock mining, Homestead Air Force Base, and a number of marinas scattered throughout Biscayne Bay and Lake Worth Lagoon.

Everglades National Park

Everglades National Park encompasses 2,353 square miles of wetlands, uplands, and submerged lands at the southern end of the Florida peninsula. The topography is extremely low and flat, with most of the area below four feet NGVD. The highest elevations are found in the northeastern section of the park and are from six to seven feet NGVD. The saline wetlands, including mangrove and buttonwood forests, salt marshes, and coastal prairie that fringe the coastline are subject to the influence of salinity from tidal action.

Everglades National Park, authorized by Congress in 1934 and established in 1947, was established to protect the unique tropical biological resources of the southern Everglades ecosystem. It was the first national park to be established to preserve purely biological (versus geological) resources. The park's authorizing legislation mandated that it be managed as:

> ...wilderness, [where] no development... or plan for the entertainment of visitors shall be undertaken which will interfere with the preservation intact of the unique flora and fauna and the essential primitive natural condition now prevailing in this area.

This mandate to preserve wilderness is one of the strongest in the legislative history of the National Park System.

Everglades National Park has been recognized for its importance, both as a natural and cultural resource as well as for its recreational value, by the international community and the national and state governments. At the international level, the park is a World Heritage Site, an International Biosphere Reserve, and a Wetland of International Significance. In 1978, Congress designated much of the park, (86 percent) as Wilderness under the Wilderness Act of 1964. In 1997, this area was redesignated the Marjory Stoneman Douglas Wilderness. Hell's Bay Canoe Trail and the Wilderness Waterway are designated National Trails. The state of Florida has designated the park an Outstanding Florida Water.

The park preserves a unique landscape where the temperate zone meets the subtropics, blending the wildlife and vegetation of both. The landscape includes sawgrass sloughs, tropical hardwood hammocks, offshore coral reefs, mangrove forests, lakes,

ponds, and bays, providing habitat for dozens of threatened and endangered species of plants and animals. It is the largest designated wilderness, at 1,296,500 acres, east of the Rocky Mountains. It protects the largest continuous stand of sawgrass prairie in North America, the most significant breeding grounds for tropical wading birds in North America, over 230,100 acres of mangrove forest (the largest in the western hemisphere), a nationally significant estuarine complex in Florida Bay and significant ethnographic resources, revealing 2,000 years of human occupation.

Increased Pressure on Open Land

As this trend continues the availability of developable land decreases putting pressure on the unprotected wetlands and agricultural lands. There is a fear that agriculture lands will come under increased pressure as lands are converted into subdivisions or set aside for environmental protection. South Miami-Dade County typifies this trend. As people continue to move into the county pushing the north and central regions to capacity, the remaining undeveloped areas in south Miami-Dade County become the easiest option for future growth. The 80,000 acres of agricultural lands in the Redland Region and other parts of unincorporated Miami-Dade County are increasingly under development pressure. In the 1995 Evaluation and Appraisal Report Miami-Dade included a recommendation that a Farmland Retention Study be conducted, noting that:

> By [the Evaluation and Appraisal Report for 2000] the currently planned Urban Development Boundary will be substantially built out and the County will be facing the prospect of having to plan for the urbanization of an additional 20 square miles of land, if we continue the past trend of low-density development.

There are several other efforts to halt these land conversion and development trends including the following: Eastward Ho!, Brownfields, and the South Miami-Dade U.S. 1 Corridor Project.

CURRENT CERP PROJECTS - WESTERN C-11 DIVERSION IMPOUNDMENT AND CANAL (CELL 11)

Description of the Water Body, Water Usage, and Hydrology

The Western C-11 Diversion Impoundment and Canal (C-11 Impoundment) is a feature of the Comprehensive Everglades Restoration Plan which includes an impoundment with a total storage capacity of 6,400 acre-feet. The initial design of the impoundment assumed 1,600 acres with the water level fluctuating up to 4 feet above grade. At this time, approximately 530 acres have been acquired for the project. The final size, depth and configuration of the feature will be determined through more detailed planning and design.

Historically, this area was once part of the Everglades ecosystem. The construction of the east coast protective levees by 1960 severed this connection. Further drainage improvements, including those done as part of the Indian Trace Improvement

District, have supported the area's development to unimproved and improved pasture. Currently, flood protection for the C-11 West Basin is provided by the C-11 Canal and the S-9 Pump Station located at the intersection of the L-37 and L-33 protective levees. This pump station returns levee seepage to Water Conservation Areas (WCA) 3A and 3B that enters the C-11 West Canal through seepage into the L-37 and L-33 borrow canals and stormwater runoff.

Agency Juristictions

The following units have jurisdiction over the proposed project site: City of Weston, Indian Trace Improvement District, Broward County, the SFWMD, the FDEP, and the USACE.

Land Use

The project area is characterized by various land uses, which include unimproved and improved pasture with livestock currently being grazed on a portion of the site. There are existing wetlands and wetland mitigation areas on-site. Invasion by exotic plant species has been noted in the area. There are also existing residential units located within the project area.

Management Strategies for Restoration and Protection of the Water Body

The purpose of the proposed project is to divert and treat excess stormwater runoff from the western C-11 Canal Basin that is presently backpumped into WCA-3A, control seepage from WCA-3 by improving ground water elevations and provide flood protection for the western C-11 Basin. After diversion and treatment in the stormwater treatment area/impoundment, water is available to be sent to the C-9 Stormwater Treatment Area/ Impoundment or the North Lake Belt Storage Area. Water quality in WCA-3 is expected to improve once stormwater runoff is no longer being backpumped. The project provides improved water supply, improved saltwater intrusion protection, and possibly additional flows to Biscayne Bay.

Studies

The C-11 Impoundment has been included in the following studies: Comprehensive Everglades Restoration Project (2000), Lower East Coast Water Supply Plan (2000) and the Water Preserve Areas Feasibility Study (tentative 2002).

Maintanence of the Water Body after Restoration

A maintenance and operation plan will be developed during the detailed planning and design phase of the project and will address the management and maintenance of the water resource development project.

Operation and maintenance may include but is not limited to regular mowing of levee surfaces; control structure maintenance, equipment replacement and overhaul; pump station maintenance, replacement and overhaul; structural maintenance and repair; canal maintenance including removal of floating and submerged vegetation; and shoreline spraying.

Project Schedule

The schedule for the implementation of C-11 Impoundment (Appendix M of the Central and Southern Florida Project Comprehensive Review Study) is as follows:

- Real Estate Acquisition October 1, 2001 – September 26, 2003
- Detailed Design October 1, 2001 – September 26, 2003
- Plans and Specifications September 29, 2003 – September 24, 2004
- Construction September 27, 2004 – September 19, 2008
- Preliminary estimates for the project total $124,837,000 in 1999 dollars

Funding Needed

The total estimated conceptual cost in 1999 dollars to complete the Western C-11 Diversion Impoundment and Canal is $124,837,000. This includes an estimated real estate acquisition cost of $85,126,000. The projected sources of funding are estimated as follows: 50 percent federal government and 50 percent SFWMD and local sponsors. The 50 percent share attributed to the SFWMD may include local cost share partners as yet to be identified.

Goals and Performance Measures

Numeric performance measures for the C-11 Impoundment will be developed during the detailed planning and design phase of the project. They may include the following performance measures:

- Flood control through flood flow attenuation and storage
- Water quality improvement by reducing flows to WCA-3A via the S-9 Pump Station; treating runoff through flow attenuation in the impoundment; treating flows to WCA-3A prior to discharge from the S-9 Pump Station, as necessary
- Incidental ground water recharge is provided by operating the S-9 Seepage Divide Structure, S-381 critical project, to maintain the western C-11 Canal stage
- Seepage control by reducing seepage losses from the WCA-3A by storing water in the impoundment

- Incidental water supply benefits by providing dry season flows to assist in meeting environmental and urban water supply demands
- Incidental reduction of impacts due to saltwater intrusion

The improvement of water quality in the WCA-3A is the main benefit realized from the C-11 Impoundment. The poor quality runoff from the western C-11 Canal Basin is no longer backpumped into the WCA-3A via the S-9 Pump Station. It is diverted into the C-11 Impoundment where it then becomes available for diversion to the C-9 Stormwater Treatment Area/Impoundment, the North Lake Belt Storage Area after it is operational or WCA-3A after treatment, as applicable. In addition, the C-11 Impoundment helps control seepage from WCA-3A and WCA-3B by increasing ground water elevations directly east of the East Coast Protective Levee.

Permitting and Regulatory Issues Related to the Project

During the development of the Comprehensive Everglades Restoration Plan (Restudy) and its associated Programmatic Environmental Impact Statement the entire program, including this project, were evaluated for compliance with the following regulations:

- National Environmental Policy Act of 1969, Final PEIS included in Appendix N of the Restudy
- Fish and Wildlife Coordination Act of 1958, Final Fish and Wildlife Coordination Act Report by the U.S. Fish and Wildlife Service and Final Fish and Wildlife Coordination Act Reports (Part II and Part III) by the Florida Game and Fresh Water Fish Commission are included in Annex A of the Restudy
- Endangered Species Act of 1973, programmatic biological opinion from U.S. Fish and Wildlife Service is contained in Annex B of the Restudy and states that the project (CERP) is in full compliance with the Act
- National Historic Preservation Act of 1966, the Restudy is in partial compliance, cultural resource investigations are ongoing to determine effects to historic properties on a program level
- Clean Water Act of 1972, the Restudy is in partial compliance and will obtain full compliance upon the issuance of a Section 401 permit from the State of Florida (See Section 404(b) Evaluation in Annex C of the Restudy)
- Clean Air Act of 1972, the Restudy will be in full compliance upon receipt of comments on the Final PEIS from the U.S. Environmental Protection Agency (USEPA)
- Coastal Zone Management Act of 1972, the Restudy is in partial compliance and will achieve full compliance upon receipt of comments from the Florida State Clearinghouse (A federal

consistency determination in accordance with 15 CFR 930 Subpart C is included in the Restudy, Annex D)

- Wild and Scenic River Act of 1968, not applicable to the Caloosahatchee River
- Estuary Protection Act of 1968, the Restudy is in full compliance
- Resource Conservation and Recovery Act of 1976, not applicable to the Restudy
- Toxic Substances Control Act of 1976, not applicable to the Restudy
- Marine Protection, Research, and Sanctuaries Act of 1972, not applicable to the Restudy
- Rivers and Harbors Appropriation Act of 1899, the Restudy is in full compliance
- Coastal Barrier Resources Act, not applicable to the Restudy
- Section 904 of the 1986 Water Resources Development Act, the Restudy is in full compliance
- Section 307 of the 1990 Water Resources Development Act, the Restudy is in full compliance
- E.O. 11988, Floodplain Management, the Restudy is in full compliance
- E.O. 11990, Protection of Wetlands, the Restudy is in full compliance
- E.O. 12114, Environmental Effects Abroad of Major Federal Actions, not applicable to the Restudy

This project will require further evaluation during detailed planning and design to determine compliance with the following regulations:

- Federal Water Project Recreation Act of 1965, recreation planning will be preformed during the detailed project engineering and design
- E.O. 12898, Environmental Justice, further analysis of community impacts will be undertaken when more specific site information is obtained during detailed planning and design
- An analysis will be performed during the detailed planning and design of the project to identify the State of Florida Consumptive Use, Surface Water Drainage, Everglades Stormwater, NPDES, dredge and fill and construction permits required for the project

Public Access for Project Lands

During the detailed planning and design phase of the project, an evaluation will be performed that will identify potential public access and recreational activities. They may include fishing, boating, nature watching, and picnicking.

Areas where recreational activities may occur are as follows:

- Fishing may be available in excavated areas that are created inside the impoundments to provide borrow material and meet control structure requirements. These excavated areas become permanent pools of water that may provide sufficient means for fish to endure the impoundments' extended dry-periods.
- Boating is a possibility when storm events provide enough runoff for the impoundment to fill.
- Limited sized boat ramps may be provided for access for boating and fishing activities.
- Public access to the C-11 Impoundment levees will be provided to the extent that public safety is assured. Recreational opportunities afforded to the public by access to levees range from fishing to nature watching and photography.
- Limited parking for the public will be provided at boat ramp sites. In addition, picnicking and other recreational opportunities may be provided at the boat ramp sites.
- External peripheral canals surround the impoundment for the purpose of seepage collection. These canals may have an additional littoral zone for fish and wildlife habitat. Public usage of these areas for further recreational opportunities is encouraged. Local roads and developments provide a large number of access points. Recreational opportunities are generally high for these areas and include all of the following: fresh water fishing, picnicking, nature watching, nature education, and photography.
- Historically, water control structures are located near public roads. This provides public access along the canals for limited recreational opportunities. These opportunities often include fishing, picnicking, and nature watching. These access points will remain open to the extent that public safety is assured.

Acquisition for Project Lands

The final land requirement for this project will be established during the early stages of the detailed design phase. Approximately 1,900 acres of land are needed for the C-11 Impoundment which is located northeast of the intersection of US Highway 27 and

C-11 Canal in Broward County. Its footprint is contained within the Cell 11 footprint. The impoundment extends south from approximately the middle of Sections 14 and 15 within the Cell 11 footprint to the C-11 Canal and east of US Highway 27.

All lands referenced above will assist in recharging of ground water.

ELIGIBLE CERP PROJECTS

P6 - Wastewater Reuse Technology - Pilot Project (West Palm Beach and Miami-Dade Counties)

Currently, two projects involve the advanced treatment of wastewater. This pilot project will address water quality issues associated with discharging reclaimed water into natural areas such as the West Palm Beach Water Catchment Area, Biscayne National Park, and the Bird Drive Basin as well as determine the level of superior treatment and the appropriate methodologies for that treatment. A series of studies will be conducted to help determine the level of treatment needed.

Pilot facilities will be constructed to determine the ecological effects of using superior, advanced treated reuse water to replace and augment freshwater flows to Biscayne Bay and to determine the level of superior, advanced treatment required to prevent degradation of freshwater and estuarine wetlands and Biscayne Bay. The constituents of concern in wastewater will be identified and the ability of superior, advanced treatment to remove those constituents will be determined.

In addition, a pilot facility will be constructed to treat wastewater from the East Central Regional Wastewater Treatment Facility using advanced and superior wastewater treatment processes to remove nitrogen and phosphorus. After treatment, the wastewater will be used to restore 1,500 acres of wetlands and to recharge wetlands surrounding the City of West Palm Beach's wellfield.

A portion of the treated wastewater will be used to recharge a residential lake system surrounding the City's wellfield and a Palm Beach County wellfield. Besides serving as a pilot project for wetlands based water reclamation this project will reduce a portion of the City's dependence on surface water from Lake Okeechobee during dry or drought events. In addition, approximately 2,000 acres of wetlands would be created or restored. Other benefits include aquifer recharge and replenishment, reduction of water disposed in depe injection wells and a reduction of stormwater discharge to tide.

17a - Pal-Mar and J.W. Corbett Wildlife Management Area Hydropattern Restoration (OPE)

This element includes water control structures, canal modifications and the acquisition of 3,000 acres located between Pal-Mar and the J.W. Corbett Wildlife Management Area in Palm Beach County.

The purpose of this separable element is to provide hydrologic connections between the Corbett Wildlife Management Area and: (1) the Moss Property, (2) the C-18 Canal, (3) the Indian Trail Improvement District, and (4) the L-8 Borrow Canal, in addition to extending the spatial extent of protected natural areas. These connections would relieve the detrimental effects on native vegetation frequently experienced during the wet season and form an unbroken 126,000-acre greenbelt extending from the Dupuis Reserve near Lake Okeechobee across the J.W. Corbett Wildlife Management Area and south to Jonathan Dickinson State Park.

17b - C-51 and Southern L-8 Reservoir (K - Part 1 and GGG)

This separable element includes a combination above ground and in-ground reservoir. The project has a total storage capacity of 48,000 acre-feet located immediately west of the L-8 Borrow Canal and north of the C-51 Canal in Palm Beach County. Other construction projects include ASR wells with a capacity of 50 million gallons per day and associated pre-and post-water quality treatment to be constructed in the City of West Palm Beach (Lake Mangonia), a series of pumps, water control structures and canal capacity improvements in the M Canal. The initial design for the reservoir assumed a 1,800-acre reservoir with 1,200 of usable acres and water levels fluctuating from 10 feet above grade to 30 feet below grade. The final size, depth and configuration of this facility will be determined through more detailed planning and design. The initial design of the wells assumed 50 wells, each with a capacity of 5 million gallons per day with chlorination for pre-treatment and aeration for post-treatment. The level and extent of treatment and number of the ASR wells may be modified based on findings from a proposed ASR pilot project.

The purpose of this separable element is to increase water supply availability and flood protection for northern Palm Beach County areas. It will also provide flows to enhance hydroperiods in the Loxahatchee Slough, increase baseflows to the Northwest Fork of the Loxahatchee River and reduce high discharges to the Lake Worth Lagoon.

Water will be pumped into the reservoir from the C-51 Canal and Southern L-8 Borrow Canal during the wet season, or periods when excess water is available, and returned to the C-51 and Southern L-8 during dry periods. Additional elements will also direct excess water into the West Palm Beach Water Catchment Area. During periods when the West Palm Beach Water Catchment Area is above desirable stages, 50 million gallons per day will be diverted to Lake Mangonia for storage in the ASR wells. The reservoir portion of this component may be implemented under a previous authorization.

17e - C-51 Back-pumping and Treatment (Y)

This separable element includes backpumping facilities and a stormwater treatment area with a total storage capacity of approximately 2,400 acre-feet located in Palm Beach County. The initial design for the stormwater treatment area assumed 600 acres in size with the water levels fluctuating up to four feet above grade. The final size, depth and configuration of this facility will be determined through more detailed planning

and design, and will address appropriate pollution load reduction targets necessary to protect receiving waters (West Palm Beach Water Catchment Area).

The purpose of this separable element is to increase water supplies to the West Palm Beach Water Catchment Area and Loxahatchee Slough by capturing and storing excess flows currently discharged to the Lake Worth Lagoon from the C-51 Canal.

Excess C-51 Canal water will be backpumped through existing and proposed water control structures and canals to the stormwater treatment area which will provide water quality treatment prior to discharge into the West Palm Beach Water Catchment Area.

19a - Acme Basin B Discharge (OPE)

This separable element includes construction of a wetland or chemical treatment area and a storage impoundment with a combined total storage capacity of 3,800 acre-feet located adjacent to the Loxahatchee National Wildlife Refuge in Palm Beach County. The initial design for the treatment area and impoundment assumed 310 acres with water levels fluctuating up to 4 feet above grade and 620 acres with the water levels fluctuating up to 8 feet above grade. The final size, depth and configuration of these facilities will be determined through more detailed planning and design.

The purpose of this separable element is to provide water quality treatment and stormwater attenuation for runoff from Acme Basin "B" prior to discharge to the Loxahatchee National Wildlife Refuge or alternative locations described below. Excess available water may be used to meet water supply demands in central and southern Palm Beach County.

Stormwater runoff from Acme Basin "B" will be pumped into the wetland treatment area and then into the storage reservoir until such time as the water can be discharged into the Loxahatchee National Wildlife Refuge. If water quality treatment criteria is not met then water will be discharged into one of two alternative locations: the Palm Beach County Agricultural Reserve Reservoir (VV) or the combination above ground and in-ground reservoir area located adjacent to the L-8 Borrow Canal and north of the C-51 Canal (GGG).

19b - Protect and Enhance Existing Wetland Systems along Loxahatchee National Wildlife Refuge including the Strazzulla Tract (OPE)

This separable element includes water control structures and the acquisition of 3,335 acres located in Palm Beach County. The purpose of this separable element is to provide a hydrological and ecological connection to the Loxahatchee National Wildlife Refuge and expand the spatial extent of protected natural areas. This land will act as a buffer between higher water stages to the west and lands to the east that must be drained. This increase in spatial extent will provide vital habitat connectivity for species that

require large unfragmented tracts of land for survival. It also contains the only remaining cypress habitat in the eastern Everglades and one of the few remaining sawgrass marshes adjacent to thecoastal ridge. This is a unique and endangered habitat that must be protected. This are provides an essential Everglades landscape heterogeneity function.

19c - Hillsboro Site 1 Impoundment (M - Part 1)

This separable element includes an above ground reservoir with a total storage capacity of approximately 15,000 acre-feet located in the Hillsboro Canal Basin in southern Palm Beach County. The initial design of the reservoir assumed 2,460 acres with water levels fluctuating up to 6 feet above grade. The final size, depth and configuration of these facilities will be determined through more detailed planning and design to be completed as a part of the Water Preserve Areas Feasibility Study.

The purpose of this separable element is to supplement water deliveries to the Hillsboro Canal during dry periods thereby reducing demands on Lake Okeechobee and the Loxahatchee National Wildlife Refuge. Water from the Hillsboro Canal will be pumped into the reservoir during the wet season or periods when excess water is available. Water will be released back to the Hillsboro Canal to help maintain canal stages during the dry-season.

19e - C-9 Stormwater Treatment Area/Impoundment (R)

This separable element includes canals, levees, water control structures and a stormwater treatment area/impoundment with a total capacity of approximately 10,000 acre-feet, located in the western C-9 Basin in Broward County. The initial design of the stormwater treatment area/impoundment assumed 2,500 acres with water levels fluctuating up to 4 feet above grade. The final size, depth and configuration of these facilities will be determined through more detailed planning and design to be completed as a part of the Water Preserve Areas Feasibility Study and will address appropriate pollution load reduction targets necessary to protect receiving waters.

The purpose of this separable element is to provide treatment of runoff stored in the North Lake Belt Storage Area, enhance groundwater recharge within the basin, maintain seepage control for Water Conservation Area 3 and buffer areas to the west, and provide flood protection for the western C-9 Basin. Seepage from the C-9 Stormwater Treatment Area/Impoundment will be collected and returned to the impoundment.

19f- Dade-Broward Levee/Pennsuco Wetlands (BB)

This separable element includes water control structures and modifications to the Dade-Broward Levee and associated conveyance system located in Miami-Dade County. The final size and configuration of these facilities will be determined through more detailed planning and design to be completed as a part of the Water Preserve Areas Feasibility Study.

The purpose of this separable element is to reduce seepage losses to the east from the Pennsuco Wetlands and southern Water Conservation Area 3B, enhance hydroperiods in the Pennsuco Wetlands, and provide recharge to Miami-Dade County's Northwest Wellfield.

19g -Eastern C-4 Control Structure (T)

This separable element consist of one water control structure located in the C-4 Canal in Miami-Dade County. The purpose of this separable element will be to enhance wetland hydroperiods and enhance recharge to several nearby wellfields.

The eastern structure will be operated to reduce regional system deliveries by diverting dry season stormwater flows to the C-2 Canal to provide salt water intrusion protection and recharge to downstream wellfields. A western structure, being implemented under the Critical Projects Program, will be operated to control water levels in the C-4 Canal at a higher elevation to reduce seepage losses from the Pennsuco Wetlands and areas to the west of the structure.

19h - Bird Drive Recharge Area (U)

This separable element includes pumps, water control structures, canals, and an above ground recharge area with a total storage capacity of approximately 11,500 acre-feet located in western Miami-Dade County. The initial design of the recharge facility assumed 2,877 acres with the water level fluctuating up to 4 feet above grade. Final design will seek to enhance and maintain the continued viability of wetlands within the basin. The final size, depth and configuration of these facilities including treatment requirements will be determined through more detailed planning and design to be completed as a part of the Water Preserve Areas Feasibility Study and will address appropriate pollution load reduction targets necessary to protect downstream receiving surface waters.

The purpose of the separable element is to recharge groundwater and reduce seepage from the Everglades National Park buffer area by increasing water table elevations east of Krome Avenue. The facility will also provide C-4 flood peak attenuation and water supply deliveries to the South Dade Conveyance System and Northeast Shark River Slough.

Inflows from the western C-4 Canal Basin and from the proposed West Miami-Dade Wastewater Treatment Plant will be pumped into the Recharge Area. Inflows from the wastewater treatment plant will stop when the Recharge Area depth exceeds three feet above ground and will be diverted to a deep well injection disposal system. Recharge area outflows will be prioritized to meet: 1) groundwater recharge demands, 2) South Dade Conveyance System demands and 3) Northeast Shark River Slough demands when supply is available. Regional system deliveries will be routed through the seepage collection canal system of the Bird Drive Recharge Area to the South Dade Conveyance system.

20 - Palm Beach County Agricultural Reserve Reservoir Project (VV - Part 1)

This project includes an above ground reservoir with a total storage capacity of approximately 20,000 acre-feet located in the western portion of the Palm Beach County Agricultural Reserve. The initial design for the reservoir assumed 1,660 acres with water levels fluctuating up to 12 feet above grade. The final size, depth and configuration of these facilities will be determined through more detailed planning and design.

The purpose of this project is to supplement water supply deliveries for central and southern Palm Beach County by capturing and storing excess water currently discharged to the Lake Worth Lagoon. These supplemental deliveries will reduce demands on Lake Okeechobee and the Loxahatchee National Wildlife Area. It is assumed that this facility could also be designed to achieve water quality improvements in downstream receiving waters, depending upon pollutant loading conditions in the watershed.

The reservoir will be filled during the wet season with excess water from the western portions of the Lake Worth Drainage District and possibly from Acme Basin B. Water will be returned to the Lake Worth Drainage District canals to help maintain canal stages during the dry-season. If water is not available in the reservoir, existing rules for water delivery to this region will be applied.

24 - Broward County Secondary Canal System Project (CC)

This project includes a series of water control structures, pumps, and canal improvements located in the C-9, C-12 and C-13 Canal Basins and east basin of the North New River Canal in central and southern Broward County.

The purpose of this project is to reduce water discharges by recharging local wellfields and stabilizing the saltwater interface. Excess water in the basins will be pumped into the coastal canal systems to maintain canal stages at optimum levels. When basin water is not sufficient to maintain canal stages, the canals will be maintained from other construction projects such as the (Site1) Impoundment and the North Lake Belt Storage Area and then from Lake Okeechobee and the Water Conservation Areas.

29 - C-111N Spreader Canal Project (WW)

This project includes levees, canals, pumps, water control structures, and a stormwater treatment area to be constructed, modified or removed in the Model Lands and Southern Glades (C-111 Basin) area of Miami-Dade County. This project enhances the C-111 Project design for the C-111N Spreader Canal with the construction of a stormwater treatment area, the enlarging of Pump Station S-332E and the extension of the canal under U.S. Highway 1 and Card Sound Road into the Model Lands. The initial design of this project pumps water from the C-111 and the C-111E Canals into a stormwater treatment area prior to discharging to Southern Everglades and Model Lands. This projects also calls for filling in the southern reach of the C-111 Canal and removal of structures S-18C and S-

197. The final size, depth, location and configuration of this project will be determined through more detailed planning and design.

The purpose of this project is to improve deliveries and enhance the connectivity and sheetflow in the Model Lands and Southern Glades areas, reduce wet season flows in C-111, and decrease potential flood risk in the lower south Miami-Dade County area.

Chapter 10
FLORIDA BAY AND THE KEYS REGION

PHYSICAL CONDITIONS - FLORIDA BAY

Florida Bay and the Ten Thousand Islands comprise 1,500 square miles of Everglades National Park. The bay is shallow, with an average depth of less than three feet. To the north is the Florida mainland and to the south lie the Florida Keys. Sheetflow across marl prairies of the southern Everglades and 20 creek systems fed by Taylor Slough and the C-111 Canal provide direct inflow of fresh surface water and ground water recharge. Surface water from Shark River Slough, the subregion's largest drainage feature, flows into Whitewater Bay and also may provide essential ground water recharge for central and western Florida Bay. Exchange with Florida Bay occurs as this lower salinity water mass flows around Cape Sable into the western subregion of the bay.

EXISTING CONDITIONS - EVERGLADES NATIONAL PARK AND FLORIDA BAY WATER MANAGEMENT

The Everglades National Park Drainage Basin is described in Cooper and Roy, 1991. The Everglades National Park Drainage Basin has an area of 1684.5 square miles and is located in western Miami-Dade County (886.5 square miles), northwestern Monroe County (773.9 square miles) and southwestern Collier County (24.1 square miles) (Cooper and Roy, 1991). The basin includes all of Everglades National Park, the Everglades National Park expansion area, the remainder of the eastern Everglades and portions of the southern Glades Wildlife Environmental Area.

Internal Project Structures

The drainage basin for Everglades National Park represents primarily undeveloped land managed for the park and its inflows. Central and South Florida Project structures are generally external to the basin and installed primarily for environmental purposes for the park or to separate drainage between the park and the area to the east of the L-31N and L-31. There are six project structures internal to this basin: the L-67 Extension, the plug in the Buttonwood Canal, S-175, S-332, S-346, and S-347. The L-67 Extension was installed to separate the portions of Everglades National Park, Western Shark Slough from the privately owned lands east, which included the northeastern portions of Shark Slough. The associated canal serves as a getaway channel allowing water to move away from the S-12 structures (Cooper and Roy, 1991). The Buttonwood Canal plug was installed at the mouth of the Buttonwood Canal on Florida Bay to prevent further intrusion of saltwater and improve conditions upstream of the canal. The S-175 and S-332 are used to deliver water to Taylor Slough, while S-346 and S-347 are used to control flow in the L-67 Extension.

External Project Inflows

Managed inflows to Everglades National Park are from the eastern farmland and from the north as an outlet of Water Conservation Areas (WCA) 3A and 3B. The managed flows delivered from WCA-3A through the S-12 structures, S-333, and from WCA-3B through G-69. Other inflow points include the L-31W Borrow Canal through S-332 and S-175 and from the C-111 between S-18C to S-197 as overland flow though the degraded canal berm into the panhandle of Everglades National Park.

Project Structures Controlling Inflow

Project structures controlling flow to the Everglades National Park Basin include: S-12A, S-12B, S-12C, S-12D, G-69, S-175, S-18C, S-197, S-332, S-333, and S-334. There are two internal structures controlling flow (S-346 and S-347), which control flow in Buttonwood Canal. There are three project structures, which are located in the basin but are not currently operated; the S-12E, S-12F, and S-14. The S-12A, S-12B, S-12C, and S-12D are identical gated spillways located in the L-29 between L-28 and L-67. They connect WCA-3A to the Everglades National Park Basin. The first connection between WCA-3A and the south Miami-Dade canals occurred in 1978 with the completion of structures S-333 and S-334 in the L-29 Canal. These structures were installed to provide additional dry season water deliveries to L-31N. Structure G-69 connects WCA-3B to the Everglades National Park Basin via the L-29 Canal. Project works are largely peripheral to the Everglades National Park Basin and have as their primary function providing a supply of water to the basin.

FUTURE WITHOUT PLAN CONDITION - WATER QUALITY - FLORIDA BAY

Both the Modified Water Deliveries to Everglades National Park and C-111 projects are assumed to be completed in the future without plan condition. The first project to be implemented is the C-111 Project. Notably, the C-111 spoil (dredged material) mounds in the marsh on the southern leg of the C-111 Canal were removed in 1997. The purpose of this project was to promote overland flow out of the canal into the marshes in the northeastern part of Florida Bay. In addition, two other features of the C-111 Project are scheduled to be completed in the near future which would beneficially affect water quality in Florida Bay. A new pump station, S-332D, is scheduled to begin operations to deliver increase stages in the L-31W Borrow Canal, preventing seepage from Everglades National Park from draining east into the canal network and downstream to tide. Operation of S-332D is intended to promote overland flow during high water conditions. Also, the existing single-span bridge over Taylor Slough in Everglades National Park is to be replaced with two longer-span bridges and two box culverts. Removing sections of an existing fill road (Ingraham Highway) across Taylor Slough will augment the bridge replacement project.

Furthermore, agricultural nonpoint pollution sources in the C-111 Basin are currently being investigated as required by the non-Everglades Construction Project

(ECP) structure requirements of the Everglades Forever Act and the C-111/Modified Water Deliveries projects implementation process.

FUTURE WITHOUT PLAN CONDITION - PHYSICAL FACILITIES AND OPERATIONS - EMERGENCY INTERIM PLAN

Legislation known as the Emergency Interim Plan for Florida Bay (Chapter 373.4593 F.S.) was passed by the Florida Legislature in May of 1994. Its purpose was to:

> Provide for the release of water into Taylor Slough and Florida Bay by up to 800 cfs, in order to optimize the quantity, timing, distribution, and quality of fresh water, and promote sheetflow into Taylor Slough.

Section 2(e) called for acquisition of the western three sections of the agricultural area known as the Frog Pond in Miami-Dade County. The South Florida Water Management District (SFWMD) took title to all eight sections of the Frog Pond in February of 1995. This effectively became Phase 1 of the Emergency Interim Plan, as the acquisition of this land eliminated land use conflicts between Everglades National Park and farming occurring in the Frog Pond. Elimination of these conflicts prevented the unnatural reduction in canal stages that had previously taken place each year in the fall to facilitate those farming activities. In addition, it allows greater flexibility in implementation of a rainfall driven plan for water levels in L-31W.

Phase 2 of the Emergency Interim Plan was designed to provide additional pumping capability into the L-31W Canal, which formed the western boundary of the Frog Pond. Pump Station S-332D (C-111 Project and Experimental Program of Water Deliveries to Everglades National Park) was built for this need and increased pumpage to 500 cfs.

WATER QUALITY PROBLEMS AND OPPORTUNITIES - FLORIDA BAY

Barnes Sound is the only segment of Florida Bay included on the Florida Department of Environmental Protection (FDEP) 1998 303(d) list. Excessive nutrients, chlorides, and low dissolved oxygen (DO) were identified as constituents of concern in ambient water quality monitoring. Other areas of Florida Bay also experience periodic water quality problems. Salinity is the primary water quality parameter of concern in the bay. Bay waters are periodically hypersaline or too low in salinity, depending upon the frequency of hurricanes and other significant storm events and flood release discharges from Central and Southern Florida Project features. Advective conditions in the bay have also contributed to extensive algal blooms. Water temperature levels are also periodically elevated above prescribed temperature limitations. Seatrout collected from Florida Bay also exhibit elevated mercury levels.

Water quality conditions in northeastern Florida Bay should improve in 2050 compared to existing (1995) conditions. Full implementation of the Biscayne Bay SWIM Plan elements should also benefit water quality conditions in Florida Bay also. When fully completed, it is anticipated that the C-111 Project would improve water quality conditions in the vicinity of Taylor Slough through the implementation of structural and operational modifications necessary to achieve preferred hydrologic conditions. It is expected that the net load of agricultural nonpoint source pollution entering the C-111 Canal and south into Florida Bay will be reduced in 2050 compared to existing conditions. The Modified Water Deliveries to Everglades National Park Project is also expected to result in water quality improvements in Florida Bay through the delivery of increased volumes of fresh water to the bay via Northeast Shark River Slough.

LAND USE - EVERGLADES NATIONAL PARK AND FLORIDA BAY

As the region has grown its land use patterns have dramatically changed. In South Florida the character of the land has acted as one of the constraints dictating early settlement patterns. Topography, soils, and aquifer maps illustrate the vulnerability of South Florida to inundation. On the east coast, the Atlantic Coastal Ridge and associated pine rocklands, due to its higher elevation and more stable soils, were the first to develop. As the coastal ridge developed and available lands were depleted (particularly over the last few decades), other less suitable lands were developed in the sprawl pattern characteristic of current day South Florida.

Agriculture

Little or no agricultural production takes place in these regions, which includes Everglades National Park, Florida Bay, the Ten Thousand Islands, and Whitewater Bay. However, water management decisions made for these regions may affect other regional farmland and should, therefore, be considered carefully.

PHYSICAL CONDITIONS - FLORIDA KEYS

The Florida Keys are a limestone island archipelago extending southwest over 200 miles from the southern tip of the Florida mainland to the Dry Tortugas, 63 miles west of Key West. They are bounded on the north and west by the relatively shallow waters of Biscayne Bay, Barnes and Blackwater sounds, Florida Bay (all areas of extensive mud shoals and seagrass beds) and the Gulf of Mexico. Hawk Channel lies to the south, between the mainland Keys and an extensive reef tract 5 miles offshore. The Straits of Florida lie beyond the reef, separating the Keys from Cuba and the Bahamas.

The Florida Keys are made up of over 1,700 islands encompassing approximately 103 square miles. They are broad, with little relief, have a shoreline length of 1,865 miles, and are inhabited from Soldier Key to Key West. Key Largo and Big Pine Key are the largest islands. The Keys are frequently divided into the following three regions:

1. the Upper Keys (north of Upper Matecumbe Key)
2. the Middle Keys (from Upper Matecumbe Key to the Seven Mile Bridge)
3. the Lower Keys (from Little Duck Key to Key West)

The Florida Keys National Marine Sanctuary encompasses approximately 3,668 square miles of submerged lands and waters between the southern tip of Key Biscayne and the Dry Tortugas Bank. North of Key Largo the sanctuary includes Barnes and Card sounds, and to the east and south the oceanic boundary is the 300-foot isobath. The Florida Keys National Marine Sanctuary also contains part of Florida Bay and the entire Florida Reef Tract, the largest reef system in the continental United States. The Florida Keys National Marine Sanctuary contains components of five distinct physiographic regions: Florida Bay, the Southwest Continental Shelf, the Florida Reef Tract, the Florida Keys, and the Straits of Florida. The regions are environmentally and lithologically unique, and together they form the framework for the sanctuary's diverse terrestrial and aquatic habitats.

EXISTING CONDITIONS - FLORIDA KEYS WATER MANAGEMENT

There is no overall surface water management canal infrastructure in the Florida Keys. The C&SF canal system has very little influence on the Florida Keys, except in the estuarine areas of Florida Bay, where it controls the amount and timing of freshwater releases into the estuaries.

FUTURE WITHOUT PLAN CONDITION - WATER QUALITY - FLORIDA KEYS

The major ongoing water quality improvement program in the Florida Keys, which is expected to result in improved water quality conditions in the future, is the Water Quality Protection Program of the Florida Keys National Marine Sanctuary Program. The U.S. Environmental Protection Agency (USEPA) and the FDEP are jointly responsible for implementing water quality improvement activities throughout the Florida Keys Region as part of the Water Quality Protection Program. Implementation of these activities will result in improved water quality conditions in the Florida Keys in the future.

WATER QUALITY PROBLEMS AND OPPORTUNITIES - FLORIDA KEYS

The Florida Keys as a whole were identified as having use-impaired water quality on the FDEP 1998 303(d) list; however, water quality problems are generally restricted to canals, marina basins, and nearshore waters as opposed to adjacent open waters. The principal pollutants of concern are excessive nutrient loading and fecal coliform bacteria

from inadequate wastewater treatment and disposal facilities, although low DO levels are also common in canals of the Florida Keys.

Due to recently imposed growth management regulations and limitations on expanded urban development, the population of the Keys is not expected to greatly increase by 2050. In addition, the Florida Keys National Marine Sanctuary Plan (National Oceanic and Atmospheric Administration, 1996) contains a Water Quality Protection Program developed by the USEPA (USEPA, 1996) in cooperation with the Administration and the FDEP. The Water Quality Protection Program Document, approved in 1996, contains a set of initial recommendations for corrective actions, monitoring, research, and education/outreach. These recommendations have been included in a Water Quality Action Plan focusing on wastewater, stormwater, marinas and live-aboard vessels, landfills, hazardous materials, mosquito spraying, canals and research and monitoring. If the recommended wstewater and stormwater corrective actions are implemented, water quality conditions in the Florida Keys Region are expected to be improved in 2050 compared to existing conditions.

The USEPA, other federal, state and local agencies and citizen stakeholders have identified wastewater infrastructure as the single most important investment to improve nearshore and canal water quality. The cost of wastewater improvements necessary to improve nearshore and canal water quality in the Florida Keys has been estimated at between $184 to $418 million, depending on the percentage reduction in wastewater nutrient loadings to be achieved and which treatment system or systems are ultimately selected. Improvements of stormwater management in the area of the Florida Keys is also needed. The cost of stormwater management and treatment necessary to reduce pollutant loadings in the Florida Keys is estimated at between $370 to $680 million, depending on the percentage reduction in stormwater pollutant loadings targeted to be achieved and which areas are selected to be retrofitted. Water quality improvements in Florida Keys canals and nearshore areas are expected to result from improved wastewater collection, treatment, and disposal implemented through the Monroe County Wastewater Master Plan and through implementation of the Monroe County Stormwater Master Plan, both of which are major components of the Water Quality Protection Program.

LAND USE - FLORIDA KEYS

In 1975, Florida designated Monroe County an Area of Critical State Concern under the authority of Chapter 380, F.S. This legislation was designed to preserve and protect the county's unique natural resources, which were being degraded by large development projects. It gave the State Department of Community Affairs (DCA) the responsibility of overseeing all development activities within the designated area. The legislation required both the drafting of a comprehensive plan and development regulations designed to set the county's growth-management standards, over which the state has final review and approval.

Significant features of the plan include the "down-zoning" of large natural areas (excluding Key West, Key Colony Beach, and Layton), and the establishment of the

Monroe County Land Authority, which is responsible for purchasing these down-zoned areas. The plan was also designed to preserve the contiguous areas of habitat as biologically functional units, specifying that required open-space areas may not be altered. It also contained the rudiments of the concept of "concurrency," which requires that a project cannot be completed without the public infrastructure necessary to support it.

Monroe County and its sister municipalities are currently revising their comprehensive plans under Chapter 163, F.S. In general, Chapter 163 legislates more specific standards, significantly expands the concept of concurrency, and allows the local government to set a "level of service" for hurricane evacuation that cannot be exceeded as a result of new development. However, because the county is an Area of Critical State Concern, the county must still meet the standards of Chapter 380, F.S.

Existing Land Use

The inhabited Keys make up only five percent of Monroe County's total land area (65,500 of 1.2 million acres). The county also contains over 99,000 acres of the Everglades, but this area is almost entirely within Everglades National Park and Big Cypress National Preserve. The majority of the county, consequently, is classified as "conservation land."

Within the county, the unincorporated area is distinguished from the four incorporated areas of Key West, Key Colony Beach, Layton, and Islamorada. Within the unincorporated area, land use is also apportioned differently between the Upper, Middle, and Lower Keys. The types of land use can be defined as residential, commercial, industrial, or public facilities and buildings; historical buildings and districts; military facilities; and recreation, conservation, and vacant land.

Residential Land

The portion of land used for residential purposes ranges from 12 percent in the Lower Keys to 58 percent in Key Colony Beach. The small percentage of residential use in the Lower Keys is due to the high proportion of conservation land, primarily in the National Key Deer Refuge. The relatively high proportion of residential development in Key Colony Beach reflects the city's reliance on Marathon for commercial and other use categories. Within the unincorporated area, the majority of residential development (78 percent) consists of single- family units. The unincorporated area also has the majority of the county's mobile homes, although the total area is relatively small. The cities of Key West and Key Colony Beach have substantial duplex development. In the city of Key West, the single-family/duplex zoning category accounts for 62 percent of all residential area. Key Colony Beach has similar percentages.

Commercial Land

The proportion of commercial land in each area is similar, although there are significant differences between the Upper, Middle, and Lower Keys. In general,

commercially zoned land accounts for about four percent of land-use acreage within the Keys. The Middle Keys contain significantly higher proportions because of the large amount of commercial land in Marathon. The lower levels in the Lower Keys reflect the large amount of refuge conservation land.

Industrial Land

The cities of Key West, Key Colony Beach, and Layton contain no significant industrial development, and rely on the adjacent unincorporated areas for their industrial needs. Two industries, rock mining and marine repair and salvage define industrial use in the Keys. The majority of rock mining operations are in Stock Island and Marathon. Other small-scale industrial businesses are located in Stock Island, Big Pine Key, Marathon, and Key Largo.

Public Facilities and Buildings

As much as eight percent of Key West is allocated to public buildings and facilities (excluding recreational uses), while the unincorporated area, Key Colony Beach, and Layton provide one percent or less.

Historic Buildings and Districts

Within the cities of Key Colony Beach and Layton, and in the unincorporated areas of the Keys, virtually no acreage is allocated for historical lands. There are, however, historic structures and buildings outside Key West, including those on Pigeon Key and the Carysfort Light off North Key Largo, both of which are listed, in the National Register of Historic Places. The city of Key West also considers large areas of "old town" historic and, as a result, requires additional permits before allowing development. In addition, the City has established a Historic Architectural Review Commission to ensure that the traditional character and appearance of the area is maintained.

Military Facilities

Military facilities are located exclusively in Key West and the Lower Keys. About 25 percent of Key West's land is used for military purposes. In the Lower Keys there are three military facilities that make up five percent of all land in the unincorporated area.

Recreational Facilities

The city of Key West provides about seven percent of its land area for recreational purposes, while the Lower and Upper Keys provide less than two percent each. The Middle Keys provide 11 percent, Key Colony Beach nine percent, and Layton none. These numbers may be somewhat misleading, however, as they are derived primarily from a list of publicly and privately owned lands that provide recreational activities. Many private

owners of resort areas provide recreational facilities geared toward water activities that include swimming pools and/or tennis courts.

Conservation Land

Conservation land makes up about 34 percent of all unincorporated land use within the Keys. The largest proportion is in the Lower Keys, and is associated with the National Key Deer and Great White Heron refuges (28 percent). In the Upper Keys (51 percent), conservation land is located primarily in North Key Largo. The cities of Layton and Key Colony Beach have no conservation land. Within the city of Key West, conservation land is undeveloped and categorized as open water, freshwater islands, tidal wetlands, mangrove, and hammock. Some of the land is in private ownership and, therefore, could be subject to future development. However, substantial areas around the "Salt Ponds" area of Key West have been (and are currently being) acquired by the Monroe County Land Authority. A total of 550 acres remains undeveloped in Key West.

Vacant Land

About 210,000 acres of land are potentially available for development, representing just over 34 percent of the Keys' total land area. In the unincorporated area of the county, vacant land is the largest land-use category. Ten percent of the county's vacant land is divided into nearly 15,000 vacant lots. These lots represent the only reasonably buildable property remaining in the Keys, and make up a substantial proportion of the total potential single-family development area.

Florida Reef Tract

The Florida Reef Tract is an arcuate band of living coral reefs paralleling the Keys. The reefs are located on a narrow shelf that drops off into the Straits of Florida. The shelf slopes seaward at a 0.06 degree angle into Hawk Channel, which is several miles wide and averages 50 feet deep. From Hawk Channel, the shelf slopes upward to a shallower area containing numerous patch reefs. The outer edge is marked by a series of bank reefs and sand banks that are subject to open tidal exchange with the Atlantic Ocean. The warm, clear, naturally low-nutrient waters in this region are conducive to reef development.

ELIGIBLE CERP PROJECTS

31 - Florida Keys Tidal Restoration Project (OPE)

This project includes the use of bridges or culverts to restore the tidal connection between Florida Bay and the Atlantic Ocean in Monroe County. The four locations are as follows: 1) Tarpon Creek, just south of Mile Marker 54 on Fat Deer Key (width 150 feet); 2) unnamed creek between Fat Deer Key and Long Point Key, south of Mile Marker 56 (width 450 feet); 3) tidal connection adjacent to Little Crawl Key (width 300 feet); and 4)

tidal connection between Florida Bay and Atlantic Ocean at Mile Marker 57 (width 2,400 feet).

The purpose of this project is to restore the tidal connection that was eliminated in the early 1900's during the construction of Flagler's railroad. Restoring the circulation to areas of surface water that have been impeded and stagnant for decades will significantly improve water quality, benthic floral and faunal communities, larval distribution of both recreational and commercial species (i.e., spiney lobster), and the overall hydrology of Florida Bay.

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Appendix A:
WMD FLORIDA FOREVER GOALS AND PERFORMANCE MEASURES

Southwest Florida Water Management District

2379 Broad Street, Brooksville, Florida 34604-6899
(352) 796-7211 or 1-800-423-1476 (FL only)
SUNCOM 628-4150 TDD only 1-800-231-6103 (FL only)
World Wide Web: http://www.swfwmd.state.fl.us

An Equal Opportunity Employer

Tampa Service Office
7601 Highway 301 North
Tampa, Florida 33637-6759
(813) 985-7481 or
1-800-836-0797 (FL only)
SUNCOM 578-2070

Bartow Service Office
170 Century Boulevard
Bartow, Florida 33830-7700
(863) 534-1448 or
1-800-492-7862 (FL only)
SUNCOM 572-6200

Venice Service Office
115 Corporation Way
Venice, Florida 34292-3524
(941) 486-1212 or
1-800-320-3503 (FL only)
SUNCOM 526-6900

Lecanto Service Office
3600 West Sovereign Path
Suite 226
Lecanto, Florida 34461-8070
(352) 527-8131
SUNCOM 667-3271

December 1, 2000

Mr. David B. Struhs, Secretary
Department of Environmental Protection
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399

Subject: Water Management Districts Florida Forever Goals and Performance Measures

Dear Secretary Struhs:

Pursuant to Section 373.1995, Florida Statutes, the state's water management districts hereby forward to you their Florida Forever Goals and Performance Measures.

This document was prepared jointly by the five water management districts working closely with the Florida Forever Advisory Council. It is based on a careful review of the goals and measures included in the original Florida Forever legislation and an evaluation of the outstanding priorities of the five districts for use of Florida Forever funds.

Each district is designing its Florida Forever Work Plan to meet the needs most pressing within that region of the State. Emphases vary between the districts but all program expenditures will be designed to meet as many of the overall statewide goals.

Please let us know if our staffs can assist in any way as this report, along with the report of the Florida Forever Advisory Council, is submitted to the Trustees of the Internal Improvement Trust Fund for approval.

Sincerely,

Douglas E. Barr
Executive Director
Northwest Florida WMD

Henry Dean
Executive Director
St Johns River WMD

Frank R. Finch, P. E.
Executive Director
South Florida WMD

Jerry Scarborough
Executive Director
Suwannee River WMD

E. D. "Sonny" Vergara
Executive Director
Southwest Florida WMD

Protecting Your Water Resources

WMD FLORIDA FOREVER GOALS AND PERFORMANCE MEASURES

The goals and measures in this document have been developed to guide the implementation of the Florida Forever program for the five water management districts. These goals and accompanying measures will be used to prepare an annual evaluation of the success of the program. Section 373.1995, Florida Statutes, directs that this set of goals and measures be forwarded to the Secretary of the Department of Environmental Protection and on to the Trustees of the Internal Improvement Trust Fund (Governor and Cabinet) for approval.

This document has been prepared jointly by the five water management districts working closely with the Florida Forever Advisory Council. It is based on a careful review of the goals and measures included in the original Florida Forever legislation and an evaluation of the outstanding priorities of the five districts for use of Florida Forever funds.

Each of the districts is designing its Florida Forever Work Plan (a separate statutory requirement) to meet the needs most pressing within that region of the State. Emphases vary between each district but all program expenditures will be designed to meet as many of the overall statewide goals as expressed in this document as practicable. Special note is made of the unique situation in south Florida where it is expected that most of the Florida Forever program revenues will be dedicated to implementing elements of the Comprehensive Everglades Restoration Plan. This is expected to skew the distribution of funding projects for the South Florida Water Management District and affect the extent to which other goals are met.

The Florida Forever program is anticipated to provide funding to address a significant number of water resource projects throughout the state over the coming decade. Land acquisition, restoration and water resource development projects will be accomplished to address priority needs for water management. These goals and measures will provide the framework to measure the accomplishments of the program statewide to demonstrate and account for the effectiveness and efficiency of the program.

This report is organized as a list of five overarching goals for the water management district implementation of the Florida Forever program. Following each goal, a set of measures and an accompanying description of how that measure will be accounted are presented.

GOAL A: PROTECT, RESTORE, AND MAINTAIN THE QUALITY AND NATURAL FUNCTIONS OF LAND, WATER, AND WETLAND SYSTEMS OF THE STATE.

Measure A1: Acres acquired that provide non-structural flood protection.

Description: Acres acquired in the 100-year floodplain as delineated by the Federal Emergency Management Agency, unless the WMD has better data

Measure A2: Acres acquired for the purpose of implementing restoration or flood protection projects.

Description: Acres acquired for the purpose of constructing capital improvements to provide water quality, environmental or flood protection benefits

Measure A3: Acres acquired that protect fragile coastal and estuarine shoreline resources.

Description: Acres acquired within detailed USGS subbasins classified as 'bay,' 'bayou,' 'lagoon,' or 'direct runoff to Gulf or bay,' or within remaining subbasins adjacent to the ocean or Gulf

Measure A4: Acres acquired for protection of water resource-related natural systems.

Description: Acres acquired that are in natural land cover, as identified by the following FLUCCS codes: all 6000s (wetlands) and 4000-4399 (upland forests)

Measure A5: Acres acquired for water resource benefits that protect working landscapes such as ranches and silvicultural areas.

Description: Acres acquired of improved pasture, range land, and planted pines, as identified by FLUCCS codes 2110, all 3000s, and all 4400s, respectively.

Measure A6: Acres of land for which a hydrologic restoration or enhancement plan has been implemented.

Description: Acres of land for which the activities in a hydrologic restoration or enhancement plan have been carried out by the WMD.

Measure A7: Percentage of the estimated acres of WMD land that need to be restored to natural communities, for which a restoration plan has been implemented.

Description: Percentage of acres of disturbed district-owned lands for which the activities in a restoration plan have been carried out. Disturbed land is identified by the following FLUCCS codes: all 1000s (urban and built-up); all 2000s (agriculture) except 2130 (woodland pasture); and 7400 (disturbed land). Improved pasture is excluded from 'disturbed District-owned lands' if the WMD does not intend to restore it. Planted pine (4400s) is included only when purchased for restoration to its natural state, e.g., conversion of slash pine to longleaf.

Measure A8: Percentage completion of WMD-targeted capital improvements in SWIM plans, regional or master stormwater management plans, or other WMD restoration or flood protection plans.

Description: Percentage of each WMD capital improvement project that has been completed

GOAL B: ENSURE THAT SUFFICIENT QUANTITIES OF WATER ARE AVAILABLE TO MEET THE CURRENT AND FUTURE NEEDS OF NATURAL SYSTEMS AND THE RESIDENTS OF THE STATE.

Measure B1: Acres acquired that provide retention and storage of surface water consistent with regional water supply plans.

Description: Acres acquired and used to retain water in natural storage areas or reservoirs to meet needs identified in a WMD regional water supply plan

Measure B2: Quantity of water made available through components of a regional water supply plan for which the WMD is responsible.

Description: Additional gallons of water available for use as a result of the implementation of WMD projects in a WMD regional water supply plan

Measure B3: Acres acquired of ground water recharge areas critical to springs, sinks, aquifers, other natural systems, or water supply.

Description: Acres of recharge areas acquired in, for example, groundwater basins feeding springs, watersheds containing sinkholes, or wellhead protection areas where water withdrawals or pollutants associated with potential development could be significantly harmful to wetlands or groundwater quality

GOAL C: INCREASE NATURAL RESOURCE-BASED PUBLIC RECREATIONAL AND EDUCATIONAL OPPORTUNITIES.

Measure C1: Acres acquired that are available for natural resource-based public recreation or education as measured in categories of relative degree of public access opportunities.

Description: Acres of WMD land in each category of the access classification system developed by the WMDs.

Measure C2: Number of new resource-based recreation or education facilities, by type, made available on WMD-owned land.

Description: Number of additional facilities of each of the following types provided: camp sites, miles of trail, parking areas, bathrooms, nature centers, kiosks, boat ramps, fishing piers, observation platforms, boardwalks, picnic areas

GOAL D: WHERE IT ACCOMPLISHES WATER RESOURCE PROTECTION AS A PRIMARY PURPOSE, INCREASE THE PROTECTION OF FLORIDA'S BIODIVERSITY AT THE SPECIES, NATURAL COMMUNITY, AND LANDSCAPE LEVELS.

Measure D1: Acres acquired of Strategic Habitat Conservation Areas (SHCAs).

Description: Acres acquired of land designated as SHCAs by the Fish and Wildlife Conservation Commission (FWC) in their 1994 report, *Closing the Gaps in Florida's Wildlife Habitat Conservation System*

Measure D2: Acres acquired of highest priority conservation areas for Florida's rarest species and communities.

Description: Acres acquired of land to be identified by the Florida Natural Areas Inventory (FNAI) to protect Florida's rarest natural communities and species

Measure D3: Acres acquired of significant landscapes, landscape linkages, and conservation corridors, giving priority to completing linkages.

Description: Acres acquired within the Ecological Network identified in the Florida Statewide Greenways System Planning Project

Measure D4: Acres acquired of native ecosystems under-represented in public ownership.

Description: Acres acquired of natural community types of which less than 15% of their original amount is publicly owned, as defined in *Florida Preservation 2000 Program Remaining Needs and Priorities Addendum Report*, 1997, and to be identified by FWC, FNAI, Division of State Lands, or the WMD

Measure D5: Number of landscape-sized protection areas that exhibit a mosaic of predominantly intact or restorable natural communities (>50,000 acres), established through new acquisition projects or augmentations to previous projects.

Description: Number of publicly owned conservation areas greater than 50,000 acres in size, achieved through a one-time acquisition of property or through acquisition of additions to existing public lands

GOAL E: ENHANCE THE COORDINATION AND COMPLETION OF LAND ACQUISITION PROJECTS.

Measure E1: Acres acquired that contribute to the completion of acquisition projects begun prior to Florida Forever.

Description: Acres acquired within the boundaries of projects that were partially completed under Preservation 2000 or another prior acquisition program

Measure E2: Acres protected through the use of alternatives to fee simple acquisition.

Description: Acres of less-than-fee interest in land acquired by the WMD

Measure E3: Number of shared acquisition projects among Florida Forever funding partners and partners with other funding sources; e.g., local governments and the federal government.

Description: Number of properties purchased jointly with other agencies, governments, or organizations such as private land trusts

Note: In all the Measures, 'acres acquired' means acquired by the WMD, and includes less-than-fee acquisitions.