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 (ENP) 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, including CERP projects, is shown on **Figure 1.**

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.

The following sections provide details on each of the regions that comprise this large study area. The Comprehensive Everglades Restoration Plan (CERP) Guidance Memorandum 012.00 defines the following set of regions:

1. Kissimmee River Region
2. Lake Okeechobee Region
3. Lower West Coast Region
4. Upper East Coast Region
5. Everglades Agricultural Area (EAA) Region
6. Everglades, Florida Bay and Keys Region
7. Water Preserve Areas Region
8. North Palm Beach County Region
9. Miami-Dade County Region

Note that the Kissimmee River Region is not a CERP region. It is included here because of the significance of the Kissimmee River Restoration project.

Comprehensive Everglades Restoration Plan Projects

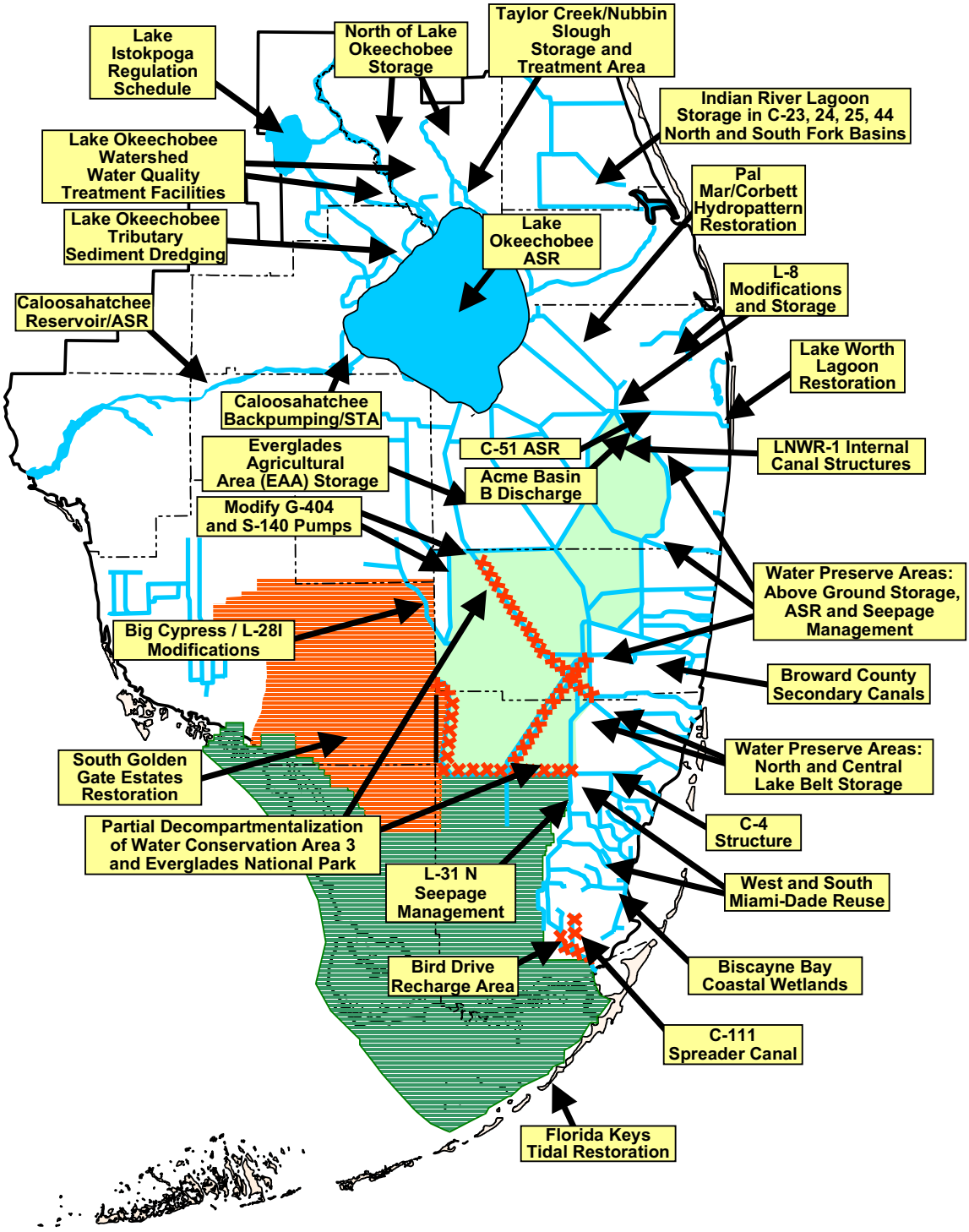

Figure 1. The Central and Southern Florida Flood Control Project Area.

FUTURE WITHOUT PLAN CONDITION - PHYSICAL FACILITIES AND OPERATIONS - THE CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL PROJECT (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 USACE to modify the project for environmental improvement. The chapters that follow list these and other projects.

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, (Public Law 92-500), are expected to result in improvements in regional water quality necessary to comply with state, tribal and local water quality standards. These water quality improvement actions are implemented by: the United States Environmental Protection Agency (USEPA); the Florida Department of Environmental Protection (FDEP); the South Florida Water Management District (SFWMD or District); the Seminole and Miccosukee Tribes and local governments. 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 (Public Law 92-500). 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 (Section 373.451–459, Florida Statutes).

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."

In its 2000 report to the USEPA, FDEP identified 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. Several key water bodies in South Florida will receive priority for TMDL development, including Lake Okeechobee and the Indian River Lagoon (IRL).

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 IRL 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.

The following chapters summarize projected water quality problems and opportunities in study area subregions. Accurately projecting future water quality conditions in the study area is difficult, due to its vast scope, 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 CERP regions 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 CERP. 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 ENP and Big Cypress National Preserve (BCNP) 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 IRL, 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 includes 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 ENP, BCNP 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 immigration 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 was 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.

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 series of white papers on key science issues in South Florida. Various agencies, including elements of the U.S. Department of the Interior (USDOI) and the SFWMD are developing several science plans to supply the information needs for ecosystem restoration.

The science plan developed by the Florida Bay Interagency Working Group, initiated by ENP 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 organizations and a representative from the FDEP on CERP implementation teams.

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. As this is a federal project, the USACE will not be issuing 404 permits for this effort, rather, a 404(b)(1) evaluation will be performed.

INTERIM LAND MANAGEMENT

The SFWMD Interim Property Management Program is responsible for managing those properties acquired by the SFWMD for future CERP and other projects until such time as the land is needed for construction.

The goals of the Interim Property Management Program are to:

- Protect the natural resource
- Provide on-site management and security for SFWMD owned lands at a minimal cost
- Minimize SFWMD expenses by increasing revenue from non-governmental sources to off-set management, maintenance and resource protection costs
- Generate additional funding for future acquisition

- Minimize impacts to the local agricultural economy by keeping viable agricultural lands in active production for as long as possible
- Minimize fiscal impacts to the local government by keeping lands on the tax roll until they are actually needed for construction

Where appropriate, historical uses of properties, such as grazing, sod, vegetable and sugar cane farming, and nurseries and tree farms, are allowed to continue through the use of reservations, leases or similar agreements. Generally, a competitive bid process is used to solicit proposals and award contracts, which include appropriate cancellation clauses so the land can be quickly made available when it is needed. In some cases, short term leases (5 years or less) are negotiated as part of the acquisition package. Lessees are typically required to actively manage the property, control exotics, provide security for the property, implement applicable best management practices, keep the property and facilities in good repair and condition, obtain all required permits and approvals for their activities, maintain required insurance coverage and pay applicable taxes.

For those lands in their natural state and/or where some type of active interim use is inappropriate, due to the environmental sensitivity of the land, and/or the projected construction timetable for the project, the SFWMD either manages the lands or contracts with another governmental entity to have the lands managed. The SFWMD conducts regular inspections of all its properties on a semi-annual basis. Arrangements are made for exotic control, cleanup, security or other activities as needed.