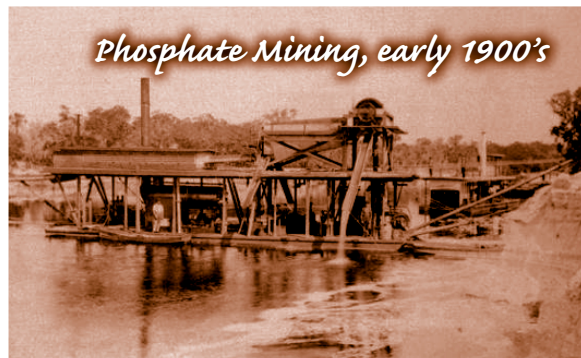
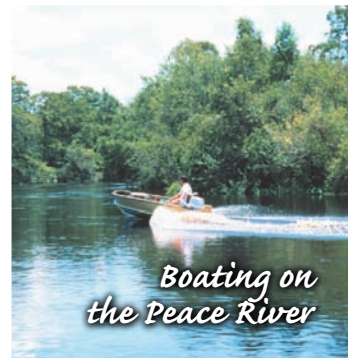


Peace River

Comprehensive Watershed Management Plan



2001
Volume II:
Strategic Action Plan

DRAFT

Southwest Florida
Water Management District



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Acronyms

AOR	Area of Responsibility
ASR	Aquifer Storage and Recovery
BMP	Best Management Practice
BMR	Bureau of Mine Reclamation
CFRPC	Central Florida Regional Planning Council
CHEC	Charlotte Harbor Environmental Center
CHNEP	Charlotte Harbor National Estuary Program
CWM	Comprehensive Watershed Management
D-BUG	Database Users Group
DRI	Development of Regional Impact
ERP	Environmental Resource Permit
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency
FFWCC	Florida Fish and Wildlife Conservation Commission
FIPR	Florida Institute of Phosphate Research
FIRM	Federal Insurance Rate Map
FPCI	Flood Protection Coordination Initiative
GIS	Geographic Information System
LOS	Level of Service
MFLs	Minimum Flows and Levels
mgd	million gallons per day
mi ²	square miles
O&M	Operation and Maintenance
PLRG	Pollution Load Reduction Goal
PRBB	Peace River Basin Board
SWFRPC	Southwest Florida Regional Planning Council
SWFWMD	Southwest Florida Water Management District
SWCFGWB	Southern West-Central Florida Groundwater Basin
SWIM	Surface Water Improvement and Management
SWUCA	Southern Water Use Caution Area
TMDL	Total Maximum Daily Load
TSI	Trophic State Index
USGS	United States Geological Survey
WHCL	Winter Haven Chain of Lakes

CHAPTER 1. INTRODUCTION

1. STATEMENT OF PURPOSE

Development of the Peace River Comprehensive Watershed Management (CWM) Plan is to aid in the establishment of effective integration and coordination of land and water planning to achieve a higher level of water resource management and protection.

2. DESCRIPTION

Volume II, of the Peace River CWM Plan will be updated on a regular basis and includes strategic action plans for each primary Area of Responsibility (AOR). These strategic plans prioritize major water resource issues described in Volume I that need more immediate action. It identifies projects for potential Basin Board funding, provides implementation schedules and associated costs, identifies responsible entities for project management and control, and evaluates the progress and outcomes for each project.

The primary arena used to fund and support these projects come from the eight Basin boards in the Southwest Florida Water Management District (SWFWMD or the District). As such, this section will summarize the basic role of the District's Basin boards and provide a more detailed overview of the Peace River Basin Board (PRBB).

3. BASIN BOARDS

The District's eight boards are facilitators in the resolution of non-regulatory water management issues for local governments within their respective jurisdictions. It is at the Basin Board level that intergovernmental water resource programs are implemented, monitored and evaluated. The Basin boards obtain feedback and work closely with local governments and citizens to identify water resource problem areas, and serve as funding partners with local governments and others in implementing water resource projects that forward the District's mission, goals, and strategic objectives. The Boards also advise the Governing Board on local water management concerns.

4. STATUTORY/BASIN RESPONSIBILITIES

Statutory provisions for Basin boards were originally adopted by the Florida Legislature in 1961 when flood control was viewed as the overriding need in southwest Florida. This original legislation, with amendments relating to water supply support, is now incorporated in s. 373.0695, *Fla. Stat.* SWFWMD is the only Water Management District with nine basins, divided along hydrologic boundaries, that encompass its entire area. Eight of these basins are governed by gubernatorial appointed boards, chaired by a Governing Board member(s), who are also appointed by the Governor. The Governing Board sits as the Green Swamp Basin Board, due to the regional hydrologic significance of this watershed.

As the water management district concept in Florida has evolved toward an integrated resource management approach, so has the focus of the Governing Board and Basin boards (see the District Water Management Plan "District Overview"). Integrated resource management recognizes the full range of resource responsibilities. These responsibilities include ensuring water supply, management of water quality, protection of natural systems and flood protection.

Additional policy guidance for Basin Board activities is contained in Florida's Water Resource Implementation Rule (Chapter 62-40, Florida Administrative Code (FAC)), and the State

Comprehensive Plan (Chapter 187, *Fla. Stat.*). These sources provide that nonstructural solutions to flood control should take precedence over structural solutions. They also call for promoting water conservation, reuse and desalination to ensure adequate water supplies and encourage natural resource and floodplain protection activities.

The functions and duties of the PRBB, consistent with Chapter 373, *Fla. Stat.*, are set forth in District Policies 110-4 and 130-4. In essence, Basin boards identify resource issues and problems, and provide funding to address such matters at the basin level. Each of the District's Basin boards share the District's ad valorem taxing capacity. The District as a whole has a taxing capacity of 1.0 mill. This capacity is divided equally between the Basin boards and Governing Board.

5. COOPERATIVE FUNDING PROGRAM

The District, through its eight Basin boards, has established the Cooperative Funding Program which provides financial assistance on a cost-share basis primarily to local governments for regional water resource projects. The Cooperative Funding Program requires that project proposals be consistent with the local government's comprehensive plan, the District's Needs and Sources Plan, the associated Five-Year Basin plan and the appropriate CWM Plan. Examples of funded activities include indoor plumbing retrofit programs, watershed analyses, analysis of agricultural impacts to water quality, stormwater management master plans, wellhead protection programs, and assistance to reuse reclaimed water. Projects can also be funded through "basin initiatives" where a Basin Board decides to provide the impetus for a water management solution, with or without a local partner.

6. FIVE-YEAR BASIN PLANS

The Five-Year Basin Plan is one component of a larger planning process at the District. All the District's water resource management goals, objectives and policies are contained in a comprehensive planning document entitled the *District Water Management Plan*. The PRBB's Five-Year Plan addresses water resource management needs and priorities and recommends work programs to address those priorities over the next five fiscal years. District staff has worked closely with the Basin boards, local governments and the public to identify the water resource projects in this Plan.

This multi-year planning approach provides a degree of certainty for the Basin boards and for local governments as they prepare their local comprehensive plans. The Five-Year Plan is divided into five "Action Plans" which include water resource development, reuse, conservation, surface water management, and education. Further, the Five-Year Plan is subject to annual budgetary and contractual approvals by the Board and is subsequently revised on an annual basis.

6-1. Water Resource Development Action Plan

The District's water resource development role, as stated in s. 373.0831, *Fla. Stat.* is primarily planning and water resource development. In support of that role, the District should seek to ensure that sufficient water will be available for all existing and future reasonable-beneficial uses and the natural systems, and that adverse effects of competition for water supplies will be avoided.

The Governing and Basin boards will take the lead in identifying and implementing water resource development projects, and be responsible for securing necessary funding for regionally

significant water resource projects. Regional water supplies will require local coordination. It is the goal of the Water Resource Development Plan to foster a regional partnership of many cooperators to reach this common goal.

6-2. Reuse Action Plan

The District's reuse goals are to assist utilities with ongoing reuse projects and to help utilities that do not have reuse programs develop reuse systems. The District will also provide assistance to investigate and determine the feasibility of aquifer storage and recovery (ASR) for reclaimed water and the feasibility of indirect potable reuse (surface water augmentation and wellfield recharge). In the long term, the District hopes to optimize reuse by reducing inefficient use of reclaimed water, regionalizing and interconnecting facilities, and reducing wet-weather disposal.

6-3. Conservation Action Plan

The District's Governing Board has adopted a conservation goal to achieve more efficient water use from all major categories of water use. These categories include public supply, agriculture, industrial/commercial, recreational, mining/dewatering, and domestic self-supply. This conservation goal will be an important element in achieving the Board's water management responsibilities.

6-4. Surface Water Management Action Plan

The Board's surface water management goal is to protect, enhance, and restore water quality and related natural systems, and to achieve flood protection.

6-5. Public Communication and Education Action Plan

The Board's public communication and education goal is to effectively support water resource management programs as presented within the other Action Plans, including new water sources, reuse, conservation, and surface water management, through creation of public understanding, education and support.

7. PLANNING APPROACH

The PRBB's Five-Year Basin Plan reflects the following cyclical stages:

1. The Basin Board considers and endorses water resource management issues and priorities through an annual planning workshop that includes updating the Board's Five-Year Plan to reflect current budget decisions and emerging issues.
2. Based on those annually established priorities, the Board targets funding allocations for each of the five program categories or "Action Plans" that address the Board's priorities.
3. District staff develops Basin Initiatives and works with local cooperators to identify Cooperative Funding and New Water Sources Initiative project proposals for the Action Plans.
4. The Basin Board annually budgets the specific program and project proposals within each Action Plan that best address its management priorities.

The following chapters are divided into the four primary AORs: water supply, flood protection, water quality, and natural systems. They recommend projects for potential cooperative funding; provide implementation schedules and associated costs; and identify responsible entities for project management and control. They also recommend potential water management strategies and policies to enhance and protect water resources. The progress and resource-related benefits for each project or implemented strategy will be evaluated and reported each as they are updated and refined.

CHAPTER 2. WATER SUPPLY

ISSUE 1. A Need for Comprehensive Assessment of Streamflow Reductions in the Upper Peace River Basin and Development of a Streamflow Management Plan That Includes Minimum Flows

STRATEGY: A series of integrated hydrologic studies should be conducted to quantify how rainfall and various anthropogenic (human) factors have affected streamflow in the Upper Peace River. Related ecological studies should assess how the ecology of the Upper Peace River has been affected by streamflow reductions, and how the river and its floodplain might respond to various degrees of flow restoration. Based on the findings of these studies, a management plan should be pursued to restore some flow in the Upper Peace River, or at a minimum, prevent further decline.

BACKGROUND: Significant declines in streamflow have been documented for gaging stations on the main stem of the Peace River, with the greatest rates of decline observed in the upper reaches of the river near Bartow and Zolfo Springs. Kissengen Springs, which contributed approximately 20 million gallons per day (mgd) flow to the Upper Peace River, stopped flowing in 1950. Sinks have formed in the channel and floodplain of the Upper Peace River, and during much of the dry season the river loses flow between Bartow and Ft. Meade.

Long-term rainfall deficits have clearly played a major role in the reduced flows, but human factors have also been important (Hammett 1992 and Flannery and Barcelo 1998). Drawdowns of the potentiometric surface of the Floridan Aquifer in the Upper Peace River Basin due to groundwater use has been identified as a major factor contributing to reduced streamflow. Extensive phosphate mining has also substantially modified the hydrology of the Upper Peace River Basin. Water control structures have been constructed on the outlets of some lakes that form the headwaters of the Peace River drainage system.

Reduced flows have had a negative impact on the water quality and biology of the Peace River system (Champeau 1990). Declining flows could also jeopardize use of the Peace River for water supplies. Because of the importance of the Upper Peace River as both a natural resource and a source of water supply, flows in the upper river require more intensive assessment and management. Coordinated and multi-faceted studies to evaluate hydrologic factors affecting flows in the upper river need to be conducted.

The District has scheduled the establishment of minimum flows for the Upper Peace River by 2001. Minimum flows are defined in Florida Statutes as “the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area.” The evaluation of minimum flows will have technical similarities to the hydrologic assessments recommended above concerning streamflow reductions in the Peace River. The minimum flow studies, however, will also include ecological components that evaluate relationships of the natural systems of the river to its flow regime. The findings of the minimum flow studies will be used to determine how much additional water, if any, is available for use from the Upper Peace River. The findings of minimum flow studies will also provide insight on ecological benefits that may be gained by flow restoration in the Upper Peace River.

ACTIONS:

ACTION 1A. Assess relationships of groundwater levels to streamflow.

Step 1. Additional technical studies should be conducted to quantify hydraulic relationships between groundwater levels and streamflow in the upper reaches of the Peace River. The findings of recent studies should be reviewed and the need for supplemental assessments determined. Such studies should identify areas of groundwater discharge and recharge along the river for different hydrologic conditions and estimate the cumulative effect of groundwater use on flows of the river.

Step 2. Pending the findings of Step 1, a groundwater management plan should be developed to protect streamflow in the Peace River from further declines due to groundwater withdrawals. If it would generate significant benefits to the river, groundwater mitigation plans to restore streamflow should be developed if such plans are physically and economically feasible.

Responsible Parties: SWFWMD, Florida Department of Environmental Protection (FDEP), Florida Institute of Phosphate Research (FIPR)

Involved Parties: SWFWMD, FDEP, Charlotte Harbor National Estuary Program (CHNEP), local governments, Central Florida Regional Planning Council (CFRPC), citizen organizations

TENTATIVE SCHEDULE:

Step 1. FY-2002

Step 2. FY-2002 and 2003

ESTIMATED COST: Studies = \$250,000. Restoration efforts to be determined.

EXPECTED BENEFITS: Improve the hydrologic and ecological characteristics of Upper Peace River with resulting benefits to natural systems and water supply availability.

MONITORING: Streamflow and groundwater levels can be monitored through existing network. Some increase in the number of groundwater monitoring wells may be necessary.

RELATED ACTIONS: Minimum flows and levels (MFLs) for the Upper Peace River and the Southern Water Use Caution Area (SWUCA).

ACTION 1B. Assess relationships of phosphate mining to streamflow in the Upper Peace River Basin and identify mined sub-basins where some flow restoration is possible.

Step 1. Complete hydrologic assessments now underway on Saddle Creek and Six Mile Creek. Implement the findings of these studies to improve streamflow characteristics in these basins.

Step 2. Conduct a comprehensive assessment of the effects of previous phosphate mining on flows in the Peace River. This assessment should be multi-faceted and deal with modifications to surface water drainage and surface water/groundwater relationships that have resulted from mining. Identify drainage basins with non-mandatory mined lands where some streamflow restoration is possible.

- Step 3. Pending the findings of the studies above, prepare a prioritized list of sub-basins where streamflow restoration should be pursued. Based on assessments of environmental benefits that can be achieved, restore flow from these basins to the Peace River drainage system to the greatest extent practical and economically feasible.
- Step 4. Review existing regulations and mining and reclamation practices to determine if improvements are needed to better protect streamflow in mined basins.

Responsible Parties: SWFWMD, FIPR, FDEP
Involved Parties: SWFWMD, FDEP, Florida Fish and Wildlife Conservation Commission (FFWCC), CHNEP, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE:

- Step 1. Review existing information during FY-2002; budget funds and commence new studies during FY-2003

ESTIMATED COST: \$300,000

EXPECTED BENEFITS: Improve the hydrologic and ecological characteristics of the Upper Peace River with resulting benefits to the natural systems and surface water supply availability of the river.

MONITORING: Streamflow and groundwater levels can be monitored through existing network, but new groundwater and surface water sites may be needed on restored lands. Land form changes from restoration should be tracked through a Geographic Information System (GIS).

RELATED ACTIONS: Groundwater management plan for the Upper Peace River; MFLs for the Upper Peace River and the SWUCA

ACTION 1C. Identify other drainage modifications that have affected streamflow in the Upper Peace River.

- Step 1. As part of restoration plans for Lake Hancock, evaluate the role that regulation of water levels and outflows from the lake have had on streamflow in the Upper Peace River. Include criteria for management of discharges from the lake in plans for lake restoration or reclamation.
- Step 2. The effect of water control structures in the Winter Haven Chain of Lakes (WHCL or Chain) on streamflow in the Peace Creek Canal and the Peace River should be evaluated. Protection of the ecological and aesthetic/recreational characteristics of the lakes must be strongly considered.
- Step 3. Identify any other drainage modifications that affect flow in the Upper Peace River.

Responsible Parties: SWFWMD, FDEP, WHCL Water Control District, Polk County.
Involved Parties: SWFWMD, FDEP, FFWCC, CHNEP, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE:

- Step 1. FY-2001 and 2002
- Step 2. FY-2002
- Step 3. FY-2002

ESTIMATED COST: \$150,000 for hydrologic studies

EXPECTED BENEFITS: Improve the hydrologic and ecological characteristics of Upper Peace River, with resulting benefits to natural systems and surface water supply availability in the watershed.

MONITORING: Streamflow can be monitored with existing networks, although some new flow monitoring sites may be necessary.

RELATED ACTIONS: Improvements to the Peace Creek Canal; restoration of Lake Hancock

ACTION 1D. Establish minimum flows for the Upper Peace River.

- Step 1. Establish minimum flow regulations for the Upper Peace River that account for the hydrologic requirements of natural systems associated with the upper river. These studies should determine if previous impacts to the river's flow regime have impacted instream or floodplain communities, and the degree to which additional water is available for use from the upper river.
- Step 2. As part of minimum flow studies, collect data that can be used to determine the ecological benefits that may be gained from flow restoration in different stream reaches. Use these findings to develop a comprehensive strategy for streamflow management in the Upper Peace River.

Responsible Parties: SWFWMD, FDEP
Involved Parties: SWFWMD, FDEP, FFWCC, CHNEP, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE: Minimum flows for Upper Peace River to be adopted by 2001.

ESTIMATED COST: Costs covered by normal operating expenses of the District

EXPECTED BENEFITS: Protect the natural systems of the Upper Peace River and determine remaining surface water supply availability. Determine ecologically based hydrologic targets for streamflow restoration.

MONITORING: See Action 1E below.

RELATED ACTIONS: Groundwater management plan for Upper Peace River; assess relationships of phosphate mining to streamflow; identify drainage modifications that affect streamflow

ACTION 1E. **Develop comprehensive management plan for streamflow management in the Upper Peace River.**

- Step 1. Prepare a comprehensive assessment of the anthropogenic (human) factors affecting streamflow in the Upper Peace River Basin. Evaluate the relative degree

that these factors affect streamflow and formulate management strategies to restore streamflow where it is practical and economically feasible.

Step 2. Periodically update this assessment by tracking the status of various factors related to streamflow restoration. Evaluate the response of the river to improvements in the flow regime by monitoring streamflow and selected physico-chemical and biological parameters.

Responsible Parties: SWFWMD, FDEP

Involved Parties: SWFWMD, FDEP, FFWCC, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE: Prepare comprehensive assessment in FY-2002 after minimum flows for upper river are adopted and assessment of drainage modifications and groundwater relationships are underway.

ESTIMATED COST: To be determined

EXPECTED BENEFITS: Improve the hydrologic and ecological characteristics of Upper Peace River with resulting benefits to natural systems and surface water supply availability in the watershed.

MONITORING: Streamflow can be monitored with existing United States Geological Survey (USGS) network. Some increase in groundwater monitoring wells will be necessary, as described in sub-issue 1A. An increase in biological sampling will be necessary to determine if the fish and wildlife of the river respond to streamflow management.

RELATED ACTIONS: Groundwater management plan for the Upper Peace River; evaluate relationships of phosphate mining to flows in Upper Peace River; assess drainage modifications affecting flows; establish MFLs for the Upper Peace River

ISSUE 2. Establish Minimum Flows for Middle and Lower Peace River and Tributaries in the Peace River Watershed

STRATEGY: Establish minimum flows for other streams in the Peace River watershed that are potential water supply sources or where previous water use has affected streamflow.

BACKGROUND: To some extent, streamflow in the Middle Peace River has been affected by water use and physical alterations in the Upper Peace River Basin. Due to its relationship flow from the upper river, minimum flows for the Middle Peace River should be scheduled for adoption after minimum flows for the Upper Peace River have been evaluated and adopted. This will allow for a stepwise, cumulative approach for assessing changes in the flow regime of the Peace River, the requirements of natural systems, and the availability of surface water for consumptive use.

The District has scheduled the establishment of minimum flows for Shell Creek and the Lower Peace River Estuary by 2003. Minimum flows for these two watercourses will account for the total freshwater flow requirements of the estuary associated with the Peace River. The determination of minimum flows for the Middle Peace River, scheduled for 2002, will account for the flow needs of freshwater ecosystems associated with the non-tidal reaches of the river below Zolfo Springs. Future withdrawals in the Peace River watershed will be required to meet a two-prong test. Withdrawals from upstream reaches cannot cause significant harm to the freshwater ecosystems in their immediate area, and they must not cause cumulative flow reductions to the Lower Peace River estuary that exceed the estuary minimum flow requirements. Minimum flows for tributaries in the Peace River watershed will be handled in the same manner to consider both localized and downstream effects.

ACTIONS:

- Step 1. Schedule establishment of minimum flows for the Middle Peace River (Zolfo Springs to Horse Creek confluence) by 2002.
- Step 2. Establish minimum flows for the Lower Peace River and Shell Creek by 2003. These will be based on the total freshwater needs of the tidal estuarine system associated with the Lower Peace River.
- Step 3. Prioritize the establishment of minimum flows for tributaries in the Peace River watershed. This prioritization should be based on the likelihood that the streams will be used for water supply or evidence that existing water use has reduced flows in those systems.

Responsible parties: SWFWMD

Involved Parties: SWFWMD, FDEP, FFWCC, CHNEP, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE: Minimum flows for the Middle Peace River is scheduled for 2002. Minimum flows for the Lower Peace River and Shell Creek are scheduled for adoption by 2003. Minimum flows for other streams should be prioritized based on factors listed in Step 3.

ESTIMATED COST: Costs to be covered by normal operating expenses of the District.

EXPECTED BENEFITS: Minimum flows will protect the natural systems associated with the streams in the watershed while determining the quantities of surface water available for consumptive use.

MONITORING: Streamflow can be monitored with existing USGS network, although some new gages may be necessary. Ecological studies of the resource will be conducted by the District.

RELATED ACTIONS: Minimum flows for the Upper Peace River

ISSUE 3. Determine the Feasibility of a Class I Designation for the Peace River

STRATEGY: A Class I water body designation would help protect the Peace River as a potable water supply source. The benefits and feasibility of a Class I designation for the Peace River should be evaluated.

BACKGROUND: The Peace River presently serves as a major source of potable water, providing about 10 mgd to citizens in the southern part of the District. Over the next 15 years, this water use is scheduled to expand to an average rate of about 32 mgd. Extensive technical work has been performed and regulatory restrictions adopted to protect the downstream estuary from excessive withdrawals. However, there are few restrictions in place to ensure that water quality in the Peace River remains suitable for human consumption.

Florida surface waters are divided into five classes depending on their designated uses. The Class I designation is reserved for potable water supplies, while the Class III designation identifies waters important for recreation and the propagation and maintenance of healthy populations of fish and wildlife. Water quality criteria for each more classification are designed to maintain the minimum conditions necessary to assure the suitability of that water body for its designated use. Water quality classifications are arranged in order of degree of protection, with Class I having the most stringent criteria. The criteria for a higher ranked classification are generally also suitable to meet the requirements of a lower ranked designation (Class I criteria typically also satisfy Class III criteria).

Because of the projected increase in use of the Peace River for potable water supplies, the re-designation of the river to Class I should be evaluated. State regulatory rules specify that more stringent criteria for a waterbody may be adopted only upon additional affirmative finding by the Environmental Regulation Commission that the proposed use is attainable upon consideration of environmental, technological, social, economic and institutional factors. In this context, the general achievability of re-designating the Peace River a Class I water should be assessed. If compliance with Class I standards is impractical for many existing permits, consideration could be given to applying Class I standards to future permits on the river.

ACTIONS:

Step 1. The management implications of a Class I designation for the Peace River should be evaluated. If found to be feasible and beneficial, a petition should be submitted proposing re-designation of the Peace River as a Class I water body.

Responsible Parties: Nomination must be submitted to FDEP.

Involved Parties: SWFWMD, FDEP, CHNEP, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE: Assessment of Class I feasibility to be conducted in FY-2002.

ESTIMATED COST: To be determined.

EXPECTED BENEFITS: Class I designation will provide better protection of the quality of potable water supplies obtained from the Peace River.

MONITORING: Water quality of river and point source discharges can be monitored with networks implemented through the regulatory process.

RELATED ACTIONS: ASR; Surface Water Supply Development

ISSUE 4. Continue Assessments of Aquifer Storage and Recovery Facilities Associated with Shell Creek

STRATEGY: Assessments of the technical feasibility and utility of ASR facilities associated with Shell Creek should be continued and ASR implemented if needed for water supply development or to relieve demands on Shell Creek in the dry season.

BACKGROUND: There may be a potential to increase available water supplies from Shell Creek within environmentally safe limits. The use of ASR, in which treated surface waters are injected into groundwater aquifers and later withdrawn for use, may pose a cost-effective and environmentally sound way to increase water supplies. Also, if necessary for environmental enhancement, water storage in ASR facilities could relieve the need for direct withdrawals from Shell Creek in the dry season. Studies regarding ASR at Shell Creek should continue and ASR facilities developed if they are necessary for water supply needs or improved environmental management.

ACTION:

Step 1. Continue ongoing investigations of ASR near the Shell Creek reservoir.

Step 2. If it proves to be an effective water storage option, use ASR facilities at Shell Creek to increase potable water supplies.

Responsible Parties: SWFWMD, FDEP, City of Punta Gorda

Involved Parties: SWFWMD, FDEP, CHNEP, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE: Evaluate findings of current studies in FY-2001. Implement ASR as necessary for water supply development or environmental protection.

ESTIMATED COST: Costs of feasibility studies covered by existing cooperative project funded by the District and the City of Punta Gorda.

EXPECTED BENEFITS: ASR would provide storage for increased water supplies and allow for a reduction in dry season withdrawals from Shell Creek, if it is determined to be necessary.

MONITORING: Selected test wells from ASR study should be continued to serve as monitor wells.

RELATED ACTION: Surface water supply development

ISSUE 5. Assess the Need for Construction of an Emergency Interconnection Between the Shell Creek Reservoir and the Peace River Water Treatment Plant

STRATEGY: An interconnection between the Shell Creek reservoir and the Peace River water treatment plant should be evaluated.

BACKGROUND: An interconnection between the Shell Creek reservoir and the Peace River Regional Water Supply Authority supply facilities at Ft. Ogden could be beneficial for ensuring continuous distribution of public water supplies if either system cannot meet its existing water supply demand during times of emergency, drought, or a pollution event such as an industrial spill. Since the Peace River and Shell Creek water treatment plants rely on streamflow from different drainage areas, an emergency interconnect would add important management potential to water supply management in the Lower Peace River region.

ACTIONS:

Step 1. Investigate the cost, feasibility, and benefits of an emergency interconnect between the Shell Creek reservoir and the Peace River water treatment plant.

Responsible parties: SWFWMD, Peace River Manasota Regional Water Supply Authority, City of Punta Gorda

Involved Parties: SWFWMD, FDEP, CHNEP, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE: Evaluate feasibility of interconnect during 2002.

ESTIMATED COST: To be determined.

EXPECTED BENEFITS: Interconnect would provide emergency supplies to City of Punta Gorda or the Peace River Manasota Regional Water Supply Authority.

MONITORING: Not applicable

RELATED ACTIONS: Surface water supply development; ASR

ISSUE 6. Evaluate Drainage Improvement and Habitat Restoration Strategies for the Peace Creek Canal

STRATEGY: Alternatives for improving drainage and restoring habitats associated with the Peace Creek Canal should be re-evaluated. Options should be investigated that do not result in significant flow reductions to the Upper Peace River.

BACKGROUND: The Peace Creek Canal was excavated around the turn of the century to drain low-lying lands in Polk County that lie south of the WHCL. Frequent flooding still occurs in low-lying lands near the Peace Creek Canal with large areas of standing water present for several months during some years. Part of this problem is unavoidable due to the flat topography of the canal basin. A previous study (SWFWMD 1997) examined the feasibility of building low-head structures in the canal to slightly increase water depths and durations and convert adjacent flood-prone lands to marshes. The Peace Creek Canal is the principle tributary to the Upper Peace River near Bartow, however, and it was found these scenarios would result in significant flow reductions to the Upper Peace River. Improvements to the Wahneta Canal, which flows to the Peace Creek Canal, were found to be beneficial and are now in the design phase.

There may still be the potential to pursue modifications to the Peace Creek Canal that could benefit the hydrologic characteristics, natural systems, and riparian lands of the Upper Peace River Basin. New drainage improvements or restoration plans could be formulated that do not result in flow reductions to the Upper Peace River. In general, the door for Peace Creek Canal modifications should remain open, and drainage and restoration alternatives pursued if they result in hydrologic and ecological benefits to the canal and upper river.

ACTIONS:

Step 1. Revisit improvement/restoration alternatives for the Peace Creek Canal. Identify alternatives that can result in improvements to the drainage, streamflow regime and natural systems of the Peace Creek Canal/Upper Peace River system.

Responsible Parties: SWFWMD

Involved Parties: SWFWMD, FDEP, CHNEP, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE: Re-evaluate modifications to the Peace Creek Canal during FY-2002.

ESTIMATED COST: Re-evaluation study estimated at \$70,000. Costs for the restoration of canal would be determined after the study is completed.

EXPECTED BENEFITS: Modifications of Peace Creek Canal could create new aquatic and wetland habitat and possibly improve drainage in the canal basin.

MONITORING: Streamflow and water quality in canals can be monitored with existing networks. Some spatial geographic analyses to determine aquatic and wetland habitats and extent of flooding will be necessary if modifications are pursued.

RELATED ACTIONS: Streamflow management plan for the Upper Peace River; MFLs

ISSUE 7. Evaluate Potential Offstream Surface Water Storage Sites on Lands Planned for Future Phosphate Mining

STRATEGY: Off-stream surface water storage may be needed for water supply development in the Peace River watershed. New phosphate mines may be able to provide excavations that can be used for surface water storage. Water use planners should identify areas where off-stream reservoirs may be needed.

BACKGROUND: In recent years, the use of off-stream water storage facilities has been emphasized for surface water supplies in southwest Florida. From an environmental perspective, off-stream reservoirs are preferable to instream reservoirs since they do not result in impoundment of natural stream channels and inundation of riverine and floodplain habitats. Off-stream reservoirs have been used in southwest Florida to store surface water supplies at the Manatee power plant located near the Little Manatee River.

Additional surface water storage may be necessary to fully utilize water supplies that may be safely withdrawn from creeks and rivers in the region without causing environmental impacts. This is because high flows in southwest Florida rivers occur relatively briefly in the wet season. During these high flow periods waters can be diverted to storage for later use in the dry season.

Phosphate mining will produce large excavations in the land surface which potentially could be used for water storage. Water supply planning projections should identify areas where surface water storage may be needed to meet water supply needs. When identified, these areas should be compared to mine plans to see if any potential reservoir sites exist. The water quality that would result in such reservoirs would also have to be evaluated if one or more sites appeared feasible based on location and water supply yield.

ACTIONS:

- Step 1. Identify areas in the Peace River watershed where off-stream reservoir sites may be necessary for water supply development.
- Step 2. Compare these areas to mine plans to determine if any potential reservoir sites are available.
- Step 3. If potential reservoir sites appear feasible, the District should coordinate with the FDEP-Bureau of Mine Reclamation (BMR) and the phosphate industry to produce reclamation plans that allow for off-stream surface water reservoirs. Water quality that would result in the offstream reservoirs should also be evaluated.

Responsible Parties: SWFWMD, FDEP-BMR

Involved Parties: SWFWMD, FDEP, CHNEP, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE: Necessity of potential reservoir sites conducted as part of SWUCA resource planning. Discussion with phosphate industry could accompany this process.

ESTIMATED COST: Evaluation can be covered by normal operating expenses. Cost of off-stream reservoir to be determined.

EXPECTED BENEFITS: Off-stream reservoirs would provide storage for surface water supplies which could be diverted from streams within limits established by minimum flows to protect natural systems.

MONITORING: Status of approved reclamation plans are tracked by the FDEP-BMR and the CFRPC. Future Environmental Resource Permits (ERPs) and Conceptual Reclamation Plans may be reviewed through the use of the team permitting approach, where opportunities for off-stream reservoirs could be identified.

RELATED ACTIONS: Surface water supply availability; MFLs

ISSUE 8. Minimum Groundwater Levels

STRATEGY: Impacts of current and future groundwater withdrawals should be managed through the establishment of minimum levels. These levels will be used to guide the long-term use and development of water resources in the region.

BACKGROUND: The area of the Peace River watershed is contained within the SWUCA. This is an area that was designated as a water use caution area in 1992 because of long-term water level declines in the Upper Floridan Aquifer that had occurred in response to increases in groundwater withdrawals over the years. The principal source of water supply in the watershed is groundwater from the Upper Floridan Aquifer. In 1996, groundwater comprised 92 percent (274 mgd) of total water use (298 mgd) in the watershed. The Peace River watershed encompasses about 46 percent (2,400 square miles (mi²)) of the total land area of the SWUCA (5,100 mi²); and, in 1996, groundwater withdrawals from within the watershed accounted for about 48 percent of total groundwater withdrawals in the SWUCA.

Groundwater in the watershed occurs as part of the Southern West-Central Florida Groundwater Basin (SWCFGWB) of the District. The Upper Floridan Aquifer within the basin can be described as well-confined and highly-transmissive. As a result, the effects of water withdrawals can extend a great distance from the actual point of withdrawal. Analyses by District staff have indicated that long-term regional water level declines in the Upper Floridan Aquifer have resulted in increased saltwater intrusion along the coast and lowering of lake levels along the Lake Wales Ridge. In addition, the cessation of flow from Kissengen Springs was attributed to lowered groundwater levels in the region. Prior to the cessation of flow in the 1950s and early 1960s, spring discharge was about 20 mgd and would flow down the spring into the Peace River.

The District's analysis confirmed that groundwater withdrawals in one part of the basin can affect water levels in other parts of the basin. This results from the nature of the Upper Floridan Aquifer in the region and the dispersed nature of withdrawals throughout the basin. It was concluded that, in order to manage groundwater levels in one part of the basin, groundwater withdrawals throughout the entire basin need to be managed. A management plan developed for the SWUCA included the adoption of modifications to the existing water use permitting rule and would have limited the permitting of new quantities of groundwater. As a result of an administrative hearing on the proposed SWUCA rule, many provisions of the rule were found invalid and the District does not currently have a permitting rule in place to deal separately with the groundwater management issues in the SWUCA.

ACTIONS:

- Step 1. Minimum levels should be established for the watershed in accordance with the District's plan for the entire SWUCA. Levels should be established to prevent long-term impacts to lakes, stream flow and excessive movement of the saltwater interface.
1. Establish guidelines and adopt criteria for establishment of minimum lake levels in the SWUCA. Establish lake levels beginning with lakes that are most vulnerable to regional groundwater drawdowns.
 2. Establish guidelines and adopt criteria for establishment of minimum aquifer levels in the Upper Floridan Aquifer to minimize future movement of the freshwater/saltwater interface.

3. Investigate the feasibility of establishing minimum aquifer levels to prevent the long-term lowering of lake levels and stream flows in the basin.

Step 2. The District should complete ongoing hydrogeologic investigations of the Highlands Ridge and "Peace River Valley" areas. Information gained from these studies will be used to form the foundation for water management in the basin.

1. The Highlands Ridge Water Resource Assessment Project should be completed.
2. The Southern District Water Resource Assessment Project should be completed.
3. A regional groundwater flow model of the entire SWUCA should be constructed. Boundaries for the model should extend beyond the boundaries of the SWCFGWB to ensure that management decisions in the entire SWUCA can be evaluated without having to address boundary related issues at a later time.

Responsible Parties: SWFWMD, FDEP

Involved Parties: SWFWMD, FDEP, CHNEP, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE:

- Step 1. Minimum lake levels for priority lakes in Polk and Highlands counties will be adopted by December 1999.
- Step 2. Minimum aquifer levels in the Upper Floridan Aquifer in the SWUCA will be adopted by March 2001.
- Step 3. A water resources management plan for the SWUCA will be adopted by March 2000.

ESTIMATED COST: Studies will be conducted by agencies using existing funds. Some additional funds may be needed to secure the outside technical review of agency work products.

EXPECTED BENEFITS: The use and development of the groundwater resources will be conserved to protect hydrologic and environmental systems in the region.

MONITORING: The District will continue monitoring the regional data collection network.

ISSUE 9. Develop Alternative Water Supplies to Meet Future Demands

STRATEGY: Alternative water supply projects need to be developed to enhance and extend current sources of water supply to meet future demands. Sources of future water supply should be developed to minimize the disruption of environmental systems as a result of current and future demands.

BACKGROUND: Because of existing stresses on the traditional groundwater sources within the SWUCA, future water supply development for the watershed will depend on development of alternative sources to sustain future economic growth in the region. These sources may be in addition to the traditional groundwater and surface water sources (e.g., brackish desalination or wastewater reuse), or they may be projects that extend the usability of current sources (e.g., ASR using high surface flows), or they may be projects designed to enhance original sources and minimize effects of resource development on these sources (e.g., rehydration, lake augmentation, or artificial aquifer recharge).

Because of the regional nature of the Upper Floridan Aquifer in the watershed and its stressed condition, it is important that future water supply development within the watershed be regionally coordinated. This will ensure a comprehensive evaluation of potential projects to determine the most beneficial application of available technologies to prevent further degradation of water resources in the region.

ACTIONS:

- Step 1. An evaluation of potential beneficial uses of reclaimed wastewater should be made. The evaluation should include establishing criteria the District will use when deciding to fund reclaimed water projects. Potential projects include: natural treatment of secondary treated wastewater for injection to the Upper Floridan Aquifer; augmentation of minimum river flows and of lakes; residential lawn and golf course irrigation; retiring existing groundwater withdrawals; and, indoor non-potable uses. Consideration should be given to the capital, operating, and energy costs of potential uses.
- Step 2. A regional management strategy should be developed to address the “best” uses of reclaimed wastewater in the watershed and SWUCA.
- Step 3. The continued and expanded use of ASR as a strategy for storing excess water from peak stream flows should be investigated. Surface waters collected at high flows could be treated at appropriate treatment facilities throughout the basin and injected into the Upper Floridan Aquifer.
- Step 4. The use of abandoned phosphate pits to store captured rainfall/runoff should be investigated. This water can be naturally treated using on-site wetlands and sand filtration. The treated water can be either injected into the Upper Floridan Aquifer or used to displace/offset effects of nearby groundwater withdrawals. Investigation of this potential source should consider impacts of the potential reduction in flows to the Peace River.

Responsible Parties: SWFWMD, FDEP, local governments, industry

Involved Parties: SWFWMD, FDEP, CHNEP, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE: Ongoing

ESTIMATED COST: Studies will need to be conducted to determine appropriate water supply technologies and associated costs.

EXPECTED BENEFITS: The use and development of the water resources will incorporate provisions to protect environmental systems in the region.

ISSUE 10. Regional Coordination of Water Supply Issues

STRATEGY: Water supply issues in the watershed should be coordinated as part of a regional strategy to address future water supply problems throughout the region.

BACKGROUND: It is important that water supply issues be addressed on a regional basis because groundwater withdrawals in one part of the groundwater basin can affect water levels in other parts of the basin. As such, a regional strategy is necessary to ensure that decisions regarding alternative sources can be made that will allow future growth while at the same time sustain the natural environment.

Step 1. Hardee, Highlands and Polk counties should continue to investigate the feasibility of forming a regional water supply authority. A regional water supply authority will help to focus on water supply issues in the area and facilitate the development of regional water management strategies.

Step 2. A regional plan to manage the use of reclaimed wastewater in the region should be developed to maximize the beneficial use of this resource.

Responsible Parties: SWFWMD, FDEP, local governments

Involved Parties: SWFWMD, FDEP, CHNEP, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE:

Step 1. Hardee, Highlands and Polk counties should continue to evaluate the feasibility of establishing a regional water supply authority.

Step 2. The District and local governments should conduct necessary studies to evaluate development of a regional plan to manage reclaimed wastewater projects in the region.

ESTIMATED COST: Studies need to be conducted by the appropriate agencies.

EXPECTED BENEFITS: The use and development of the groundwater resources will incorporate provisions to protect environmental systems in the region.

CHAPTER 3. FLOOD PROTECTION

Flood protection has never been a simple task. In the not too distant past, flood protection measures primarily consisted of the construction of ditches and canals that transported water, and flooding problems to downstream areas. In addition, flood protection improvements were usually implemented without regard to other types of impacts on the system. Today, current federal, state and local regulations approach flood protection as one component of a much larger, and more comprehensive water resource issue. Natural system preservation, water supply, water quality, and flood protection considerations are being integrated in order to understand the entire water resource system. As a result, sophisticated surface and groundwater models have been developed to evaluate not only flood levels, but also the effects of flood protection measures as they relate to base flows, water quality, water supply and the health of natural systems, including estuaries. Improvements in personal computers and modeling techniques have made it possible to develop larger and more accurate dynamic surface water models to evaluate the response of entire watersheds to changes made in the surface water management system. Models have also been developed that link groundwater and surface water modeling to reflect infiltration and evapo-transpiration losses and base flows within the system, and how these functions affect surface water flows and levels in both wet and dry periods.

The purpose of the following sections is to identify outstanding issues associated with flood protection, and to propose action plan strategies to address these issues. Agencies, local governments and other interested groups are identified as possible partners for implementing the recommended strategies. Associated cost estimates and scheduling information is also provided, if available.

ISSUE 1. Standardized Data Management

STRATEGY: Standardize hydrologic/hydraulic and flood protection data collection and management.

BACKGROUND: Data management includes the collection, maintenance, update/revision and retrieval of the information required to understand the systems that influence our water resources. Data relating to watershed characteristics and conveyance system facilities can be used to produce modeling information to identify flood-prone areas. To be used effectively, this database information must be in a consistent format, and must be updated frequently.

The ability of the District, private consultants, federal, state, or local governments to complete accurate flood-prone area analysis is dependent upon the quality and availability of existing data. There is no one source for all of the flood protection data currently available. Likewise, there is no standardization with regard to data format. There are also limitations on the collection of quality data including the cost of data acquisition, and an inability to gain legal access to portions of the watershed management system.

ACTIONS:

- Step 1. Develop a standardized data management system that provides the information required to define flood-prone areas. This database should include the input data components of available flood protection modeling information, in addition to the model results. (That is to say the database should include information on basin parameters, topography, land use, land cover, soil types, culvert locations, sizes and invert elevations, as well as anticipated floodplain elevations.)

- Step 2. Develop and provide a consistent set of data standards, in an ArcInfo-based GIS format, to allow the transfer and formulation of input and output data from numerical models. This will support further data development for other predictive models (i.e., water quantity, water quality, groundwater, and natural systems). It will also provide access to the data and modeling results for surface water regulation within the watershed.
- Step 3. Encourage the development of data transfer tools by the developers of stormwater management software. The goal is to have software with the capability to transfer the input data and output results to a universally acceptable standard or to translate the information to data formats used by other stormwater management software and GIS.
- Step 4. Encourage the use of the above described standardized data format in association with existing permitting programs. In this way, information submitted to the FDEP or the District for ERPs could be easily incorporated into the database.
- Step 5. Identify data gaps, including those areas within the watershed where topographic information is either outdated or unavailable, and perform aerial topographic mapping.
- Step 6. Promote the development of cooperative agreements with other entities to identify data collection and database maintenance responsibilities based upon the needs and capabilities of the agencies or other entities involved.
- Step 7. Identify or establish one entity who will be the recipient of all surface water modeling performed by local governments and as part of submittals for large projects such as Developments of Regional Impact (DRIs). This entity will be responsible for quality control of the data supplied, and for cataloging the information, as well as updating the database system.

Responsible Parties: SWFWMD

Involved Parties: SWFWMD, FDEP, local governments, CFRPC, Southwest Florida Regional Planning Council (SWFRPC), Federal Emergency Management Agency (FEMA), FIPR, private entities/industries, citizen organizations

TENTATIVE SCHEDULE: ArcInfo information including topography, land use, land cover, and soil type is currently available via the District's Internet site. In addition, the District has established data standards that are currently being used for cooperatively funded flood protection and watershed management plan related projects. The identification of data gaps is also being accomplished, usually through the watershed management plan process. However, the identification of information gaps is also included as a component of the Flood Protection Coordination Initiative (FPCI), described later in this section.

At this time, the remainder of the actions described above have not been scheduled.

ESTIMATED COST: Cost estimates have not been developed for most of these actions. The costs associated with the use of a standardized data format are incorporated into the costs for modeling. These costs will need to be broken out as a separate item in future cooperatively

funded projects to evaluate these costs. Costs related to aerial topographic modeling are estimated to be between \$7,000 and \$9,000 per square mile, depending on the level of urbanization.

EXPECTED BENEFITS: The establishment of a comprehensive database will make flood protection information from multiple sources readily available to governmental entities, consultants and private citizens. Having a reliable single source for compiling this information will promote its use for project design, permitting, and watershed studies.

The availability of this data will enhance federal, state and local flood protection programs. A system of this type would provide for the incorporation of updated information, facilitating watershed scale modeling for those local governments and private entities that would not otherwise be able to afford such a comprehensive evaluation. This information could also be used to model water quality and MFLs needed to maintain healthy environmental systems; and to evaluate the use of surface water sources for water supply.

MONITORING: Not applicable for this issue.

RELATED ACTIONS: Collating of existing watershed information; the development of FPCI agreements with local governments; require the use of the District data standards for all cooperative funding projects; encourage the use of District's data standards for state and District ERP permitting and Regional Planning Council DRI reviews

ISSUE 2. Collating of Existing Watershed Information

STRATEGY: Collect and evaluate the quality/usefulness of available floodplain information for the Peace River watershed for use in the development of a standardized floodplain information database.

BACKGROUND: Available flood information is held by many organizations and individuals. Consolidation of available material into a centralized flood information database specific to the Peace River watershed would greatly improve the usefulness of the data. It would make the data readily accessible, permit rigorous quality control, facilitate updating the data, and would allow consistency in its application and use. Such a database could be implemented through the use of the District's GIS.

Although copies of most of the flood-prone area studies conducted by governmental entities are readily available, their format requires interpretation of flood information at various cross-sections to determine flood-prone area boundaries projected in the studies. Delineation of flood-prone area boundaries on aerial maps, and possibly within GIS systems, would provide a useful tool for analyses of water quantity issues. Also, associated hydrologic/hydraulic information should be processed and incorporated into the database.

Many useful floodplain studies have been conducted by private entities such as electric power suppliers and phosphate mining companies, for submittal in support of permit and DRI applications. This information would be particularly helpful with regard to forecasting the response of the watershed after these large scale projects are completed, and in identifying areas where flood protection improvements could be implemented.

ACTIONS:

- Step 1. Collect and catalog all available floodplain analysis conducted by governmental entities, or in association with large projects. Delineate and identify the boundaries of said study areas on a GIS layer using 1" = 200' aerials maps. (Use USGS Quad maps if aerials are not available.)
- Step 2. Identify the methods used, level of detail and goals of each study.
- Step 3. Identify areas that were not adequately addressed in existing studies.
- Step 4. Perform quality control, and confirm the accuracy of completed studies by field observation of the physical conditions of the study area, and by comparing modeled results with available monitoring data.
- Step 5. Identify areas of flooding directly impacted by storm surge, in addition to identifying the riverine floodplain.

Responsible Parties: SWFWMD

Involved Parties: SWFWMD, FDEP, CHNEP, local governments, CFRPC, SWFRPC, FEMA, FIPR, Tampa Electric Company, Florida Power Corporation, phosphate companies, citizen organizations

TENTATIVE SCHEDULE: A schedule has not been developed.

ESTIMATED COST: Cost estimates have not been developed.

EXPECTED BENEFITS: Expanding the pool of available floodplain information currently provided through prior studies conducted by FEMA or local governments. Benefits would also include an accurate representation of large scale projects that were not included in prior FEMA studies, or that were implemented after the most current FEMA maps were completed.

MONITORING: An analysis of compiled study data will be made using available monitoring information.

RELATED ACTIONS: Determine who will conduct the inventory and quality control review of the available floodplain data. Determine how this effort will be funded, and which entities will be involved in conducting and or funding this project.

Establish a manner in which the study input and output information will be reported and subsequently converted to the District's standardized data format, and made available via the internet.

ISSUE 3. Flood-Prone Area Analysis

STRATEGY: Standardize modeling methods and level of detail required for flood-prone area analysis.

BACKGROUND: The methods used in flood-prone area analysis vary from statistical analysis of measured physical data of past conditions to the use of mathematical algorithms in computer programs (models). Models predict a simulated response by the watershed, based upon physical data, and assumptions of the watershed characteristics. The level of detail and quality of data used for the model input directly influences the accuracy and usefulness of the modeling results. The goals of the analysis will establish the level of detail required. The modeling level of detail required to provide reasonable assurance of “no adverse impact” to obtain a construction permit for a project is often very different from the level of detail required to accurately identify flood levels within a natural or channelized conveyance system.

The modeling of flood-prone areas should include verification and calibration of the data used in the computer program and the model results. Predicted flows and elevations must be within the realm of physical possibility and represent the physical conditions that would occur, or did occur, as a result of a documented flooding event. In addition, the response of the watershed to rainfall events of several different durations and intensities should be provided to ensure the model accurately reflects the watershed characteristics.

ACTIONS:

- Step 1. District standards should be established for the methods used to complete a flood-prone area study.

- Step 2. District minimum standards should be established for the level of detail required for the input and output data included in flood-prone area analysis. In addition, a standardized format (electronic and paper form) should be established for the reported information for use in a floodplain information database (Issue #1).

- Step 3. Standardized study and data collection methods should be made available to the municipalities and counties in the watershed for distribution to contractors when hiring outside consultants to perform flood and stormwater management studies.

- Step 4. The use of the District’s data standards and preferred level of modeling detail should be required for all floodplain analysis projects that are cooperatively funded by the District.

Responsible Parties: SWFWMD

Involved Parties: SWFWMD, FDEP, CHNEP, local governments, CFRPC, SWFRPC, citizen organizations

TENTATIVE SCHEDULE: The District’s data standards are currently available. New floodplain analysis related projects that are cooperatively funded by the District are being required to use the District’s data standards.

ESTIMATED COST: Costs for a flood-prone area analysis vary from \$7,000 to \$20,000 per acre, depending on the amount of detailed information available for the area being studied.

EXPECTED BENEFITS: Improved and consistent level of detail for floodplain modeling that can be easily incorporated into a floodplain information database (Issue #1).

MONITORING: Modeling related to calibrating or confirming model results.

RELATED ACTIONS: Educate the public regarding the availability of the District's data standards, and the level of detail desired for floodplain modeling. Distribute information on data standards to local governments and existing or potential cooperative funding project partners.

ISSUE 4. Infrastructure Management Policies, Regulation, and Programs

STRATEGY: Develop analysis protocol that contributes to the assessment of impacts beyond peak flows.

BACKGROUND: Urban development in a pristine watershed changes its runoff characteristics. Increases in peak discharge rates and runoff volumes typically occur as a watershed is developed. To counter these effects, District rules provide that the post-development peak runoff rates cannot be greater than the pre-development runoff rates. This is accomplished by creating attenuation basins that temporarily store runoff excesses and regulates discharge from the site. However, total volumetric increases from a development site still occur. These regulatory policies potentially extend the post-development runoff hydrograph durations beyond the duration of the pre-development hydrograph thus affecting tailwater and/or headwater conditions for adjacent tributary areas. If enough of these independent development sites exist, the cumulative impact could increase flood levels.

Use of several different strategies can help address the problem of increased runoff volumes. Analysis of various duration rainfall events for a specific return period can identify which event results in the greatest amount of flooding. Florida Department of Transportation (FDOT) regulations require a similar analysis, known as the "critical event" analysis (FDOT 1987). In addition, modification of current regulations could require more or less detention for slower or quicker release of runoff to avoid peak flows and stages in the receiving water. Reuse of stormwater for irrigation purposes is potentially another method for reducing runoff volumes. If built on an appropriately large scale, the volume available in stormwater reuse holding ponds could also provide flood protection.

ACTIONS:

1. Require modeling that establishes tailwater conditions and the potential effects of new stormwater systems on upstream and downstream stages. Peak discharge and timing analyses should be performed to minimize impacts on water levels in the receiving waterbody or stream.
2. Promote revisions to existing regulations as necessary to include "critical event" criteria.
3. Promote projects that increase storage volume in flood-prone areas while maintaining existing conveyance ways.
4. Develop regional models that can evaluate cumulative impacts associated with land use changes within the watershed.

Responsible Parties: SWFWMD

Involved Parties: SWFWMD, FDEP, CHNEP, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE: A schedule has not been developed.

ESTIMATED COST: Cost estimates have not been developed. However, costs to implement most of these actions would be developed for individual project budgets that are proposed through the District's cooperative funding program.

EXPECTED BENEFITS: The capacity of infrastructure improvements will not be exceeded as a basin is developed, and cumulative impacts will be avoided. In addition, promoting storage within

the basin will enhance groundwater infiltration, and the development of alternative supplies of water for nonpotable uses, such as irrigation.

MONITORING: Monitoring receiving system flows and levels would be beneficial in evaluating the effectiveness these design methods.

RELATED ACTIONS: Develop a method by which information submitted in support of permit applications can be added to a regional model to evaluate the potential for adverse impacts, and to continually update the database and regional model information.

ISSUE 5. Inaccurate Flood Level Information

STRATEGY:

Watershed analysis should be performed using a detailed modeling protocol. This strategy will provide the foundation for the conveyance system inventory by the proper identification of all floodplain areas, including those that are not located directly adjacent to the river itself.

BACKGROUND:

Inadequate enforcement of flood protection regulations can occur when there is a lack of information, lack of public and political support, or errors made in identifying flood-prone areas. Land alterations, which limit or destroy the function of the flood-prone areas, have been allowed within the Peace River watershed. This usually occurs because the flood-prone areas were not properly illustrated on the Flood Insurance Rate Maps (FIRM). However, the FIRM information, provided by FEMA, is often the best available floodplain information.

Storage of floodwaters occurs on most properties in Florida, especially where jurisdictional wetlands exist. As a result, current regulations, enforced by the District, FDEP, and local governments, require that storage in these areas be included in the existing condition analysis (pre-development) for proposed projects. Typically, the 100-year, 24-hour storm event is evaluated to establish the existing condition floodplain for a site.

Nevertheless, certain land use alterations are not as strictly regulated, providing a means whereby the function of the floodplain can be altered. The types of land uses presenting the most risk are low density rural developments, and some agricultural operations that do not require an Environment Resource Permit. Because these areas typically require less permitting, unauthorized flow diversions, fill, and conveyance system restrictions are often constructed within the floodplain. A thorough infrastructure inventory and identification of the system floodplains, coupled with a public education program can help prevent this from occurring.

In addition, flood levels for some areas of the Peace River watershed are based on the combination of USGS regional regression equations and the model HEC-2. USGS equations are used to predict the peak discharge rates for a contributing area while the HEC-2 model is used to predict the resultant water surface elevations within the conveyance ways. USGS regression equations are developed from gage station data and other watershed information that are extrapolated to apply to other areas within the region. Regression equations are ballpark predictions and therefore tend to have large predictive errors. These prediction errors may be associated with unknown hydraulic features of the basin, incomplete knowledge of the rainfall volumes and distributions, and varying antecedent moisture conditions. These areas should be re-evaluated using a higher level of detail, and dynamic modeling to more accurately define the floodplain boundaries.

ACTIONS:

- Step 1. Development of regional models that provide an inventory of the flood-prone areas along with their associated infrastructure.

- Step 2. Ensure that adequate floodplain information is readily available, and that design regulations are enforced. A major component of stormwater regulations is a requirement for compensation for impacts due to development in flood-prone areas. Efforts should be made to ensure that areas used for floodplain mitigation storage is readily available, and provides the same function as the areas impacted. In addition, concurrent compatible uses of the storage areas should not interfere with the designed flooding of the site.

- Step 3. Conservative determinations of seasonal high groundwater elevations should be used when determining compensating storage for encroachments into the floodplain.
- Step 4. Cumulative impacts to open basins due to an increase in runoff volume, or due to a change in the timing of the discharge should also be considered during permitting, in addition to evaluating peak rates. This action may require modifications to Chapter 40D-4, FAC regulations.
- Step 5. Periodic inspection and maintenance of stormwater management systems should be performed to ensure the structural integrity of impoundments, embankments, and other hydraulic components of the surface water management system. Systems permitted in accordance with Chapter 40D-4, FAC must submit inspection reports on a regular basis to confirm that the system is still operating in accordance with the permit. However, inspections as to the structural stability of embankments is not normally a part of ERP permitting. Modifications to existing regulations may be needed to require this type of inspection.

Responsible Parties: SWFWMD

Involved Parties: SWFWMD, FDEP, CHNEP, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE: Regarding Action Item 1, the District is currently involved in the preparation of detailed floodplain models with Polk and DeSoto counties, and several local governments through the cooperative funding program. Current rules address the issues raised in Action Items 2 and 3. A schedule has not been developed for addressing Action Items 4 and 5.

ESTIMATED COST: Costs for a flood-prone area analysis vary from \$7,000 to \$20,000 per acre, depending on the amount of detailed information available for the area being studied.

EXPECTED BENEFITS: The retention of existing floodplain storage volumes within the watershed would help prevent increasing flood levels, and associated damage to public and private properties. In addition, costs related to upgrading the system in the future could be reduced or avoided.

MONITORING: Monitoring floodplain flows and levels would be useful in evaluating the effectiveness of improved regulations, and to confirm the accuracy of the detailed models.

RELATED ACTIONS: Improve access to floodplain information by making it available in a centralized location via the internet. Determine target level of service (LOS) for all regional and intermediate conveyance systems.

Evaluate ability of conveyance systems to achieve target LOS. Promote system improvements, or changes to appropriate regulations and local government requirements to achieve, or maintain desired LOS.

ISSUE 6. Conflicts with Land Use Planning and Water Management

STRATEGY: Better linkage between watershed management and land use planning.

BACKGROUND: Current land use regulations within the Peace River watershed allow development to occur within the 100-year floodplain. Generally, finished floor slabs are constructed above the 100-year flood level to prevent the incidence of structural flooding. Nevertheless, nuisance flooding of yards, septic systems, and roadways still occurs. Recent efforts have been made to provide more protection of the 100-year floodplains by restricting development within the 25-year floodplains in order to maintain the primary conveyance ways. Natural attenuation helps prevent the deterioration of estuaries by dampening the peak discharges that induce large salinity variations. Development within floodplains tends to decrease the amount of natural storage available for peak discharge attenuation. The reduction of natural storage occurs through the installation of fill within the floodplains which in turn causes increases in flood levels.

As more and more development occurs within a floodplain, political pressure is heightened to alleviate the flooding of yards, roadways, and other ancillary features. Since most of the more elevated portions of the floodplain are now occupied by development, it becomes difficult to devise a mitigation plan that reduces flood levels while minimizing adverse water quality and environmental effects. As a result, remedies can involve a costly detention/diversion system. Purchase of homes is an option that is sometimes difficult to implement due to the high cost of the structures and the lack of willing sellers.

The home rule authority of cities and counties within the watershed, and the local decisions about the use of land that derive from this authority, have important ramifications for water management. This is particularly true of flood-prone areas. Flooding problems occur where these natural areas are developed for residential or commercial use. A cooperative relationship is needed to link management of land and water resources to minimize flood damages and the loss of natural flood storage areas.

ACTIONS:

- Step 1. Encourage local governments to established levels of service for current (present) and targeted (built-out) conditions for the watershed. Infrastructure capabilities for flood protection should be evaluated by methods developed by the Stormwater LOS Conventions Committee.
- Step 2. Assist local governments in using LOS criteria in their comprehensive plans to measure the watershed's current flood management capacity. Within the next year, all Florida jurisdictions must develop LOS criteria in their local mitigation strategy.
- Step 3. Cooperate with FDOT and local governments on the design of roads. The roads should be designed to meet floodplain LOS. For those that do not meet the specified LOS, warning signs could be provided to alert drivers to flooding conditions.
- Step 4. Support legislation that requires transfer deeds or other real estate documents to identify lands within a floodplain.
- Step 5. Support the establishment of limitations imposed on flood insurance claims for repetitive flood damage in order to reduce flood insurance premiums.

- Step 6. Determine and establish appropriate setbacks from riparian systems for any structure, i.e., landward of 100-year floodplain, or some distance from 10-year floodplain or wetland boundary. State agencies need to work with local governments to enforce setbacks.
- Step 7. Lobby local and county governments to change land use plans to limit densities in floodplains, and establish protocol to determine what is an acceptable density. This could include the use of “density credits” or other incentives.
- Step 8. Encourage nonstructural land uses (i.e., agricultural, recreational corridors) in floodplains that minimize alterations to the natural storage.
- Step 9. Encourage conservation easements, greenways, efficient use of the required stormwater management storage, and placement of mitigation areas within existing flood-prone areas.
- Step 10. Work with local governments to encourage clustering of developments outside the floodplain. Also local governments should encourage cluster developments inside the floodplain if no other lands are available outside the floodplain. This encourages less infrastructure, less impervious surface, and the preservation of natural vegetation.

Responsible Parties: SWFWMD

Involved Parties: SWFWMD, FDEP, CHNEP, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE: These actions are currently being implemented within the watershed to varying degrees.

ESTIMATED COST: Cost estimates have not been developed. However, implementation of most of these actions could be incorporated into current tasks and functions.

EXPECTED BENEFITS: Improved protection of vital storage capacity within existing floodplain areas.

MONITORING: ERP Staff Reports developed for permits issued by the District Regulation Department define the amount of floodplain storage impacted and the amount of floodplain mitigated volume provided. This information is included in the District database, and could be used to evaluate the effectiveness of the above described actions.

RELATED ACTIONS: Determine of ownership and Operation and Maintenance (O&M) responsibility.

ISSUE 7. Ownership and Operation and Maintenance Responsibility for Flood Management Systems

STRATEGY: Determine ownership and O&M responsibility for flood management systems.

BACKGROUND: The existing system is a melange of natural and manmade systems. A major factor in ensuring that an acceptable LOS is provided is to keep channels and conveyance ways clear of sediment, debris, and excessive aquatic growth. Siltation of channels decreases the cross sectional flow area while debris and aquatic growth create resistance to flow. Erosion from agricultural areas is of particular concern due to the removal of stabilizing vegetation. Under these conditions, intense storm events can generate sufficient velocities to erode the soil surface, transporting large volumes of sediment to receiving streams and water bodies. Construction projects can create the same situation.

In addition, the District, federal, state, municipal governments, state established authorities and private entities are responsible for the operation and maintenance of flood management systems within the conveyance system itself, and within the watershed.

ACTIONS:

- Step 1. Conduct a study to identify the owners of significant flood management systems within the watershed.
- Step 2. Determine who is responsible for the operation and maintenance of the these systems.
- Step 3. Develop a holistic operation and maintenance plan for these significant flood management systems. This includes developing strategies for maintaining and operating the systems, obtaining easements or ingress and egress agreements with property owners, and naming the governments or other responsible parties to operate and maintain these systems.

Responsible Parties: SWFWMD, FDEP

Involved Parties: SWFWMD, FDEP, CHNEP, local governments, CFRPC, state established local districts, citizen organizations, private industry

TENTATIVE SCHEDULE: A schedule has not been developed.

ESTIMATED COST: Cost estimates have not been developed. However, these actions could be incorporated into the development of future watershed management plans cooperatively funded by the District. Costs for a flood-prone area analysis vary from \$7,000 to \$20,000 per acre, depending on the amount of detailed information available for the area being studied.

EXPECTED BENEFITS: A holistic O&M plan that could benefit the entire watershed, and help to achieve minimum and maximum flow and level goals. This would also provide clear guidance as to who the responsible entities are, and a detailed plan establishing O&M expectations. In addition, all necessary access and operational approvals would be obtained.

MONITORING: Monitoring to ensure O&M plans are properly implemented. Monitoring flows and levels to evaluate effectiveness of O&M plan, and accuracy of associated modeling.

RELATED ACTIONS: Detailed modeling of the watershed to develop appropriate O&M plans and schedules; development of permit modifications, or legal agreements to implement the desired O&M plans

ISSUE 8. Planning and Implementing Future Flood Management Systems

STRATEGY: Planning for future flood protection through multiple efforts.

BACKGROUND: Flood protection should be part of stormwater management planning efforts. Some flooding problems in developed areas can be addressed without expensive remedies. For example, periodic maintenance keeps existing ditches clean and existing detention facilities structurally sound. Acquisition programs that protect floodplains from alteration can also help reduce future flood damage. Stormwater management master plans should address existing flooding problems by focusing on solutions that minimize environmental impacts and improve water quality and contribute to the water supply. This is the comprehensive approach to watershed planning.

ACTIONS:

- Step 1. Encourage municipal and county governments to inventory existing drainage systems.
- Step 2. Current state regulations may be inadequate for the prevention of flooding conditions. Encourage county and municipal governments to set goals for flood protection based on an appropriate LOS policy, and develop maintenance schedules for the system.
- Step 3. Assist local governments in the development of watershed management plans to evaluate existing flood protection LOS, and to design system improvements or basin specific regulatory requirements to meet desirable LOS.
- Step 4. Incorporate other planning elements in the stormwater management master plans, i.e., transportation, major developments with regional significance, greenway/wildlife corridors, recreation/parks, agricultural development, water supply, and environmental management.
- Step 5. The District's requirements for stormwater management plans should develop a consistent framework for management throughout the watershed, and promote the use of consistent data standards, (i.e., the District's data standards.)
- Step 6. Pursue special development codes for building construction in floodplains (i.e., no fill for house pads in floodplains, signage required for depth of flooding, etc.) This is especially true of low density rural development and agricultural operations.

Responsible Parties: SWFWMD, local governments

Involved Parties: SWFWMD, FDEP, CHNEP, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE: Most of these actions are currently being incorporated into watershed management plan projects funded through the District's cooperative funding program.

ESTIMATED COST: Most of these activities are incorporated into cooperative funding project administration costs.

EXPECTED BENEFITS: The development of accurate floodplain information and any necessary regulatory program modifications to define the floodplain, and to protect or enhance the flood protection LOS.

MONITORING: A monitoring element is not proposed at this time.

RELATED ACTIONS: During dry times, maintenance of conveyance systems tends to become less of a priority. However, to be effective, system maintenance must be ongoing. O&M entities must be encouraged to be proactive in its approach to maintenance, and to provide appropriate and consistent funding for these activities.

ISSUE 9. Funding Sources for Flood Management Programs

STRATEGY: Develop consistent source(s) of funding for the construction and maintenance of flood management systems.

BACKGROUND: Funding mechanisms are available for surface water management systems at the federal, state, regional, county and city government levels. Cooperative funding programs are available that provide assistance on projects that meet predetermined expectations. Flood hazard mitigation and special projects fall into this category. Municipal governments fund stormwater projects through a variety of funding mechanisms. The primary mechanism has been through their capital improvement program for highway construction or a stormwater utility allocation program. However, a source that is typically overlooked in the master planning process for a watershed is private entities. Master plans typically address drainage system improvements without consideration of participation from the private sector that develop and use the system.

New development or land alteration projects require stormwater management systems. These systems are under the jurisdiction of the municipal governments but are not necessarily funded, owned, maintained, or operated by the municipality. As a result, major conveyance systems and storage areas are constructed by a variety of entities with minimal guidance as to these systems should interact within the watershed. Therefore, a well directed master plan and funding program should help provide a coordinated stormwater system that meets the expected LOS. Versatility will be a key component of this effort.

ACTIONS:

- Step 1. Alternatives to general revenue sources should be considered for funding of stormwater projects.
- Step 2. Encourage the establishment of stormwater management utility fees from the entities that are beneficiaries of the system.
- Step 3. Encourage the establishment of special assessment districts.
- Step 4. Encourage contributions to regional facilities that are based on a stormwater management master plan.
- Step 5. Develop an educational program to be implemented by the District for county and local governments that illustrates available funding sources.
- Step 6. Regional stormwater systems should be planned and funded as the upstream contributing areas develop or change.
- Step 7. Encourage cooperative projects or piggyback scenarios where many agencies contribute to a project developed through a watershed wide study. Credits could be provided for developers, roadway improvements (FDOT, counties, cities) who tie into regional projects that provide efficient stormwater quality and quantity storage, wetland mitigation, and protection of the floodplain and its function. Provide mechanisms for maintenance and operation funding.
- Step 8. The District currently participates in, and should continue participating in, Local Mitigation Strategy programs to help prioritize projects and programs funded with disaster mitigation funds.

Responsible Parties: SWFWMD, local governments, Florida Department of Community Affairs
Involved Parties: SWFWMD, FDEP, CHNEP, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE: The District currently participates in Local Mitigation Strategy programs. A schedule for the remainder of the actions listed above has not been developed.

ESTIMATED COST: Cost estimates have not been developed. However, many of the above actions listed above could be incorporated into the District's cooperative funding program.

EXPECTED BENEFITS: The establishment or identification of adequate and consistent funding sources for watershed management planning and maintenance.

MONITORING: A monitoring element is not proposed at this time.

RELATED ACTIONS: Flood management awareness

ISSUE 10. Flood Management Awareness

STRATEGY: Develop public education programs that inform the citizens about floodplains and their importance in protecting residences from flooding and damage.

BACKGROUND: Public understanding of flood protection is necessary to build support for stormwater management projects or programs to protect the natural floodplain and its function. Many of the natural amenities provided in Florida are wetlands, lakes, rivers, and estuaries. The public must be made aware of the water level fluctuation of these systems along with their biological functions, and why it is important to build the necessary infrastructure to protect them.

ACTIONS:

- Step 1. Educate public and elected officials that roadways and yards within developments are often designed to frequently flood.
- Step 2. Educate the public on the hydrologic cycle and its interaction with the water resource and effects on water use. Is flooding part of the water supply solution? Flood-prone areas are often times part of the water supply system that we depend on.
- Step 3. Demonstrate to public and elected officials that the benefits of restricting development in floodplains will result in significant monetary savings and enhance natural systems.
- Step 4. Clarify respective flood protection responsibilities for District and local governments.
- Step 5. Clarify the role of FEMA and their responsibilities and contribution to flood protection.
- Step 6. Promote cooperation between the responsible jurisdictions on flood protection issues.
- Step 7. Provide educational seminars to technical groups.

Responsible Parties: SWFWMD, local governments, Florida Department of Community Affairs

Involved Parties: SWFWMD, FDEP, CHNEP, local governments, Regional Planning Councils, citizen organizations, state established local districts

TENTATIVE SCHEDULE: These activities are currently being provided by District staff, often in conjunction with the District's cooperative funding program.

ESTIMATED COST: Cost estimates have not been developed. These activities are often incorporated into District staff time related to cooperative funding projects.

EXPECTED BENEFITS: The role of federal, state and local governments is often misunderstood. These efforts help educate individuals, and set the framework for working with other governmental entities to achieve mutual flood protection goals.

MONITORING: A monitoring element is not proposed.

RELATED ACTIONS: Development of cost savings estimates related to Action 3 above;
development of the DSS model

CHAPTER 4. WATER QUALITY

ISSUE 1. Restoration Plan for Lake Hancock

STRATEGY: Pursue a restoration plan for Lake Hancock that will result in improvements to water quality and the diversity of biological communities in the lake. The restoration plan should also result in improvements to the quality and timing of water releases from the lake to the Upper Peace River.

BACKGROUND: Lake Hancock is considered to be one of the most polluted lakes in Florida, with Trophic State Index (TSI) values routinely among the highest recorded in the state. Point-source discharges to tributaries of the lake, agricultural runoff, and nearby phosphate mining have all contributed to hypereutrophic conditions in the lake. Although external nutrient loading to the lake has been greatly reduced in recent years, thick layers of flocculent organic sediments have accumulated in the lake resulting in high rates of internal nutrient recycling.

Periodic discharges of algal-rich water from Lake Hancock degrade water quality in the Peace River and occasionally cause the degradation of river fauna some distance below the lake. Releases from the lake have also been attributed to taste and odor problems in potable water supplies obtained from the river downstream near Ft. Ogden. Restoration of Lake Hancock could potentially benefit not only the lake, but the entire Peace River ecosystem. If improvements to water quality are achieved, the schedule for seasonal water releases from the lake could be revised to benefit the dry season flow regime of the Upper Peace River.

ACTIONS:

- Step 1. Restoration and/or water quality improvement projects for Lake Hancock should be identified and designed. Consideration should be given in the restoration/improvement plans to maintaining greater water level fluctuations in the lake compared to previous management practices. Such water level fluctuations may help maintain water quality and the diversity of biological habitats in the lake, and allow for more natural patterns of water releases to the Upper Peace River.
- Step 2. The feasibility of constructing a water quality improvement project to remove phytoplankton and suspended sediments from the lake water before it flows to the Peace River should be investigated. A project of this type will be important to design and build whether the lake bottom is mined or not. Removing the phytoplankton and suspended sediments from the water column will be imperative to improvements downstream from the lake.

Responsible Parties: SWFWMD, FDEP

Involved Parties: SWFWMD, FDEP, University of South Florida, CHNEP, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE:

- Step 1. The District has contracted with a consulting firm to update the water and nutrient budget for Lake Hancock and design and permit a water quality improvement project. The design and permitting process is expected to be completed in December 1999.

Step 2. In 2000, the Florida Legislature provided Polk County with a grant focusing on the restoration of Lake Hancock and the Upper Peace River. The project is designed to determine the historical water quality conditions that existed in Lake Hancock. This information would be vital for determining whether or not Lake Hancock has always suffered from poor water quality, and if so, whether restoration of the lake to “fair” water quality is advisable or possible. Core samples will be collected to determine whether trends in water quality are evident through changes in nutrient and/or phytoplankton levels found in the cores.

ESTIMATED COST: Not determined at this time.

EXPECTED BENEFITS: The construction of a water quality improvement project to remove phytoplankton and suspended sediments from the lake water before it flows to the Peace River would provide benefits to the natural systems in the Upper Peace River and to the water supply downstream which is used a potable resource.

MONITORING: Polk County staff have been monitoring the lake and it is expected they will continue to do so.

REGULATORY, PROGRAMMATIC OR OTHER WATER MANAGEMENT NEEDS:

If improvements to water quality are achieved, the schedule for seasonal water releases from the lake could be revised to benefit the dry season flow regime of the Upper Peace River and maintain greater water level fluctuations in the lake compared to previous management practices. Such water level fluctuations may help maintain water quality and the diversity of biological habitats in the lake, and allow for more natural patterns of water releases to the Upper Peace River. Improved water quality exiting the lake should reduce the taste and odor problems in potable water supplies obtained from the river downstream near Ft. Ogden.

RELATED ACTIONS: The CHNEP is preparing their Comprehensive Conservation and Management Plan. The Peace River Basin is a major portion of the watershed affecting Charlotte Harbor. The CHNEP is very interested in activities and management actions within the Upper Peace River.

ISSUE 2. Assessment of Algal Blooms and Related Water Quality Problems in the Peace River and Establishment of Pollutant Load Reduction Goals

STRATEGY: In coordination with Lake Hancock restoration, investigate other factors contributing to algal blooms and related water quality problems in the main stem of the Peace River. Evaluate the technical basis and feasibility of a comprehensive management strategy to reduce the occurrence of algal blooms and improve water quality in the Peace River, including the development of pollutant load reduction goals (PLRGs).

BACKGROUND: The main stem of the Peace River has experienced significant water quality degradation for many years. In earlier decades, large point-source discharges and periodic mining related spills caused serious impacts to the river's water quality. Although impacts from these factors have been greatly reduced, the Peace River still periodically experiences large algal blooms and depressed dissolved oxygen concentrations. These degraded water quality conditions appear to be causing serious negative impacts to fish and other biological resources of the river. Furthermore, periodic blooms of cyanobacteria (blue-green algae) affect the use of the river downstream for potable water supplies. Various factors may be influencing the occurrence of algal blooms and other water quality problems in the river, including discharges from Lake Hancock, downstream nutrient loading and reduced streamflow. However, the relative effects of these factors have not been well defined. A comprehensive study is needed to examine factors affecting water quality in the Peace River and management strategies to improve water quality, including PLRGs.

ACTIONS:

- Step 1. Conduct study to identify sources or causes of algal blooms in the main stem of the Peace River and determine appropriate pollution reduction goals.
- Step 2. In coordination with Lake Hancock restoration, evaluate the technical basis and feasibility of a management plan to achieve pollution load reduction goals that reduce the occurrence of algal blooms and related water quality problems in the Peace River.

Responsible Parties: SWFWMD, FDEP

Involved Parties: SWFWMD, FDEP, CHNEP, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE:

Begin technical study of algal blooms in FY-1999

Establish PLRGs by FY-2001

Develop management plan to reduce algal blooms by FY-2002

ESTIMATED COST: \$100,000 for technical study and development of management plan.

EXPECTED BENEFITS: Improvement to water quality and health of biological communities in the Peace River. Reduction of taste and odor problems in public water supplies.

MONITORING: Monitoring of Peace River should be conducted to track levels of algal populations in the river.

RELATED ACTIONS: Lake Hancock restoration; streamflow restoration in Upper Peace River

ISSUE 3. Water Quality Targets and Pollutant Load Reduction Goals for the Lower Peace River/Charlotte Harbor Estuary

STRATEGY: Continue research to develop resource-based water quality targets and PLRGs for the Peace River estuary and associated areas of Charlotte Harbor.

BACKGROUND: Although it is generally considered to have fair to good water quality, the estuary associated with the Lower Peace River and Upper Charlotte Harbor periodically experiences significant water quality problems. Low concentrations of dissolved oxygen (hypoxia) are common in portions of the estuary during the summer rainy season and large algal blooms can occur throughout the year. Factors contributing to these conditions are complex and have been the source of recent studies (Squires, et. al 1998 and Heyl 1998). One study found increasing trends for inorganic nitrogen in low salinity waters and total nitrogen concentrations in high salinity waters (EQL 1995). Combined with increasing nitrogen trends observed in several tributaries of the estuary, this may be indicating cultural eutrophication. Studies to date, however, have produced inconclusive findings regarding relationships of nutrient loading to water quality problems in the estuary. Continued research is needed to better define these relationships and determine water quality targets and PLRGs for the Lower Peace River/Charlotte Harbor estuary.

ACTIONS:

- Step 1. Conduct studies to examine relationships of nutrient loading to algal blooms and hypoxia in the Lower Peace River/Charlotte Harbor estuarine system.

- Step 2. Determine PLRGs for the Lower Peace River estuary.

Responsible Parties: SWFWMD, CHNEP

Involved Parties: SWFWMD, FDEP, CHNEP, local governments, SWFRPC, CFRPC, citizen organizations

TENTATIVE SCHEDULE:

- Step 1. FY - 1999
- Step 2. FY - 2002

ESTIMATED COST: \$150,000

EXPECTED BENEFITS: Protection of the ecological resources associated with the Lower Peace River/Charlotte Harbor estuarine system. Avoidance of ecological problems related to cultural eutrophication.

MONITORING: Existing monitoring programs of estuary should be continued to track water quality.

RELATED ACTIONS: Restoration of Lake Hancock; pollution load reduction goals for tributary sub-basins

ISSUE 4. Priority List for Establishment of Pollutant Load Reduction Goals for Tributaries in the Peace River Watershed

STRATEGY: Develop a list of tributaries in the Peace River watershed which: (1) do not currently meet state water quality standards; or (2) meet state standards but exhibit declining water quality trends. Evaluate the degree that water quality impairment has resulted in impacts to biological communities associated with those tributaries. In conjunction with the determination of PLRGs for both the Peace River and its estuary, identify those tributary sub-basins that contribute excessive loads of nutrients or other constituents. Based on this assessment, prepare a priority list of tributaries in the Peace River watershed for the establishment of PLRGs. Establish such pollution load reduction goals in a timely manner.

BACKGROUND: Tributary streams of the Peace River exhibit a wide range of water quality conditions. Many streams in the upper portions of the watershed have historically been affected by phosphate mining and point-source discharges. In recent years, water quality has improved in some tributaries due to improvements in mining practices, waste treatment processes and alternate means of waste disposal. However, other tributaries in the watershed (e.g., Horse, Joshua Creeks) have shown pronounced trends of increasing nutrient concentrations as a result of rising non-point source pollution. The status of water quality of streams throughout the watershed needs to be reexamined and compared to biological information for these systems and PLRGs for the Peace River and its estuary.

ACTIONS:

- Step 1. Generate a list of tributaries or stream reaches within the watershed which currently exhibit significant violations of state water quality standards or have shown declining water quality trends through time.
- Step 2. Determine if these violations or trends have resulted in impacts to the biological communities associated with these tributaries.
- Step 3. Determine if loadings of nutrients or other constituents from these tributaries are excessive in relation to the establishment of PLRGs for the Peace River or its estuary.
- Step 4. Based on these assessments, develop a priority list for the establishment of resource-based water quality targets and PLRGs for identified tributaries or stream reaches.
- Step 5. Establish pollution load reduction goals for priority tributaries in a timely manner.

Responsible Parties: SWFWMD

Involved Parties: SWFWMD, FDEP, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE:

- Step 1. FY - 1999
- Step 2. FY - 1999
- Step 3. FY - 2000
- Step 4. FY - 2001

ESTIMATED COST: \$150,000

EXPECTED BENEFITS: Improvement of water quality and biological conditions in tributaries in the watershed. Protection of the water quality and biological resources of the Peace River and its receiving estuary.

MONITORING: Monitoring of tributaries, river, and estuary should allow assessments of success of program in future years.

RELATED ISSUES: Pollution load reduction goals the for Peace River; pollution load reduction goals for the Peace River/Upper Charlotte Harbor estuary

ISSUE 5. Water Quality Criteria for Streamflow Management of the Upper Peace River

STRATEGY: Incorporate water quality criteria in the technical evaluation of minimum flows for the Upper Peace River, or other management strategies intended to restore streamflow in the upper river or prevent further decline.

BACKGROUND: As described in Issue #1 for Water Supply, considerable evidence indicates that streamflow in the Upper Peace River has been reduced by human-related activities. These flow reductions have probably also impacted the water quality characteristics of the upper river. The Water Management District is scheduled to adopt minimum flow regulations for the Upper Peace River in 1999. Ecological studies supporting minimum flows may provide information on relationships of water quality to streamflow in the upper river. Studies of algal blooms in the upper river recommended in Issue #2 should also provide information on streamflow/water quality relationships. Pending the findings of these studies, water quality criteria should be included in the determination of minimum flows for the Upper Peace River, or any other management plans to restore or maintain streamflow.

ACTIONS:

- Step 1. Incorporate water quality criteria in the determination of minimum flows for the Upper Peace River.
- Step 2. Incorporate water quality criteria in development of restoration strategies to restore or maintain streamflow in the Upper Peace River.

Responsible Parties: SWFWMD

Involved Parties: SWFWMD, FFWCC, FDEP, CFRPC, DCA, mining industry, local governments

TENTATIVE SCHEDULE:

- Step 1. FY- 1998
Step 2. FY- 2000

ESTIMATED COST: N/A - incorporated in other projects

EXPECTED BENEFITS: Improvements in water quality and health of biological communities in the Upper Peace River

MONITORING: Monitoring programs of the Upper Peace River should track success of project.

RELATED ACTIONS: Minimum flows for Upper Peace River; assessment of algal blooms in upper river

ISSUE 6. Shell/Prairie Creek Water Quality Protection

STRATEGY: Pursue Outstanding Florida Water status for the Shell/Prairie Creek system relative to other tributaries in the watershed. Evaluate other management strategies, such as land acquisition and local ordinance development, to protect water quality and streamflow in Shell and Prairie Creeks.

BACKGROUND: Shell Creek and its tributary Prairie Creek are among the least impacted streams in the Peace River watershed. Because of its relatively large drainage area and flow, the Shell Creek system has special hydrologic and ecological importance in the southern part of the District. Shell Creek supplies about one-fourth of the total freshwater flow from the Peace River watershed to its receiving estuary. Nutrient concentrations in Shell Creek are low compared to other tributaries in the watershed, and flows from Shell Creek are important for maintaining water quality and the health of the Lower Peace River/Charlotte Harbor estuarine system. Shell Creek also provides potable water supplies for the City of Punta Gorda. Poorly managed changes in land use could, however, threaten the quality of the Shell Creek system. Given the importance of this resource, special management or regulatory measures may be appropriate to better protect water quality and natural systems associated with the Shell/Prairie Creek system.

ACTIONS:

- Step 1. Prepare nomination document for Outstanding Florida Water status for the Shell Creek and Prairie Creeks.

- Step 2. Develop coordinated management plan to implement other measures to protect water quality in Shell Creek system.

Responsible Parties: SWFWMD, FDEP Ecosystem Management, local governments
Involved Parties: SWFWMD, FDEP

TENTATIVE SCHEDULE:

- Step 1. FY - 1999
- Step 2. FY - 2000

ESTIMATED COST: \$50,000

EXPECTED BENEFITS: Enhanced protection of water quality and biological communities in Shell Creek and the Lower Peace River/Upper Charlotte Harbor estuary

MONITORING: Monitoring programs of Shell Creek and estuary will track success of program.

RELATED ACTIONS: PLRGs for Lower Peace River estuary; PLRGs for tributary sub-basins

ISSUE 7. Restoration - Winter Haven Chain of Lakes

STRATEGY: Pursue strategy as outlined in the Board and FDEP approved Surface Water Improvement and Management (SWIM) Plan for the WHCL. The plan targets phosphorus as the nutrient of concern with a PLRG equivalent to a 5,000 pound reduction in the annual phosphorus load. The main strategy is geared toward stormwater treatment, for more information refer to the adopted SWIM Plan (Kelly 1998).

BACKGROUND: The WHCL is a ranked priority SWIM water body. The WHCL is composed of 19 interconnected lakes located within and around the City of Winter Haven in north-central Polk County with a combined surface area of 7,000 acres. An investigation of lake sediment cores from five lakes on the Chain was conducted to evaluate historical changes in water quality. Sediments dated to about 1860 indicated that the lakes were historically in the mesotrophic to eutrophic range (moderately to slightly nutrient enriched) with a lack of blue-green algae blooms during the summer. It was inferred that the TSI for the lakes was probably around 50; however, due to extreme hydrologic changes to the lakes and the high degree of urbanization of the watershed, TSI's in the slightly eutrophic range are the best that can be expected (i.e., TSI's from 50 to 60). A target TSI of 60 is proposed for the Chain as a whole.

A 25% reduction in non-point loading of phosphorus will be required to lower the TSI ten units. Further, it has been estimated that a 25% reduction in non-point source loading will require a 50% reduction in stormwater phosphorus loading. In the case of the Southern Chain of Lakes this equates to an annual load reduction of 4,000 pounds of phosphorus, and for the Northern Chain, approximately 1,000 pounds. Using typical wet detention systems, this will require the equivalent of 20-25 retrofit projects on the highest loading sub-basins.

The Board adopted SWIM Plan for the WHCL proposes to continue to implement stormwater treatment projects as funding becomes available. It is anticipated that stormwater treatment projects will include a mix of typical (e.g., wet detention) and innovative technologies (e.g., alum injection, periphyton filter system, etc.). In addition, the plan proposes to develop detailed nutrient budgets for at least two lakes on the Chain. The large number of lakes involved precludes an in-depth investigation of each. However, it is felt that accurate budgets for at least two lakes will increase confidence in model predictions, allow refinement of pollutant reduction goals, and help to develop the most cost effective nutrient reduction strategies.

The original SWIM plan for the WHCL identified stormwater treatment as a high priority. The updated plan (Kelly 1998) essentially reaffirms that position. The degree and speed of implementation of future stormwater treatment projects will be dependent on available funds from the state, District, and local governments.

ACTIONS: Refer to adopted SWIM Plan (Kelly 1998).

TENTATIVE SCHEDULE: Refer to adopted SWIM Plan (Kelly 1998).

ESTIMATED COST: For specifics refer to adopted SWIM Plan (Kelly 1998); the SWIM Section has requested \$250,000 annually to implement the adopted plan. Stormwater retrofit projects require a 50% local match.

EXPECTED BENEFITS: A ten unit reduction in TSI which is equivalent to reducing the amount of algae in the water column by half. This should lead to reduced incidence of cyanobacterial (blue-green algae) blooms, fish kills, and related trophic problems.

MONITORING: Polk County with assistance from the Lakes Region Lake Management District collects quarterly water quality samples from all lakes in the WHCL. Results of monitoring are published annually by Polk County (Division of Natural Resources and Drainage).

RELATED ACTIONS: PLRGs for tributary sub-basins

ISSUE 8. Assessment of Water Quality Problems, Development of Lake Management Plans, and Establishment of Pollutant Load Reduction Goals for Other Lakes in Watershed

STRATEGY: Develop and implement numerical water quality targets, PLRGs and site-specific restoration plans for lakes which currently violate state standards and are known to make significant contributions to watershed-wide water quality problems.

BACKGROUND: The District either as a result of cooperative efforts with local governments, basin initiatives or legislation (SWIM Act) has conducted a number of diagnostic/feasibility studies (e.g., Lake Parker, Lake Mariana) and developed water body specific management plans (e.g., Banana Lake, WHCL) for select surface waterbodies within the Peace River Basin. In addition to designated SWIM priority waterbodies (e.g., WHCL) a number of lakes within the Peace River watershed currently violate certain state water quality criteria, fail to meet their designated uses, or are noticeably degraded from their historic condition. Various efforts have demonstrated that most lake water quality problems are attributable primarily to excessive nutrient enrichment. Characteristic of cultural eutrophication is a marked increase in the frequency and severity of cyanobacteria blooms (blue green algae). Blooms of cyanobacteria and algae, aside from causing aesthetic problems, can generate concerns for health, cause fish kills, increase the rate of sediment accumulation within a lake, and affect downstream water quality. Development also threatens lakes due to loss of habitat and associated wildlife.

ACTIONS:

- Step 1. Develop prioritized list of waterbodies which (1) do not currently meet state water quality standards; (2) meet criteria but exhibit declining water quality trends; and (3) meet criteria but are potentially threatened by projected land use changes.
- Step 2. Establish resource-based water quality targets and PLRGs for prioritized waterbodies.
- Step 3. Develop water body specific restoration/preservation management plans for priority waterbodies.
- Step 4. Acquire needed funds and implement elements of water body specific management plans.
- Step 5. Evaluate success of monitoring, re-evaluate goals, adjust management plan as needed.

Responsible Parties: FDEP, SWFWMD

Involved Parties: FDEP, SWFWMD, CFRPC, local governments, citizen organizations

TENTATIVE SCHEDULE: Not Determined at this time.

ESTIMATED COST: Highly variable from water body to water body. It is generally conceded that restoration is more expensive than preservation, that restoration is more expensive the more highly urbanized an area becomes, and that point sources of pollution are easier and more cost effective to control than non-point sources. Specific restoration actions may range from whole lake dredging, stormwater treatment, habitat restoration, and improvements in wastewater treatment. Restoration will typically involve a combination of these actions.

EXPECTED BENEFITS: Improved water quality and associated natural systems

MONITORING: Monitoring environmental response will typically involve diagnostic/feasibility studies and a period of pre-restoration monitoring followed by a period of post-implementation monitoring.

RELATED ACTIONS: PLRGs for tributary sub-basins

ISSUE 9. Coordination of Water Quality Monitoring Programs

STRATEGY: Surface and groundwater quality data for many areas of the watershed are limited. Furthermore, the interval, frequency, and quality of existing data is often inadequate and/or poor, limiting its usefulness to managers and planners for making informed decisions. A comprehensive water quality monitoring network will be devised and implemented for surface and groundwaters within the SWFWMD.

BACKGROUND: The SWFWMD has over 1,600 lakes, an estimated 8,900 miles of rivers, streams and canals, and vast aquifer systems. Of the District's total annual budget, approximately 20% goes to water quality projects and programs associated with these water resources. Clearly, a level of monitoring effort must be maintained to ensure adequate water quality data for watershed planning, managing water quality, and ensuring the effectiveness of management activities. Generally, these data needs fall into six categories:

1. The collection of water quality data from consistent key sites and wells with the objective of water quality trend detection. Many such sites exist (e.g., USGS gaged sites, road crossings, structure outfalls, water quality monitoring program, saltwater intrusion monitoring wells, etc.). It is important to maintain most of these sites, particularly those with a long period of record and to add new sites as necessary.
2. The collection of water quality data to identify surface water and groundwater that deviate from local or regional ambient conditions. By increasing the spatial coverage of water quality data, it may be possible to identify streams, rivers, and lakes that have different water quality from other surface waters in the same geographical area. It will also be possible to identify areas of poor groundwater quality that threaten the use of the aquifer.
3. In many cases, water managers are called upon to make judgements or management decisions about surface water and groundwater for which the data are outdated, of low quality, or nonexistent. It may be desirable to have widespread sampling sites with a lower frequency of data collection, so that data are readily available to aid in decision making. Collected over a sufficiently long period, trend identification may also be possible for these sites.
4. For managing some water bodies, it is important to have pollutant loading data for model development and verification (e.g., Hillsborough River Reservoir, Tampa Bay and Charlotte Harbor nutrient loads from contributing watersheds, Lake Thonotosassa and other SWIM water quality projects). Furthermore, pollutant loading data are necessary to develop PLRGs, and to support state requirements to develop total maximum daily loads (TMDLs) for water bodies. Chemical concentrations in flowing waters often vary greatly with the volume of flow. Sites for the estimation of pollutant loads must be gaged, and samples should be collected across the range of flows common to the stream or river. Load monitoring sites are usually selected that represent runoff from an entire watershed or tributary sub-basin.
5. To better protect aquifer resources, it is important to have water quality data prior to, during, and following the use of the aquifer. This allows staff to assess the impacts of that use to processes such as saltwater intrusion, sulfate upwelling, or induced recharge.

6. The District funds numerous water quality projects within its 16-county area. Managers need pre- and post-monitoring data to determine the effectiveness of water quality programs and projects.

Responsible Parties: FDEP, SWFWMD

Involved Parties: FDEP, SWFWMD, CFRPC, local governments, citizen organizations

ACTIONS AND TENTATIVE SCHEDULE:

Step 1. Inventory the existing data (*who: SWFWMD Database Users Group (D-BUG Group and CWM team members)*). During FY-1999 through FY-2002:

- a. Identify which agencies are presently collecting water quality data, the location of sampling sites, sampling frequency, sampling purpose, which sample constituents are being analyzed, and the agency's laboratory QA/QC plan and record.

Completed: In August 2000 information was compiled that includes all agencies currently collecting surface-water quality data in the Peace River Basin. The list includes monitoring site locations (latitude/longitude), site names, field and laboratory analytes collected, contact person / data manager for each agency, and purpose / goal of the water quality monitoring project. This list is available through the District's Peace CWM water quality team leader and will be updated on a yearly frequency.

- b. Identify the data quality, its completeness, and period of record.
- c. Identify data access. Are data available as paper files or can they be electronically accessed in an existing database? Can paper files be entered into a permanent electronic database?

Step 2. FY-2002: From the information gathered above, create a map of all sites currently monitored within the District. (*Who: CWM teams, local governments, District GIS staff*)

Step 3. FY-2000 to FY-2002: Identify data gaps and data needs. (*Who: CWM teams, local governments, District staff, D-BUG data committee*)

- a. Coordinate with other sampling entities to attempt coordination of sample sites, sample frequency, sample quality, and sample constituents monitored – avoid the duplication of monitoring effort and ensure the maximum benefit to all agencies for monitoring effort and expense.
- b. For identified sampling sites, both existing and proposed, determine the priority for sampling, and a sampling plan for each site.
- c. Identify where water quality data will reside, and its level of accessibility to all (private citizens as well as cooperating agencies). Will all the data reside in one database, or linked by Internet access to multiple databases?
- d. Identify means of funding, and opportunities for cooperation between agencies, for implementing an expanded water quality monitoring program.

Step 4. Establish and oversee a regional monitoring committee that includes all agencies collecting water quality data for non-permit related needs. Such a committee would provide the framework for standardizing collection and analysis techniques and methods, and promote better flow of data between agencies.

Other actions that should be considered include: establishing a standard list of minimum sampling constituents for all sites within the District (sample collection is probably the greatest expense associated with monitoring); ending the sampling of sites that are not used for long-term trend analysis; evaluating the need for the level of data collection at sample sites; identifying who will manage, use, and analyze the data, and whether periodic data reports will be made available that summarize the data; and coordinating with other agencies to ensure that sample sites are maintained (if a sample site is dropped by one agency, others need to be informed so that sampling can be continued, if appropriate).

ESTIMATED COST: Not determined at this time.

EXPECTED BENEFITS: Detection of water quality trends. Detection of water quality data which may deviate from historical “background” levels. Recent, qualified data for use in water management decisions and goals. Reduction in duplication of efforts which also reduces funds required for monitoring projects. Assists with TMDLs and PLRGs.

MONITORING: FDEP Watershed Assessment monitoring. SWFWMD surface and groundwater quality monitoring programs, USGS monitoring programs. Polk County monitoring programs. Charlotte Harbor Environmental Center (CHEC), CHNEP, Peace River/Manasota Regional Water Supply Authority

REGULATORY, PROGRAMMATIC OR OTHER WATER MANAGEMENT NEEDS: Assist with TMDLs and PLRGs

ISSUE 10. Assess Programs to Control Pesticides in Surface Waterbodies

STRATEGY: Identify lakes and stream reaches in which pesticide concentrations in the water column or sediments currently reach levels sufficient to cause toxicological impacts in humans or wildlife. Implement best management practices (BMPs) to reduce pesticide concentrations in problem areas.

BACKGROUND: Surface water quality in some portions of the Peace River watershed may be at risk due to pesticide application practices in the watershed. Although pesticide (insecticide and herbicide) concentrations are not intensively monitored in the Peace River watershed, a recent National Oceanic and Atmospheric Administration study suggested that surface water quality in the region may be at risk due to high per-acre application rates of several relatively hazardous compounds (Pait et al. 1992). Among herbicides, the Charlotte Harbor watershed (including the Peace and Myakka River basins) had the highest estimated 2,4-D use (more than 330,00 pounds/year) of Gulf of Mexico estuaries, with the majority of the material applied to pasture and rangelands (Pait et al. 1992). Among insecticides, endosulfan (applied to tomatoes) and chlorpyrifos (applied to citrus) made the largest contributions to the elevated risk ranking calculated for Charlotte Harbor (Pait et al. 1992). Much of this agricultural chemical use presumably occurred in the Peace River drainage basin, which contains a large proportion (about 85%) of the non-rangeland agricultural acreage that currently exists in the Charlotte Harbor watershed.

ACTIONS:

- Step 1. Design and implement a monitoring program to assess pesticide concentrations in surface waters and their environmental impacts in the portions of the watershed which have been identified as potentially at risk.
- Step 2. If significant concentrations and impacts are detected, select and implement BMPs to reduce pesticide discharges to surface waters in impacted areas.

Responsible Parties: SWFWMD, FDEP

Involved Parties: SWFWMD, FDEP, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE: Not determined at this time.

ESTIMATED COST: Not determined at this time.

EXPECTED BENEFITS: Determine if pesticide constituents are impacting the Peace River and/or its tributaries.

ISSUE 11. Restoration Plan for Banana Lake

STRATEGY: Pursue strategy as outlined in the Banana Lake SWIM Plan approved by the Board and FDEP. For more information refer to the adopted SWIM Plan (Kelly 1995).

BACKGROUND: The District either as a result of cooperative efforts with local governments, basin initiatives or legislation (SWIM Act) has conducted a number of diagnostic/feasibility studies (e.g., Lake Parker, Lake Mariana) and developed water body specific management plans (e.g., Banana Lake, WHCL) for select surface waterbodies within the Peace River Basin. In addition to designated SWIM priority waterbodies (e.g., WHCL) a number of lakes within the Peace River watershed currently violate certain state water quality criteria, fail to meet their designated uses, or are noticeably degraded from their historic condition. Various efforts have demonstrated that most lake water quality problems are attributable primarily to excessive nutrient enrichment. Characteristic of cultural eutrophication is a marked increase in the frequency and severity of cyanobacteria blooms (blue-green algae). Blooms of cyanobacteria and algae, aside from causing aesthetic problems, can generate concerns for health, cause fish kills, increase the rate of sediment accumulation within a lake, and affect downstream water quality. Development also threatens lakes due to loss of habitat and associated wildlife.

ACTIONS: Refer to the adopted SWIM Plan (Kelly 1995).

Responsible Parties: FDEP, SWFWMD

Involved Parties: FDEP, SWFWMD, CFRPC, local governments, citizen organizations

TENTATIVE SCHEDULE: To be completed.

ESTIMATED COST: Highly variable from water body to water body. It is generally conceded that restoration is more expensive than preservation, that restoration is more expensive the more highly urbanized an area becomes, and that point sources of pollution are easier and more cost effective to control than non-point sources. Specific restoration actions may range from whole lake dredging, stormwater treatment, habitat restoration, and improvements in wastewater treatment. Restoration will typically involve a combination of these actions.

EXPECTED BENEFITS: Improved water quality and associated natural systems

MONITORING: Monitoring environmental response will typically involve diagnostic/feasibility studies and a period of pre-restoration monitoring followed by a period of post-implementation monitoring.

RELATED ACTIONS: PLRGs for tributary sub-basins

CHAPTER 5. NATURAL SYSTEMS

ISSUE 1. Developing a Comprehensive Management Plan to Restore Water Quality and Hydrologic Functions in the Upper Peace River Watershed

STRATEGY: To the greatest extent practicable, a comprehensive management plan for the Upper Peace River watershed needs to be developed and implemented in order to maintain and/or restore the ecological characteristics of this system. Such a management plan should address the restoration of flows and water quality in the Upper Peace River, consistent with strategic actions recommended in preceding sections of this plan (please refer to Issues 1 and 2 in the Water Supply Chapter and Issues 2 and 5 in the Water Quality Chapter). Addressing the poor water quality of outflow from Lake Hancock will be a critical element of any management plan to improve the water quality and natural systems associated with the upper river. The plan should also promote the acquisition of remaining high quality natural areas associated with the river, such as the floodplain of the river and its tributaries, and some adjacent uplands that buffer such areas. Another strategy that should be investigated is the strategic reclamation of Old Lands that were mined for phosphate prior to modern regulations that require reclamation. Such reclamation should target sites that would help to restore flows and riverine habitats in the upper watershed.

BACKGROUND: Studies conducted by the FFWCC have shown that fish populations in the Upper Peace River have been negatively affected by human activities. Fish populations in the upper reaches are characterized by low biomass and low diversity, with species compositions dominated by pollution-tolerant (gar, bowfin) or exotic (tilapia) species. Poor water quality in the upper river, particularly hypereutrophic conditions and low dissolved oxygen concentrations, have been linked to the decline of the fish fauna. The FDEP has attributed a similarly-affected invertebrates fauna to poor water quality in the upper river and its tributaries. Reductions in streamflow in the upper watershed have also been identified as a factor affecting the poor status of fish populations. Impacts to fish and invertebrate populations are probably manifested upwards in the food web to include terrestrial wildlife associated with the upper river.

ACTIONS: A comprehensive management plan that provides for the restoration of the hydrology, water quality, and natural systems of the upper river should be developed. The plan should, at a minimum, address the following items:

- Step 1. The treatment of hypereutrophic outflow from Lake Hancock with a wetlands treatment system or other effective approach.
- Step 2. An assessment, and subsequent management, of point source discharges in the upper watershed.
- Step 3. A restoration of flows in the upper watershed, with particular attention directed toward restoring higher base flows that will better sustain fish and wildlife populations in the upper river during the dry season.
- Step 4. Acquisition of land to protect the remaining natural communities associated with the upper river, including sensitive uplands and wetlands associated with tributaries to the upper river.
- Step 5. The reclamation of non-mandatory (i.e., Old Lands) phosphate land to restore hydrologic functions and flows to the Upper Peace River should be investigated, particularly where previous mining has severed tributaries from the system.

Responsible Parties: SWFWMD, FDEP, CHNEP
Involved Parties: SWFWMD, FDEP, CHNEP, CFRPC, CHNEP, FIPR, local governments

TENTATIVE SCHEDULE: A study to update the water and nutrient budget for Lake Hancock has recently been completed and will provide a basis for the design and permitting of a water quality improvement project. Many of the natural lands within the Peace River floodplain have already been evaluated for acquisition and are now approved for acquisition as part of the District's Upper and Lower Peace River Corridor projects. The District-owned Deep Creek Preserve along the lower river was purchased as part of that project and similar acquisitions should now target lands along the upper river. Planning for the hydrologic restoration of the Six Mile Creek watershed is in progress, and CHNEP is sponsoring a coordinated effort, in partnership with CHEC, to identify Old Lands around the upper river where reclamation would benefit the entire Peace River system. The Peace CWM Team is participating in this "Feasibility Assessment for the Environmental Restoration of Selected 'Old Mined Lands' in the Upper Peace River Watershed."

ESTIMATED COST: Given the multi-faceted nature of this proposal, it is difficult to estimate cumulative costs. As noted previously, an updated water and nutrient budget has already been completed for Lake Hancock and is being used to help outline a lake restoration strategy. Three approaches to restoration have been proposed, ranging in estimated cost from \$7.5 million to \$13.3 million. The District, in partnership with the Lake Hancock/Upper Peace River Water Quality Advisory Group convened by Polk County, are continuing to evaluate water quality restoration strategies. The restoration of flows in the upper watershed, which will be largely dependent on the restoration of mined lands, and the acquisition of remaining natural areas, will also be expensive undertakings. Land acquisition costs would be borne by the Preservation 2000 and Florida Forever land acquisition programs, with possible participation by Polk County's acquisition program. The Old Lands reclamation program provides funds for the reclamation of "non-mandatory" lands that were mined for phosphate prior to modern reclamation requirements; however, the funding provided by this program is sufficient to cover only a minimal level of restoration and the initial cost must be borne by the landowner, with eventual reimbursement from the Old Lands fund. Success in this effort may be dependent on some level of financial assistance from the District and other partners.

EXPECTED BENEFITS: Water quality improvements and enhanced flows in the upper watershed will greatly improve habitat conditions for fish and other wildlife dependent on the aquatic systems of the Peace River and Lake Hancock. Public acquisition of fee title or less-than-fee interest of lands in the Peace River floodplain will help to ensure long-term protection of the habitat values of both the floodplain and the river channel, and offer resource-based recreational opportunities to the public. The reclamation of Old Lands to improve water quality conditions and enhance flows may potentially create additional wildlife habitat and provide links among conservation lands.

MONITORING: Monitoring sites have been established at intervals along the entire Peace River and these sites will discern any long-term improvements in water quality and changes in discharge rates.

RELATED ACTIONS: The CHNEP and FDEP have a similar interest in the restoration of Lake Hancock due to perceived benefits for the entire river and Charlotte Harbor estuary system. The FFWCC is promoting and facilitating a pilot sub-basin restoration project for Six Mile Creek to determine the feasibility of restoring hydrologic function to mined sub-basins, and an effort sponsored by CHNEP and facilitated by CHEC to identify Old Lands that should be restored to benefit the Peace River has just been initiated.

ISSUE 2. Establishing Minimum Flow Regulations for the Middle and Upper Reaches of the Peace River

STRATEGY: Studies should be conducted to better define surface water/groundwater relationships in the Upper Peace River watershed. Potentially, these studies could be used to develop special groundwater management strategies to protect or restore flows in the Upper and Middle Peace River Basin.

BACKGROUND: At present there are very few permitted withdrawals of surface water from the middle and upper portions of the Peace River. Flows in the upper river, however, have shown significant declines due to rainfall deficits, groundwater drawdowns, and drainage modifications in the upper reaches of the watershed. Before any new surface water withdrawals from the upper and middle reaches of the Peace River are permitted, the District should evaluate hydrologic and environmental relationships in those reaches and establish appropriate minimum flow regulations. These minimum flows would establish how much water is available for withdrawal from the upper and middle reaches of the river, while simultaneously maintaining river flows sufficient to support the aquatic and wetland systems associated with the river. The evaluation of minimum flows should account for existing reductions in streamflow that have resulted from current withdrawals and other anthropogenic alterations to the system.

Restrictions on withdrawals from the Lower Peace River have already been established as conditions of the water use permit that allows for potable supply withdrawals from the lower river near Fort Ogden. The District has committed to the establishment of minimum flows for the Lower Peace River by 2003, for the Upper Peace River by 2001, and for the middle reaches of the river by 2002. Minimum flows established for the upper and middle reaches of the river should be coordinated with the withdrawals already permitted from the lower river so that cumulative withdrawals will not adversely affect flows to the lower river and Charlotte Harbor estuary.

The minimum flows that are scheduled for establishment will pertain to surface water withdrawals. The District expects that forthcoming SWUCA rules will prevent any further reductions of streamflow in the river due to lowering of water levels in the Floridan Aquifer. However, as described in Issue 1 of the Water Supply Chapter of this volume, studies should be conducted to better define surface water/groundwater relationships in the upper watershed. These studies could potentially be used to develop special groundwater management strategies that will help to protect or restore flows in the upper portion of the watershed.

ACTIONS:

- Step 1. The establishment of minimum flows for the upper and middle portions of the Peace River, scheduled for 2001 and 2002, respectively, should account for the hydrologic needs of natural systems associated with the river and previous impacts to the river's flow regime.
- Step 2. Minimum flows established for the upper and middle reaches of the Peace River should be coordinated with the withdrawals already permitted from the Lower Peace River so that cumulative withdrawals will not adversely affect flows to the lower river and estuary.
- Step 3. Additional studies should be conducted to better define surface water/groundwater relationships in the Upper Peace River. These studies could potentially be used to support special groundwater management strategies to protect or restore flows in the upper river.

Responsible Parties: SWFWMD
Involved Parties: SWFWMD, CFRPC, FDEP, CHNEP, local governments, mining industry, citizen groups

TENTATIVE SCHEDULE: As noted above, minimum flows for the Upper Peace River are to be adopted by 2001. Minimum flows for the middle reaches of the river are to be adopted by 2002, and for the lower river by 2003.

ESTIMATED COST: Costs for the adoption of minimum flows are to be covered by normal operating expenses of the District.

EXPECTED BENEFITS: The adoption of separate minimum flows for the upper, middle, and lower river will ensure that the water needs of associated natural systems are met.

MONITORING: Streamflow will be monitored by an existing USGS network. A biological monitoring program will have to be implemented to track or document the response of aquatic life to resulting streamflow management.

RELATED ACTIONS: Minimum groundwater levels will eventually be established, and adverse declines in groundwater levels will be avoided through establishment of the SWUCA.

ISSUE 3. Protecting Large Blocks of Core Wildlife Habitat to Preserve Natural Communities and Wildlife Populations

STRATEGY: Promote and participate in a coordinated effort to protect core habitat areas capable of supporting the long-term survival of a diverse and viable assemblage of the natural communities and wildlife species indigenous to the Peace River watershed.

BACKGROUND: The acreage and spatial distribution of protected core habitat in the Peace River watershed is inadequate to support the long-term survival of viable populations of many wildlife species. As noted in the Natural Systems chapter of Volume I of this plan, very few natural areas of substantial size have been protected through public acquisition within the Peace River watershed. Generally, large blocks of natural habitat are essential to effective habitat protection programs because only large sites are likely or able to: include the full diversity of native plant communities; support populations of wildlife that will be large enough to prevent the genetic consequences of inbreeding; and accommodate prescribed burning programs, which are an indispensable habitat management tool.

At present, the Babcock/Cecil Webb Wildlife Management Area (78,000 acres), Highlands Hammock State Park (8,140 acres), Tenoroc Fish Management Area (7,350 acres), and District-owned RV Griffin Reserve (5,850 acres) and Deep Creek Preserve (1,980 acres) represent the only large blocks of public land where protection of wildlife habitat values serves as a fundamental management goal. Babcock /Cecil Webb Wildlife Management Area is situated at the extreme southern end of the watershed and less than half of the site (35,000 acres) lies within the watershed. The Tenoroc tract consists of reclaimed mine land managed primarily to accommodate recreational usage and is situated within a matrix of developed areas and other mined lands. Management and use of the RV Griffin Reserve must place primary emphasis upon water supply functions associated the Peace River Water Supply Facility. These factors, in combination with the relatively small size of most of the tracts, will compromise the long-term ability of the Peace River watershed to provide high quality habitat for wildlife and to support viable wildlife populations.

A number of public land acquisition projects have been proposed for the watershed, including the District's Lower Peace River Corridor and Upper Peace River Corridor projects (cumulative total of approximately 57,500 acres), and a project that targets the protection of 25,150 acres along Shell and Prairie Creeks through a combination of fee title and less-than-fee title acquisitions. A project targeting protection of the Charlie Creek floodplain through purchase of conservation easements has recently been approved. In addition, some existing conservation areas may be expanded through the acquisition of adjoining natural lands. Lands lying outside the watershed but adjacent to the RV Griffin Reserve could, for example, expand the total size of this core habitat area by over 9,000 acres. The long-term habitat value of the RV Griffin Reserve would be enhanced significantly through such an expansion.

The Preservation 2000, Florida Forever, and Conservation and Recreation Lands acquisition programs have received a statutory mandate to seek out opportunities for protecting natural areas through "less-than-fee" alternatives to "fee simple" purchases, typically through the purchase of conservation easements. The District's purchase of a conservation easement over a 32,000-acre portion of the Bright Hour Ranch in DeSoto County will effectively ensure the preservation of an extremely significant natural area while allowing the private landowner to continue engaging in an environmentally-compatible ranching operation. There is considerable

potential for future less-than-fee acquisitions to greatly enhance habitat protection efforts in the Peace River watershed and throughout the State of Florida. Core habitat protection efforts in the Peace River watershed should embrace less-than-fee protection strategies whenever they may serve as an appropriate alternative to fee simple acquisition.

ACTIONS:

- Step 1. Continue an ongoing assessment and GIS-based analysis of remaining, unprotected natural areas in the Peace River watershed in order to identify those sites that should be considered high priority targets for future habitat protection efforts.

- Step 2. Work closely with FDEP, other public agencies, local governments, private conservation groups and private industry to ensure that future land protection projects are executed cooperatively whenever possible and that the District's program is coordinated with other protection programs.

- Step 3. Pursue less-than-fee alternatives to fee simple acquisition whenever such an approach will be adequate to achieve the desired level of protection.

Responsible Parties: SWFWMD, FDEP, Polk County

Involved Parties: SWFWMD, FDEP, CHNEP, local governments, CFRPC, citizen organizations

TENTATIVE SCHEDULE: Update the GIS-based analysis by the end of FY 2002 and ensure that any newly-identified land protection projects are incorporated into the District's FY 2003 Five-Year Plan.

ESTIMATED COST: The ongoing GIS-based analysis is being supported as a basic component of the CWM effort. The primary funding source for land protection projects will be Preservation 2000, Florida Forever, and Conservation and Recreation Lands, in addition to any locally-funded programs, e.g., an acquisition program begun by Polk County.

EXPECTED BENEFITS: A resource-based analysis of remaining natural areas will help to ensure that the most important areas in terms of core habitat value will be protected. Coordination with FDEP and other possible partners in land acquisition or protection efforts can potentially simplify or streamline the process by defining the responsibilities and roles of each party and sharing or assigning primary responsibility for individual projects. Less-than-fee acquisitions can reduce public expenditures related to acquisition and long-term management, and reduce the fiscal impacts on affected local governments.

MONITORING: The planned update of the GIS-based analysis of remaining natural areas in the watershed will also reflect preceding land protection efforts and recent habitat destruction, thereby serving as a measure of the success achieved in protection of core wildlife habitat.

RELATED ACTIONS: Efforts to reclaim mined phosphate lands to natural land cover, and preserve a network of reclaimed mine lands for conservation purposes are underway through Team Permitting for newly-proposed mines and through other ongoing efforts. These are addressed in subsequent issue descriptions.

ISSUE 4. Preserving Corridors or Linkages Inside and Outside of the Watershed to Maintain the Long-Term Viability and Integrity of Preserved Natural Areas

STRATEGY: An acquisition or land protection approach that recognizes the need to maintain connections or linkages between protected areas of core habitat located within the watershed, and larger core habitat areas located outside the watershed, must be outlined and implemented.

BACKGROUND: As noted previously, very few natural areas of substantial size have been protected through public acquisition within the Peace River watershed. At present, the Babcock/Cecil Webb Wildlife Management Area (78,000 acres), Highlands Hammock State Park (8,140 acres), Tenoroc Fish Management Area (7,350 acres), and District-owned RV Griffin Reserve (5,850 acres) and Deep Creek Preserve (1,980 acres) represent the only large blocks of public land where protection of wildlife habitat values serves as a fundamental management goal. Babcock /Cecil Webb Wildlife Management Area is situated at the extreme southern end of the watershed, and the Tenoroc tract has been mined for phosphate and is situated within a matrix of developed areas and other mined lands at the extreme northern end of the watershed. The RV Griffin Reserve and Highlands Hammock State Park are both located around the central reaches of the watershed but lie on opposing boundaries of the watershed (western and eastern, respectively). The disjunct arrangement of these sites, in combination with their relatively small size and isolation from other protected areas, limits their ability to provide high quality “core” habitat for wildlife.

Although a number of public land acquisition projects have been proposed for the watershed that could potentially result in a significant expansion of core wildlife habitat, the addition of core habitat alone will be insufficient to perpetuate a complete assemblage of indigenous wildlife. Successful preservation of a diverse and viable complement of the wildlife species native to the Peace River watershed will also be dependent upon maintaining linkages among core areas located within the watershed, and linking such areas to large blocks of core habitat lying outside the watershed whenever possible. Approved acquisition projects within the watershed, e.g., the Peace River Corridor and Charlie Creek projects, would maintain linkage among some of the watershed’s most significant natural areas, and FDEP’s Integrated Habitat Network represents an effort to maintain connectivity throughout the mined portion of the watershed (Cates 1992). Inter-watershed connections will be equal in importance to these intra-watershed connections.

There are several large blocks of protected lands located outside the watershed that serve as core areas of wildlife habitat of state-wide significance. Core areas proximate to the Peace River watershed include: the Myakka River State Park complex of lands (71,700 acres), consisting of the Myakka River State Park (28,800 acres), the District’s MacArthur Tract (8,200 acres) and Myakka River tract (3,990 acres), and Sarasota County’s T. Mabry Carlton Memorial Reserve (24,560 acres) and Pinelands Reserve (6,150 acres); the Avon Park Air Force Range complex (177,645 acres), comprised of the federally-owned Avon Park Air Force Range (106,110 acres), the state-owned Kissimmee Prairie Preserve State Park (46,450 acres) and Lake Wales Ridge State Forest (20,280 acres), and The Nature Conservancy’s Tiger Creek Preserve (4,805 acres); the state-owned Babcock/Cecil Webb Wildlife Management Area (78,000 acres), which actually straddles the watershed boundary; and the Green Swamp, which includes contiguous public lands totaling approximately 150,000 acres. Acquisition projects that have been approved by the District (Myakkahatchee Creek and Myakka River) may ultimately expand the Myakka River State Park complex to approximately 102,000 acres. Protected lands in the Green Swamp may also be expanded.

At present, the most feasible opportunity for maintaining an inter-watershed connection lies in protection of the 9,190-acre RV Griffin Reserve addition and completion of the Myakkahatchee

Creek project. In combination, these projects would connect the western boundary of the District's RV Griffin Reserve, and ultimately the Peace River corridor, with the Myakka River State Park complex of lands.

The regional and state-wide significance of these sites that lie outside the watershed, but in close proximity, may play a critical role in preserving the wildlife of the Peace River watershed. The highly-altered nature of the watershed places severe limitations on opportunities for preserving core habitat within the watershed. Long-term viability of wildlife populations in the Peace River watershed may be unavoidably linked to maintaining physical connections to these sites lying outside the watershed. Corridors protected by conservation easements and/or consisting of agricultural land may be adequate to maintain functional connections in some cases.

ACTIONS:

- Step 1. Use the District's GIS to identify the most viable or valuable corridors and linkages between protected lands within the Peace River watershed, and significant core habitat areas located outside the watershed.

- Step 2. Coordinate with the FFWCC, FDEP, local governments, the phosphate industry, and others as appropriate, to promote development of an integrated and cooperative approach to land preservation in the watershed that utilizes a combination of fee-simple land acquisition and appropriate less-than-fee alternatives.

- Step 3. Strongly emphasize the need for acquisition of the RV Griffin Reserve Addition (a.k.a. Toledo Blade) and Myakkahatchee Creek projects to maintain connectivity between the central systems of the Peace River valley and the Gulf Coast systems of the Myakka River State Park complex.

Responsible Parties: SWFWMD, FDEP

Involved Parties: SWFWMD, CFRPC, FDEP, local governments, mining industry, citizen groups

TENTATIVE SCHEDULE: The Upper Peace River Corridor and Lower Peace River Corridor land acquisition projects have been approved for acquisition and identified as a land acquisition priority (SWFWMD 2001). The acquisition of these project areas will require an extended period of time given the number of individual ownerships involved, but will provide a continuous corridor of protected lands that could serve as the central spine of a linked network. Other land protection efforts are also difficult to schedule according to a timeline.

ESTIMATED COST: The cost of acquiring the District-approved project areas discussed above will be based on fair market value, which will be determined on a parcel by parcel basis and in conformance with District-approved real estate appraisal methods. The cost of these and other acquisitions by the District will be funded through the Preservation 2000 and Florida Forever programs.

EXPECTED BENEFITS: Acquisition of the target lands will ensure the long-term protection of resident wildlife populations, protect the integrity and function of aquatic communities of the river, maintain the aesthetic values of the natural areas, and preserve resource-based recreational opportunities for the public.

MONITORING: Monitoring actions implemented in association with other protection and restoration strategies will be adequate to document preservation of the riverine system.

RELATED ACTIONS: FDEP's BMR has identified a network of lands, known as the Integrated Habitat Network, in the upper watershed that maintain connectivity within the Bone Valley phosphate region. As noted in the following section of this plan, the maintenance of viable wildlife habitat in the upper watershed will be contingent upon maintaining connectivity among lands that have been mined for phosphate, reclaimed to natural habitat, and dedicated to conservation.

ISSUE 5. Incorporating a Strategic Network of Mined, Unmined, Reclaimed and Unreclaimed Lands into a Watershed-Wide Network of Preserve Lands

STRATEGY 1: During the mine planning and permitting process, minimize mining impacts to valuable natural areas located within mining sites, and maintain future potential for protecting a linked network of preserve lands in the upper watershed, by setting aside such lands as “no mine” areas.

BACKGROUND: The current mosaic of mined, unmined, reclaimed and unreclaimed lands under ownership of the phosphate industry account for a total land area of approximately 530,000 acres. Historically, mitigation for environmental impacts associated with phosphate mining has not focused strongly on the potential benefits of preserving select lands within the mine site to compensate for impacts to wildlife. Instead, reclamation of such lands after mining operations have concluded has been the preferred approach. Land preservation within the boundaries of a mining operation, provided such lands are extensive enough and linked with off-site habitat, can help to ensure that local wildlife populations survive on-site and provide a source for the expansion of wildlife into surrounding reclamation areas following the completion of mining.

ACTIONS:

- Step 1. Identify important floodplain corridors, core wildlife habitat, and valuable buffer areas within lands proposed for mining.
- Step 2. Distinguish environmentally sensitive sites that would be incapable of effective reclamation.
- Step 3. Restrict mining in areas known to provide important habitat for threatened and endangered species.
- Step 4. Develop incentives for the mining industry to preserve existing natural areas within proposed mine sites.
- Step 5. Ensure that preserved areas will be protected in perpetuity through conservation easements or other appropriate methods.

Responsible Parties: FDEP has primary responsibility and jurisdiction over phosphate mining activities and would be the appropriate agency to implement the proposed actions, in cooperation with the industry. The SWFWMD and FFWCC should play a supporting role in identifying lands that merit protection and outlining incentives.

Involved Parties: CFRPC, SWFRPC, FIPR, and local governments.

TENTATIVE SCHEDULE: This strategy should be implemented immediately through the ongoing team permitting review of the Ona, Pine Level and Farmland Hydro mining proposals, which encompass a total land area of approximately 61,000 acres and will account for a large proportion of the phosphate mining that will take place in the foreseeable future.

ESTIMATED COST: Unknown. Dependent on team permitting review of mining proposals.

EXPECTED BENEFITS: Land protection within the boundaries of large-scale mining operations will help to ensure protection of environmentally-sensitive sites while providing a source for the reestablishment of wildlife populations within adjoining reclaimed areas.

RELATED ACTIONS: Efforts to implement a “whole mine/whole sub-basin” approach to permitting and post-mining reclamation, being implemented through an ecosystem management/team permitting approach.

STRATEGY 2: Ensure that future mine reclamation plans contain a comprehensive land preservation component which highlights reclaimed areas that will be preserved in perpetuity, including linkages to other preserve lands.

BACKGROUND: Reclaimed mine lands are dedicated to a multitude of land uses, including residential or commercial development and agriculture. The expansive size of the phosphate region suggests that an effective natural system protection strategy for the Peace River watershed must ensure that some of these lands are set aside permanently for conservation purposes as one element of an integrated network of protected lands.

ACTIONS

- Step 1. Provide the mining industry with maps depicting the results of the District’s GIS analysis of natural systems in the Peace River watershed so these maps can be used as a resource in the design of future reclamation schemes.
- Step 2. Provide the inter-agency team permitting review teams with maps depicting the results of the District’s GIS analysis of natural systems in the Peace watershed and encourage them to use these maps as a resource in establishing reclamation options for proposed phosphate mines.
- Step 3. Strongly encourage a “whole mine/whole sub-basin” approach to permitting for future phosphate mines so that post-mining reclamation produces functional hydrologic systems that will continue to discharge to the Peace River and maintain associated aquatic communities.
- Step 4. Participate in an ongoing effort sponsored by Polk County to identify mined, reclaimed lands that should be incorporated into a linked, watershed-wide network of conservation lands.

Responsible Parties: SWFWMD, FDEP, Polk County
Involved Parties: SWFWMD, FDEP, CHNEP, local governments, CFRPC, SWFRPC, citizen organizations

TENTATIVE SCHEDULE: These measures should be implemented immediately for use in ongoing review of the Ona, Pine Level and Farmland Hydro mining proposals.

ESTIMATED COST: Unknown. Expense of reclamation is borne by the phosphate industry. The primary public costs associated with these measures will be expended during the permitting review process. As a strategy based on planning and coordinating reclamation in a more holistic and carefully considered manner, there may not be any new costs resulting from these measures, and a holistic approach to planning and reclamation may present opportunities for reducing overall costs relative to historic review and permitting approaches.

EXPECTED BENEFITS: Avoid adverse impacts to streamflow in the Peace River by ensuring that sub-basins mined in the future will continue to drain to the river after the completion of mining and reclamation activities.

RELATED ACTIONS: Water Supply Action 1B seeks to restore hydrologic connections between the Peace River and sub-basins that have been mined for phosphate. The above approaches will provide a proactive method of ensuring that reclamation of sub-basins mined in the future will be planned to preserve hydrologic relationships.

STRATEGY 3: Prioritize unreclaimed mine lands in the upper watershed for eventual reclamation through the Old Lands Program.

BACKGROUND: The Old Lands Program provides a funding source, derived as a portion of the severance taxes levied on mining companies, to support the reclamation of certain lands that were mined for phosphate prior to modern regulations that require post-mining reclamation. The program is voluntary and its funds are typically used to reimburse landowners who have performed minimal levels of reclamation that subsequently allow mined lands to be returned to a useful state. The CHNEP has funded an effort to identify and prioritize those Old Lands that should be reclaimed to restore hydrology in the upper watershed and/or to serve as wildlife habitat in this highly-altered portion of the watershed. Known as the Feasibility Assessment for the Environmental Restoration of Selected “Old Mined Lands” in the Upper Peace River Watershed, the study was initiated in 2001 and is being facilitated by CHEC.

ACTIONS:

- Step 1. Participate in the ongoing assessment of Old Lands to identify those unreclaimed sites that should be reclaimed to natural habitat and incorporated into a linked, watershed-wide network of conservation lands.

- Step 2. Evaluate the spatial context and configuration of Old Lands evaluated through the Feasibility study discussed above to identify those tracts that are most likely to fill in existing gaps between conservation lands, including mined lands that have been dedicated to conservation.

Responsible Parties: FDEP, CHNEP, CHEC

Involved Parties: SWFWMD, CFRPC, FIPR, local governments, private land owners

TENTATIVE SCHEDULE: This effort was initiated in May 2001. A schedule for developing the priority list calls for completion of the list before the end of the calendar year. Subsequent planning and Implementation of the reclamation recommended by the list will require a long-term effort, including coordination with private landowners who must voluntarily participate.

ESTIMATED COST: Funding for the prioritization is provided by a grant from the CHNEP. Subsequent reclamation efforts will be supported by the Old Lands fund, which is administered by FDEP. Historically, such funds have been used to provide a minimal level of reclamation. Given the great expense of even minimal levels of reclamation, reclamation to natural land cover types may require additional funding sources. A source of “seed” funding may also be required because the Old Lands program is designed to reimburse landowners, who must initially bear the full cost of reclamation.

EXPECTED BENEFITS: The project may ultimately produce a linked network of viable conservation lands in the Upper Peace River watershed, which currently lacks the land base for creating such a network.

RELATED ACTIONS: Polk County is coordinating an inter-agency effort to identify reclaimed mine lands that could be purchased or otherwise protected and dedicated to conservation. Successful creation of a viable, linked network of conservation lands in the upper watershed will likely require protecting a mosaic of reclaimed, unreclaimed (i.e., Old Lands), and unmined lands.

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