

# **Bear Creek**

## **Stormwater Management Master Plan**

**PUBLIC INFORMATION PAMPHLET**

**PREPARED FOR**

**THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT  
COASTAL RIVERS BASIN BOARD AND  
PASCO COUNTY**

**By:**

**GHIOTO & ASSOCIATES  
Water Resources and Civil Engineering**

**September 1993**

# **SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT**

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## DEFINITIONS

### ◆ 100-YEAR FLOOD

Refers to the flood levels that have a statistical probability of occurring once within any 100-year period. These flood levels are not necessarily produced by a single rainfall event, of the same probability, due to potential differences in conditions within the watershed prior to occurrence of that rainfall.

### ◆ DISCHARGE CAPACITY

The ability to pass flow through a channel, culvert or water control structure. Discharge capacity is related not only to the size of the facility, but also to upstream and downstream water levels at the facility.

### ◆ EXISTING CONDITIONS

For this study, existing conditions include the existing land uses within the watershed and the physical condition of existing conveyance facilities. Conveyance facilities consist of channels, lakes, culverts, bridges and water control structures.

In addition to the inventoried conditions described above, proposed land uses and facilities which were permitted for construction by local, state and federal agencies were included in the definition.

### ◆ OPERABLE AND NON-OPERABLE STRUCTURES

A non-operable structure is one which retains a constant discharge capacity for a given upstream and downstream

water level. Examples include fixed weirs and culverts beneath roadways.

An operable structure is one which can be modified to obtain different flows under given upstream and downstream water levels. Examples include gated structures with a controllable opening and culverts with riser structures possessing flash boards that can be added or removed to change discharge capacity.

### ◆ BENEFIT/COST RATIO

Economic benefit of the Stormwater Management Master Plan is calculated as the difference between the dollar value of damages that would occur under existing conditions minus the dollar value of damages that would occur if the plan were to be implemented.

The cost of implementation consists of the sum of cost for construction, land acquisition, operation and maintenance.

The Benefit/Cost Ratio, or B/C Ratio, is defined as the Benefits accrued over the lifetime of the project (50 Years) divided by costs. It is considered to be a measure of the economic feasibility of the project.

A B/C Ratio less than 1.0 indicates that costs exceed benefits and there should be other over-riding considerations if the project is to be implemented (e.g., public safety).

A B/C Ratio greater than or equal to 1.0 is an indication that the project is viable on economic grounds alone. The higher the ratio becomes, the greater the return on investment.

## BACKGROUND

The Bear Creek Study Area is located in western Pasco County, north and west of the Pithlachascotee River and northeast of the City of New Port Richey. A general location map is provided in Figure 1. The watershed lies to the east of US 19 and is traversed in an east to west fashion by SR 52 and by SR 587 (Moon Lake Road). SR 587 loops from the southwest corner of the area eastward and then to the north where it intersects SR 52. The study area was divided and analyzed in two parts, the Bear Creek System in the northern two-thirds of the study area, and the wetland lake system in the southern one-third of the study area.

Flood producing storm events that have historically affected the area generally consist of tropical depressions, tropical storms and hurricanes. The lake systems in the southern portion of the study area are also subject to flooding associated with long term wet season accumulation coupled with less severe rainfall events. This study attempts to evaluate all of these types of conditions with exception of coastal flooding associated with tidal surge.

Documented accounts of historic flooding within the Bear Creek watershed date back to 1960 when the lower portion of the watershed experienced high flood levels which overtopped SR 52 to an elevation of 17.4 feet. Historic accounts of residential flooding were not documented for that flood, perhaps because population densities were considerably lower at the time. However, it is reasonable to assume that flooding of some homes within both basins would have been experienced in 1960.

More recently, high density development has occurred, resulting in changes to surface water systems and to the character of the runoff process. Some of these changes consist of additional discharge capacity that have led to increased flood discharges and elevations. Significant storms have occurred since 1984 which produced additional awareness of flood potential in the study area, culminating with a major storm in September 1988. Rainfall over a 5 day period of approximately 18.7 inches in the vicinity of the lakes to the south resulted in inundation of homes for up

to 23 days. Based on rainfalls throughout the watershed, it is estimated that the 1988 storm was between a 50 and 100-year event, depending upon location. Flooding of homes and significant road overtopping was also experienced in the lower portion of the Bear Creek Area. This major flood prompted Pasco County to request joint funding from the SWFWMD to perform a comprehensive study of the area for the purpose of understanding why and where flooding occurs, and to develop a master plan which would attempt to mitigate the flood damages that were occurring.

## PURPOSE AND SCOPE

The purpose of this investigation was to determine the extent and severity of flooding problems and to develop a Stormwater Management Master Plan (SWMMP) to alleviate those problems. In addition, both the District and the County will use the stormwater model developed for the watershed to regulate future development in a manner consistent with the SWMMP. The detailed scope of work is public record and can be obtained from either agency.

## PROBLEM AREAS

Specific problem areas (shown in Figure 2) were defined using existing condition simulations, reports of historic flooding and input from the public. Other flooding problems, associated mostly with secondary drainage systems, are beyond the focus of this study. In addition, flooding of open land and undeveloped areas is presumed to be a factor that should be addressed through local and state regulation if these areas become developed in the future.

### Problem Areas in the Bear Creek Basin.

Within the Bear Creek Basin, flooding problems can generally be split into two categories: those that primarily have an economic cost associated with physical damage to private property and public infrastructure, and those that are primarily associated with public safety issues. In the western portion of this basin (west of Osceola

# Bear Creek Stormwater Management Master Plan

## LOCATION MAP

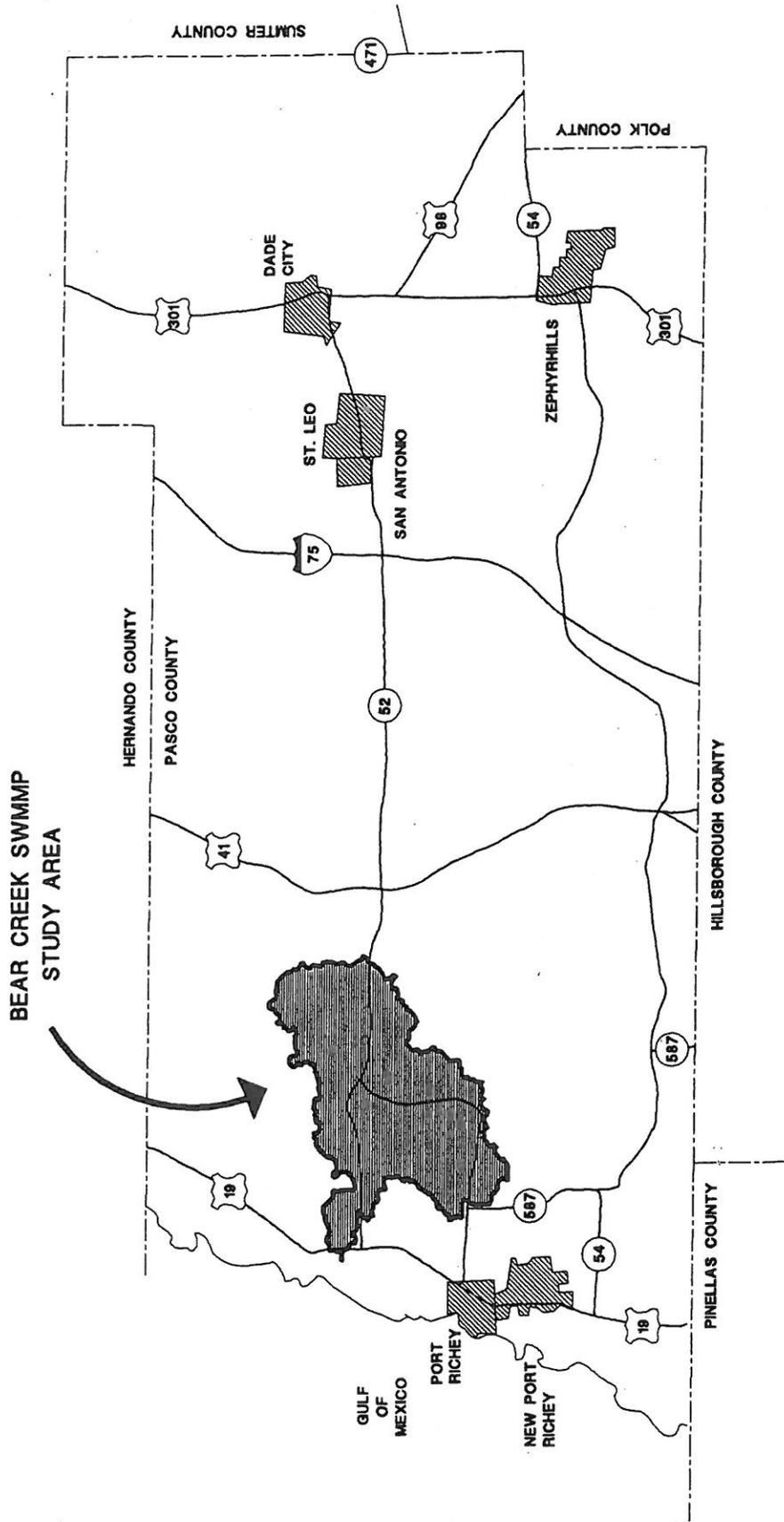


Figure 1

Drive) the first category is most applicable. In the eastern portion (east of, and including Osceola Drive) the second category is most applicable.

Beacon Woods Problem Area. This area is generally bounded by US 19 on the west, Plaza Drive on the east and SR 52 on the south. Reports of flooded roads and homes were received at a public meeting, held shortly after the study began, and were mainly associated with the 1988 storm event.

Flooding of homes, yards and streets was reported just north of Round Sink and in the vicinity of River Mill Lake. The constricted and partially dammed outlet channel from Round Sink to Majestic Boulevard is somewhat responsible for persistent flooding problems in this area.

Existing conditions simulations indicate that Majestic Boulevard will not be overtopped in the 25-year or lesser storm events. The simulated peak stage at this location was 13.7 feet for the 25-year event. For the 100-year storm, the peak upstream flood elevation was predicted to be 15.6 feet, and the road would be overtopped by 1.6 feet. Total duration of overtopping would be about 28 hours.

SR 52 Problem Area. Historic accounts indicate that SR 52 has overtopped and that local flooding has occurred upstream (south) of this bridge. As part of the SR 52 road improvements, the FDOT (Florida Department of Transportation) has designed an improved bridge with the deck at elevation 16.7 feet. This facility, at the time of this writing is partially constructed, and was considered as an existing improvement for purposes of this study. Under the 100-year storm, flood levels are predicted at elevation 16.2 feet upstream of this location. Flooding problems south of the bridge are therefore significantly reduced.

Little Road Problem Area. Little Road has also been historically overtopped and for significant periods of time. The County has also taken action at this location by design of improvements to Little Road. Existing culverts will be replaced by a 103-foot bridge with the road crown raised to elevation 16.1 feet.

Osceola Drive Problem Area. This culverted road crossing overtops at elevation 18.7 feet. Simulations indicate that this road will overtop by as much as 0.4 feet and will remain inundated for 20 hours during a mean annual storm (2.33 year return interval). For the 100-year storm, the maximum depth of overtopping would be 2.8 feet and the duration would be 71 hours.

Flood impacts at this location consist of minor economic damage to homes and relatively frequent damage to roads in the vicinity of the crossing.

More importantly, overtopping conditions and high velocity flows present a public safety problem.

Bruin Drive Problem Area. This road crossing overtops at elevation 23.5 feet. Simulations indicate that this road will overtop by as much as 0.4 feet and will remain inundated for 10 hours during a mean annual storm (2.33 year return interval). For the 100-year storm, the maximum depth of overtopping would be 2.2 feet and the duration would be 55 hours.

Flood impacts at this location consist of minor economic damage to homes and relatively frequent damage to roads in the vicinity of the crossing. Under lesser flow conditions, vortexing has been observed upstream of the road. Funnel shaped vortexes form with spiraling flow patterns from the water surface to the pipe inlet. Internal velocities are very high. This location has also been identified as a public safety problem. In addition, this crossing is the only access to approximately 35 lots located south of Bear Creek along Bruin Drive and Calumet Drive.

Moon Lake Estates Problem Areas. There are three road crossings in this area, located east of SR 587 (Moon Lake Road), that experience severe overtopping according to simulations and field observations. These roads are located along the primary flowway for a large portion of the Bear Creek drainage area. Most residences adjacent to the Creek in this area are elevated manufactured homes. Peak discharges at these locations range from 378

# Bear Creek Stormwater Management Master Plan Problem Areas

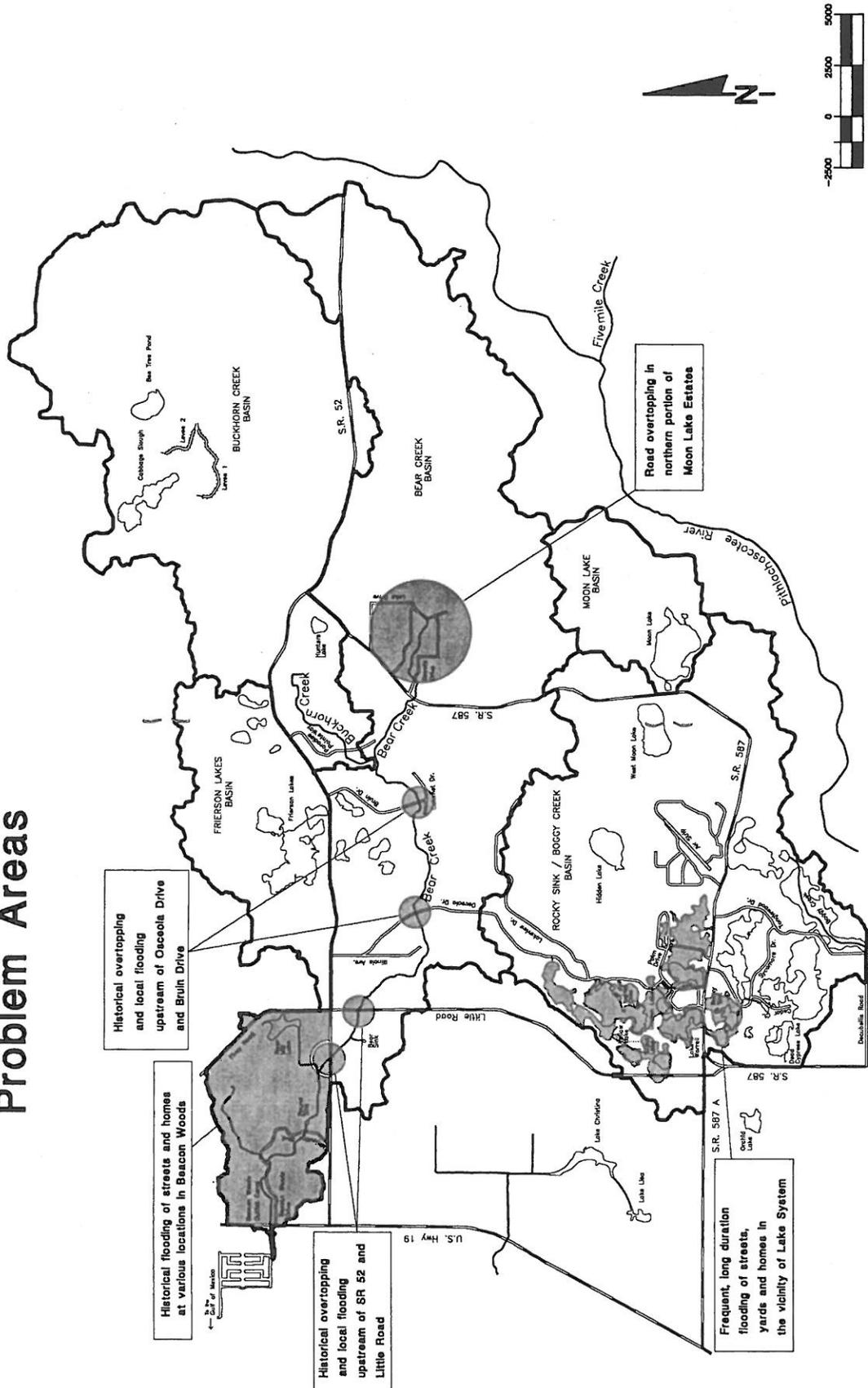


Figure 2



cfs for the Mean Annual Storm to 1,390 cfs for the 100-year storm. There is some potential flooding of homes predicted in this area as well as local road damage.

Problem Areas in the Rocky Sink/Boggy Creek Basin.

Most of the flood damages in this basin are associated with flooding of homes, yards and streets in the vicinity of Lakes Worrell, Garden, and Worley. Additional flooding problems exist around Yellow and Scout Lakes, and road overtopping is predicted in the vicinity of the Hidden Lake Airport. A peak flood stage of 22.9 feet was measured, and a flood duration of 23 days was reported by residents for the 1988 storm event. In addition to structural flooding, there were long periods of time for which access to homes throughout the lake system was impeded by flood waters. Storm event simulations confirm these reported and observed conditions.

Simulated flood stages and durations for the Worrell, Garden and Worley system are summarized in the following table. The number of homes flooded is based on surveyed first floor elevations cited in "Bass Lake Drainage Study," June 15, 1989 by Casson Engineering.

Number of Homes Affected by Flooding - Lakes Worrell and Worley

Storm Event Frequency	Peak Stage feet	Number of Homes
2.33-year	21.2	4
5-year	21.4	5
10-year	21.9	6
25-year	22.6	13
50-year	22.9	18
100-year	23.1	24

The lowest first floor on Lake Worley is at elevation 20.4 feet.

The problem with this system is that Rocky Sink and the southern outlet to the Pithlachascotee River do not provide sufficient discharge or outflow capacity for the contributing system.

**ELEMENTS OF THE SWMMP**

In development of the SWMMP, a computer modeling methodology was employed to predict existing conditions, to quantify flooding problems and to test alternatives for engineering feasibility. Flooding problem areas were determined from results of modeling the existing condition in concert with the evaluation of information obtained from the public, District and County staffs, and local engineers. It was then determined that problems to be addressed by the SWMMP would cover the lower Bear Creek Basin from Bruin Drive to the western terminus of the Beacon Woods Outfall Canal, west of US 19. In addition, solutions to flooding problems would be investigated for the Rocky Sink/Boggy Creek Basin.

Facilities and water management strategies evaluated in the alternative development phase were screened to insure that maximum flood benefit could be derived with minimum environmental impacts and minimum disturbance to the aesthetic character of the watershed.

Three selected alternatives for both basins were subjected to a detailed Benefit/Cost analysis that determined flood damages for existing conditions as well as for each alternative. The net difference in damages to both structures and public facilities between existing conditions and each alternative was used as the net benefit attributable to the alternative. Using computed annualized benefits and capital costs, a Benefit to Cost Ratio (B/C Ratio) was calculated for each alternative.

Results of the alternatives analysis were presented to District and County engineering and regulatory staffs, the public, the Coastal Rivers Basin Board and the Pasco County Board of County Commissioners. From these, a Preferred Plan for the watershed was selected as the Bear Creek SWMMP.

Bear Creek Basin Elements.

In general, improvements to this basin consist of increased channel and structure flow capacity. The result will be a more efficient

discharge of flood waters, with lowered flood elevations and durations. The locations of these improvements are provided in Figure 3. The following describes specific elements contained in the SWMMP in a progression from downstream to upstream, beginning with works recommended west of US 19.

Beacon Woods Canal From Leisure Beach to US 19. Improvements consist of a deepened section from elevation 3.1 to elevation 0.0 feet west of US 19. The channel will slope gradually to the west to an elevation of -0.5 feet just upstream of its entry point into the Leisure Beach Canal System. The typical recommended section consists of a 40-foot bottom width with 3:1 side slopes.

Beacon Woods Canal Weir East of US 19. This reinforced concrete weir structure will replace the existing earthen berm, discussed above. Its 40 foot long crest will be set at elevation 3.0 feet and will be anchored into the channel banks for a sufficient length to avoid end erosion. The channel at this location will be excavated between the weir and US 19, and for a distance of about 150 feet east of the weir. This excavation is necessary to force flow control at the weir to insure maximum discharge efficiency.

Beacon Woods Canal at Beacon Woods Drive. The existing culverts at this location will be replaced with three 89-inch arch pipes (or equivalent).

Beacon Woods Canal at Majestic Boulevard. The existing culverts at this location will be replaced with three 96-inch culverts.

Beacon Woods Canal from Majestic Blvd. to Round Sink. Channel improvements for this reach include a trapezoidal section with a 25 foot bottom width with 3:1 side slopes. The flowline will be set at elevation 4.0 from Round Sink to Majestic Boulevard. An existing utility crossing in this reach, which lies exposed at the bottom of the channel, upstream of Majestic Boulevard, will be relocated.

Proposed Bridge - Bear Creek at Osceola Drive. The existing culverts at this location will be replaced with a bridge possessing

sufficient opening to pass 100-year flows without overtopping.

Proposed Bridge - Bear Creek at Bruin Drive. The existing culverts at this location will be replaced with a bridge possessing sufficient opening to pass 100-year flows without overtopping.

#### Rocky Sink/Boggy Creek Basin Elements.

In general, improvements in this basin include increased outlet capacity to the Pithlachascotee River under carefully controlled conditions. The result will be lowered peak flood elevations and significant reductions in flood durations. The degree of improvement will ultimately depend upon safe discharge criteria as related to coincident conditions in the Pithlachascotee River. For example, discharges to the river should not be increased if they would potentially worsen flood conditions in the river. The following describes the specific elements of the SWMMP for this basin as shown in Figure 4.

Culverts and Structure at Northern Sycamore Drive Crossing. The existing 36-inch culverts at this location will be replaced with double 40-foot long 12x4 foot box culverts. Immediately upstream of the box culverts, a reinforced concrete box facility will be constructed with gate openings capable of accepting 4 - 4x4 foot underflow gates. These gates will remain closed until Lake Worrel reaches elevation 19.0 feet as a result of a storm in progress at the time. In addition, the structure contains a 4 foot wide rectangular opening which will allow the downstream wetland system to interact with Rocky Sink as it currently does. The approach channel west of this structure and the exit channel from Sycamore Drive to the downstream lake will need to be improved to a 25-foot bottom width trapezoidal section with 3:1 side slopes.

Culverts at Southern Sycamore Drive Crossing. The existing 36-inch culverts at this location will be replaced with double 150-foot long 12x4 foot box culverts. This facility will allow for additional conveyance through the road. The extended length of these culverts is provided to avoid ditch safety hazards near the homes located south of the road on either side of the pipe. Immediately

# Bear Creek Stormwater Management Master Plan Preferred Plan - Bear Creek Basin

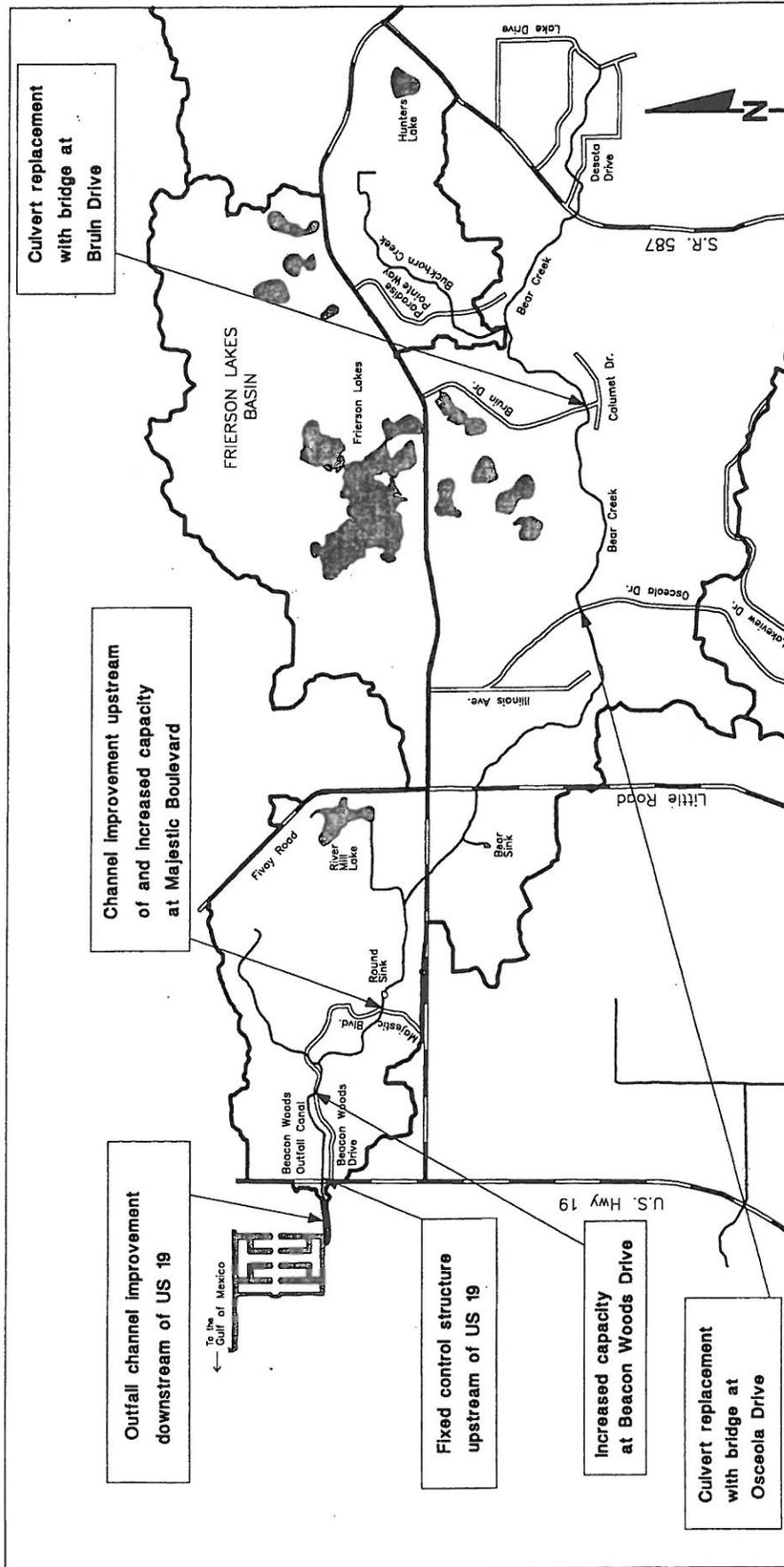


Figure 3

# Bear Creek Stormwater Management Master Plan Preferred Plan - Rocky Sink / Boggy Creek Basin

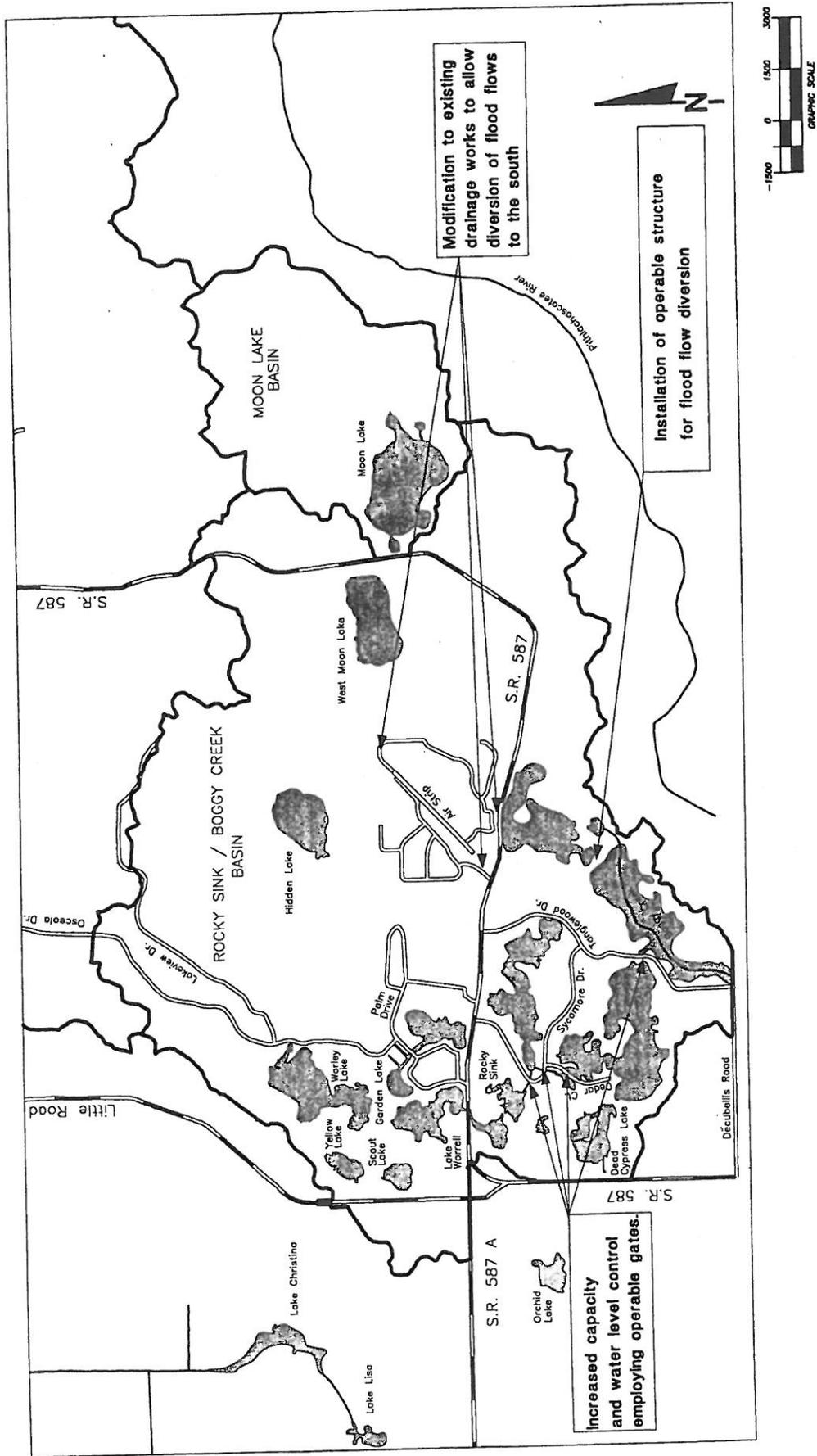


Figure 4

upstream of the box culverts, a reinforced concrete box facility will be constructed with gate openings capable of accepting 4 - 4x4 foot underflow gates. These gates will remain closed until Lake Worrel reaches elevation 19.0 feet as a result of a storm in progress at the time. In addition, the structure contains a 4 foot wide rectangular opening. Some improvements to the existing channel south of the culvert installation will be required.

Culverts at Cedar Court. The existing 36-inch culverts at this location will be replaced with double 50-foot long 12x4 foot box culverts. Some improvements to the existing channel (approximately 50 feet east and west of the road) will be required.

Culverts and Structure at Tanglewood Drive Crossing. The existing double 27-inch arch pipes at this location will be replaced with double 70-foot long 12x4 foot box culverts. Immediately upstream of the structure, a reinforced concrete box facility will be constructed with gate openings capable of accepting 4 - 4x4 foot underflow gates. The inverts of the gate openings will be set at elevation 17.25 feet. These gates will remain closed until Lake Worrel reaches elevation 19.0 feet as a result of a storm in progress at the time. In addition, the structure contains a 4 foot wide rectangular opening. This structure will provide the downstream controls necessary to maintain nearly the same hydroperiod for upstream wetlands while allowing for adequate discharge capacity to Boggy Creek.

Hidden Lake Airport Culverts. The existing double 24-inch culverts located along the entrance road to the Hidden Lake Airport will be fitted with manual gates. In addition, the single 36-inch culvert located at the north end of the runway will also be fitted with a manual gate. These will be closed when Lake Worrel reaches elevation 19.0 feet.

In addition, the entrance road will be raised to elevation 27.0 feet and surfaced for a distance of approximately 650 feet in the vicinity of the culverts. This is necessary to effect the diversion to the south without overtopping the road.

SR 587 Culvert Upgrade. The existing double 30-inch reinforced concrete pipes will be replaced with six 30-inch pipes at the same invert elevation. This installation will provide capacity for diversion of flows from the Hidden Lake Airport area to the south when Lake Worrell reaches elevation 19.0 feet.

New Diversion Structure near Pasco-Hernando Community College. This facility provides for diversion of overflow from the Hidden Lake Airport area to the northern end of Boggy Creek. It will be located immediately north of the existing sand ridge that currently separates these areas (behind the college). It consists of a concrete box structure supporting five 4x4 foot underflow gates with sill elevations at 24.4 feet to maintain existing upstream hydroperiods. These gates will normally be closed. However, when conditions in Lake Worrel trigger operation, they will be opened to effect a diversion south to Boggy Creek.

Four 34x53-inch elliptical reinforced concrete pipes, with inverts at an appropriate elevation to match the downstream flowline, will connect the proposed gate box through the ridge to Boggy Creek and provide discharge capacity to the south.

#### Operation of the SWMMP

Plan elements in the Bear Creek Basin will not require an operation schedule due to the fact that they are all static (non-operable) facilities. However, there will be a need for operational decisions to effectively utilize the proposed facilities for the Rocky Sink/Boggy Creek Basin. A conservative Interim Operations Procedure was developed for this system which will be revised during the recently initiated Pithlachascotee River Floodplain Study.

The pre-requisite condition for system operation hinges upon stages in Lake Worrell and weather conditions. The lake reaches elevation 19.0 (the trigger elevation for discharges) on a relatively frequent basis. Therefore, there should be some consideration of prior and anticipated rainfall prior to operating the system. It is recommended that the operating procedure be considered when the lake is between elevation 19.0 and 19.5 feet and there has been

a rainfall in excess of 3.0 inches within the last 24 to 48 hours. If Lake Worrell is above elevation 19.5 feet and rising, the rainfall criterion should be disregarded. Under either condition, additional criteria, related to conditions in the Pithlachascotee River (downstream), would then apply.

### IMPLEMENTATION COSTS

Estimated costs of proposed works for the SWMMP were computed based on the 1991 edition of the Construction Contract History of the State of Florida, Department of Transportation. Where necessary, these cost data were supplemented using limited bid data from Pasco County and previous cost opinions for similar projects.

Capital cost for improvements in the Bear Creek Basin is estimated at \$1,689,373 which annualizes to \$90,539 over a 50-year lifetime at a 5 percent interest rate. Annual benefits total \$184,919 for a computed B/C Ratio of 2.0. This ratio is considered to be very acceptable for a project of this nature.

Capital cost for improvements in the Rocky Sink/Boggy Creek Basin is estimated at \$1,105,959 which annualizes to \$60,581 over a 50-year lifetime at a 5 percent interest rate. Annual benefits total \$64,385 for a computed B/C Ratio of 1.1. This ratio is considered to be acceptable since a break even ratio would be equal to 1.0.

### IMPLEMENTATION OF THE SWMMP

#### Physical Improvements.

The Bear Creek Basin improvements can be implemented separately from the Rocky Sink/Boggy Creek improvements. Within each system, it is important that the sequential physical construction of individual plan elements be accomplished from the most downstream to the most upstream elements.

#### Regulatory Measures.

There are also a number of recommendations related to the implementation of regulatory measures for the watershed that are specifically related to this investigation.

These can be implemented by the District and Pasco County at the earliest practical date.

### ENVIRONMENTAL IMPACTS AND BENEFITS

Environmental impacts associated with the proposed facilities in the Bear Creek Basin are generally considered to be localized and temporary. In addition, detailed design and construction strategies are recommended to minimize those impacts.

Environmental impacts related to construction of the proposed facilities in the Rocky Sink/Boggy Creek Basin will be local and temporary, and can be lessened through recommended design and construction strategies.

There will be lower hydroperiods within some of the lakes, most notably Worley Lake and Yellow Lake. However, due to the fact that these systems are already altered by peripheral development, the hydrologic changes are not considered to be significant enough to alter the ecological character of these systems. Hydroperiods of water bodies and wetlands south of SR 587 and east of the Hidden Lake Airport will be improved over existing conditions. The most dramatic improvements will be in Dead Cypress Swamp, which has been significantly impacted through previous drainage.