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A PROPOSED FLOOD MANAGEMENT PLAN FOR THE LITTLE WEKIVA RIVER BASIN, ORANGE AND SEMINOLE COUNTIES, FLORIDA

by

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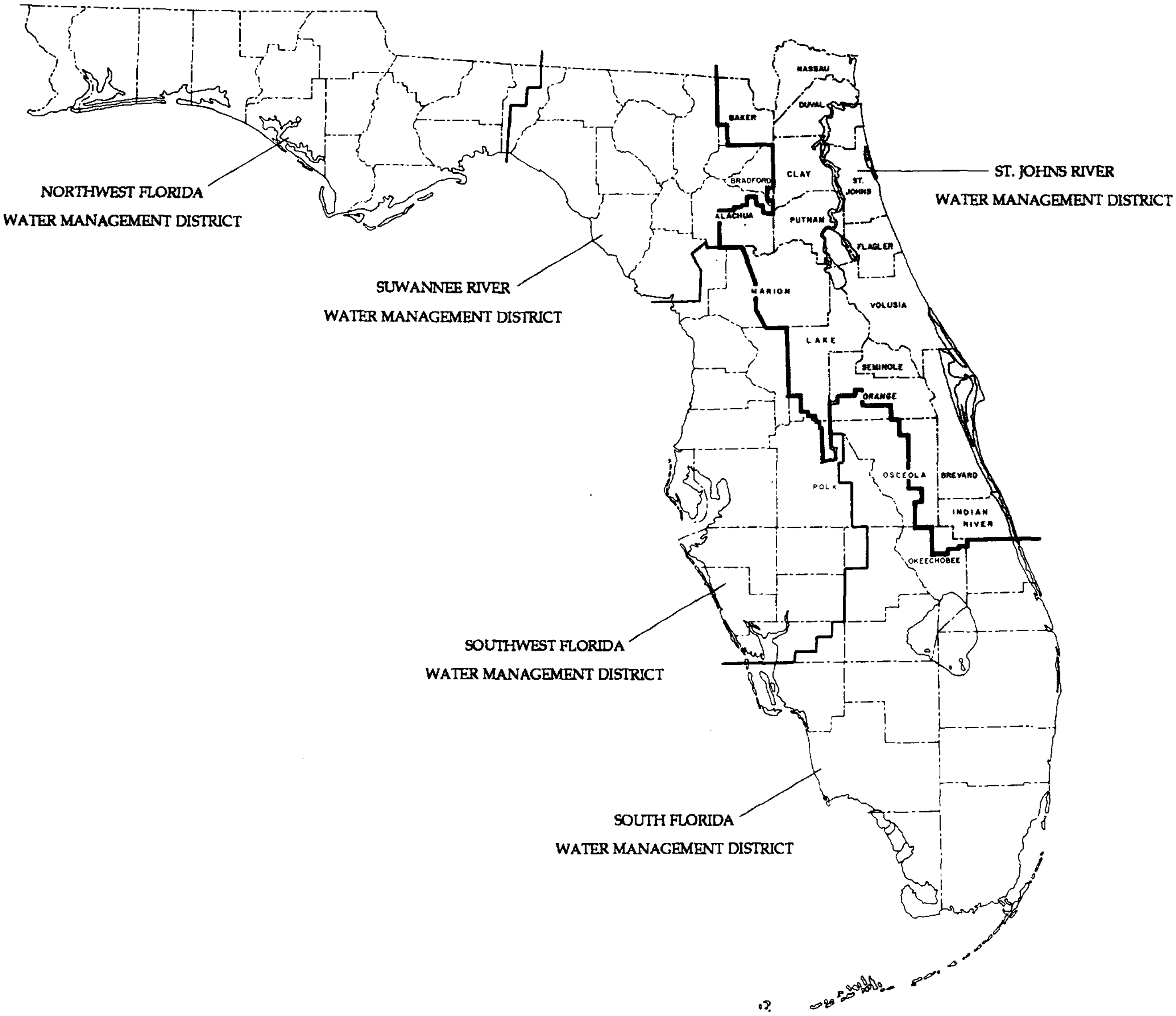


THE ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

The St. Johns River Water Management District (SJRWMD) was created by the Florida Legislature in 1972 to be one of five water management districts in Florida. It includes all or parts of nineteen counties in northeast Florida. The mission of SJRWMD is to manage water resources to insure their continued availability while maximizing environmental and economic benefits. It accomplishes its mission through regulation; applied research; assistance to federal, state, and local governments; operation and maintenance of water control works; and land acquisition and management. Technical reports are published to disseminate information collected by SJRWMD in pursuit of its mission.

EXECUTIVE SUMMARY

The Little Wekiva River basin is located in central Florida, Orange and Seminole counties in the St. Johns River Water Management District (SJRWMD). It is highly urbanized, and street flooding, damages to residential and commercial buildings, losses of bridges and culverts, and channel and bank erosion can occur within the basin during major storm events. The SJRWMD conducted a two phase study to evaluate the flooding problems of the basin and formulate a comprehensive flood management plan to reduce flood and erosion damages. Water quality and environmental conditions in the basin were also assessed.

Phase I of the study (floodplain study) determined flood elevations and flood prone areas in the basin (using detailed hydrologic and hydraulic analyses.) The floodplain study indicated that more than 500 buildings (primarily single family houses and some multifamily and commercial units) are located in the 100-yr floodplain; the study also found that 25 bridges and culverts might be overtopped during a 100-yr storm event.

Phase II of the study (this report) analyzed damages, identified major problem areas in the basin, and presented several flood protection alternatives for each problem area. An analysis of water quality in the basin, environmental conditions, and wetland loss was also part of this study. The Phase II study found that although more than 500 buildings are in the 100-yr floodplain, only about 140 buildings might suffer actual flood damages, as indicated by survey of the structures. Other residents would experience street or yard flooding but no structural damages because the first floor elevations of the houses were more than one foot above the 100-yr flood elevation. The structures that may sustain damages during a major storm event are scattered throughout the basin (Table A and Exhibit A).

Expected residential damages were calculated based on Federal Insurance Administration guidelines. In addition, other likely damages, i.e.,

Table A. Major problem areas and flood protection alternatives
(See Exhibit A for locations of problem areas)

PROBLEM AREA ORANGE COUNTY	ESTIMATED DAMAGES IN THOUSAND DOLLARS				FLOOD PROTECTION ALTERNATIVES	BENEFIT/COST RATIO
	ITEMS	10 YR	25 YR	100 YR		
I. Lawne Lake and Vicinity						
A. Tributary I	Homes Streets	0.0 0.0	0.0 0.0	15.3 0.5		
B. Multi-Family Units on Lawne Lake East Shore	Homes Streets	0.0 0.0	0.0 0.0	9.7 0.3		
C. Subdivision North of Lawne Lake	Homes Streets	0.0 0.0	0.0 0.2	39.4 0.5	1. Local Levee Protection 2. Reduce Flood Stages in Lawne Lake ** i) Create Storage on Tributary I ii) Increase Discharge Capacity of Lawne Lake	0.43 *
D. Commercial Unit North of Silver Star Road	Building	0.2	0.6	0.9		
II. Lake Orlando and Vicinity	Homes Streets Bridges	6.3 1.5 5.0	14.2 2.0 10.0	32.2 2.4 10.0	1. Reduce Flood Stages in Lake Orlando ** i) Expand Bridge at Edgewater Dr. ** ii) Maintain Lake Orlando at low Elevations iii) Create Storage Areas Upstream iv) Replace Butterfly Valve with Box Culverts v) Regulate Discharges from Lake Fairview and Lawne Lake @ 2. Floodproofing/Raise Mobile Home Floor Elevations	 Very low * * 1.15
III. Lake Fairview & Little Lake Fairview	Homes Streets Bridges	13.1 0.5 0.0	26.1 0.8 10.0	99.5 1.0 10.0	1. Reduce Flood Stages in Lake Fairview i) Maintain Lake at Low Stages During Wet Period ii) Increase Discharge Capacity of Lake Fairview Weir iii) Create Additional Storage 2. Local Levee Protection 3. Floodproofing	 * * * *
IV. Tributary G	Homes Streets Bridges	0.0 0.8 0.0	1.0 1.0 5.0	45.3 1.2 10.0	** 1. Reduce Flood Stages in Eatonville Borrow Pit 2. Local Levee Protection	 0.35
V. Oranole Rd. Vicinity	(Flooding) Homes Streets Bridges (Erosion) Homes	 4.4 5.0 96.0 112.0	 11.4 10.0 384.0 448.0	 18.9 15.0 480.0 560.0	1. Reduce Flood Stage ** i) Create Storage upstream of Sheetpile Weir ii) Improve Channel and Expand Bridges iii) Acquire 13 Houses and Restore Channel	 1.60 1.17
VI. Lakes Gandy & Lockhart	Homes Streets Bridges	0.6 0.5 0.0	16.5 0.8 0.0	60.8 1.0 0.0	1. Maintain Lakes at Low Elevations	

* Not evaluated
** This measure will not provide full protection
@ This alternative will not reduce area flooding

Table A. Major problem areas and flood protection alternatives
(See Exhibit A for locations of problem areas)

PROBLEM AREA SEMINOLE COUNTY	ESTIMATED DAMAGES IN THOUSAND DOLLARS				FLOOD PROTECTION ALTERNATIVES	BENEFIT/COST RATIO
	ITEMS	10 YR	25 YR	100 YR		
VII. Tributary F Confluence						
A. Area Downstream of Confluence	Homes Streets	1.4 0.2	2.4 0.4	3.8 0.5		
B. Area Upstream of Confluence	Homes Streets	19.4 1.2	59.9 1.4	125.3 1.5	1. Reduce Flood Stage @@ i) Improve Channel @@ ii) Remove Footbridge 7 and Improve Channel 2. Local Levee Protection 3. Floodproofing	 0.26 0.87 2.81 *
C. Bridges	Bridges	5.0	5.0	10.0		
VIII. Tributary C	Homes Streets Bridges	0.0 0.5 0.0	0.2 0.8 10.0	5.9 1.0 20.0		
IX. Montgomery Road Vicinity	Homes Streets Bridges	0.0 0.5 0.0	13.4 0.8 0.0	169.0 1.0 0.0	1. Local Levee Proctection 2. Improve Channel	0.20 0.14
X. Tributary B	Homes Streets Bridges	0.0 0.0 0.0	0.0 0.0 0.0	0.3 1.0 0.0		
XI. Springs North of S.R. 434						
A. Subdivision on West Bank of River	Homes Streets	0.0 0.5	1.8 0.8	19.5 1.0		
B. Footbridges	Bridges	0.0	0.0	25.0		
C. Recreational Area on East Bank of River	Building Streets	17.5 0.0	29.9 0.0	43.1 0.0	** 1. Channel Improvements to Reduce Flood Stages 2. Floodproofing	 *
XII. Trib. A	Homes Streets	40.0 0.8	81.5 1.0	125.0 1.2	@@ 1. Expand Culverts at Springs Landing Boulevard, and Wisteria Drive North 2. Create Storage Area Upstream	0.30 Very low

* Not evaluated
** This measure will not provide the necessary protection
@@ This measure provides only partial protection

overtopping of bridges and culverts, street flooding, and damages due to erosion were considered in identifying problem areas. Because these areas are scattered throughout the basin, providing flood relief to all areas by a single solution is not possible. This report identifies problem areas I-XII (Table A and Exhibit A) to be areas in need of minor or major flood control measures to alleviate damages. Each of the 12 areas was considered separately in formulating and evaluating different flood protection alternatives. Areas or parts of areas with low damages (not exceeding $25,000 during a 100-yr storm event), however, were excluded from the study. (It is suggested that the counties re-evaluate these areas based on actual flood experience).

Water quality and environmental assessments indicated that the river suffers from low dissolved oxygen concentrations and elevated levels of biological oxygen demand (BOD), nutrients, turbidity, total and fecal coliforms, and trace metals. Erosion and the resultant sediment loading are significant problems that have degraded water quality and wetland habitat. The river is highly influenced by urban stormwater runoff, which is probably the source of most pollutants. Sewage treatment plant effluent and contamination from septic tank leachate are other possible pollutant sources. In addition, the basin lost 48 percent (about 2,000 acres) of its wetlands since 1947 due to urban development, contributing to water quality and flood control problems. The flood control measures implemented should strive to improve the foregoing conditions wherever feasible.

A number of flood protection alternatives were considered for each problem area with significant damages (Table A). In general, costs of flood control measures are found to be much greater than the direct monetary benefits accruing from a given measure. Therefore, the optimal flood protection alternative is not necessarily obvious from economic analysis alone. For most problem areas, if flood protection measures are to be provided now, the justification has to come from considerations other than direct benefits. Significant other considerations include: major indirect and intangible benefits; environmental impact; improvement to public health; availability of funds for a specific cause (e.g., preserving wetlands); and local government liability and responsibility.

RECOMMENDED FLOOD PROTECTION ALTERNATIVES: ORANGE COUNTY

Flood protection alternatives for the various problem areas are presented here in order of decreasing severity of the flood threat. MSSW (Management and Storage of Surface Waters) and Wetland Resource permits would be required prior to construction of any flood protection measure.

Oranole Road Vicinity (Problem Area V)

Portions of Riverside Acres subdivision have a major flood threat. Since the expected damages are high, the two alternatives with structural measures have favorable benefit/cost ratios. The solutions presented, however, are typical. Further economies are possible by optimizing them with various other flood protection measures. Indirect and intangible benefits, such as environmental benefits, should be weighed carefully in making a choice between the two cost effective alternatives: channel and bridge improvements or acquiring houses and restoring the channel.

Lakes Fairview, Gandy, and Lockhart (Problem Areas III and VI)

Flood protection for buildings near Lake Fairview and Lakes Gandy and Lockhart can be achieved by suitable regulation of water levels in the respective lakes. Some scenarios for lake operation are presented in this report. Additional scenarios can be modeled to determine optimal lake regulation schedules. Construction of some auxiliary structures may be necessary to maintain the lakes at the required elevations.

Lake Orlando and Vicinity (Problem Area II)

The Lake Orlando area might experience major area flooding with no commensurable direct damages. Consequently, this area defies a solution on economic grounds. Direct flood damages can be eliminated by floodproofing the houses threatened and by raising the mobile homes to higher elevations. The only possible solution to reduce area flooding appears to be the creation of additional storage areas upstream, which is very expensive. This should be considered if funds are available.

Lawne Lake and Vicinity and Tributary G (Problem Areas I and IV)

Areas near Lawne Lake and Eatonville Borrow Pit may experience damages during severe flood events (return periods exceeding 25 years). Counties should re-evaluate these areas based on actual flood experience.

General Measures

Inspect bridges periodically. Provide/maintain erosion protection measures. For river reaches where erosion is observed or erosion potential is indicated by this study, determine non-scouring and non-silting velocities. Provide a design channel to convey 100-yr discharge or greater.

RECOMMENDED FLOOD PROTECTION ALTERNATIVES: SEMINOLE COUNTY

Major flood damage areas in Seminole County include the Tributary F confluence, the subdivision west of Montgomery Road on the east bank of the Little Wekiva River, Tributary A, and the recreational area on the east bank of the river in the Springs development (Problem areas VII, IX, XII, and XI-C, respectively, Table A and Exhibit A). Minor damages can occur at isolated locations in Tributary B and C basins and in the Springs Development.

Tributary F (Problem Area VII-B)

A levee would protect the seven expensive houses at the Tributary F confluence.

Recreational Area (Problem Area XI-C)

Floodproofing appears to be the only solution to protect the recreational area in the Springs development.

The Subdivision West of Montgomery Road and Tributary A (Problem Areas IX and XII)

This study finds the costs of flood protection measures for these areas much greater than the benefits. Detailed analyses for these areas are recommended.

General Measures

Perform special studies based on actual flood experience for areas where minor damages are indicated. Inspect bridges periodically. Provide/maintain erosion protection measures. For river reaches where erosion is observed or erosion potential is indicated by this study, determine non-scouring and non-silting velocities. Provide a design channel to convey 100-yr discharge or greater.

CONTENTS

FIGURES

The following additional drawings were prepared for use by Orange and Seminole counties and the City of Altamonte Springs. These drawings give further details of the basin, but they are not available for general distribution. They may be inspected at the county engineering offices, at the District library in Palatka, or at the District field offices in Jacksonville, Orlando, and Melbourne.

TABLES

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The Little Wekiva River basin is located in central Florida, in Orange and Seminole counties, in the St. Johns River Water Management District (SJRWMD). It is highly urbanized, and experiences considerable flooding during major storm events. It has been identified as an area seriously in need of surface water management. In 1982, at the request of Orange and Seminole counties, SJRWMD commenced a water management study for the basin.

The objectives of the study were to complete a floodplain study (Phase I) and to develop a comprehensive water management plan for the basin (Phase II). The floodplain study was completed by late 1988, and the final report was released in August 1989 (Rao, Ziegler, and Clapp 1989). The floodplain study consisted of detailed hydrologic and hydraulic analyses to determine flood elevations and flood prone areas throughout the basin. The report presented flood profiles for the 10-, 25-, and 100-yr 24-hr storm events, and 100-yr floodplain maps for the existing conditions of the basin.

This study, Phase II, consists of a combination of a detailed flood management study evaluating the areas affected by the 100-yr storm event and an environmental assessment of the basin. It presents a water management plan to reduce flood and erosion damages. Flood damages for these areas were estimated and major problem areas were identified. For areas where damages due to a 100-yr flood would exceed $25,000, several flood protection alternatives are discussed and some were evaluated. Approximate costs were estimated for the promising alternatives to determine benefit/cost ratios.

Water quality and environmental conditions in the basin were assessed. The effects of various flood protection alternatives on water quality and the environment are summarized. Additional studies will be conducted for evaluating and adopting minimum flows and levels and consideration of other environmental issues.

1.2 SUMMARY OF FLOODPLAIN STUDY

The floodplain study (Rao, Ziegler, and Clapp 1989) completed as Phase I of the water management study for the Little Wekiva River basin presents a comprehensive summary of basin physiography and hydrology; a summary of previous studies; and, details of hydrologic and hydraulic modeling, including model input data. The basin, which has an area of about 42 sq mi and nine major tributaries (A through I, Fig.1-l), was divided into 75 contributing subbasins (1-75) and nine non-contributing subbasins (101-109, Fig. 1-2).

The U.S. Army Corps of Engineers (USACOE) HEC-1 computer program (USACOE 1981) was used for runoff calculations, and the HEC-2 program (USACOE 1982) for computing water surface profiles. Flood elevations were computed for lakes and streams (under the existing conditions) for 10-yr, 25-yr, and 100-yr return periods. Flood discharges were derived based on a rainfall distribution for a 24-hour duration storm developed for the Little Wekiva River basin (Rao 1988).

The 100-yr floodplain maps were prepared using 1981/1982 aerial photogrammetric maps. More than 500 structures, primarily single family houses and some multifamily and commercial units, were found to lie within the 100-yr floodplain.

The floodplain study also indicated that about six river structures (bridges and culverts) might be overtopped during a 10-yr storm event, 18 during a 25-yr event and 25 during a 100-yr event. The stream velocities were evaluated by HEC-2 modeling for the three storm events. These velocities indicate channel locations with potential erosion problems.

The results of the floodplain study were used to identify the areas of flooding and erosion potential and to assess flood damages.

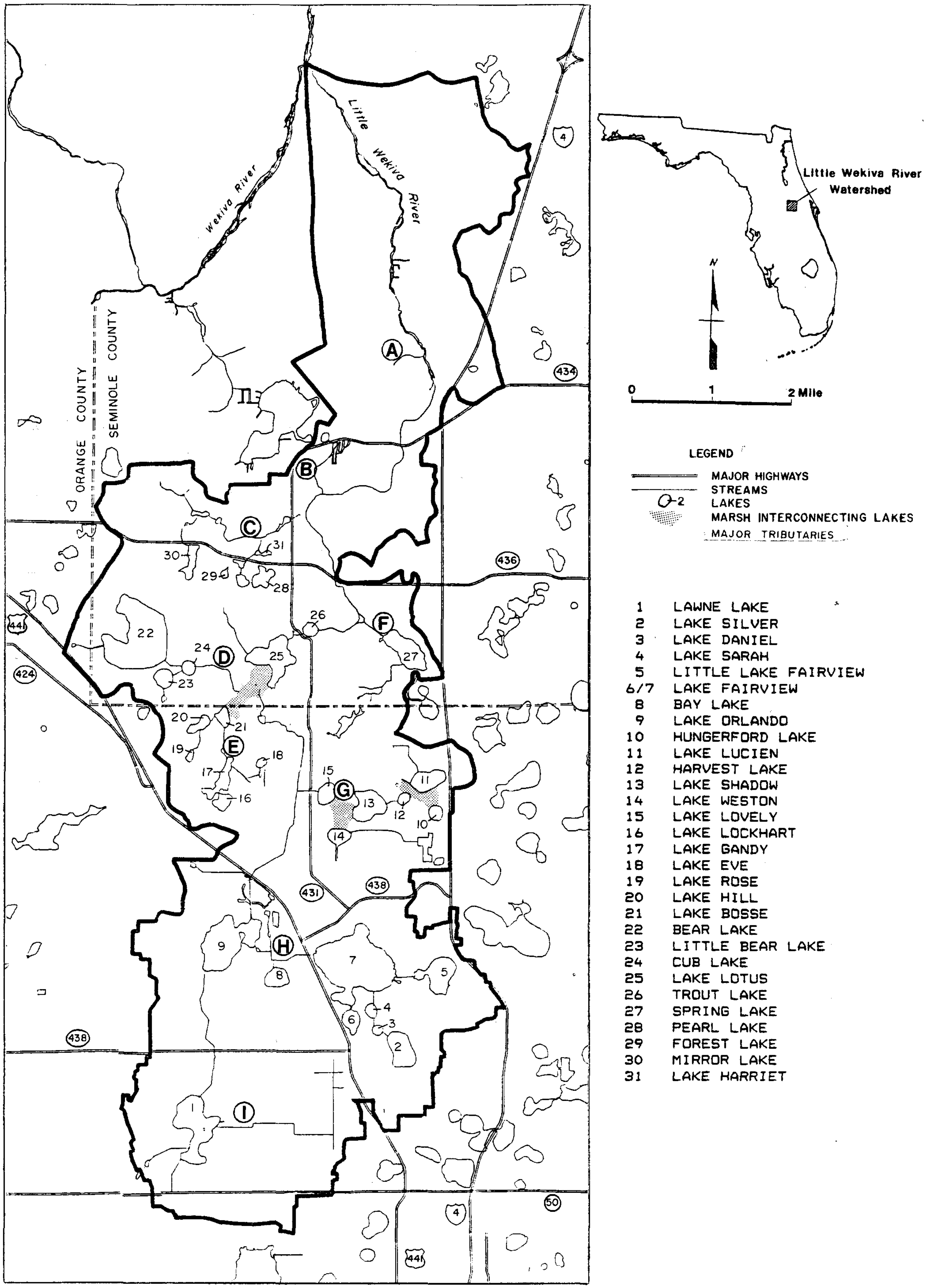


Figure 1-1. The Little Wekiva River basin

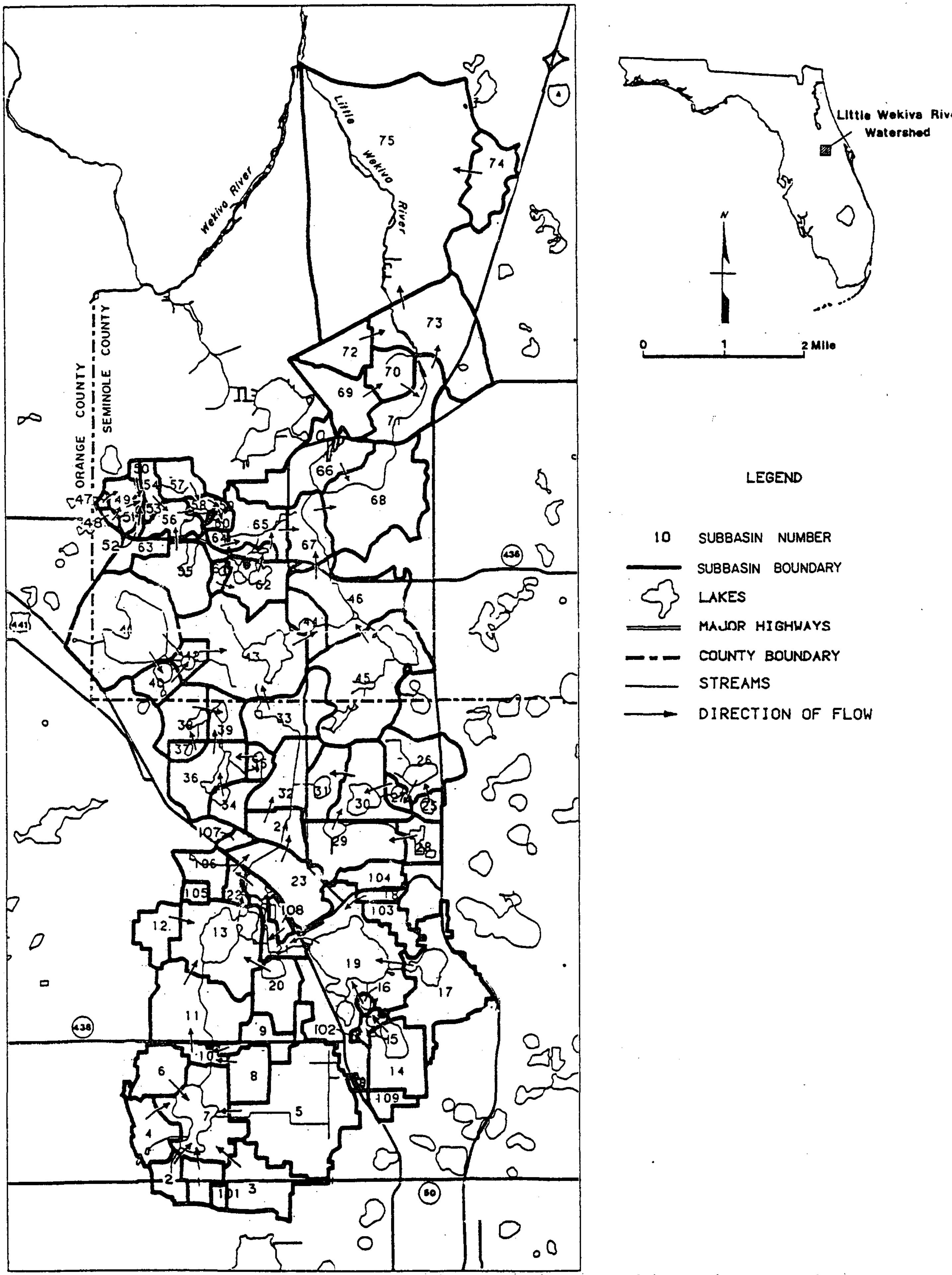


Figure 1-2. Subbasin delineation in the Little Wekiva River basin

2.0 FLOOD DAMAGE ASSESSMENT AND IDENTIFICATION OF PROBLEM AREAS

To develop various flood management alternatives for the Little Wekiva River basin, all areas with potential flood damages were first identified. The erosion problems were then considered to identify additional critical areas.

2.1 RESIDENTIAL DAMAGES

All structures (buildings) in the 100-yr floodplain were assigned identification numbers, and Orange and Seminole counties were requested to survey these structures to obtain additional information. The information collected (Fig. 2-1) consists of the value of the structure as appraised by the county for taxing purposes, type of structure, first floor and ground elevations, whether the house has a septic tank or is connected to the city sewer, and other miscellaneous information including a photograph of the structure. The counties were also requested to provide similar information for structures built, if any, in the 100-yr floodplain, after the 1981 photogrammetric mapping. The survey indicated that a majority of the houses in the 100-yr floodplain have their first floor elevations over one foot above the 100-yr flood elevation (Table 2-1). Thus, most of the residents in the floodplain will experience area/street flooding rather than structural/property damages.

Flood damages for single storm events for each structure were calculated from the 1974 depth-damage data developed by the Federal Insurance Administration (FIA) (Table 2-2). The FIA developed these data based on flood insurance claims. It is not practical to obtain, by survey, the value of the contents of each house. Therefore, an assumption was made that the contents have a value of 35 percent of the structure, as suggested by

Structure Survey Field Form

Project Name: LITTLE WEKIVA RIVER Project Number: 20-200-09
Prepared By: GLEN DENMAN Date: October 17, 1988
structure I.D.# 398 County: SEMINOLE
Section, Township, Range: 3 , 21 , 29
Resident: Pollack Norman S. & Joyce E.
Address: 324 Spring Run
City:

Structure Category:
(X) Residential -- Single Family
( ) Residential -- Multi-Family
( ) Commercial
( ) Other

Structure Type:
( ) Mobile Home
(X) Single Story
( ) Multi-Story

Structure Value: $ 94, 640

Land Value: $ 27,000 Total: $ 121,640

Survey Data: Ground Elevation Next to Structure: 28.70 ft NGVD

1ST Floor Elevation: 29.60 ft NGVD

Comments: City Sewer

Figure 2-1. Field survey information

Table 2-1. Number of houses that may sustain damages during a 100-yr flood event

(See Exhibit A for locations of flood areas)

	Number of structures* in 100-yr floodplain	Number of structures which might sustain damages
SEMINOLE COUNTY		
Mainstem of the Little Wekiva River	72	43
Tributary A	24	5
Tributary B	98	2
Tributary C	29	2
Tributary D	14	0
Tributary F	9	9
TOTAL	246	61
ORANGE COUNTY		
Mainstem of the Little Wekiva River	106	26
Tributary E	12	5
Tributary G	28	21
Tributary H	113 @	25
Tributary I	6	3
	265	80

* Single family houses, mobile homes, and commercial units.
@ This includes 22 mobile homes and 36 single family homes for which flood damages were not evaluated because structural survey could not be completed.

Table 2-2. The 1974 depth-damage data of the Federal Insurance Administration

Damage as a percentage of structure or contents value

Depth above & below first floor (feet)	One-Story No Basement		One Story With Basement	
	Structure	Contents	Structure	Contents
-8.0				0
-3.0			0	5
-2.0		0	4	7
-1.0	0	*	8	8
0.0 (first floor)	7	10	11	15
1.0	10	17	18	20
2.0	14	23	20	22
3.0	26	29	23	28
4.0	28	35	28	33
5.0	29	40	33	39
6.0	41	45	38	44
7.0	43	50	44	50
8.0	44	55	49	55
9.0	45	60	51	60
10.0	46		53	
11.0	47		55	
12.0	48		57	
13.0	49		59	
14.0	50		60	
15.0				
16.0				
17.0				
18.0				

Source: Federal Insurance Administration (1974)

*No value is given by FIA. A value of zero is assumed for this study.

Johnson (1985). Note that damages for houses with no basements begin when flood level is one foot below the first floor elevation (Table 2-2). When water is this close to the house its contents may get wet because of the capillary action of water. The 10-, 25-, and 100-yr flood elevations at each house (structure) were evaluated from the results of the floodplain study and the damages were calculated based on the depth of flooding from an elevation one foot below the first floor and the damage factors given in Table 2-2. For all buildings located within the 100-yr floodplain, the first floor elevation; the 10-, 25-, and 100-yr flood elevations; depth of flooding; the structure value; and the flood damages are summarized in Appendix A. In general, the structures that may sustain damages during a major storm event are scattered throughout the basin.

2.2 DAMAGES DUE TO EROSION

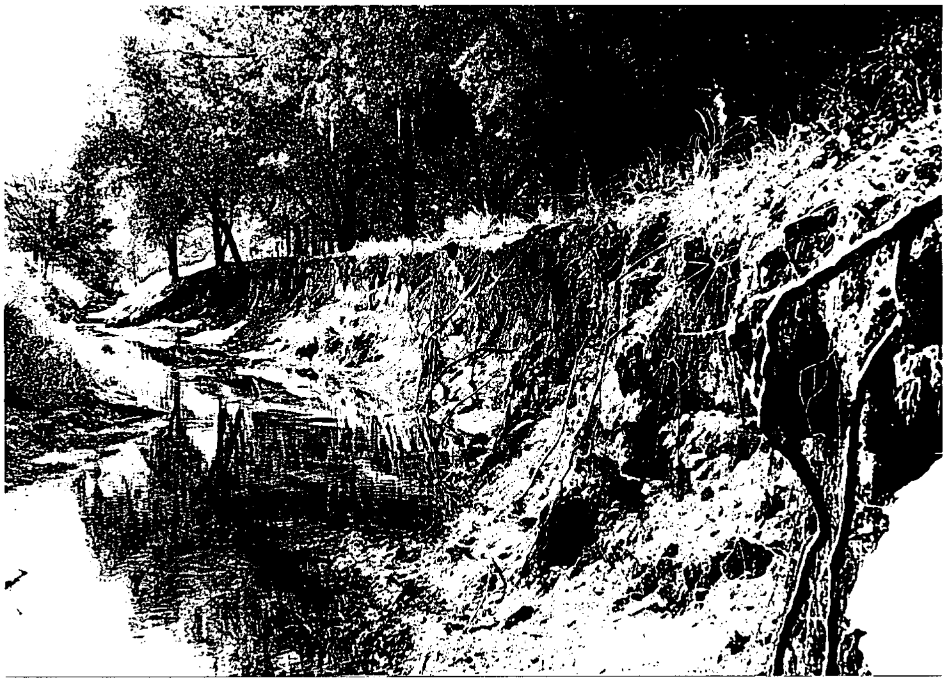
Major storms produce high velocities of flow in the Little Wekiva River and its tributaries. When these velocities exceed a certain limit (about 3 feet per second, fps) the dynamic forces of flood waters cause channel erosion. If not adequately protected, erosion of channel bed and banks and bridge abutments can occur. In general, flow velocities exceeding 3 fps develop at all bridges and culverts on the Little Wekiva River and its tributaries during 10-, 25-, and 100-yr storm events (Appendix B). In addition, channel reaches at several locations carry flow of high velocities. Extensive bank erosion and damage to bridge abutments have been observed throughout the Little Wekiva River basin (see Figs. 2-2 and 2-3). Figure 2-4 identifies locations of potential channel erosion and also indicates channel reaches where major erosion was observed.

Bank erosion poses a threat to nearby houses and safety of bridges. Foundations of some houses are known to have suffered subsidence requiring grout treatment as a result of problems caused by bank erosion. No detailed survey has been made as a part of this study to estimate the potential damage (in dollars) due to erosion in various reaches of the Little Wekiva River. However, the Riverside Acres subdivision in Orange County (Fig. 2-5) has been identified as an area that would suffer maximum damage as a result of the combined effects of high flood stages, overtopping of bridges, and erosion. The bridges at Oranole Road, Campo Way, Egret Way, and Elba Way (Fig. 2-5) are likely to collapse during a 100-yr flood event; about 13 houses located on

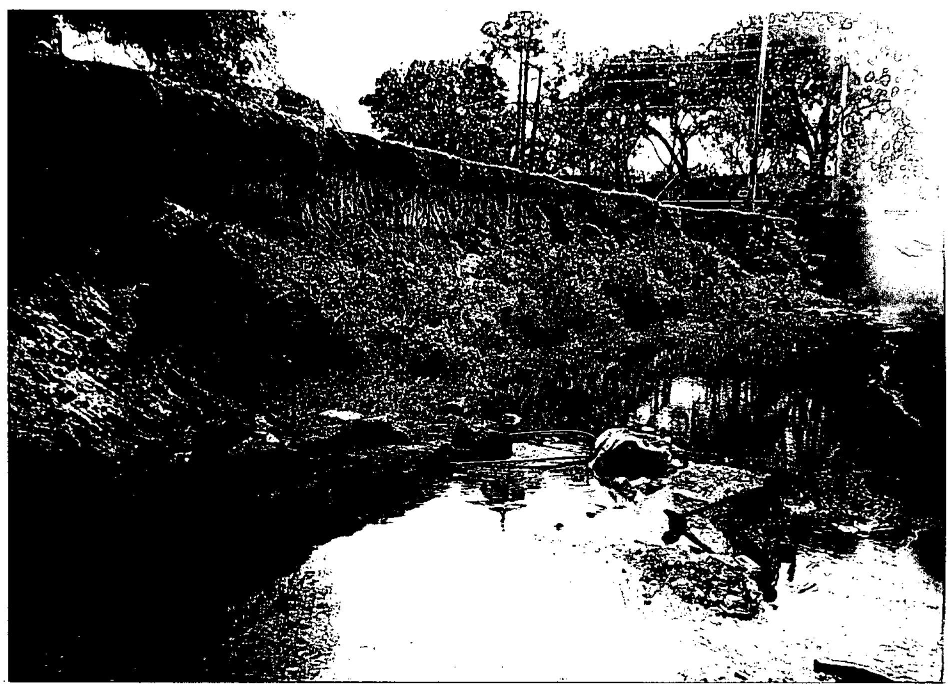
(Between Riverside Park Road and Sherry Drive, Orange County)

(Downstream of SR 436 Rail Road Bridge, Seminole County)

Figure 2-2. Typical erosion damage in channels of the Little Wekiva River, continued

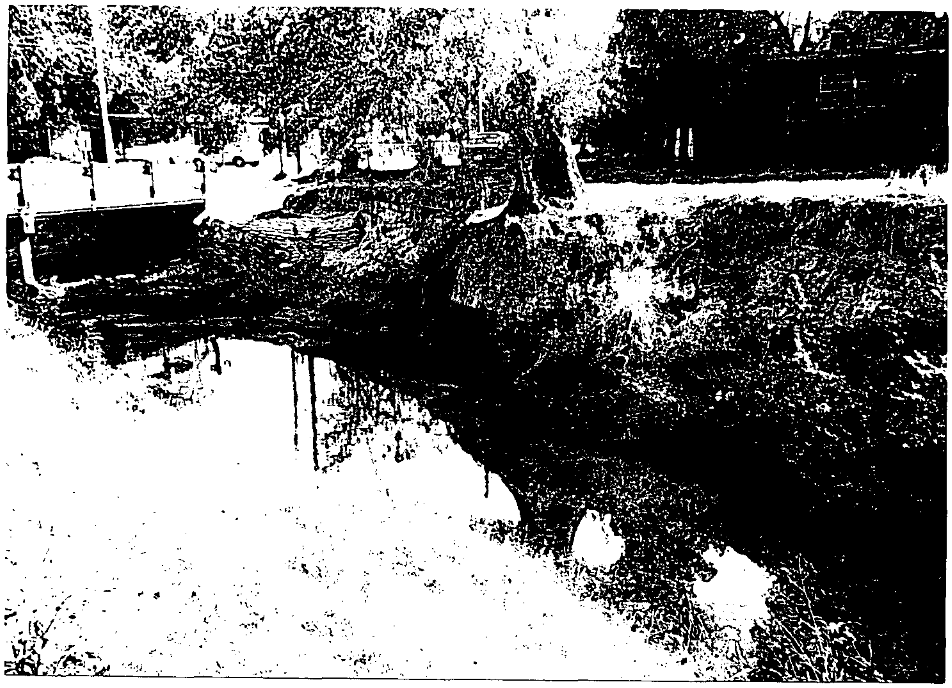


(Near the confluence of Tributary F with the Little Wekiva River, Seminole County)



(Downstream of Wallington Drive, Orange County)

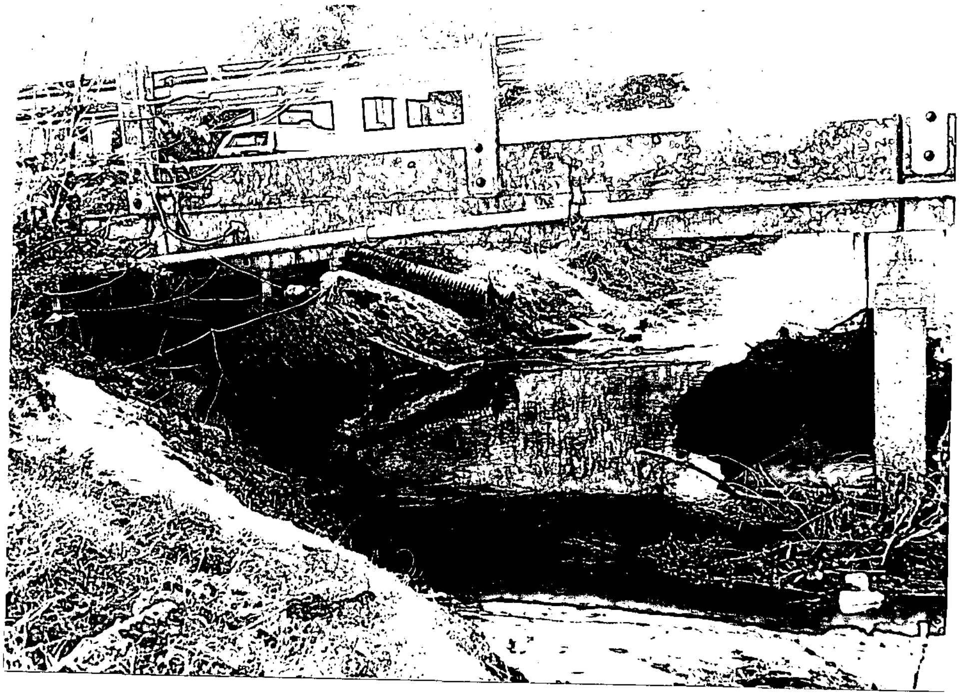
Figure 2-2. Typical erosion damage in channels of the Little Wekiva River, Orange and Seminole counties



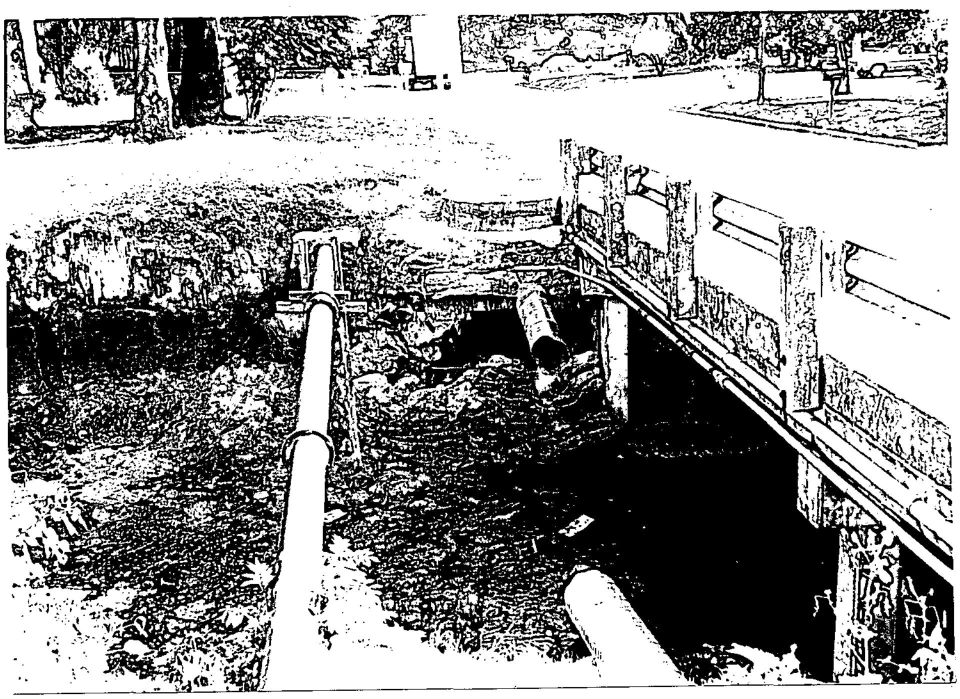
(Wallington Drive bridge, Orange County)

(Downstream of Kelvington Drive bridge, Orange County)

Figure 2-3. Typical erosion damage near bridges over the Little Wekiva River, continued



(Egret Way bridge, Riverside Acres subdivision, Orange County)



(Kelvington Drive bridge, Orange County)

Figure 2-3. Typical erosion damage near bridges over the Little Wekiva River, Orange and Seminole counties

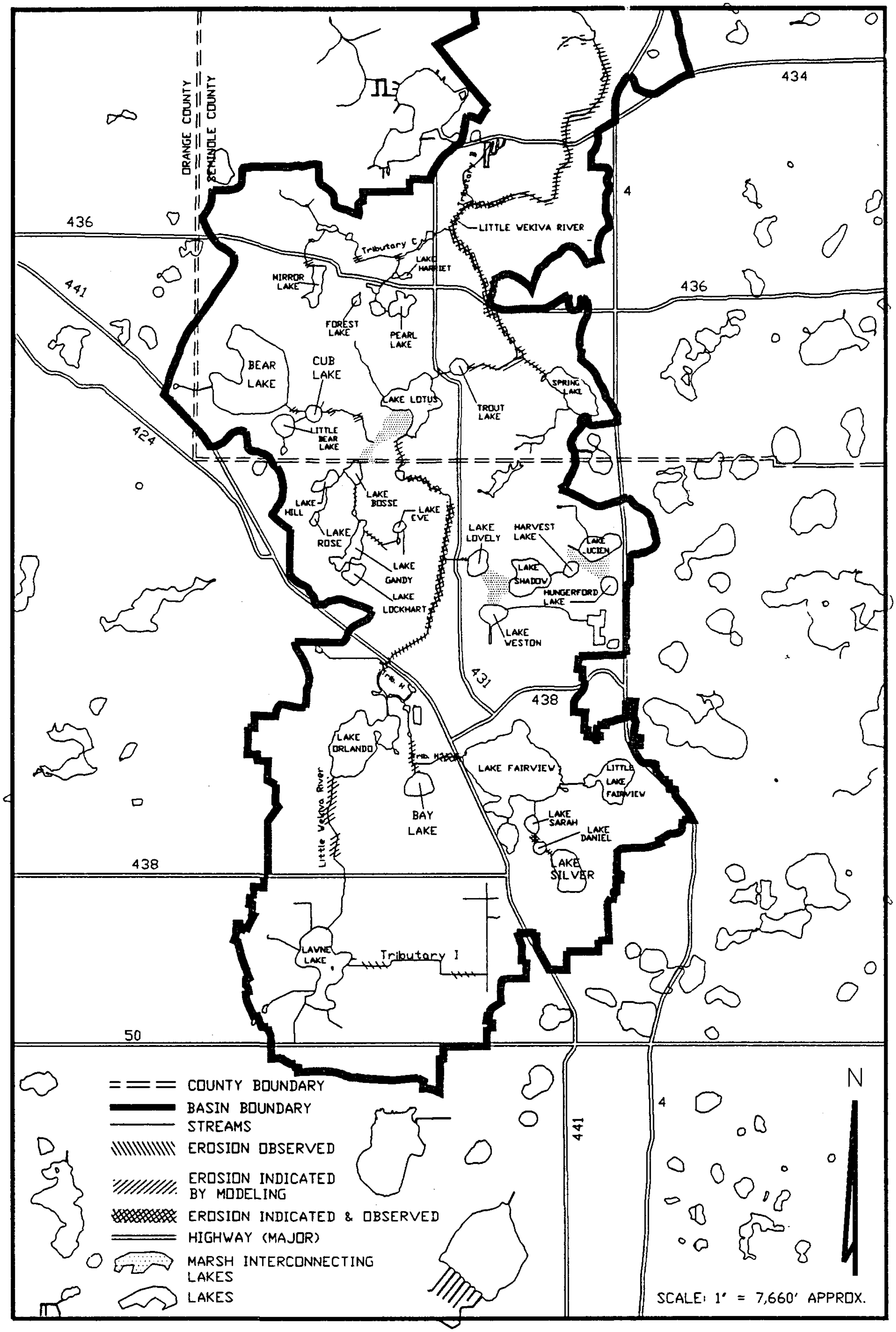


Figure 2-4. Areas of observed and potential channel erosion

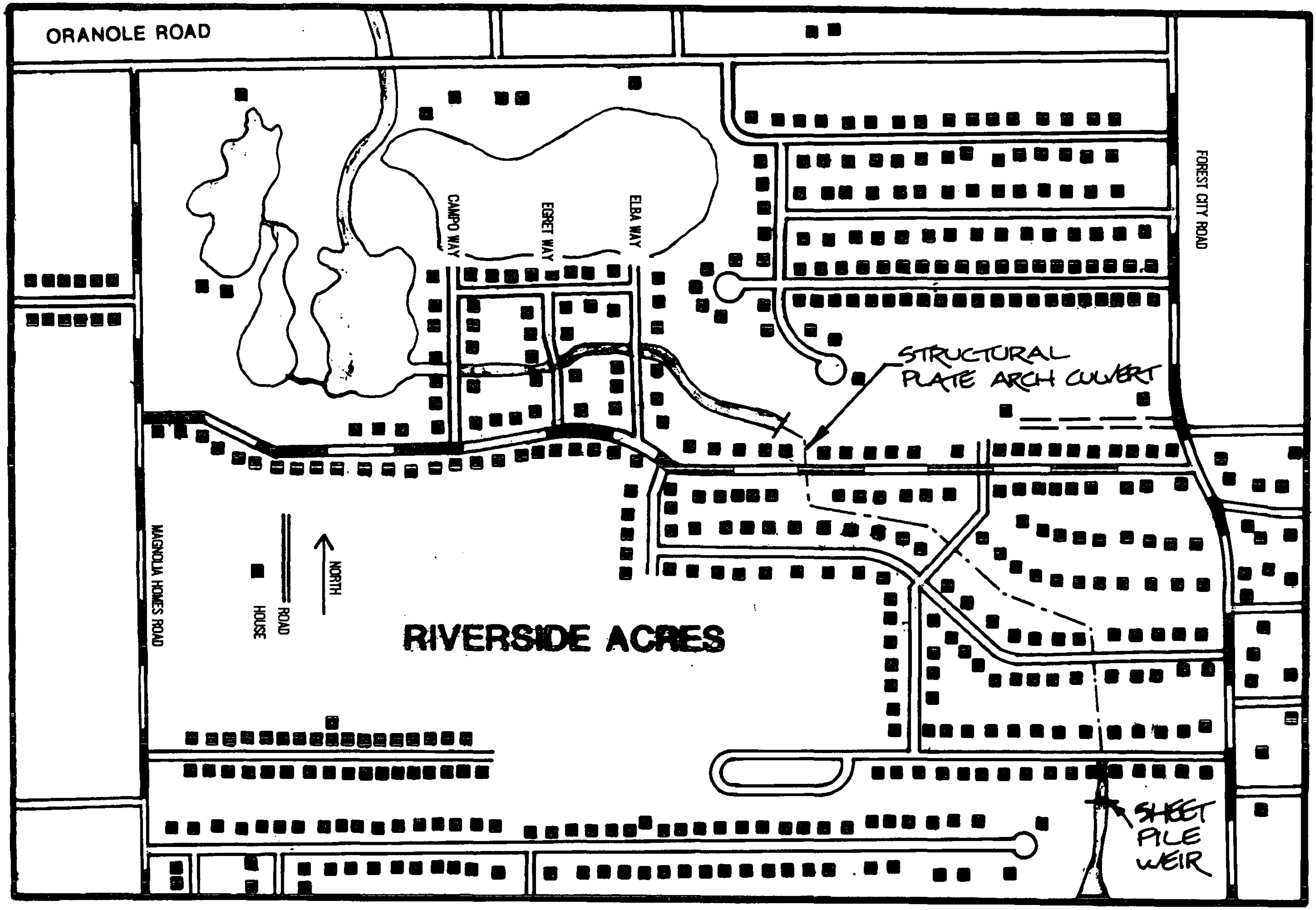


Figure 2-5. The Riverside Areas subdivision, Orange County

the two banks of the river are likely to suffer major damage during the same event.

2.3 AREAS OF POTENTIAL DAMAGES

Residential damages for the 100-yr storm event are lumped together for various locations and marked on the basin map (Exhibit A) to identify problem areas with potential flood and erosion damages. In all, 12 specific areas are found to be in need of minor or major flood control measures to alleviate residential flood damages. In addition to residential damages, other likely damages, i.e., overtopping of bridges and culverts, street flooding, damages due to erosion as discussed previously, also were considered to estimate total damages at each problem area (Table 2-3).

In a later section, several flood protection alternatives are considered for each problem area. Some of the alternatives were evaluated to determine the benefits to the problem area and their effects downstream.

2.4 BENEFIT/COST CALCULATIONS

Benefits are the flood damages prevented by a given flood protection measure. Benefits (i.e., the preventable flood damages) and costs of the flood protection alternatives are expressed as annual figures. The ratio of annual benefits to the annual cost is a simple economic indicator (the benefit/cost ratio) for selecting flood control alternatives. Annual cost is calculated by amortizing the present total cost of the flood protection measure over its expected life. The following methods are used in this study for calculating annual benefits:

Table 2-3: Major problem areas and expected annual damages

PROBLEM AREA ORANGE COUTNY	ESTIMATED DAMAGE IN THOUSAND DOLLARS				EXPECTED ANNUAL DAMAGES *
		10 YR	25 YR	100 YR	
I. Lawne Lake and Vicinity					
A. Tributary I	Homes	0.0	0.0	15.3	$425.00
	Streets	0.0	0.0	0.5	
B. Multi-Family Units on Lawne Lake East Shore	Homes	0.0	0.0	9.7	$850.00
	Streets	0.0	0.0	0.3	
C. Subdivision North of Lawne Lake	Homes	0.0	0.0	39.4	$1,360.00
	Streets	0.0	0.2	0.5	
D. Commercial Unit North of Silver Star Rd	Homes	0.2	0.6	0.9	$26.00
II. Lake Orlando and Vicinity	Homes	6.3	14.2	32.2	$2,560.00
	Streets	1.5	2.0	2.4	
	Bridges	5.0	10.0	10.0	
III. Lake Fair-view & Little Lake Fairview	Homes	13.1	26.1	99.5	$5,100.00
	Streets	0.5	0.8	1.0	
	Bridges	0.0	10.0	10.0	
IV. Tributary G	Homes	0.0	1.0	45.3	$1,570.00
	Streets	0.8	1.0	1.2	
	Bridges	0.0	5.0	10.0	
V. Oranole Rd. Vicinity	Homes	4.4	11.4	18.9	$103,000.00
	Streets	5.0	10.0	15.0	
	Bridges	96.0	384.0	480.0	
	Homes	112.0	448.0	560.0	
VI. Lakes Gandy and Lockhart	Homes	0.6	16.5	60.8	$2,620.00
	Streets	0.5	0.8	1.0	
	Bridges	0.0	0.0	0.0	

* Annual damages are computed based on an approximate damage-frequency curve, see Figure 2-6.

Table 2-3. Major problem areas and expected annual damages, continued

PROBLEM AREAS SEMINOLE COUNTY	ESTIMATED DAMAGE IN THOUSAND DOLLARS				EXPECTED ANNUAL DAMAGES *
		10 YR	25 YR	100 YR	
VII. Tributary F Confluence					
A. Area Downstream of Confluence	Homes Streets	1.4 0.2	2.4 0.4	3.8 0.5	$578.00
B. Area Upstream of Confluence	Homes Streets	19.4 1.2	59.9 1.4	125.3 1.5	$10,400.00
C. Bridges	Bridges	5.0	5.0	10.0	$716.00
VIII. Tributary C	Homes Streets Bridges	0.0 0.5 0.0	0.2 0.8 10.0	5.9 1.0 20.0	$1,220.00
IX. Montgomery Road Vicinity	Homes Streets Bridges	0.0 0.5 0.0	13.4 0.8 0.0	169.0 1.0 0.0	$4,940.00
X. Tributary B	Homes Streets Bridges	0.0 0.0 0.0	0.0 0.0 0.0	0.3 1.0 0.0	$40.00
XI. Springs North of S.R. 434					
A. Subdivision on West Bank of River	Homes Streets	0.0 0.5	1.8 0.8	19.5 1.0	$759.00
B. Footbridges	Bridges	0.0	0.0	25.0	$607.00
C. Recreational Area on East Bank of River	Unit Streets	17.5 0.0	29.9 0.0	43.1 0.0	$1,370.00
XII. Trib. A	Homes Streets Bridges	40.0 0.8 0.0	81.5 1.0 5.0	125.0 1.2 5.0	$13,400.00

* Annual damages are computed based on an approximate damage-frequency curve, see Figure 2-6.

2.4.1 Direct Flood Damages

Urban flood damages are primarily a function of flood peaks, i.e., flood severity or flooding depth. In certain instances, damages also depend on flood duration, e.g., agricultural and erosion damages. In this study, flood damages were estimated based primarily on peak floods.

For each flood peak, based on probability theory, it is possible to assign a percent chance that the flood would occur in given year. In this study, three representative flood magnitudes were chosen, i.e., 1 percent (100 yr), 4 percent (25 yr), and 10 percent (10 yr) annual probability events. For each problem area, the total residential damages (Appendix A) and damages to streets and bridges were estimated separately for each storm event chosen (Table 2-3). Calculation of residential damages was explained under Section 2.1. Cost of repair or replacement of a damaged bridge constitutes the damages to bridges. Street damages are essentially debris clearance and street clearing following a storm event. These values were estimated based on 1989 dollar costs.

2.4.2 Annual Flood Damages

If flood damages for a community are calculated for an infinite number of floods covering all possible magnitudes, and a relationship is drawn between flood damages and the annual percent flood probability, the resulting graph would be as shown in Figure 2-6. It is not practical to estimate flood damages for a large number of floods to derive a smooth relationship as shown in Figure 2-6.

The 10-, 25-, and 100-yr flood damages calculated for a given problem area provide three points on the damage frequency curve (Fig. 2-6). The remainder of the curve is sketched approximately based on the trend of the curve already drawn. The area under the curve represents the expected annual damages (EAD) (James and Lee 1971). EAD values for the 12 problem areas are summarized in Table 2-3.

2.4.3 Total Cost of a Flood Protection Alternative

Flood protection alternatives considered in this study are: Levee construction, channel and bridge improvements, storage area or reservoir

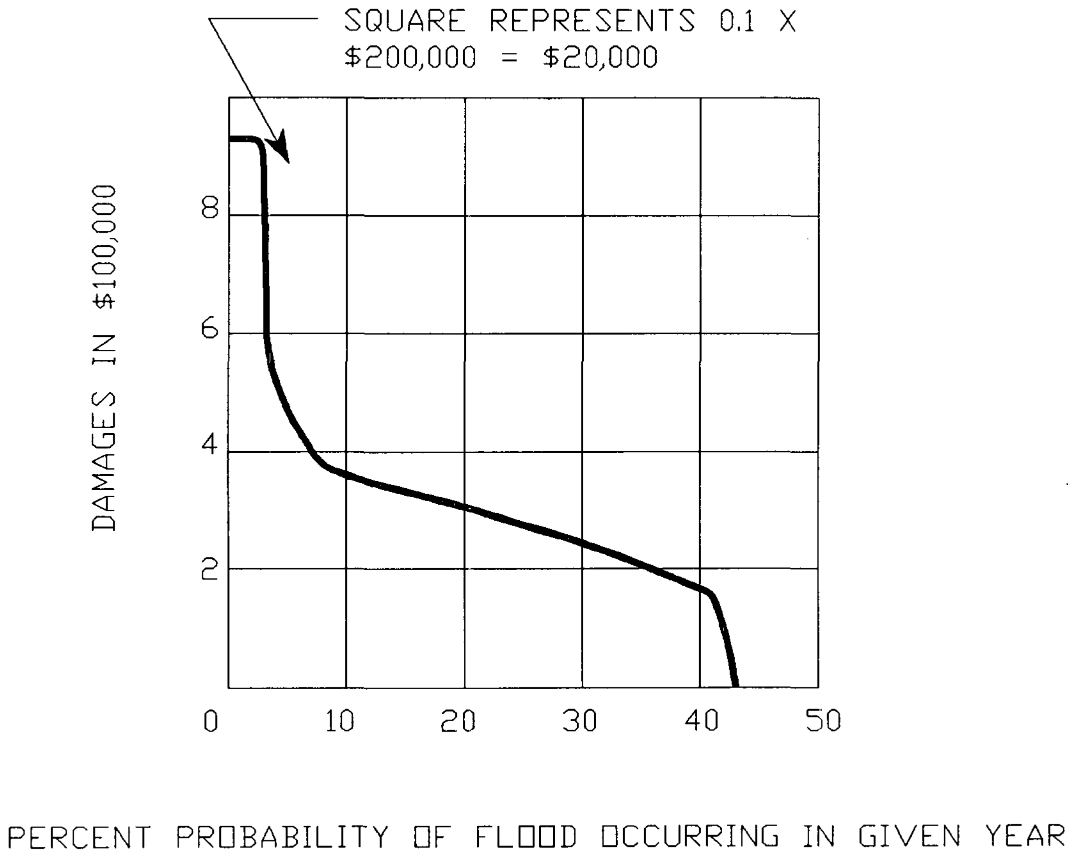


Figure 2-6. Typical damage-frequency curve

development, and floodproofing. Each of these measures consist of a number of components, e.g., earthwork sodding, structural components, labor, etc. Present day unit costs of various components are used to compute the total of a proposed flood control alternative (Appendix E).

2.4.4 Annual Cost of a Flood Protection Alternative

The formula for converting the "present worth" into "annual values" over a period of time is as follows:

$$CRF = \frac{C}{P} = \frac{i\,(1+i)^N}{(1+i)^N-1}$$

Where CRF = Capital recovery factor, the number and dollars one can withdraw in equal amounts at the end of each on N years if $1 is initially deposited at i percent annual interest rate.

P = Present worth, i.e., total cost of the flood protection alternative in present day (1989) dollars.

C = Annual cost of the flood protection alternative.

All annual costs (c) in this report are calculated suing an annual discount rate (i) of 8 percent, and a life expectancy (N) of 50 years for the improvements.

2.4.5 Benefit\Cost Ratio

The annual benefits offered by a flood protection alternative are calculated by:

$$B = EAD_p - EAD_a$$

Where B = Annual benefits

EAD_p = Expected annual damage under present conditions, i.e., without flood control project.

EAD_a = Expected annual damages after the improvements, i.e., with flood control project.

If a proposed flood control project prevents flood damages only partially, the value of EAD_a needs to be evaluated as described under Sections 2.4.1 and 2.4.2.

The benefit/cost ratio is given by B/C.

2.4.6 Indirect and Intangible Benefits

In projecting benefit/cost ratios for various flood protection alternatives in this study, only direct benefits (i.e., those accruing from a reduction in physical damage to items coming in contact with flood water) were considered. A flood control project offers several other benefits which are either indirect or intangible. In project decision making all these benefits should be carefully evaluated and considered. A detailed analysis of these benefits is beyond the scope of this study. The following are some of these benefits (James and Lee 1971).

- Benefits from reduced interruptions to transportation and communication (detouring around the flooded area and flood-induced interruptions in utility service)
- Reduction in wages lost by workers if industrial plants are closed by floods
- Land-enhancement benefits as a result of reduction in flood threat
- Saving of lives or improvement of health
- Improved aesthetics and the preservation of areas of natural beauty and scenic interest
- Environmental benefits

By analyzing a number of projects of the U.S. Army Corps of Engineers, Kates (USACOE 1958) found the values of these indirect and intangible benefits to be 15 percent of the direct flood damages for residential damage, 37 percent for commercial, 45 percent for industrial, 10 percent for agricultural, 10 percent for damage to utilities, 34 percent for public property, 25 percent for highways, and 23 percent for railroads.

The intangible effect most strongly emphasized in flood control planning is the sense of security that comes when floods no longer occur. Most agencies use rare design floods because, according to the Senate Committee on National Water Resources (U.S. Congress 1960), "If the degree of protection originally provided is too low, a false sense of security is induced, unwarranted development is encouraged, and when the great flood comes, inevitably the stage will be set for a disaster."

Flood loss patterns can be highly variable from year to year, occasionally reaching catastrophic proportions (Bhavnagri and Bugliarello 1965). The insecurity brought on by the uncertainty of when major floods will occur is considered to create a cost above the expected damages (James and Lee 1971). Thus, the total average annual damages consist of the following: direct damages (as calculated in this study), indirect damages, and an uncertainty cost. Although the benefit/cost ratios calculated for various flood protection measures in this study are found to be very small for some areas, the true ratios can be higher than the calculated values because of indirect and intangible benefits. The calculated benefit/cost ratios may be increased by 30 percent to account for these benefits.

Water quality and wetland losses in the Little Wekiva River basin were examined as part of this study. Water quality data were taken from various water quality stations in the basin. The location of these stations and of wetland losses in the basin in relation to the 12 flooding problem areas is indicated in Table 2-4.

Table 2-4. Location of water quality stations and wetland losses in the Little Wekiva River basin in relation to flooding problem areas

Problem Area	Water Quality Stations Near the Problem Area	Wetland Loss
ORANGE COUNTY		
Problem Area I Lawne Lake and vicinity	LWA, LW10N	Areas surrounding north, west, and south portions of Lawne Lake Extensive areas to the east of Lawne Lake. All wetlands remaining in this area have been drained.
Problem Area II Lake Orlando and vicinity	LWB	Extensive wetland loss surrounding all of Lake Orlando
Problem Area III Lake Fairview and Little Lake Fairview	LW28	Extensive wetland loss south of Little Lake Fairview
Problem Area IV Tibutary G	no available water quality information	Extensive wetland loss east and south of Lake Weston
Problem Area V Oranole Road vicinity (Riverside Acres subdivision)	LW1	Extensive wetland loss in the main channel of the Little Wekiva River south of Lake Lotus
Problem Area VI Lakes Gandy and Lockhart	LW1 is downstream	Insignificant

Table 2-4. Location of water quality stations and wetland losses in the Little Wekiva River basin in relation to flooding problem areas, continued

Problem Area	Water Quality Station Near the Problem Area	Wetland Loss
SEMINOLE COUNTY		
Problem Area VII Confluence of Tributary F and the Little Wekiva River	LW3	Extensive wetland loss on Tributary F
Problem Area VIII Tributary C	no available water quality information	Extensive wetland loss on Tributary C
Problem Area IX Subdivision west of Montgomery Road, Altamonte Springs	between LW3 & LW6	Extensive wetland loss along the banks of the main channel of the Little Wekiva River
Problem Area X Tributary B	no available water quality information	Insignificant
Problem Area XI Springs Development North of S.R.434	between LW3 and LW6	Extensive wetland loss along the banks of the main channel of the Little Wekiva River
Problem Area XII Tributary A	LW6	Extensive wetland loss in the extreme northern portion of the study area

3.0 WATER QUALITY AND ENVIRONMENTAL ASSESSMENT OF THE LITTLE WEKIVA RIVER BASIN

The loss of wetlands in the Little Wekiva River basin through developmental activities has resulted in the degradation of water quality, reduction of water storage capabilities, increased erosion and sedimentation, and general ecological deterioration. This chapter assesses water quality conditions in the basin, quantifies wetland loss, and discusses the problems associated with wetland loss.

3.1 METHODS

Water quality samples were collected at various stations in the Little Wekiva basin (Fig. 3-1).

3.1.1 Orange County Data

Data from the Orange County Environmental Protection Department (Appendix C), were used to assess water quality at three stations (Fig. 3-1) along the mainstem of the Little Wekiva River, in Orange County. A station at the north lobe of Lake Lawne (LW10N) was sampled from 1980-82 and 1986-88. Station LWA at the intersection of Silver Star Road and the Little Wekiva River and LWB at the intersection of U.S. 441 and the Little Wekiva River were sampled from 1980-1988. All samples were collected at approximately quarterly intervals.

A fourth sample site in Orange County was located in the north lobe of Lake Fairview (LW28). Quarterly water quality data were available for LW28 from 1980 to 1988.

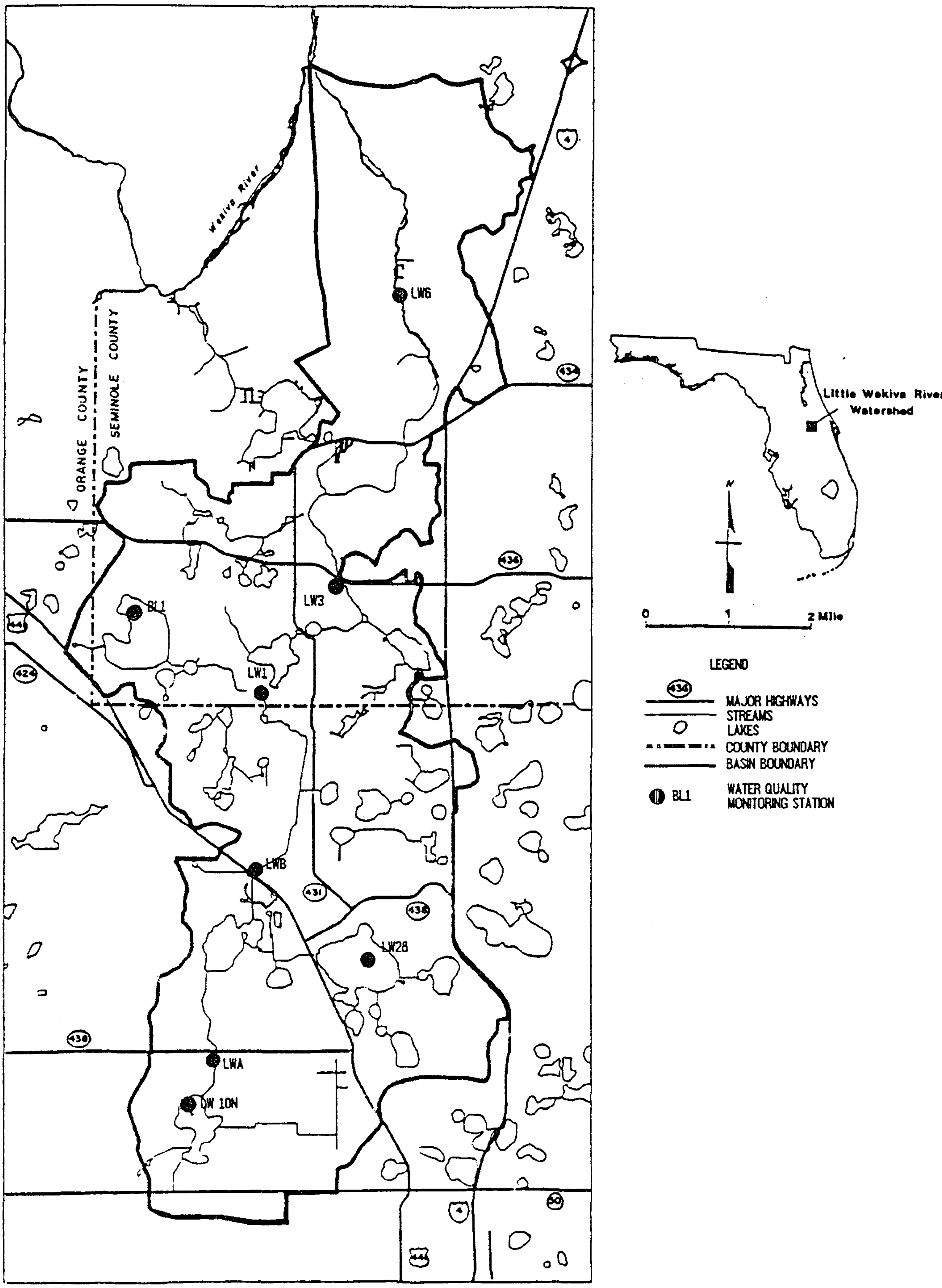


Figure 3-1. Water quality stations, Little Wekiva River basin

3.1.2 Seminole County Data

Seminole County Environmental Services (Appendix C) provided data for three stations along the mainstem of the Little Wekiva River in Seminole County from 1980 to 1986 (Fig. 3-1). The stations were located at the intersection of the Little Wekiva River and Oranole Road (LW1), S.R.436 (LW3), and Delks Road (LW6) (Fig. 3-1). Water quality data from 1980 to 1985 were also available from a fourth station in the east side of Bear Lake (BL1). Seminole County stations were sampled at varying time intervals.

3.2 STANDARDS

Water quality was evaluated using the Department of Environmental Regulation's (DER) 1988 Florida Water Quality Assessment and the State Water Quality Standards (Chapter 17-3, Florida Administrative Code).

3.2.1 DER Standards

DER's water quality assessment uses a Water Quality Index (WQI) and Trophic State Index (TSI) to determine water quality in rivers and lakes, respectively. The WQI, used for assessing the river, is a mathematical model using data on water clarity, dissolved oxygen, biological oxygen demand, total and fecal coliforms, nutrients, and biological diversity. Index values are calculated based on these parameters and they are compared with index values for other Florida rivers. Rivers receiving values of 0-44 are rated "good", 45-59 are "fair", and 60-90 are "poor". The TSI, used for assessing lakes, is calculated based on nutrient (nitrogen and phosphorus) concentrations, chlorophyll *a*, and Secchi depth. Lakes receiving values of 0-59 are rated "good", 60-69 are "fair", and 70-100 are "poor" compared with other Florida lakes. The parameters used in this report to calculate the WQI and TSI ratings are listed in Table 3-1.

3.2.2 State Standards

The state water quality standards include numerical and subjective criteria for assessing Florida waters. The Little Wekiva River is a Class III water, so water quality data are compared to Class III numerical standards.

Table 3-1. Water quality parameters and the method of assessment

Parameters	Assessment		
	WQI (Rivers)	TSI (Lakes)	State (Class III Water)
Cu			X
Pb			X
Zn			X
Cd			X
Ni			X
Turbidity	X		
Secchi Depth		X	
Dissolved Oxygen	X		X
Biological Oxygen Demand	X		
Chlorophyll _a_		X	
Total Coliforms	X		X
Fecal Coliforms	X		X
Total Nitrogen	X	X	
Total Phosphorus	X	X	

The parameters assessed are heavy metals, dissolved oxygen, and total and fecal coliforms (Table 3-1). Seminole County data did not include metals, Secchi depth, chlorophyll *a*, or coliforms (Table 3-2). Averages used are for all samples for the period of record except when stated in the text.

3.3 SUMMARY OF DATA

The Little Wekiva River is influenced by large amounts of urban stormwater runoff with possible inflows from industrial areas and septic tank leachates. As a result elevated levels of biological oxygen demand and nutrients are evident as well as low dissolved oxygen concentrations.

Total and fecal coliforms and heavy metals were sampled only in Orange County. In general, coliform levels were elevated and average levels of cadmium, lead, and sometimes zinc exceeded Class III state water quality standards.

A portion of the river in Seminole County is highly influenced by sewage treatment plant (STP) effluent. STPs immediately south of S.R.436 discharge high levels of nitrogen and phosphorus into the river. These nutrient levels are diluted downstream by water from Sanlando, Palm, and Starbuck springs.

Water quality in Lake Fairview (Orange County) and Bear Lake (Seminole County) is generally good. Average levels of cadmium exceeded Class III state water quality standards at Lake Fairview; heavy metals were not sampled at Bear Lake.

The average data from the Little Wekiva River basin are compared with the applicable standards: the Class III state water quality standards (Table 3-3), WQI ratings (Table 3-4), and TSI ratings (Table 3-5).

A comparison of Lawne Lake, Lake Fairview, and Bear Lake by annual TSI indicates water quality is somewhat worse in Lawne Lake that the other two lakes (Figure 3-2). A comparison of river stations (in downstream order) by annual WQI may indiate that water quality is slightly better n Seminole County than Orange County (Figure 3-3).

Table 3-2. Water quality parameters sampled in each county

Parameters	Orange Co.	Seminole Co.
Cu	X	
Pb	X	
Zn	X	
Cd	X	
Ni	X	
Turbidity	X	X
Secchi Depth	X	
Dissolved Oxygen	X	X
Biological Oxygen Demand	X	X
Chlorophyll a	X	
Total Coliforms	X	
Fecal Coliforms	X	
Total Nitrogen	X	X
Total Phosphorus	X	X

Table 3-3. Average water quality values for heavy metals and dissolved oxygen (DO) for stations in the Little Wekiva River basin

Water Quality Parameters
State Standards

Location	Station	Cu 30 ug/1	Pb 30 ug/1	Zn 30 ug/1	Ni 100 ug/1	Cd 1.2 ug/1	DO 5.0 ppm
Lawne Lake	LW10N	25	31*	35*	46	9.5*	6.8
Little Wekiva River Mainstem	LWA	20	--	17	37	14.4*	4.0*
	LWB	17	32*	8	--	16.9*	4.6*
	LW1	--	--	--	--	--	5.5
	LW3	--	--	--	--	--	5.6
	LW6	--	--	--	--	--	5.2
Lake Fairview	LW28	19	17	21	37	9.0*	8.3
Bear Lake	BL1	--	--	--	--	--	7.6

* Do not meet state Class III water quality standards

Table 3-4. Average water quality values and water quality index ratings from river stations in the Little Wekiva River

Stations		Parameters						
Location	Station	Turbidity FTU	Dissolved Oxygen ppm	Biological Oxygen Demand mg/1	Total Nitrogen mg/1	Total Phosphorus mg/1	Total Coliform #/100ml	Fecal Coliform #/100ml
Little Wekiva River Mainstem	LWA	4.2/Good	4.0/Poor	4.9/Poor	1.28/Fair	0.19/Poor	925/Fair	160/Poor
	LWB	5.0/Fair	4.6/Poor	3.8/Poor	1.03/Fair	0.10/Good	356/Good	95/Fair
	LW1	3.0/Good	5.5/Fair	1.8/Fair	1.30/Fair	0.10/Fair	--	--
	LW3	1.4/Good	5.6/Fair	1.9/Poor	2.55/Poor	0.40/Poor	--	--
	LW6	0.9/Good	5.2/Poor	1.0/Good	1.10/Good	0.23/Poor	--	--

Table 3-5. Average water quality values and trophic state index ratings from lake stations in the Little Wekiva River basin

Stations		Parameters			
Location	Station	Secchi Depth m	Chlorophyll *a* mg/m^3	Total Nitrogen mg/1	Total Phosphorus mg/1
Lawne Lake	LW10N	1.0/Fair	18.2/Good	1.26/Fair	0.15/Fair
Lake Fairview	LW28	3.0/Good	5.4/Good	0.72/Good	0.02/Good
Bear Lake	BL1	2.4/Good	--	0.68/Good	0.03/Good

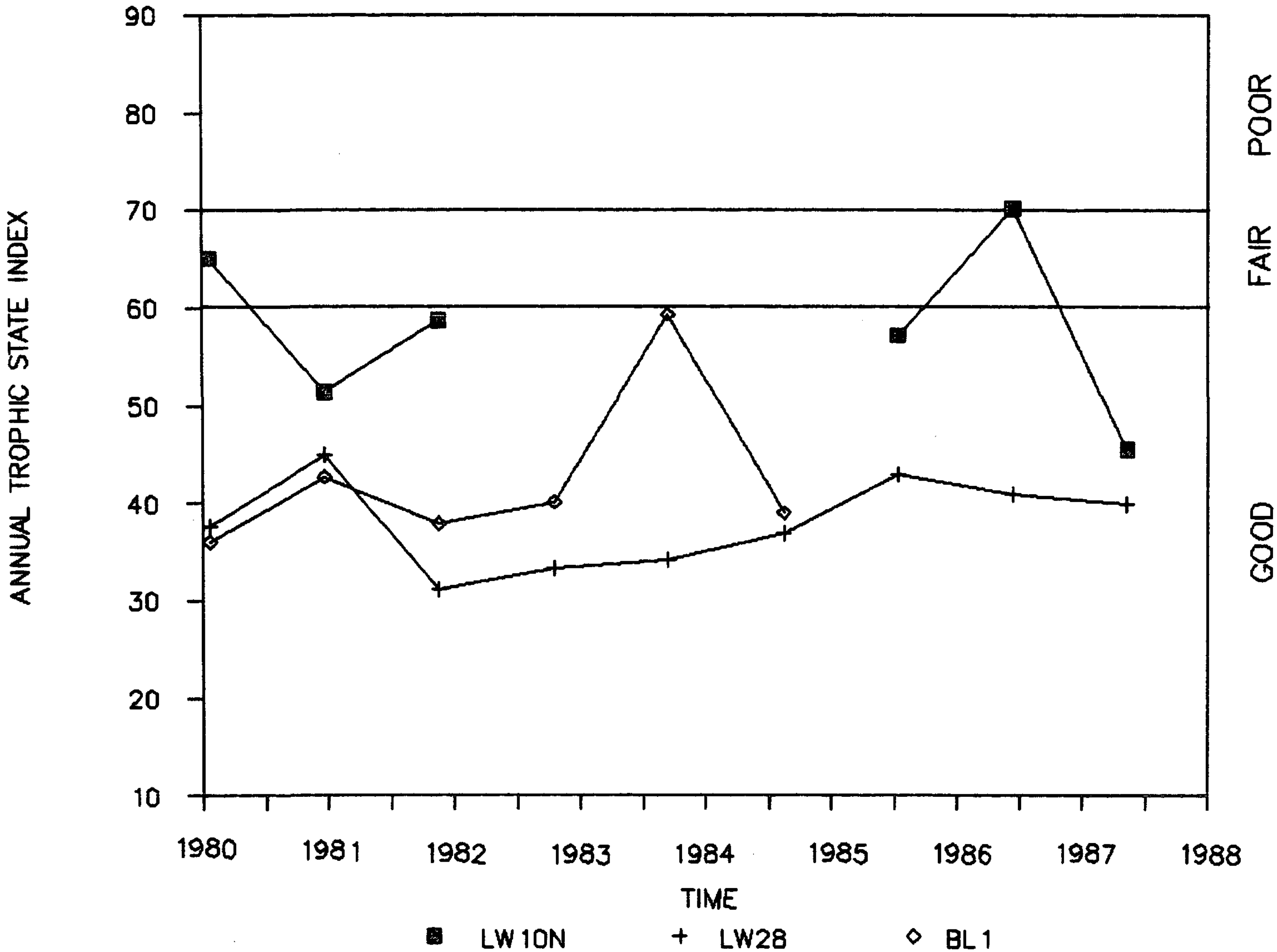


Figure 3-2. Average annual trophic state index values for lakes in the Little Wekiva River basin. LW10N is in Lawne Lake, LW28 is in Lake Fairview, BL1 is in Bear Lake.

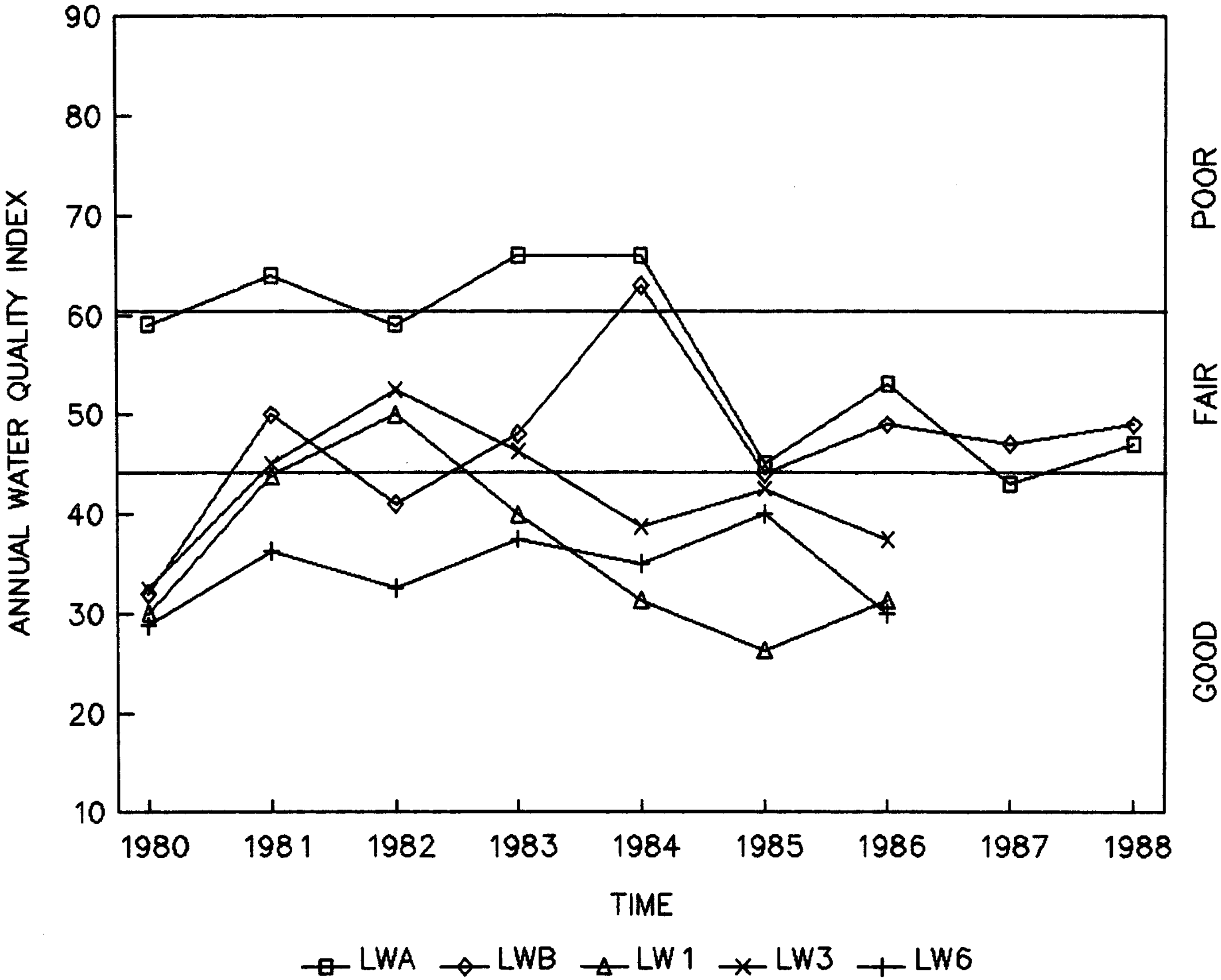


Figure 3-3. Average annual water quality index values for stations in the Little Wekiva River. The stations are listed in order, moving downstream.

3.4 ORANGE COUNTY WATER QUALITY

3.4.1 Little Wekiva River Mainstem

In general, water quality monitoring stations along the mainstem channel of the Little Wekiva River in Orange County exhibited low dissolved oxygen (DO) concentrations and elevated levels of the following: biological oxygen demand (BOD), nutrients, turbidity, total and fecal coliforms, and heavy metals. The river is highly influenced by urban stormwater runoff (East Central Florida Regional Planning Council 1980) with possible inflow from industrial areas and septic tank leachate. The river can become very turbid during periods of high flow due to resuspension of sediments.

Water quality at LW10N in Lake Lawne was rated "good" by the Trophic State Index (TSI=58). However, individual water quality samples fluctuated from "good" to "poor" with a range of 36-78 (see Fig. 3-4).

Water quality at LWA and LWB, in the mainstem of the Little Wekiva River, was rated "fair" by the WQI. The average annual WQI at LWA and LWB was 56 and 47, respectively. However, individual water quality samples fluctuated from "good" to "poor", with a range of 27-78 at LWA and 29-72 at LWB (Fig. 3-5 and 3-6).

Heavy Metals. The heavy metals measured were copper (Cu), lead (Pb), zinc (Zn), nickel (Ni), and cadmium (Cd). Average concentrations of Cu were within state water quality standards of 30 ug/l (Class III water). Concentrations of Cu exceeded the Class III water quality standard in 2 of 22 (9%) samples collected at station LW10N, 2 of 28 samples (7%) collected at LWA and 2 of 29 (7%) samples collected at LWB.

Average concentrations of Pb exceeded the state water quality standard of 30 ug/l at stations LW10N (31 ug/l) and LWB (32 ug/l) (Fig. 3-7); however, few samples were taken. Pb exceeded the Class III state water quality standard for 1 of 3 (33%) samples collected at LW10N and 3 of 7 (43%) samples collected at LWB. No Pb data were collected from LWA.

Average concentrations of Zn exceeded the state water quality standard of 30 ug/l at LW10N (35 ug/l) (Fig. 3-7). At station LWA, average concentrations of Zn were below the state water quality standard; however, a value of 1233 ug/l Zn (sampled 10/19/87) was not used in computations

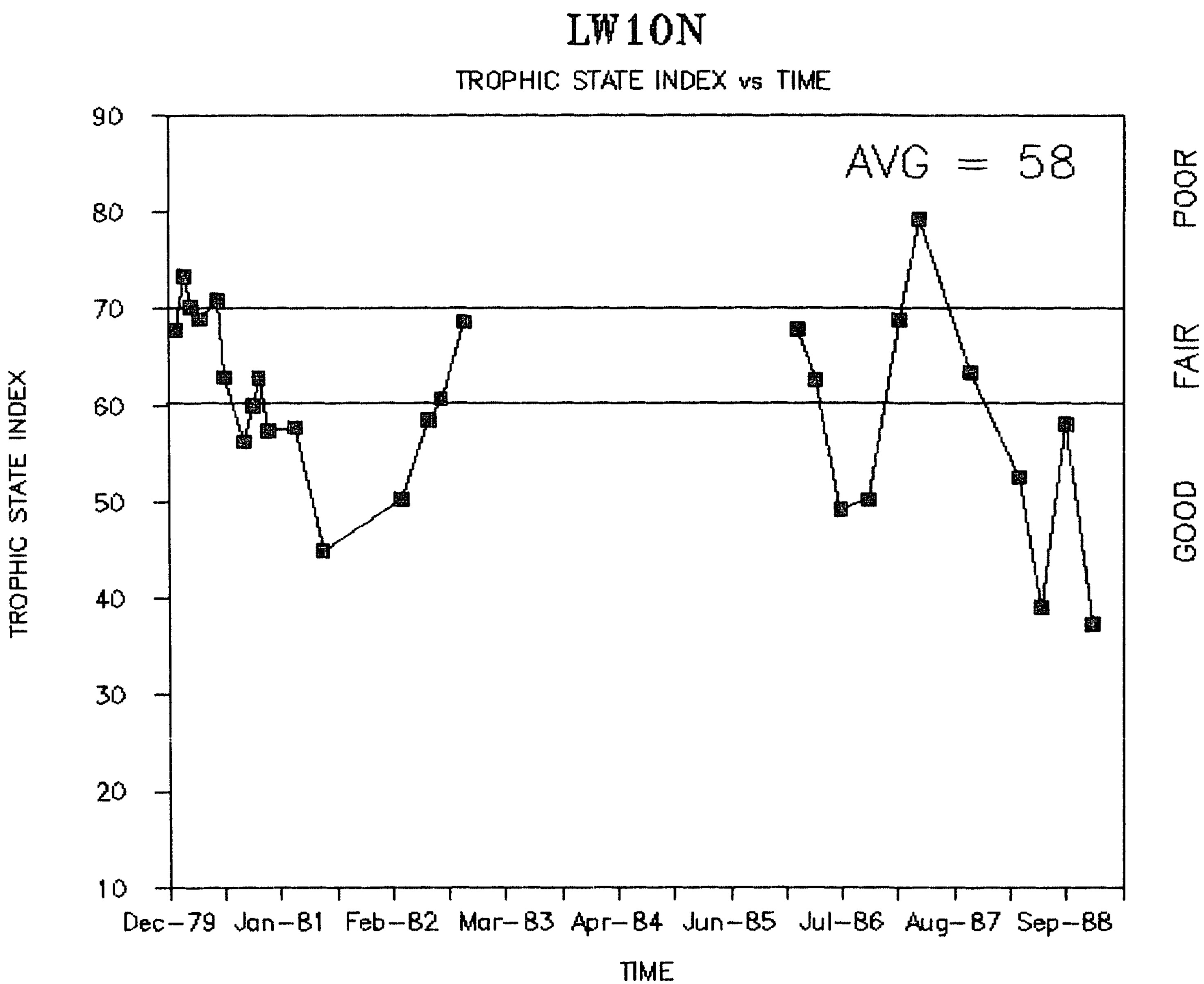


Figure 3-4. Trophic state index values for Lawne Lake (LW10N), Orange County

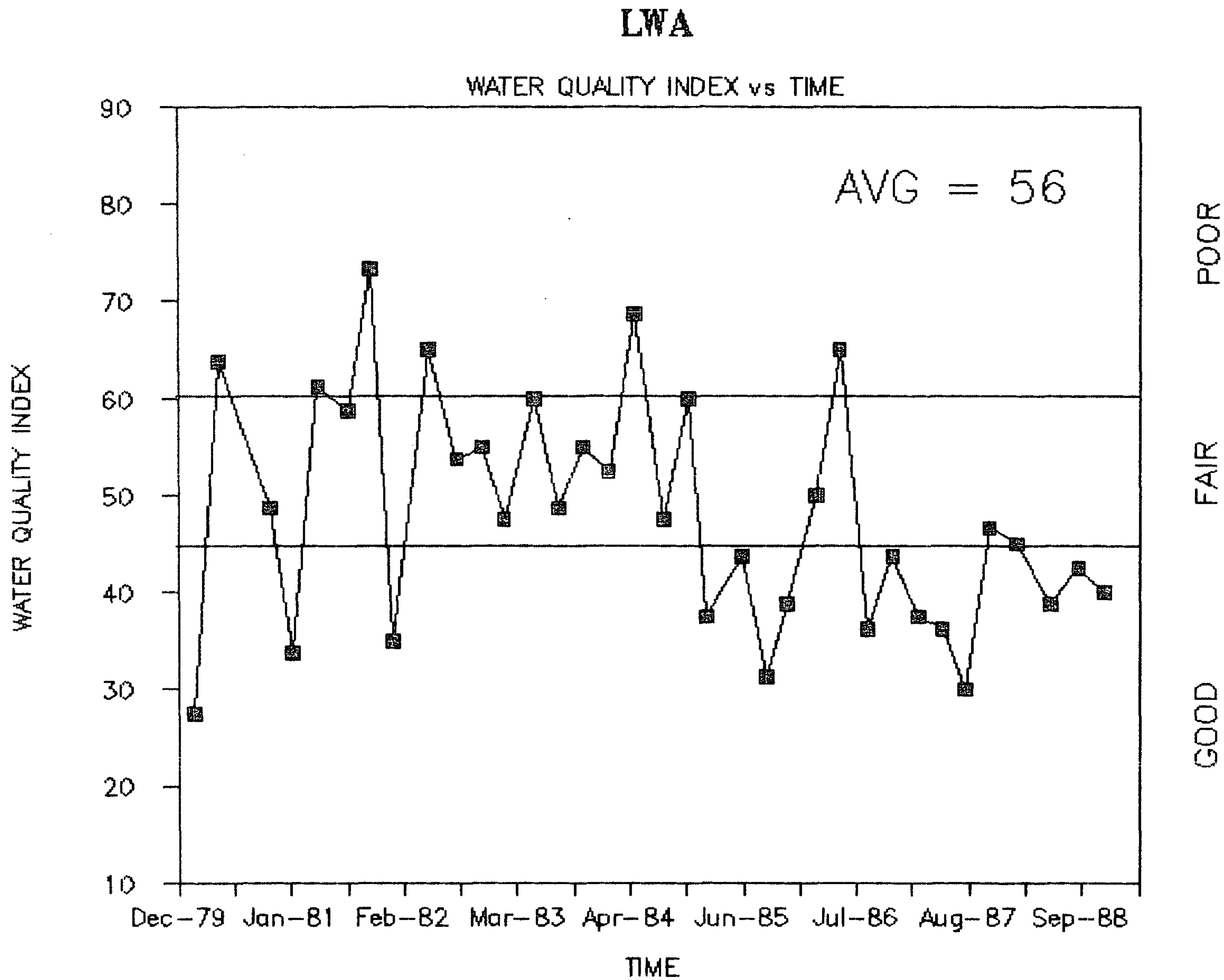


Figure 3-5. Water quality index values for LWA, in the Little Wekiva River, Orange County

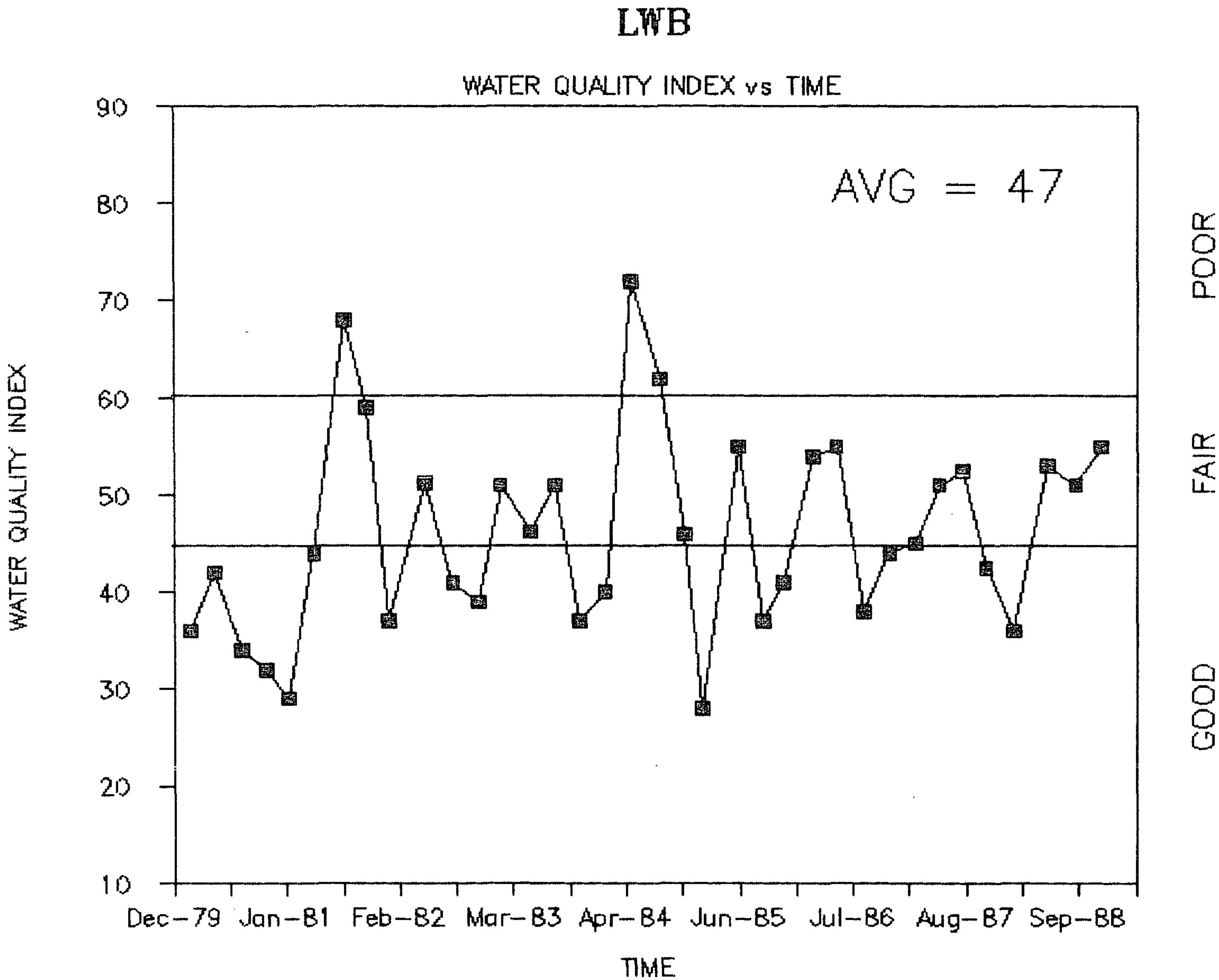


Figure 3-6. Water quality index values for LWB, in the Little Wekiva River, Orange County

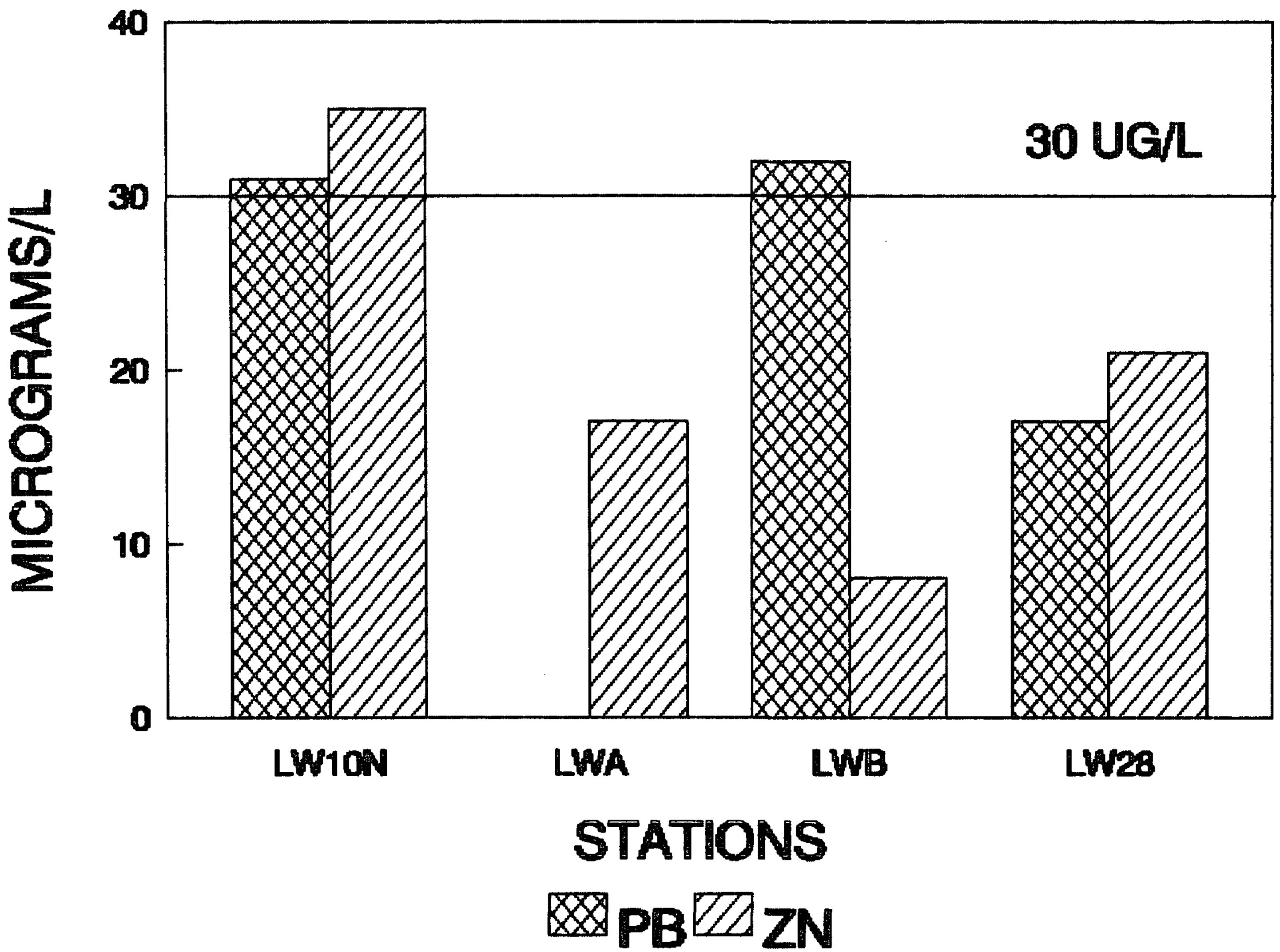


Figure 3-7. Average concentrations of lead (Pb) and zinc (Zn) in Lawne Lake (LW10N), Lake Fairview (LW28), and the Little Wekiva River (LWA, LWB), Orange County. Levels of Pb or Zn above 30 ug/l exceed the state Class III water quality standard.

because it is not known if this high level (the average level is 17 ug/l for 22 samples without this value) is due to error or is a result of infrequent local conditions. Zn exceeded the state water quality standard in 2 of 12 (17%) samples at LW10N, 3 of 22 (14%) samples at LWA, and 2 of 23 (9%) samples at LWB. Zinc is widely used in metallurgy and galvanizing and also as a pigment in paint and rubber (Casarett and Doull 1980). Stormwater runoff or drainage from industrial parks in the area are possible sources.

Average concentrations of Ni were within the state water quality standard of 100 ug/l at all stations. Ni exceeded the state water quality standard in only 1 of 12 (8%) samples collected at LW10N.

Average concentrations of Cd exceeded the state water quality standard of 1.2 ug/l at all stations (Fig. 3-8). However, not all values recorded for Cd were used in computation. Prior to 1986 the instrumentation used by Orange County to determine Cd levels was not sufficiently sensitive to detect concentrations approaching the state water quality standard. Average concentrations of 9.5 ug/l for LW10N, 14.4 ug/l for LWA and 16.9 ug/l for LWB were calculated from data obtained from new instrumentation (1986 to present), which provided more accurate readings. Cd exceeded the state water quality standard 6 of 12 (50%) samples collected at LW10N, 5 of 9 (56%) samples at LWA, and 6 of 9 (67%) samples at LWB. Cadmium is used for electroplating and is present in paint, printing ink, plastics, batteries, and fluorescent and video tubes (Casarett and Doull 1980). Stormwater runoff or drainage from industrial parks in the area are possible sources.

Turbidity. There are no numerical state water quality standards for turbidity. Turbidity values are measured in Formazin Turbidity Units (FTU) and are considered comparable to Nephelometric Turbidity Units (NTU) (USEPA 1979). Average turbidity values from LWA (4.2 FTU for 34 samples) and from LWB (5.0 FTU for 35 samples) are rated "good" and "fair," respectively by the WQI (see Fig. 3-9). Although the WQI ratings are at least "fair," water in this stretch of the Little Wekiva River can become very turbid because of resuspended sediments during periods of high flow. The TSI for lake station LW10N was evaluated based on Secchi depth as a measure of turbidity. The average Secchi depth at LW10N is 1.0 m for 27 samples, which is rated "fair."

Dissolved Oxygen, Biological Oxygen Demand, and Chlorophyll *a*. Average dissolved oxygen (DO) concentrations were below the minimum state water quality standard of 5.0 ppm at the stations in the Little Wekiva

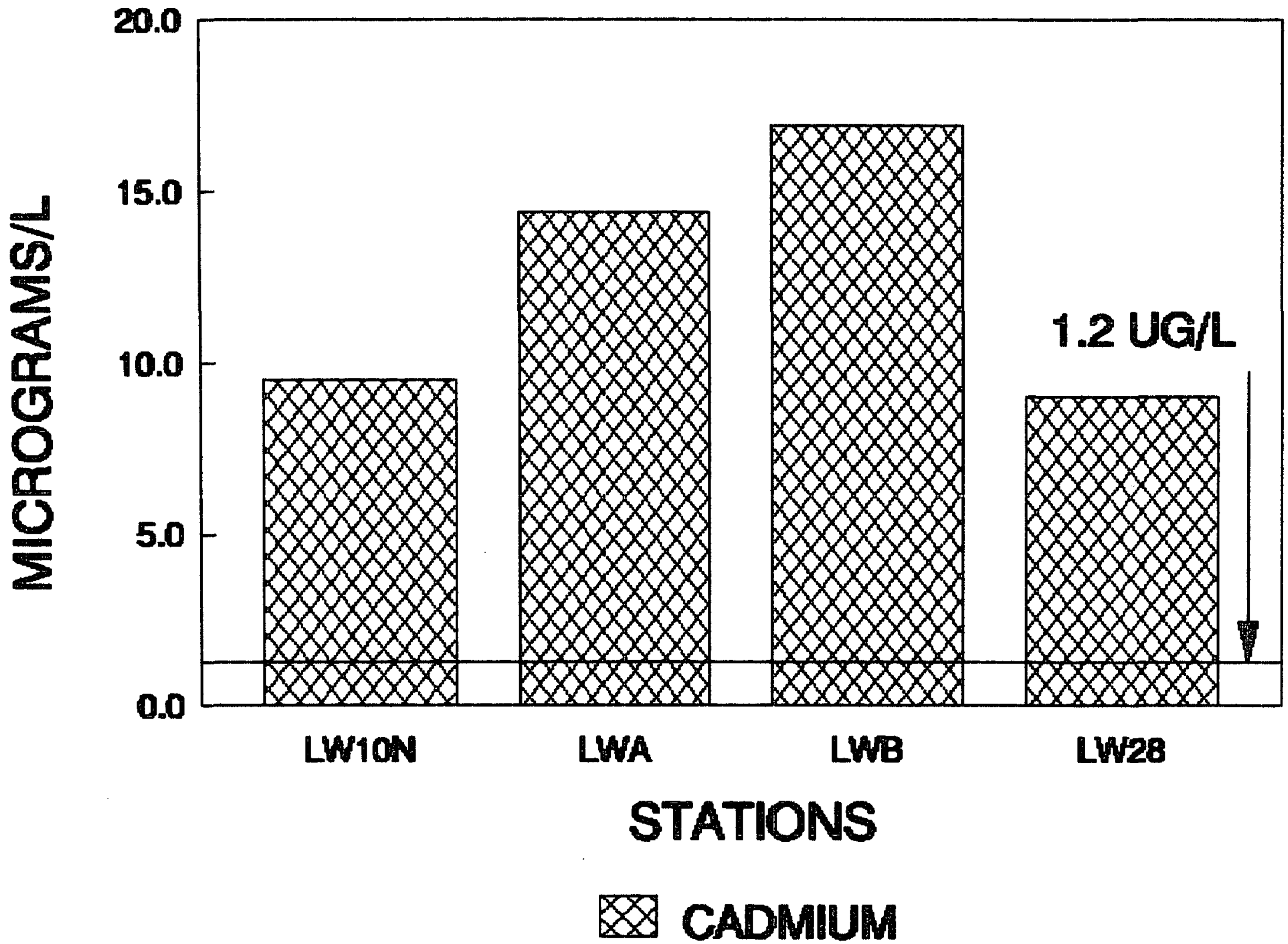


Figure 3-8. Average concentrations of cadmium (Cd) in Lawne Lake (LW10N), Lake Fairview (LW28), and the Little Wekiva River (LWA, LWB). Levels of Cd above 1.2 ug/l exceed the state Class III water quality standard.

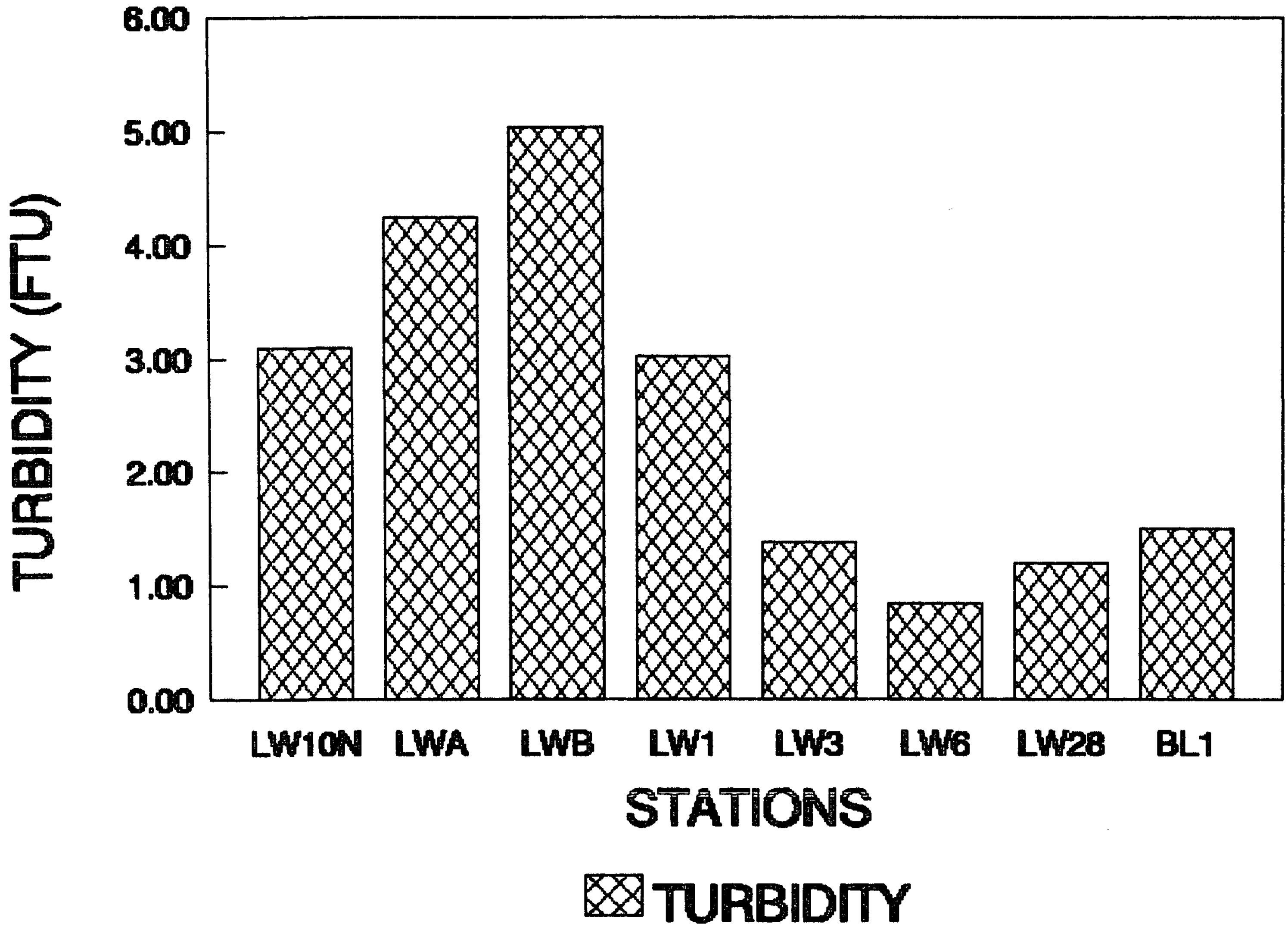


Figure 3-9. Average turbidity values from all stations in the Little Wekiva River basin. There is no trophic state index standard for rating turbidity in lakes (LW10N, LW28, BL1). Turbidity in river stations is considered to be poor at 8.8 FTU according to the water quality index.

River: LWA (4.0 ppm) and LWB (4.6 ppm) (see Fig. 3-10). These concentrations are rated "poor" by the WQI. Oxygen concentrations were below the state water quality standard 4 of 25 (16%) samples collected at LW10N, 24 of 34 (71%) samples at LWA, and 24 of 35 (69%) samples at LWB.

Average BOD at stations LWA (4.9 mg/l for 35 samples) and LWB (3.8 mg/l for 35 samples) was rated "poor" by the WQI (Fig. 3-11). High BOD at stations LWA and LWB coupled with slow water flow and little mixing (Rao, Ziegler, and Clapp 1989 and East Central Florida Regional Planning Council 1980) may explain the low dissolved oxygen concentrations at these stations. The slow water movement reduces re-aeration and allows decaying organic matter to deplete oxygen. The input of stormwater discharge low in oxygen may also be a contributing factor. The elevated DO concentrations (despite a relatively high BOD of 4.0 mg/l for 26 samples) at LW10N Lawne Lake may be the result of greater photosynthetic activity by phytoplankton and/or increased mixing.

Average chlorophyll *a* concentrations, indicating the extent of phytoplankton populations, were higher at LW10N than LWA and LWB (see Fig. 3-12). Based on an average chlorophyll *a* concentration at LW10N of 18.2 mg/m3 (n=25), the TSI is "good." There is no rating for chlorophyll concentration in rivers.

Coliforms. Levels of fecal coliforms met state water quality standards (maximum 800 fecal coliforms/100ml) in the Little Wekiva River basin except for one sample at LWB. Levels of total coliforms were also within state water quality standards (2400 total coliforms/100ml) except for 5 of 30 samples (17%) at LWA and 1 of 34 samples (3%) at LWB. The average number of total coliforms at LWA (925/100ml) and LWB (356/100ml) is rated "fair" and "good" respectively by the WQI. The average number of fecal coliforms at LWA (160/100ml) and LWB (95/100ml) is rated "poor" and "fair" respectively by the WQI.

Nitrogen and Phosphorus. Nutrient concentrations are elevated for these stations. Average concentrations of total nitrogen (TN) at LWA (1.28 mg/l, n=35) and LWB (1.03 mg/l, n=36) were rated "fair" by the WQI (Fig. 3-13). Average concentrations of total phosphorus (TP) at LWA (0.19 mg/l, n=35) were rated "poor" and at LWB (1.10 mg/l, n=36) were rated "good" (Fig. 3-14). Average nutrient concentrations at LW10N (when considering the ratio of total nitrogen to total phosphorus as required by the TSI) were rated "fair" by the TSI. The average concentration of total nitrogen was 1.26 mg/l (n=27). The

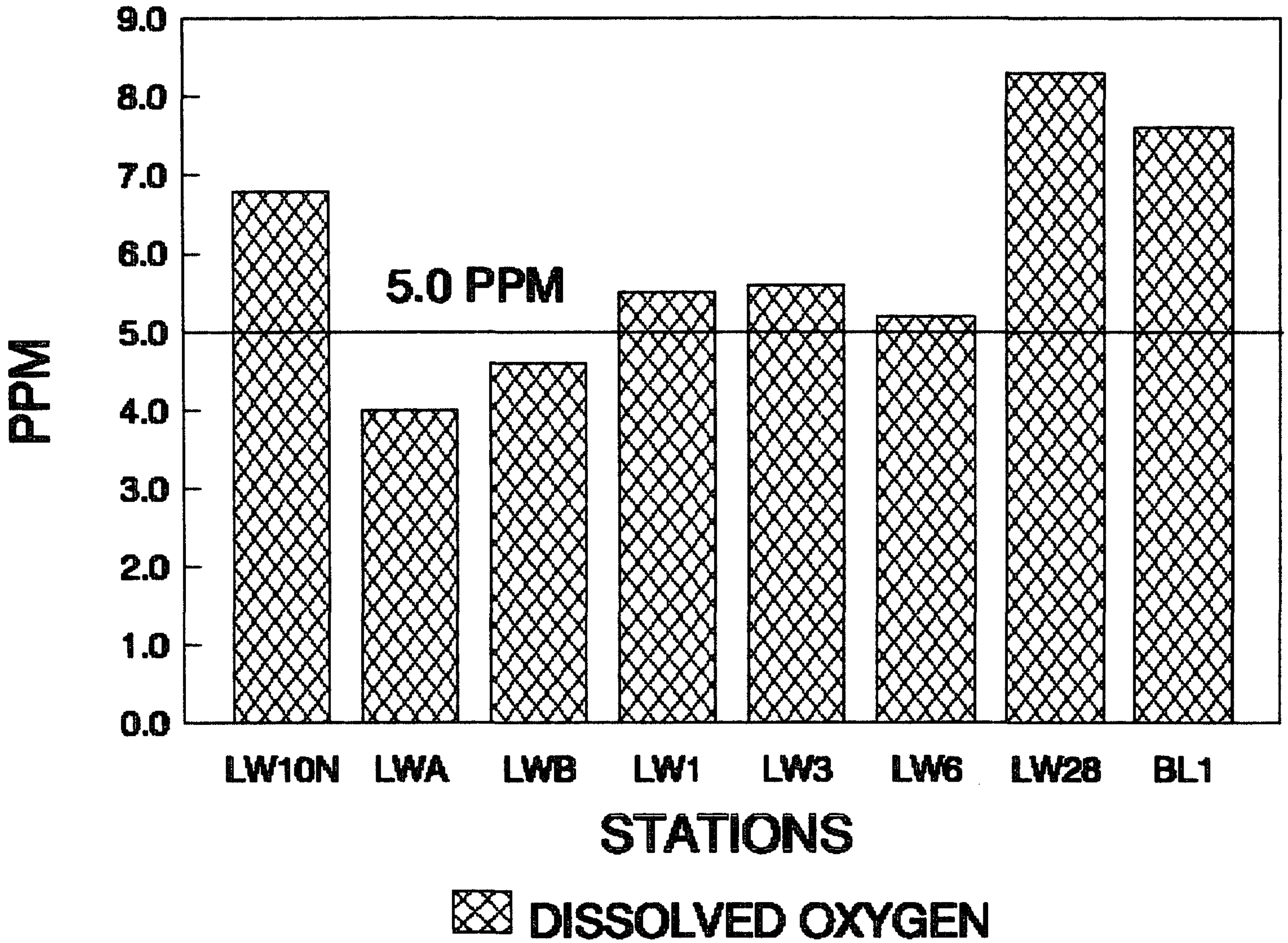


Figure 3-10. Average dissolved oxygen (DO) levels from all stations in the Little Wekiva River basin. DO levels lower than 5.0 do not meet the state Class III water quality standard.

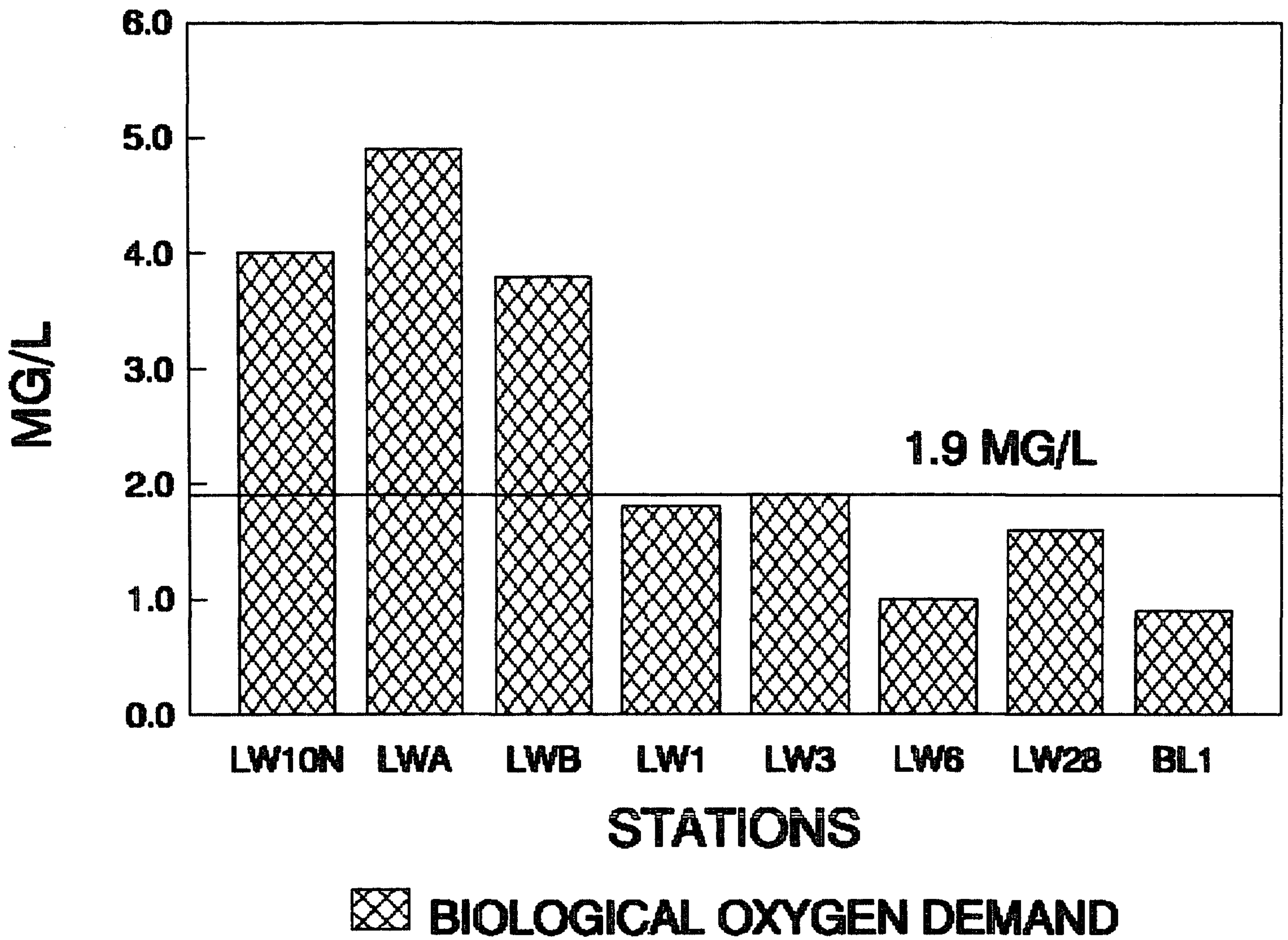


Figure 3-11. Average biological oxygen demand (BOD) from all stations in the Little Wekiva River basin. For river stations (LWA, LWB, LW1, LW3, LW6), greater than 1.9 mg/l BOD is considered poor. Less than 1.5 mg/l is considered good. For lakes (LW1ON, LW28, BL1) there is no trophic state index rating for BOD.

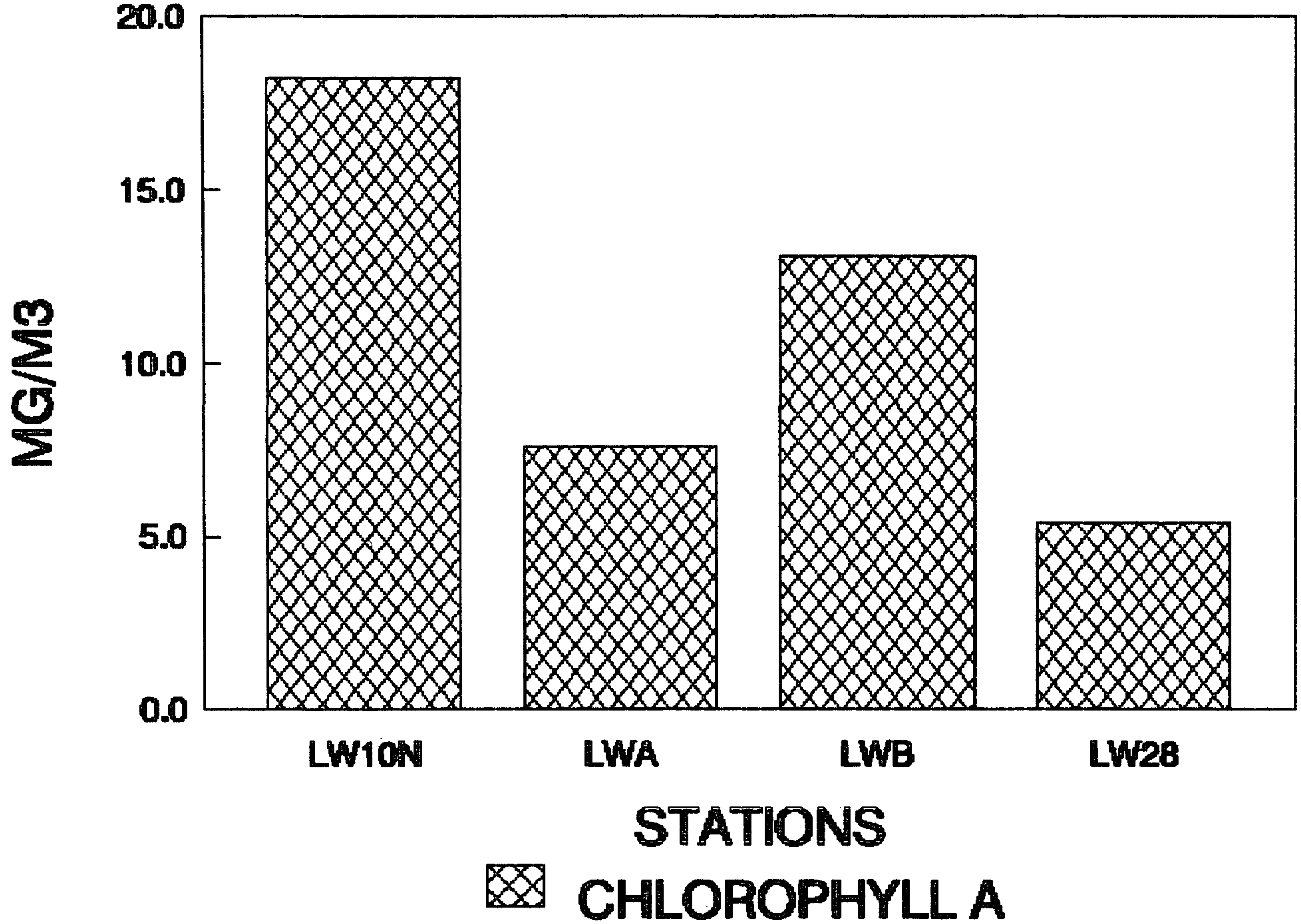


Figure 3-12. Average chlorophyll *a* concentrations in Lawne Lake (LW1ON), Lake Fairview (LW28), and the Little Wekiva River (LWA, LWB), Orange County. For lakes (LW1ON, LW28), below 20 mg/m3 chlorophyll *a* is considered "good" by the trophic state index. For river stations (LWK, LWB), there is no water quality index rating for chlorophyll *a*.

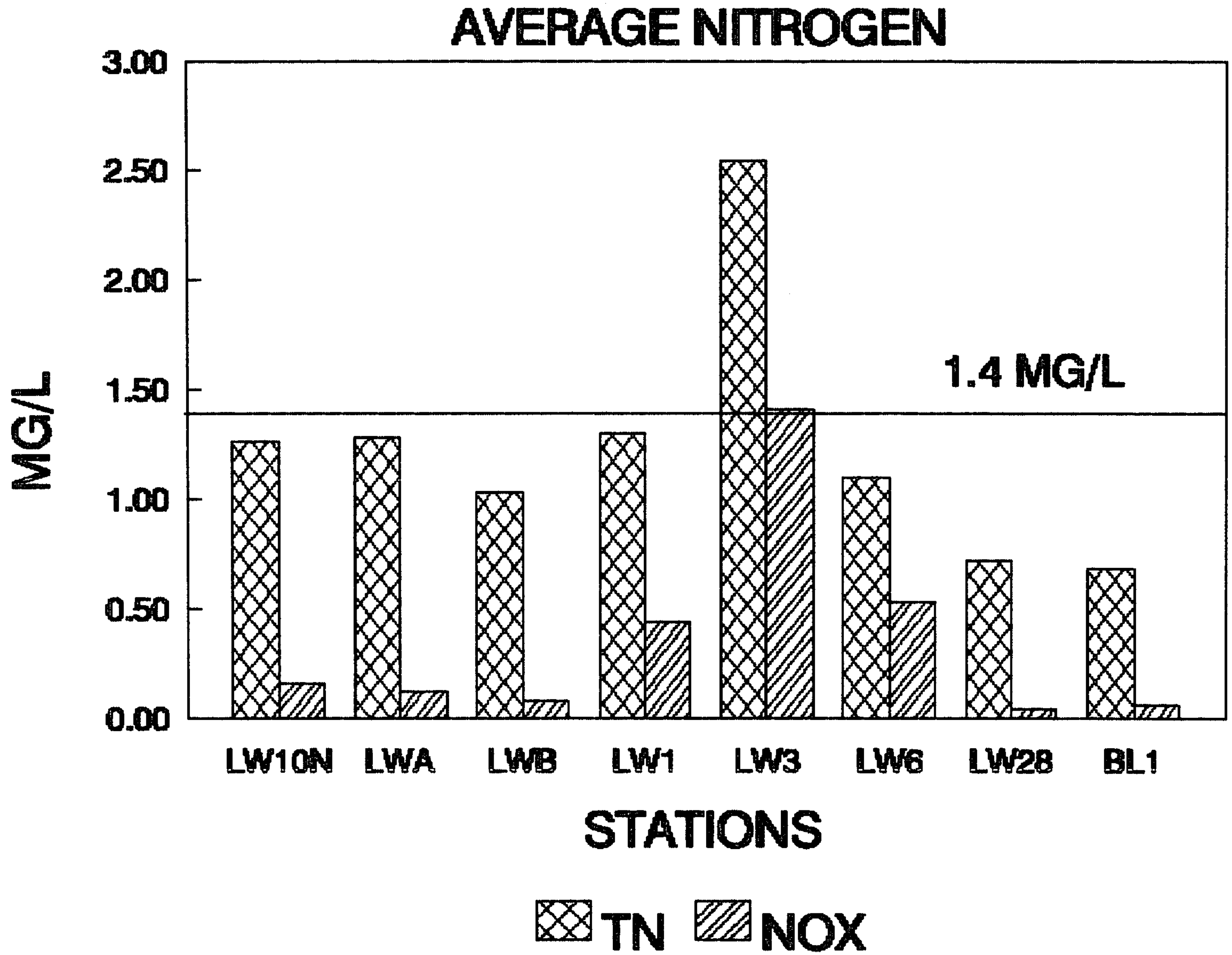


Figure 3-13. Average concentrations of total nitrogen (TN) and nitrates plus nitrites (NOX) from all stations in the Little Wekiva River basin. A level of 1.4 mg/l TN for river stations (LWA, LWB, LW1, LW3, LW6) is considered "poor" by the water quality index. There is no specific trophic state rating for TN for lake stations (LW10N, LW28, BL1). Note that NOX values are high immediately downstream (LW3) from the sewage treatment plant.

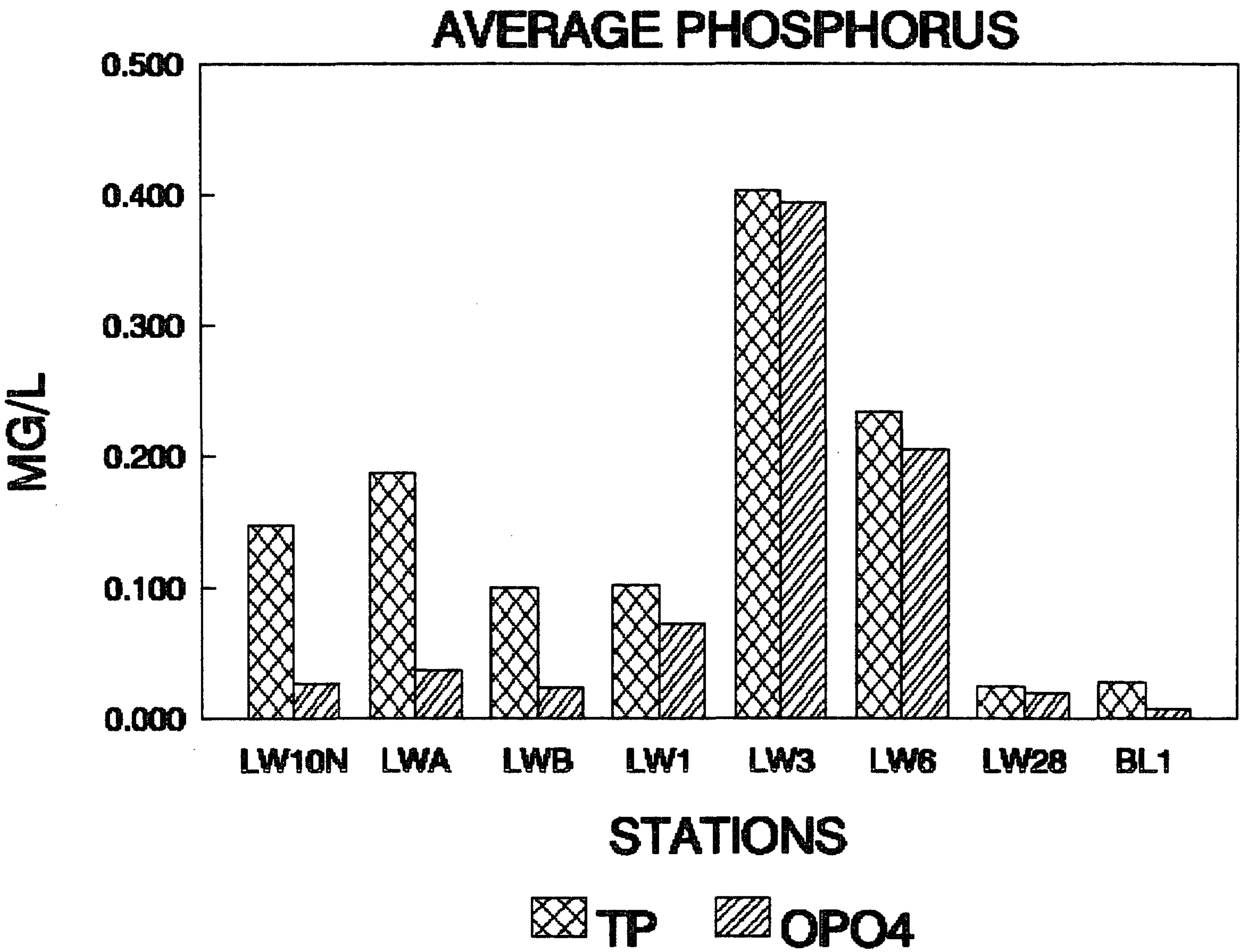


Figure 3-14. Average concentrations of total phosphorus (TP) and ortho-phosphate (OPO_4) stations in the Little Wekiva River basin. A level of 0.16 mg/l TP for from all river stations (LWA, LWB, LW1, LW3, LW6) is considered "poor" by the water quality index. There is no specific trophic state rating for TP for lake stations (LW1ON, LW28, BL1). Note that TP and NOX values are high downstream (LW3, LW6) from the sewage treatment plant.

average concentration of total phosphorus was 0.15 mg/l (n=27). 3.4.2 Lake Fairview

Generally, elevated levels of Cd were present in Lake Fairview (LW28), but turbidity, DO, chlorophyll *a*, total and fecal coliforms, and nutrient concentrations were within state water quality standards or were rated "good" by the TSI.

Water quality in Lake Fairview (at LW28) was rated "good" by the TSI with an average annual value of 38 (Fig. 3-15). Individual water quality samples fluctuated between 21 and 51.

Heavy Metals. Average concentrations of Cu, Pb, Zn, and Ni in Lake Fairview (at LW28) were within state water quality standards. Average concentrations of Cd (9.0 ug/l) exceeded state water quality standards of 1.2 ug/l (Class III water). Only values determined by new instrumentation were used in computation (see Fig. 3-8).

Cu exceeded state water quality standards in 4 of 46 samples (9%), Pb in 2 of 14 (14%), Zn in 5 of 37 (14%), Cd in 9 of 13 (64%) and Ni in 1 of 37 (3%).

Turbidity. Average turbidity was 1.3 FTU (n=45) and is considered low (Fig. 3-9). Station LW28 is a lake station, however, and was rated by the TSI, which employs Secchi depth rather than turbidity. The average Secchi depth in Lake Fairview was 3.4 m (n=45) and was rated "good."

Dissolved Oxygen. Average concentrations of oxygen in Lake Fairview (8.5 mg/l) were high, with oxygen concentrations never below the state standard of 5.0 ppm for 55 samples (see Fig. 3-10).

Chlorophyll *a*. Average concentrations of chlorophyll *a* in Lake Fairview of 4.4 mg/m^3 (n=43) were rated "good" by the TSI (see Fig. 3-12).

Coliforms. Numbers of total and fecal coliforms were within state water quality standards for all 46 and 49 samples, respectively.

Nutrients. Nutrient levels (when considering the ratio of total nitrogen to total phosphorus as required by the TSI) were rated "good." Average concentrations of total nitrogen and total phosphorus were 0.69 mg/l and 0.03 mg/l (n=48), respectively (Fig. 3-13 and 3-14).

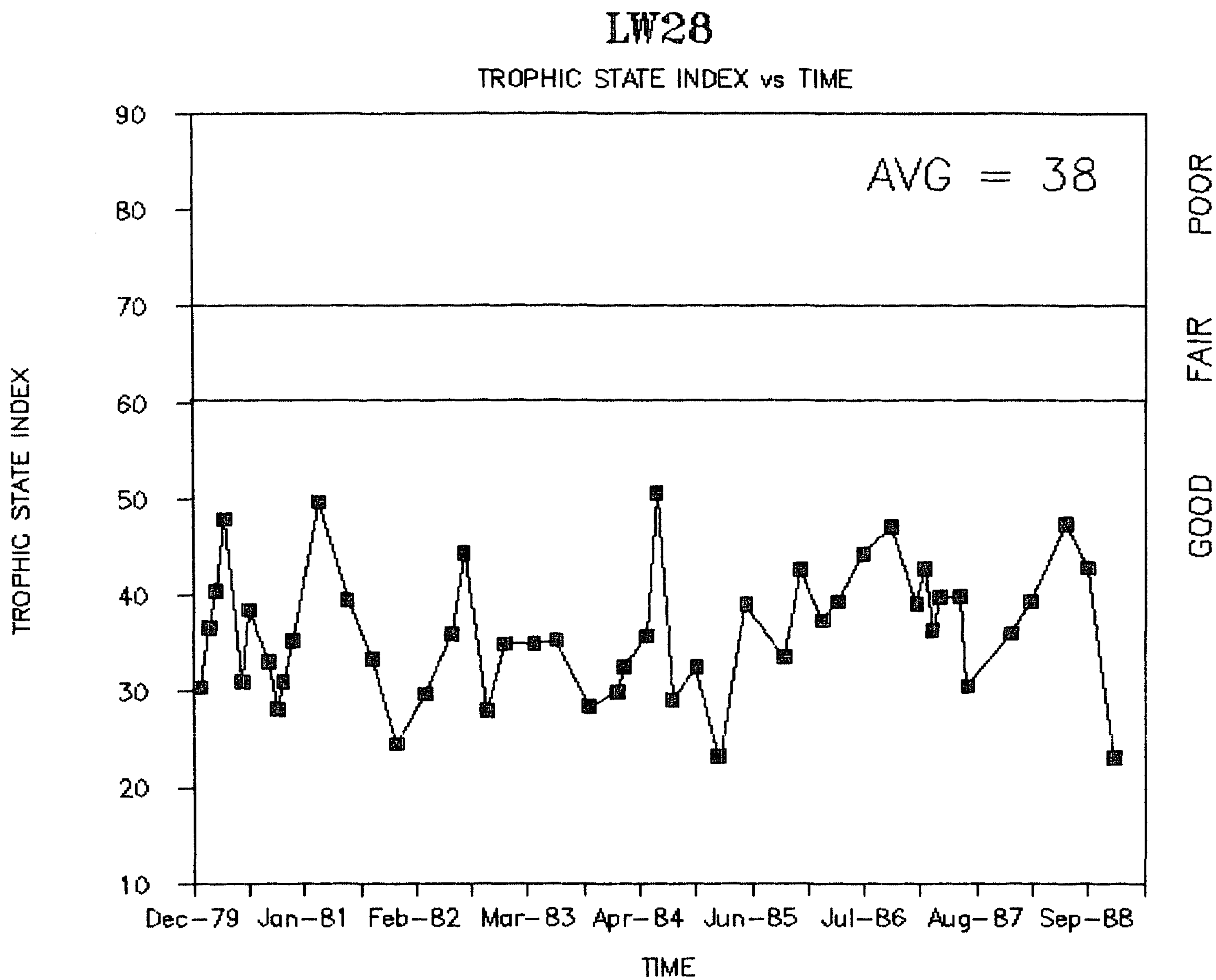


Figure 3-15. Trophic state index values for Lake Fairview (LW28), Orange County

53

3.5 SEMINOLE COUNTY WATER QUALITY

3.5.1 Mainstem of the Little Wekiva River

In general, the mainstem of the Little Wekiva River in Seminole County is relatively clear. However, the water can become quite turbid during periods of high flow. DO concentrations were low (often less than state water quality standards), in part due to inputs from low-oxygen springwater and stormwater discharge. BOD was generally high, but not as high as the BOD measured from the mainstem of the river in Orange County. Lower BOD levels and turbidity readings in Seminole County were probably due to the settling out of suspended stream material at Lake Bosse, which is immediately upstream of LW1. Elevated nutrient concentrations were present, particularly at LW3 (immediately downstream of sewage treatment plant (STP) outflow). No measurements of heavy metals or total and fecal coliforms were available. Contamination of the river by septic tank leachate is possible (East Central Florida Regional Planning Council 1980).

Water quality is highly influenced by hydrology. During periods of low flow, low quality STP effluent from Altamonte Springs and the Weathersfield plant contributes a significant amount of water to the Little Wekiva River (Canfield and Hoyer 1988). In addition, water quality may be worsened since 1986 because of the loss of high quality dilution water from the Hi-Acres Citrus plant (Canfield and Hoyer 1988). The plant stopped discharging low nutrient cooling water in late 1986. As a result, high nutrient and chloride water from the STPs have a greater influence on the water quality of the lower Little Wekiva River.

Water quality at LW1, LW3, and LW6 was rated "good" by the WQI with average annual values of 36, 42, and 34, respectively (Figs. 3-16, 3-17 and 3-18). Individual water quality samples varied greatly, fluctuating from 14 to 77, 23 to 60, and 13 to 47, respectively.

Turbidity. There are no numerical state water quality standards for turbidity. Average turbidity values at LW1 (3.0 FTU, n=24), LW3 (1.4 FTU, n=24), and LW6 (0.9 FTU, n=23) would be rated "good" by the WQI (see Fig. 3-9). However, the water can become very turbid because of resuspended sediments during periods of high flow.

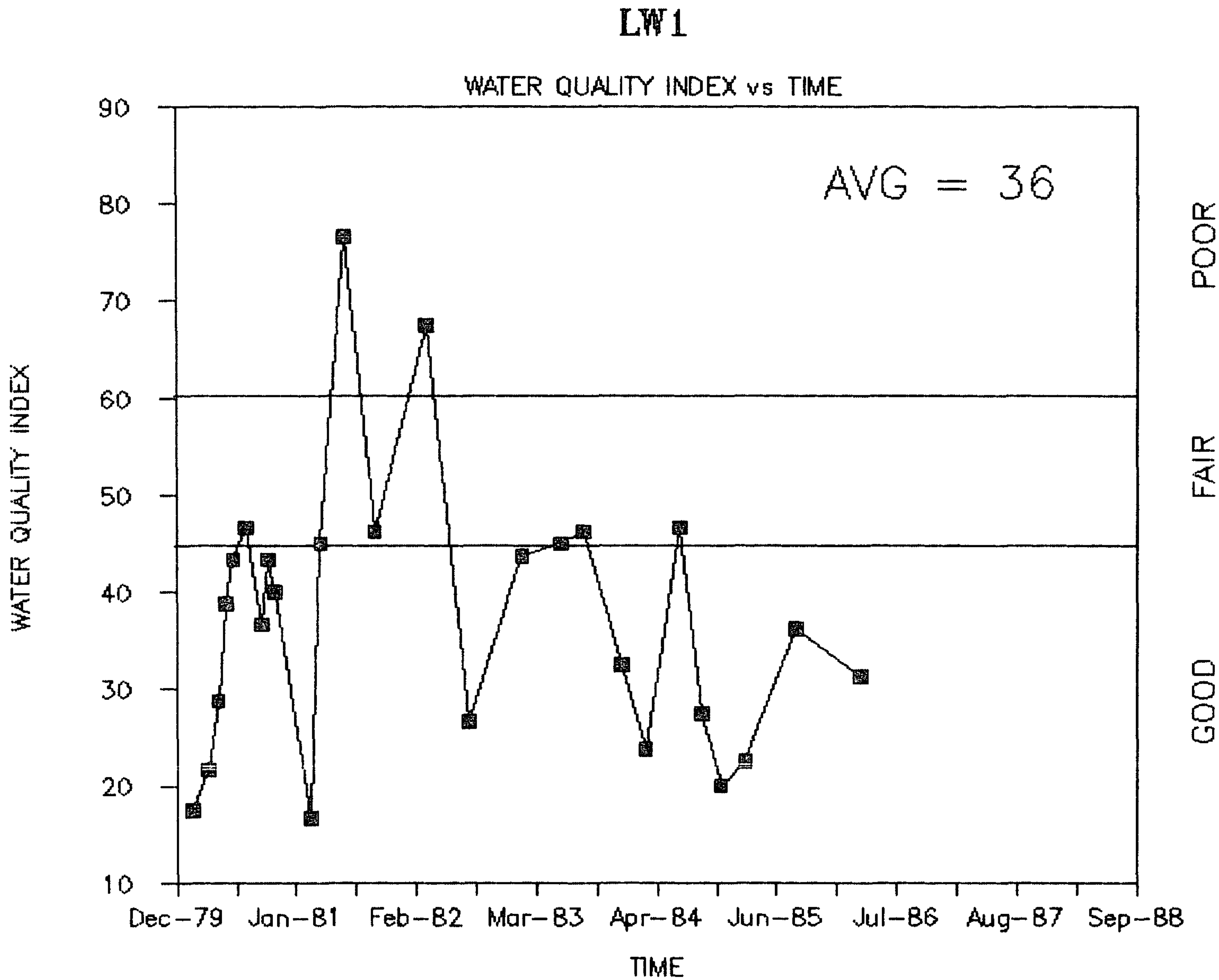


Figure 3-16. Water quality index values for LW1 in the Little Wekiva River, Seminole County

55

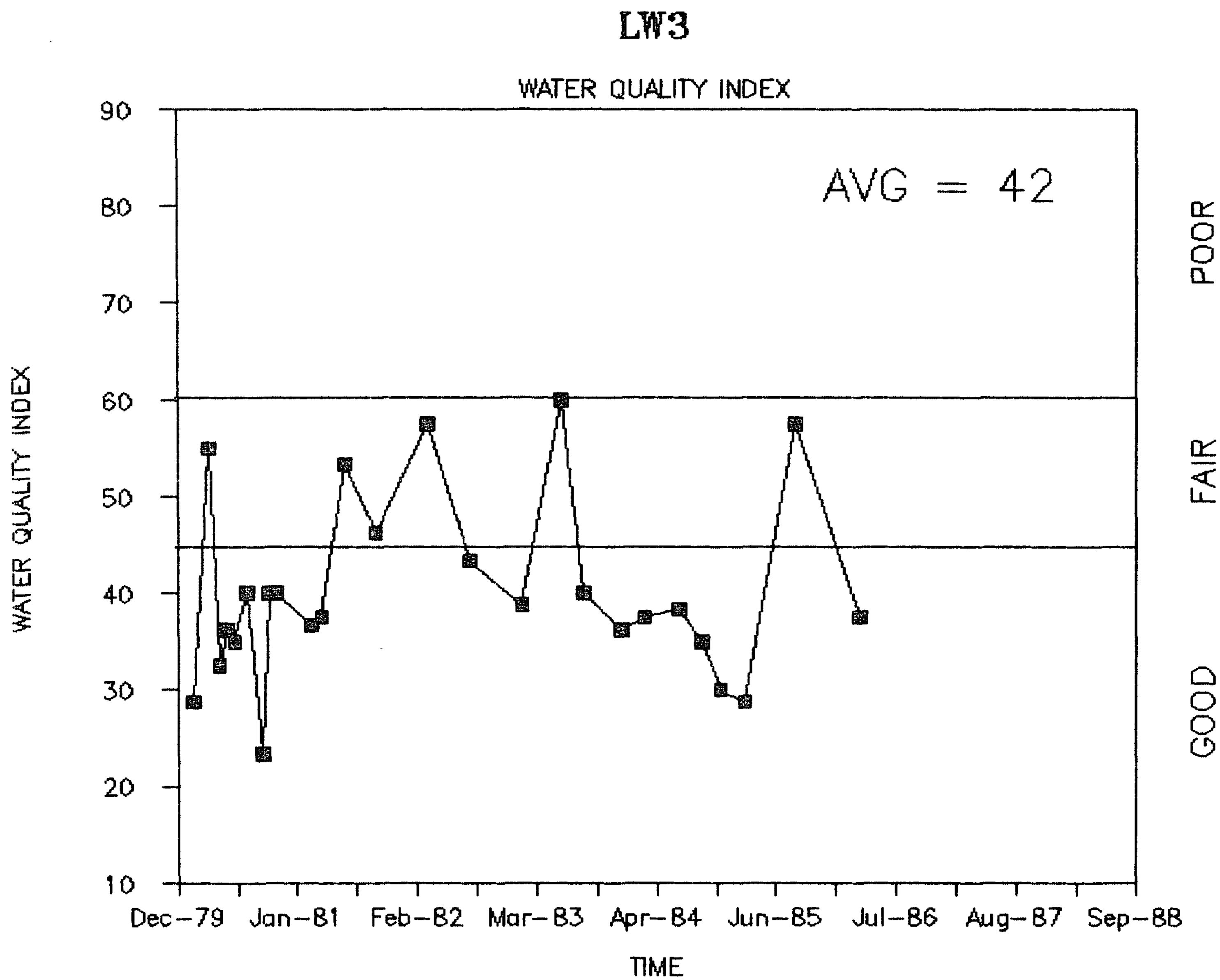


Figure 3-17. Water quality index for LW3 in the Little Wekiva River, Seminole County

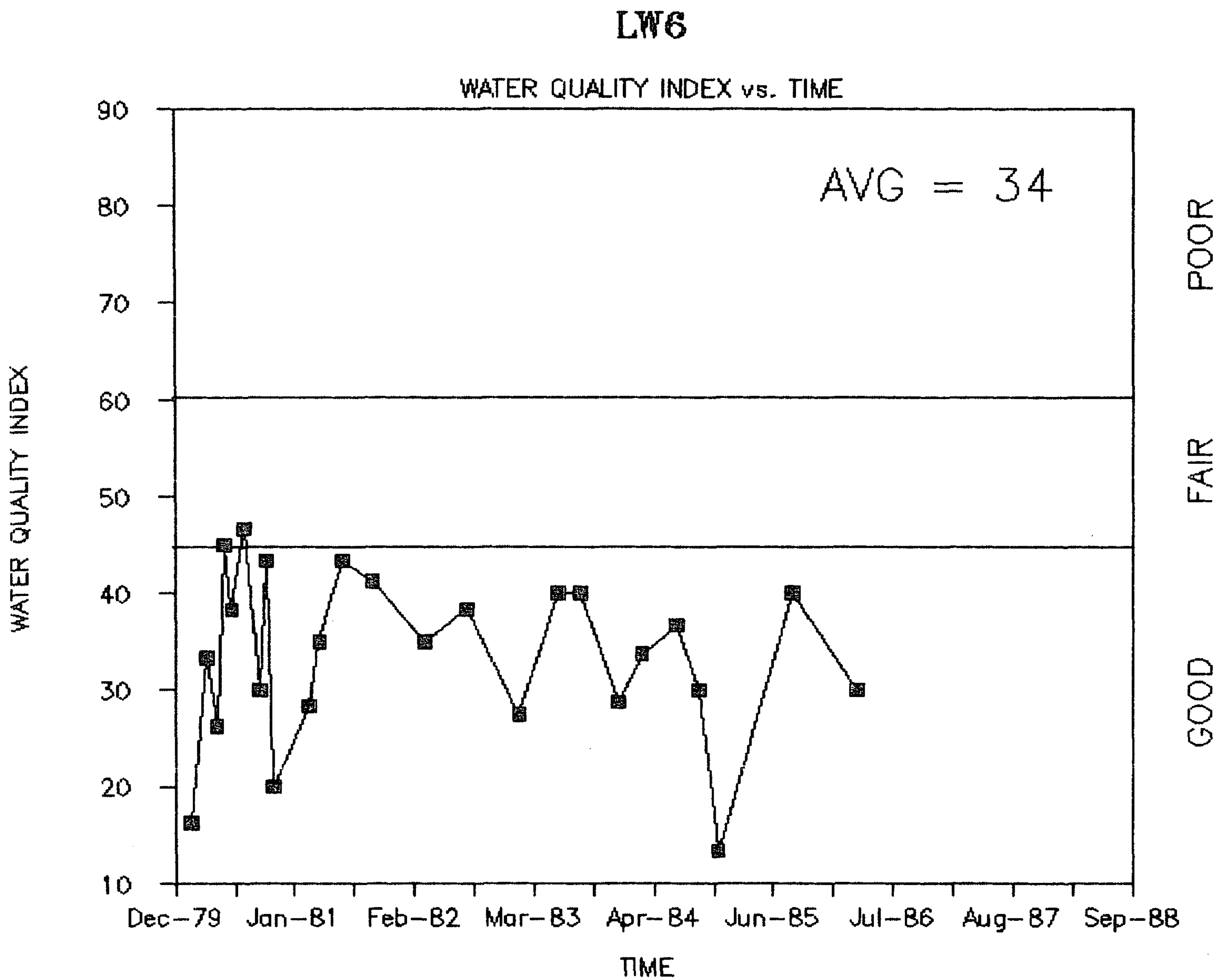


Figure 3-18. Water quality index values for LW6 in the Little Wekiva River, Seminole County

Dissolved Oxygen and Biological Oxygen Demand. Average concentrations of oxygen at LW1 (5.5 ppm), LW3 (5.6 ppm), and LW6 (5.2 ppm) were higher than the state water quality standard of 5.0 ppm (see Fig. 3-10). Oxygen concentration was less than the state water quality standard 11 of 24 times (46%) at LW1, 6 of 24 times (25%) at LW3 and 9 of 23 times (39%) at LW6. However, average concentrations of oxygen are rated "fair" by the WQI at LW1 and LW3 and "poor" at LW6.

Average BOD at LW1 (1.8 mg/l), LW3 (1.9 mg/l) and LW6 (1.0 mg/l) for 8 samples are rated "fair," "poor," and "good," respectively (See Fig. 3-11).

Discharges from the Altamonte Springs and Weathersfield sewage treatment plants and the Hi-Acres Citrus plant (all immediately upstream of LW3) appear not to be the source of depressed oxygen concentrations and elevated BOD (Canfield and Hoyer 1988). These conditions were present at LW1, which is upstream from the plants. Depressed oxygen concentrations at LW6 are due to the input of low oxygen water from Sanlando, Palm, and Starbuck springs. Inputs of low oxygen stormwater discharge may also be a factor throughout the Little Wekiva River.

Nitrogen and Phosphorus. Average concentrations of TN (see Fig. 3-13) at LW1 (1.30 mg/l, n=24), LW3 (2.55 mg/l, n=26), and LW6 (1.10 mg/l, n=23) were rated "fair," "poor," and "good," respectively. High concentrations of TN, nitrates (NO_3), and nitrites (NO_2) at LW3 were indicative of sewage treatment plant discharges. Canfield and Hoyer (1988) identified the two sewage treatment plants immediately upstream of LW3 as the source of elevated nitrogen concentrations.

Average concentrations of TP (see Fig. 3-12) at LW1 (0.10 mg/l, n=21), LW3 (0.40 mg/l, n=21) and LW6 (0.23 mg/l, n=20) are rated "fair," "poor," and "poor," respectively. High concentrations of TP and ortho-phosphate (OPO_4) at LW3 and LW6 are indicative of upstream sewage treatment plant effluents.

Elevated concentrations of nitrogen and phosphorus measured at LW3 were substantially reduced at LW6 due to spring water dilution (Canfield and Hoyer 1988). Numerous springs discharge into the river between the two stations.

Evidence of spring water dilution can be observed from changing chloride concentrations at LW1, LW3, and LW6. Chloride is a conservative element and is valued as an indicator of dilution. Chloride concentrations increased sharply from LW1 to LW3 (see Fig. 3-19) and indicated sewage treatment plant discharges. Chloride concentrations then decreased sharply at LW6 due to spring water inputs.

3.5.2 Bear Lake

In general, turbidity, DO, and nutrient concentrations at Bear Lake (BL1) were within state water quality standards or were rated "good" by the TSI. Measurements of trace metals and chlorophyll *a* were not available.

Water quality in Bear Lake was rated "good" by the TSI with an average annual value of 43. Individual water quality samples fluctuated between 15 and 59 (see Fig. 3-20).

Turbidity. Station BL1 is a lake station and was rated by the TSI, which employs Secchi depth rather than turbidity. The average Secchi depth was 2.4 meters for 11 samples, which is rated "good" based on the TSI. The average turbidity was 1.4 FTU n=11 and is considered low (see Fig. 3-9). A value of 92 FTU sampled on 8/18/81 was removed from turbidity computations. It is not known if this high level (the average is 1.5 FTU for 11 samples without this value) is due to error or a result of infrequent local conditions.

Dissolved Oxygen. Average concentrations of oxygen in Bear Lake (7.6 mg/l) were high, with no oxygen concentrations below the state standard of 5.0 ppm (see Fig. 3-10).

Nutrients. Nutrient concentrations (when considering the ratio of total nitrogen to total phosphorus as required by TSI) are rated "good." Average concentrations of TN and TP were 0.68 mg/l and 0.03 mg/l (n=12) (see Figs. 3-13 and 3-14).

3.6 EFFECTS OF WETLAND LOSS IN THE LITTLE WEKIVA RIVER BASIN

Wetlands have important hydrologic and biological functions. They store large volumes of stormwater runoff, delaying the movement of water into stream channels. As a result, flood amplitudes are reduced. Wetlands

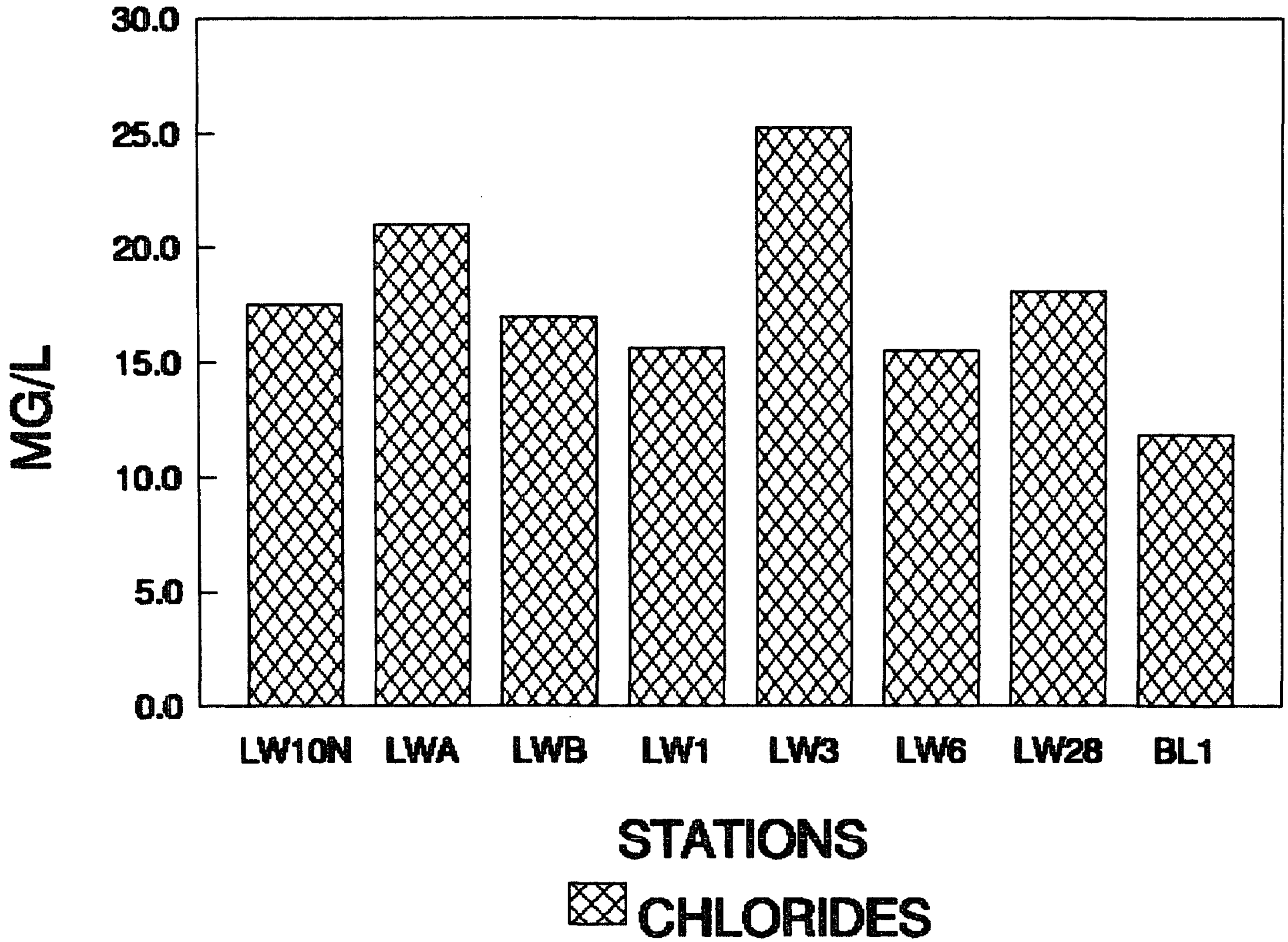


Figure 3-19. Average chloride concentrations from all stations in the Little Wekiva River basin. There are no standards for chlorides in Class III water.

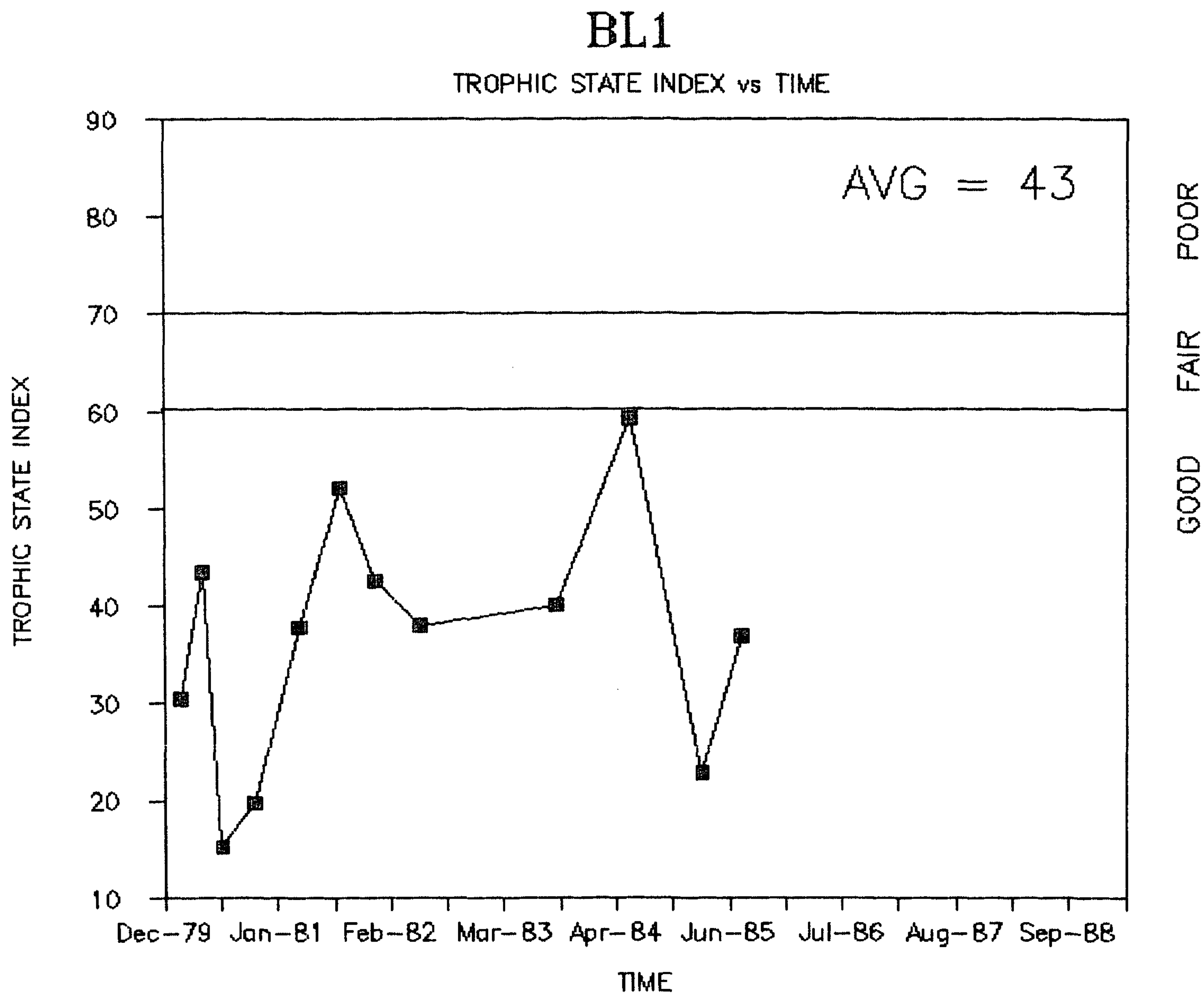


Figure 3-20. Trophic state index values for Bear Lake (BL1), Seminole County

remove pollutants from stormwater runoff by entrapping sediments, nutrients, and metals, and preventing the movement of these substances into receiving water bodies. The retention of these materials maintains water quality by averting the degradation of the adjacent water resources.

Vegetation in wetlands controls erosion. The dense mats of plants along stream banks decrease the flow of water, reducing the erosive force of high water velocities from upland runoff. Wetland areas provide critical native plant and wildlife habitat, serving as refugia for fish, waterfowl, and endangered species, as well as nursery and spawning habitat for aquatic biota.

3.6.1 Vegetation Mapping

Development in the basin has involved the filling and draining of many wetlands. In order to determine the extent of wetland loss, vegetation maps were prepared from 1947 and 1984/ 1988 aerial photography. Areas of vegetation types were compared using the District's Geographical Information System (Figs. 3-21 and 3-22).

Wetlands were interpreted for 1947 using 2/23/47 Agricultural Stabilization and Conservation Service (ASCS) black and white aerial positive transparencies (scale 1:20,000). A small northern section of Seminole County was not covered by these photos, so 3/27/57 transparencies were used. Wetlands were interpreted for 1984/1988 using 3/8/84 color, infrared aerial photographic transparencies (scale 1:24,000) for Seminole County and 3/16/88 transparencies for Orange County. The acreages presented for 1947 are approximate because of the impossibility of ground verification.

Photos were viewed using a high intensity light table with stereo-optics. Vegetation types were delineated on high transmissivity mylar using india ink pens. Wetlands were characterized according to the St. Johns River Water Management District wetland diagnostic characteristics (Appendix D) and then grouped as forested, shrub, or herbaceous. Vegetation polygons were digitized and entered into the ARC.INFO GIS computer system. Vegetation polygons were analytically adjusted for spatial distortions due to aircraft movements using an in-house photorectification process. Acreages were calculated by GIS and maps plotted using an electrostatic plotter.

A comparison of the wetland vegetation maps for 1947 and 1984/1988 indicated that the total wetland loss for the basin was approximately 2,025

WETLANDS VEGETATION OF THE LITTLE WEKIVA RIVER BASIN

1947

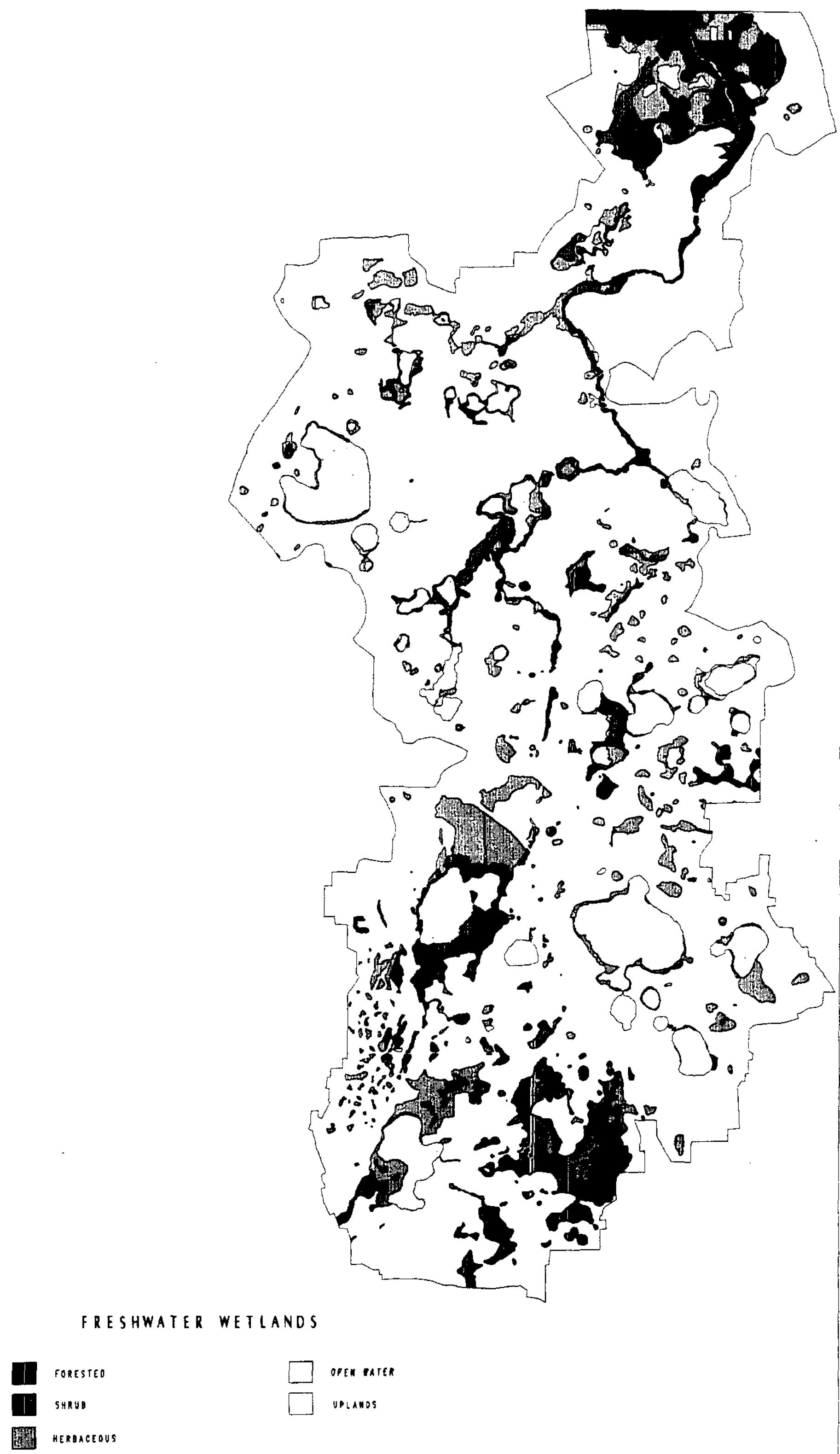


Figure 3-21

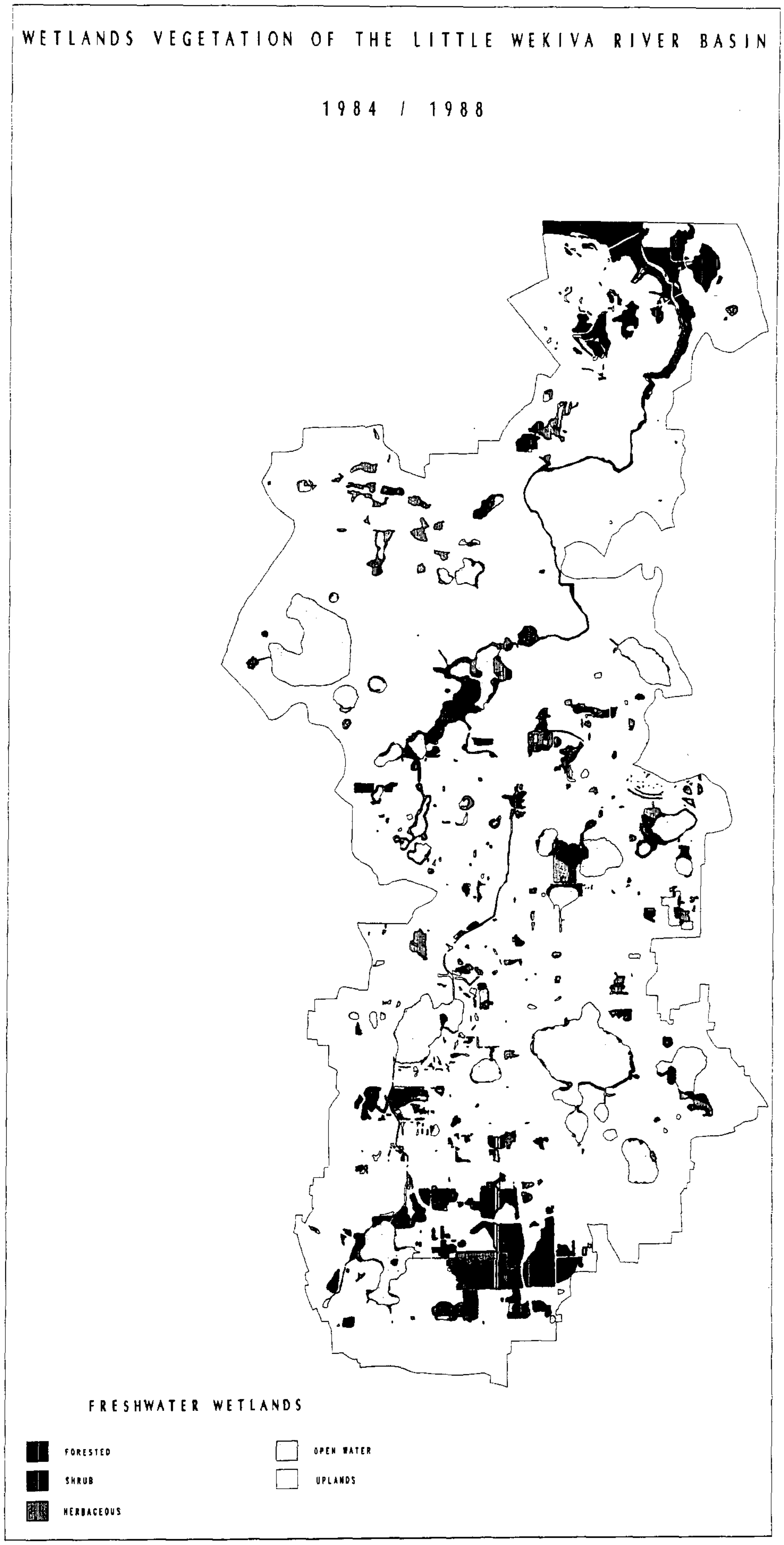

WETLANDS VEGETATION OF THE LITTLE WEKIVA RIVER BASIN
1984 / 1988
FRESHWATER WETLANDS
FORESTED
SHRUB
HERBACEOUS
OPEN WATER
UPLANDS

Figure 3-22

acres, or 48 percent (Table 3-6, Figs. 3-21 and 3-22). The largest wetland loss in the basin was herbaceous wetland (1330 acres, 74% of the 1947 acreage) followed by forested wetland (604 acres, 32% of the 1947 acerage) and shrub wetland (90 acres, 16% of the 1947 acreage).

Areas of extensive wetland loss are listed below (see Table 2-4).

Orange County:

- The main channel of the Little Wekiva River just south of Lake Lotus
- Areas east and south of Lake Weston
- Areas south of Little Lake Fairview
- Extensive areas surrounding all of Lake Orlando
- Areas surrounding the north, west, and south portions of Lawne Lake
- Extensive areas to the east of Lawne Lake. The wetlands remaining in this area have been drained.

Seminole County:

- The extreme northern portion of the study area
- The banks of the main channel of the Little Wekiva River
- Areas along Tributary C
- Tributary F
- Areas west of Bear Lake

3.6.2 Effects of Lost Wetlands

Approximately 2,025 acres of Little Wekiva River basin wetlands were lost from 1947 to 1988. Replacement of wetlands by parking lots, buildings, and roadways negated some stormwater storage and pollutant removal capabilities. As a result, increased flood amplitudes and degraded water quality is evident. Critical native plant and wildlife habitat, refugia, nursery, and spawning functions were lost.

Removal of wetlands caused an increase in stream erosion. Anthropogenic activities associated with construction removed vegetation and destabilized stream banks (Canfield and Hoyer 1988). As a result, the aquatic ecosystem was affected through scouring and downstream sedimentation. Many of the remaining wetlands in the Little Wekiva River basin lost some

Table 3-6. Wetland acreages and losses from 1947 to 1988 by type, Little Wekiva River basin

ACREAGE BY TYPE	WETLAND ACREAGES 1947	WETLAND ACREAGES 1984/1988	ACRES LOST	% LOST
FORESTED	1907	1303	604	32%
SHRUB	557	468	90	16%
HERBACEOUS	1800	470	1330	74%
BASIN TOTAL	4264	2241	2024	48%

hydrologic and biological functions. Although technically present, these wetlands were drained and deprived of surrounding buffer zones. These impacts contributed to the loss of ecological functions through the oxidation of organic soils, invasion by xerophytic plant species, loss of critical wildlife habitat, and greater susceptibility to fire. These wetlands are now only semi-functional.

3.6.3 Erosion

As a direct result of wetland loss, erosion problems have occurred in the Little Wekiva River basin. The cutting away of stream banks is an obvious effect, but erosion also affects the aquatic community by introducing suspended solids to the water column and increasing downstream sedimentation.

Suspended solids attenuate light penetration, reducing primary productivity. As a result, submerged vegetation is stunted or killed, resulting in a loss of native plant and wildlife habitat. Decaying vegetation causes oxygen depletion and can eliminate sensitive species when conditions are severe. In addition, suspended solids increase the biological and chemical oxygen demand. Suspended solids absorb additional radiant energy, increasing water temperatures. As a result, oxygen solubility is decreased, nutrient release is increased, and sensitive aquatic organisms are physiologically stressed. If water temperature is raised sufficiently, some aquatic organisms may be eliminated from the community and replaced by less desirable species. Increased suspended solids also affect the behavior patterns of many aquatic organisms. A reduction in swimming activity, changes in social dominance, and interference with feeding and hunting behaviors have been observed in other systems (Darnell 1976).

Sedimentation is the settling of suspended solids from the water column. The benthic community is covered, resulting in a loss of productivity, a reduction of food supply for higher trophic levels, loss of habitat diversity and species, the elimination of spawning areas, and smothering of eggs and larvae. Biological effects similar to those caused by increased suspended solids also occur.

4.0 FLOOD PROTECTION ALTERNATIVES

A single solution will not provide flood relief to all the affected areas in the Little Wekiva River basin because the areas of potential flood damages are scattered throughout the basin. Each of the 12 problem areas identified in Section 2.0 is considered separately in formulating and evaluating different flood protection alternatives (Table 4-1). Some of the alternatives have been conceptually presented without evaluation. Areas with low damages (not exceeding $25,000 during a 100-yr storm event) are excluded from this study. The counties should re-evaluate these areas based on actual flood experience. In most of these cases, providing flood control measures may not be justified from cost considerations and to take no action may be the best economic course.

Before starting construciton on most of the proposed flood protection alternatives, the respective counties would need to obtain certain permits including but not limited to a Management and Storage of Surface Waters (MSSW) permit and a Wetland Resource Management (WRM) permit.

4.1 EFFECTS OF THE PROPOSED FLOOD CONTROL MEASURES ON THE ENVIRONMENT AND WATER QUALITY

The following are the general kinds of flood control measures proposed in this study (Table 4-1):

- o Construction of levees and floodproofing
- o Expansion of bridges and culverts
- o Channel widening

Table 4-1: Major problem areas and flood protection alternatives

PROBLEM AREA ORANGE COUNTY	ESTIMATED DAMAGES IN THOUSAND DOLLARS				FLOOD PROTECTION ALTERNATIVES
	ITEMS	10 YR	25 YR	100 YR	
I. Lawne Lake and Vicinity					
A. Tributary I	Homes Streets	0.0 0.0	0.0 0.0	15.3 0.5	
B. Multi-Family Units on Lawne Lake East Shore	Homes	0.0 0.0	0.0 0.0	9.7 0.3	
C. Subdivision North of Lawne Lake	Homes Streets	0.0 0.0	0.0 0.2	39.4 0.5	1. Local Levee Protection 2. Reduce Flood Stages in Lawne Lake i) Create Storage on Tributary I * ii) Increase Discharge Capacity of Lawne Lake
D. Commercial Unit North of Silver Star Rd	Unit	0.2	0.6	0.9	
II. Lake Oralndo and Vicinity	Homes Streets Bridges	6.3 1.5 5.0	14.2 2.0 10.0	32.2 2.4 10.0	1. Reduce Flood Stages in Lake Orlando i) Expand Bridge at Edgewater Dr. ii) Maintain Lake Orlando at low Elevations iii) Create Storage Areas Upstream * iv) Replace Butterfly Valve with Box Culverts * v) Regulate Discharges from Lake Fairview and Lawne Lake 2. Floodproofing/Raise Mobile Home Floor Elevations
III. Lake Fairview & Little Lake Fairview	Homes Streets Bridges	13.1 0.5 0.0	26.1 0.8 10.0	99.5 1.0 10.0	1. Reduce Flood Stages in Lake Fair- i) Maintain Lake at Low Stages During Wet Period * ii) Increase Discharge Capacity of Lake Fairview Weir * iii) Create Additional Storage * 2. Local Levee Protection * 3. Floodproofing
IV. Tributary G	Homes Streets Bridges	0.0 0.8 0.0	1.0 1.0 5.0	45.3 1.2 10.0	1. Reduce Flood Stages in Eatonville Borrow Pit 2. Local Levee Protection
V. Oranole Rd. Vicinity	Homes Streets Bridges Homes	4.4 5.0 96.0 112.0	11.4 10.0 384.0 448.0	18.9 15.0 480.0 560.0	1. Reduce Flood Stage i) Create Storage upstream of SPPA ii) Improve Channel and Expand Bridges iii) Acquire 13 Houses and Restore Channel
VI. Lakes Gandy and Lockhart	Homes Streets Bridges	0.6 0.5 0.0	16.5 0.8 0.0	60.8 1.0 0.0	1. Maintain Lakes at Low Elevations

* Not Evaluated

Table 4-1. Major problem areas and flood protection alternatives, continued

PROBLEM AREAS SEMINOLE COUNTY	DAMAGES IN THOUSAND DOLLARS				FLOOD PROTECTION ALTERNATIVES
	ITEMS	10 YR	25 YR	100 YR	
VII. Tributary F Confluence					
A. Area Downstream of Confluence	Homes Streets	1.4 0.2	2.4 0.4	3.8 0.5	
B. Area Upstream of Confluence	Homes Streets	19.4 1.2	59.9 1.4	125.3 1.5	1. Reduce Flood Stage i) Improve Channel ii) Remove Footbridge 7 and Improve Channel 2. Local Levee Protection * 3. Floodproofing
C. Bridges	Bridges	5.0	10.0	10.0	
VIII. Tributary C	Homes Streets Bridges	0.0 0.5 0.0	0.2 0.8 10.0	5.9 1.0 20.0	
IX. Montgomery Road Vicinity	Homes Streets Bridges	0.0 0.5 0.0	13.4 0.8 0.0	169.0 1.0 0.0	1. Local Levee Proctection 2. Improve Channel
X. Tributary B	Homes Streets Bridges	0.0 0.0 0.0	0.0 0.0 0.0	0.3 1.0 0.0	
XI. Springs North of S.R. 434					
A. Subdivision on West Bank of River	Homes Streets	0.0 0.5	1.8 0.8	19.5 1.0	
B. Footbridges	Bridges	0.0	0.0	25.0	
C. Recreational Area on East Bank of River	Unit Streets	17.5 0.0	29.9 0.0	43.1 0.0	* 1. Floodproofing
XII. Trib. A	Homes Streets Bridges	40.0 0.8 0.0	81.5 1.0 5.0	125.0 1.2 5.0	1. Expand Culverts at Springs Landing Boulevard, and Wisteria Drive North and South 2. Create Storage Area Upstream

* Not Evaluated

- o Lowering of lake levels during wet periods for achieving additional flood storage capacity
- o Creation of marsh storage areas

The first three measures, which involve construction activity, disturb the soils and vegetation near the construction sites and alter the existing stream configuration. Depending on the specific situation, these disturbances cause the following effects on the environment/ecology and water quality.

Levees. Levee building and channel widening affect the aquatic community when streambank or streambed sediments are removed. These sediments often contain contaminants that will be released to the water when stirred up. Organic matter, having high biological oxygen demand, is often present in sediments and will cause depressed oxygen levels if introduced to the water. Deleterious compounds found in sediments depend upon surrounding land uses.

Scraping the banks to remove fill also disrupts the benthic community. Removal of vegetation near streambanks destroys wildlife habitat and promotes erosion and downstream sedimentation.

Erosion. The general effects of erosion and sedimentation were discussed previously, but the downstream impact to the Aquatic Preserve prompts other ecological concerns. Canfield and Hoyer (1988) observed that in the Little Wekiva River basin, large amounts of sand move downstream, burying native aquatic plants. Sand bars are formed, then colonized mainly by the exotic paragrass (*Brachiaria mutica*). The invasion of the aquatic preserve by sand-bar hopping paragrass or other non-native species is possible. Exotics may also out-compete and permanently replace native vegetation. In addition, paragrass forms shallow water habitats that block downstream flow, causing flood control problems.

Bank Construction. Bank construction removes the tree canopy at the water's edge so the channel is no longer shaded. Canfield and Hoyer (1988) reported that more sunlight reaching the Little Wekiva River could cause aquatic weed problems. Nutrients in the water would support a significant aquatic weed population, but lack of light has generally prevented the growth of these plants. More sunlight results in higher water temperatures. Some native fish are sensitive to temperature changes and would be physiologically stressed. Higher temperatures also reduce dissolved oxygen levels and may increase nutrient release from underlying muds.

Widened Channels. Widened channels are often lined with construction materials to prevent erosion. This lining suffocates the benthic community, and leaches substances into the water, changing its chemical composition. Channel widening changes water flow dynamics. A wider channel conveys more water but may dry out during periods of little rain. The benthic community requires a minimum flow of water to be sustained. The construction managers and contractors are required to follow certain "best management practices" to minimize the effects of construction activities on the environment. A detailed discussion of these practices is beyond the scope of this report. The following are some important remedial measures:

- Native plants should be used for bank stabilization. This will prevent the spread of exotics and preserve native habitat.

- Spoil banks and levees should not isolate adjacent wetlands. Levees will alter the wetlands and eliminate the flow of water, the transport of organic matter, and migration of animals. Canfield and Hoyer (1988) reported that increasing the residence time of nutritive river water could cause algal populations to increase drastically. Algal populations generally do not form in fast moving water but may proliferate in slow flow or stagnant pools.

Lowering Lake Stages. The final two flood control measures, i.e., lowering lake levels for flood water storage and creating marsh storage areas, are ecologically beneficial. Lowering water levels in lakes during wet periods would induce small-scale fluctuations that produce minor ecological benefits. Controlled lakes fluctuate less than their natural counterparts. As a result, wetlands surrounding the lakes shrink and organic matter accumulates on lake bottoms. Fluctuation, necessary for healthy wetlands, rejuvenates lakeshores and allows oxidation of organic sediments. The degree of ecological benefit depends on the amount and duration of fluctuation and lake bottom exposure.

Constructing Wetlands. Constructing wetlands as a flood control alternative provides water storage and improves water quality. Wetland plants remove sediments, nutrients, and metals and also control erosion by slowing the velocity of water. Constructed wetlands provide wildlife habitat. They should include a tree canopy to prevent proliferation of surface water exotics.

4.2 ORANGE COUNTY FLOOD PROTECTION

4.2.1 Problem Area I: Lawne Lake and Vicinity

Flood damages would occur at four separate locations near Lawne Lake during a 100-yr storm event (Exhibit A, Sheet 1). Damages at locations A, B, and D are insignificant, hence these areas are excluded from consideration. Location C is a subdivision north of Lawne Lake adjoining the west bank of the Little Wekiva River. The southeastern portion of this subdivision is a low-lying area with 12 houses lying in the 100-yr floodplain. About 10 houses may suffer damages during a 100-yr storm event. The subdivision, however, was expanded after 1981 with a retention pond provided just north of Lawne Lake. The current elevations (contours) of the extended subdivision are not known. It is assumed that the houses built later are outside the 100-yr floodplain. There are two flood protection alternatives for Lawne Lake and vicinity: building a levee and reducing flood stages in Lawne Lake.

Local Levee Protection. A levee could be built on the west bank of the river up to the retention pond. Approximate length = 900 ft; average height = 5 ft; top width = 10 ft with 2:1 side slopes, completely sodded. The approximate cost for this would be $38,000, and the annual cost, $ 3,180. The benefit cost ratio is 0.43.

Reducing Flood Stages in Lawne Lake. Flood stages in Lawne Lake can be reduced by the following two methods:

- o Creating storage on Tributary I
- o Increasing the discharge capacity of Lawne Lake weir (not evaluated)

These measures will have downstream effects and broader implications requiring an environmental assessment.

To create storage on Tributary I, a control structure should be built at Mercy Drive restricting Tributary I outflow to 0 cubic feet per second (cfs) when the storage elevation is less than 94.00 ft NGVD (National Geodetic Vertical Datum of 1929); 0 - 50 cfs between elevations 94.00 ft and 95.00 ft

NGVD; and 50 - 100 cfs between elevations 95.00 ft and 97.00 ft NGVD. Providing this storage would make the following difference from existing conditions:

	Existing conditions	With storage
100-yr flood elevation upstream of Mercy Drive	95.22 ft NGVD	96.17 ft NGVD
100-yr flood elevation at Lawne Lake	92.38 ft NGVD	92.28 ft NGVD
100-yr flood discharge from Lawne Lake	494 cfs	486 cfs

Creating storage would not provide the required protection to the subdivision north of Lawne Lake. It has only a marginal beneficial effect on flooding downstream, i.e., at Lake Orlando.

The cost for creating storage has not been estimated. It would be more expensive than building a local levee since it entails land acquisition. However, this measure would increase wetland area, which is environmentally beneficial.

4.2.2 <u>Problem Area II: Lake Orlando and Vicinity</u>

Major street and area flooding would occur in the vicinity of Lake Orlando during a 100-yr storm event. However, the property damage might be limited to three mobile homes, two single family homes, and a golf course maintenance building (Exhibit A, Sheet 1). Two minor bridges might be damaged. A reduction in flood stages in Lake Orlando will give relief to both area flooding and residential damages. There are two flood protection alternatives for Lake Orlando and vicinity: to reduce flood stages in the lake and to raise mobile homes to higher elevations and provide individual protection (floodproofing) to the other three structures.

Reduce Flood Stages in Lake Orlando. There are five potential methods for reducing flood stages in Lake Orlando:

- o Expand the bridge at Edgewater Drive
- o Maintain Lake Orlando at low elevations
- o Create storage areas upstream
- o Replace butterfly valves downstream of Lake Orlando with box culverts (not evaluated)
- o Regulate discharges from Lake Fairview and Lawne Lake

Currently, an unknown amount of water is diverted via a 3-ft culvert, from Lake Orlando to Crooked and Horseshoe Lakes for recharge purposes. The effect of this diversion on peak stages in Lake Orlando has been assumed to be insignificant in the present evaluations.

The first alternative for reducing flood stages in Lake Orlando is to expand the bridge at Edgewater Drive. Edgewater Drive, located at about 2,500 ft downstream from U.S.441 (Exhibit A, Sheet 1), acts as a constriction for flow from Lake Orlando, creating a backwater effect downstream of the butterfly valves. Two butterfly valves controlling discharges from Tributary H and Lake Orlando, respectively, are located just upstream of U.S.441. Under this flood-control alternative, an additional 5-ft x 8-ft box culvert would be added at the Edgewater Drive bridge to two similar culverts already present, and the channel upstream and downstream would be improved locally to conform to the bridge improvements.

Expanding the Edgewater Drive bridge downstream from Lake Orlando would make the following difference from existing conditions:

	Existing conditions	With improvements
100-yr flood elevation at Lake Orlando	88.42 ft NGVD	88.33 ft NGVD
100-yr discharge from Lake Orlando	606 cfs	620 cfs
25-yr flood elevation at Lake Orlando	87.22 ft NGVD	86.94 ft NGVD

This alternative results in only a marginal reduction in the 100-yr flood elevation.

The second alternative for reducing flood stages in Lake Orlando is to maintain Lake Orlando at low elevations. Based on previously observed elevations, it was assumed that under existing conditions Lake Orlando would be at an elevation of 83.80 ft NGVD at the onset of a storm (Rao, Ziegler, and Clapp 1989). By suitable operation of the Lake Orlando control weir and diversion of water from Lake Orlando to Crooked and Horseshoe lakes, 2 miles west (Exhibit A, Sheet 1), it is possible to maintain the lake at lower elevations during wet weather. This alternative assumes that the lake would be maintained at 83.00 ft NGVD:

	Flood Stage/Discharge at Lake Orlando	
	100-yr elevation (ft NGVD)	100-yr discharge (cfs)
Existing Conditions	88.42	606
With Lake Orlando at lower initial elevation	88.36	600
With Edgewater Drive bridge expansion plus the above	88.26	616

This alternative, even in conjunction with expanding the bridge at Edgewater Drive, only marginally reduces the 100-yr flood stage at Lake Orlando.

The third alternative is to create storage areas upstream. Vacant land (partly hardwood swamp) of more than 250 acres exists between Lake Orlando and Old Silver Star Road (Exhibit A, Sheet 1). Under this alternative 215 acres of this land would be acquired and developed into a marsh storage area with about 60 percent of the area having a bottom elevation of 83.00 ft NGVD. This storage area would be essentially an extension of Lake Orlando. This alternative has been evaluated in conjunction with expanding the bridge at Edgewater Drive.

Creating storage areas upstream would make the following difference from existing conditions:

	Existing conditions	With improvements
100-yr elevation in Lake Orlando	88.42 ft NGVD	87.66 ft NGVD
100-yr discharge from Lake Orlando	606 cfs	577 cfs
25-yr elevation at Lake Orlando	87.22 ft NGVD	86.32 ft NGVD

Creating storage areas upstream would greatly reduce area flooding as well as flood damages. Downstream peak discharges would decrease slightly. No cost estimate is made for this alternative. However, this alternative would not be economically feasible just to provide flood control benefits. It may be justified with additional benefits accruing from the environmental benefits of preserving wetlands.

The fourth alternative for reducing flood stages in Lake Orlando is to replace butterfly valves downstream of Lake Orlando with culverts. At high stages the butterfly valves located downstream of Lake Orlando control outflow from the lake. Replacing these valves with box culverts can increase outflow and reduce flood stages in Lake Orlando. This alternative, however, is considered undesirable without additional storage areas downstream being created to receive increased discharge from Lake Orlando. Vacant land, about 28 acres, exists downstream of Edgewater Drive. The feasibility of acquiring this land and developing it into a marsh storage area should be considered.

The fifth alternative for reducing flood stages in Lake Orlando is to regulate discharge from Lawne Lake and Lake Fairview. However, under existing conditions, flooding of low lying areas (including several houses) occurs around both Lawne Lake and Lake Fairview. Thus, no storage is available in these lakes for providing flood control downstream. Therefore, this alternative is considered infeasible.

Floodproofing and Raising Mobile Homes to Higher Elevations. Damages to the three buildings and the three mobile homes threatened by flooding near Lake Orlando can be prevented by floodproofing the buildings and raising the mobile homes to a level above 100-yr flood elevation. This measure, however, would not reduce area flooding or prevent damages to bridges. The total cost of this alternative is estimated as about $25,800.00 with an annual cost of $2,110.00. This gives a benefit-cost ratio of 1.15

4.2.3 Problem Area III: Lake Fairview and Little Lake Fairview

Flooding occurs in the low lying areas along the shoreline of both Lake Fairview (about 400 acres in area) and Little Lake Fairview. About 48 mobile homes and 65 single family houses are located within the 100-yr floodplain (Exhibit A, Sheet 1). These structures are scattered all along the shoreline.

Discharge from Lake Fairview is controlled by a concrete weir with a permanent sill elevation located at 87.60 ft NGVD. The lake elevation can be maintained at higher elevations, if desired, by raising the sill elevation by wooden boards. A sill elevation of 88.00 ft NGVD is currently maintained. The lake elevation, however, varies between 87.50 ft NGVD and 88.00 ft NGVD for most of the time because of evaporation loss and seepage through drainage wells located along the periphery of the lake. A maximum elevation of about 90.20 ft NGVD was observed in July 1974 and a minimum of about 85.60 ft NGVD during the 1981 drought (July 81). The 100-yr flood elevation for the lake was estimated as 91.10 ft NGVD (Rao, Ziegler, and Clapp 1989).

There are three flood protection alternatives for Lake Fairview and Little Lake Fairview:

- o Reducing flood stages in Lake Fairview

  1. Maintaining lake at low stages during wet period
  2. Increasing discharge capacity of Lake Fairview weir
  3. Creating additional storage

- o Local levee protection

- o Floodproofing

Reducing Flood Stages in Lake Fairview. The first alternative for reducing flood stages in Lake Fairview is to maintain the lake at low elevations during the wet period of the year. For estimating peak elevations (Rao, Ziegler, and Clapp 1989), it was assumed that Lake Fairview would be at an elevation of 87.90 ft NGVD at the onset of a storm event. If the lake is maintained at lower elevations during the wet period of the year (May-September/October), the additional storage available in the lake can reduce flood stages. Simulations were performed assuming that the initial stage would be (a) 87.50 ft NGVD, and (b) 87.00 ft NGVD.

Maintaining Lake Fairview at low stages during the wet period of the year would have the following results:

Lake Fairview Elevations	Existing Conditions	Initial Stage 87.50 ft NGVD	Initial Stage 87.00 ft NGVD
Beginning of Storm	87.90 ft NGVD	87.50 ft NGVD	87.00 ft NGVD
100-yr	91.08 ft NGVD	90.78 ft NGVD	90.39 ft NGVD
25-yr	90.14 ft NGVD	89.86 ft NGVD	89.48 ft NGVD
10-yr	89.65 ft NGVD	89.36 ft NGVD	88.94 ft NGVD

In general, the results indicate that because of the vast storage in the lake, maintaining the lake at low elevations would substantially reduce flood stages.

The second alternative for reducing flood stages in Lake Fairview is to increase the discharge capacity of the Lake Fairview weir. Lake Fairview has an area of about 400 acres. To reduce the flood stages of this size lake, it would be necessary to discharge large quantities of water. This would increase the flood threat to downstream properties; therefore this alternative is considered undesirable.

The third standard alternative for reducing flood stages would be to create additional storage. However, no vacant lands are available near Lake Fairview, therefore this alternative is not feasible.

Local Levee Protection and Floodproofing. The vicinity of Lake Fairview is a highly aesthetic area. Construction of levees and/or floodproofing, used as sole flood protection measures, would disfigure the area and may not be acceptable to the residents. For valuable properties, levees or floodproofing should be considered in conjunction with maintaining the lake at low stages during the wet period.

Summary. Since Lake Fairview is a highly aesthetic area it is not desirable to provide flood protection by levees, which would disfigure the area. No vacant land is available nearby to create additional storage areas. Increasing the outlet capacity of the lake would pose a flood threat to downstream properties. Reducing peak stages by suitable regulation of water levels in the lake appears to be both a feasible and a desirable solution. Two scenarios for lake operation are presented here. Other scenarios should be modeled to determine the optimal lake regulation schedule. The need for additional flood protection measures should be ascertained after computing the expected flood stages with the adopted lake regulation schedule.

4.2.4 Problem Area IV: Tributary G

About 20 single-family houses located on the west side of Eatonville Borrow Pit (Exhibit A, Sheet l) may suffer damage during a 100-yr storm as a result of high water levels in the borrow pit. Excess flood waters from the borrow pit escape through a 24-inch pipe culvert and eventually reach Lake

Weston about a mile away. There are two flood protection alternatives for Tributary G:

- o Reduce flood stages in Eatonville Borrow Pit
- o Local levee protection

Reduce Flood Stages in Eatonville Borrow Pit. By increasing the discharge capacity of the outlet culvert of Eatonville Borrow Pit, it is possible to reduce flood stages in the borrow pit. Tripling the capacity of the present culvert has been found to reduce the 100-yr flood stage from 96.43 ft NGVD to 95.89 ft NGVD. However, the stage for the same event in Lake Weston will increase from 85.92 ft NGVD to 86.17 ft NGVD, which may cause problems to some expensive houses. Further investigation is needed for this alternative.

Local Levee Protection. Houses affected by the 100-yr flood can be protected by building a levee, length about 1,200 ft, average ground level 94.00 ft NGVD. A 5-ft high levee with 10-ft top width and 2:1 side slopes, completely sodded, would cost about $55,000. The benefit/cost ratio is calculated as 0.35.

4.2.5 Problem Area V: Oranole Road Vicinity (Riverside Acres sub-division)

The vicinity of Oranole Road would suffer severe damage in Orange County during a major storm event. By the combined action of flooding and erosion, the bridges at Oranole Road, Campo Way, Egret Way, and Elba Way (Fig. 2-5) might collapse. Severe channel erosion would seriously affect the foundations of about 13 houses built close to the river. The expected annual damages for the area are calculated as $103,000.

There are three flood protection alternatives for the vicinity of Oranole Road:

- o Reduce flood discharges in the Oranole Road reach of the Little Wekiva River by creating storage areas upstream
- o Provide channel improvements and expand bridges where necessary

- o Acquire the 13 houses that are threatened by channel erosion and provide necessary channel improvements

Creating Storage Areas Upstream. Flood discharges in the Oranole Road reach can be reduced by creating flood detention reservoirs upstream and regulating outflow. No significant vacant lands, however, are available upstream of the Riverside Acres subdivision. There is a possibility of creating a 30-acre reservoir just upstream of the current sheetpile weir (Fig. 2-5). This reservoir, with a 10-ft wide weir as the outlet, would reduce 100-yr discharge from 1,550 cfs to 1,330 cfs at Oranole Road, and 1,300 cfs to 1,010 cfs at the outlet of Riverside Acres culvert. Flood stages will reduce by 0.2 ft at Oranole Road and 0.25 ft to 0.5 ft at the other three bridges. All four bridges, however, would be still under more than a foot of water during a 100-yr storm event.

Provide Channel Improvements and Expand Bridges Where Necessary. The primary reason for flooding and erosion problems in this area is the existence of a narrow channel from upstream of Elba Way to Lake Lotus. Especially for a length of about 1000 ft where Elba Way, Egret Way, and Campo Way cross the river (Fig. 2-5), the channel is extremely narrow, with a county right-of-way of about 50 ft width including the channel. The channel in this reach has a bottom width of about 12 ft and a top width of 35 ft. Some of the houses are located 10-15 ft from the river bank. The following improvements are proposed under this alternative.

- o Expand the narrow channel from upstream of Elba Way to Campo Way. This narrow reach, about 1000-ft in length, would be modified into a rectangular section of 41.50 ft width. The channel sides (and the channel bottom if necessary) should be protected by appropriate lining material.

- o Improve the channel between Campo Way and Lake Lotus using the following measures:

    - Continue the 41.50 ft channel from Campo Way to the Oranole Road bridge. However, from the end of the narrow reach, which occurs at about 150 ft downstream of Campo Way, provide a trapezoidal channel with a bottom width of 41.5 ft and banks at a 2:1 slope.

- Under the Oranole Road bridge, clean the channel so that the bridge opening has a clear width of 41.5 ft with vertical or near vertical banks.

- Between Oranole Road and Lake Lotus, modify the channel to have a bottom width of at least 30 ft with 2:1 side slopes.

The foregoing channel improvements would make the following changes in existing conditions:

Bridge location	Low Chord Elev. ft NVGD	Overflow (Curb) Elev ft NGVD	Flood Elevations, ft NGVD					
			Existing Conditions			Improved Channel		
			10 yr	25 yr	100 yr	10 yr	25yr	100 yr
Oranole Rd	64.9	67.0	65.80	67.15	68.01	63.21	64.25	65.80
Campo Way	65.8	68.0	67.15	68.10	68.97	63.91	64.99	66.79
Egret Way	66.7	68.8	67.94	68.91	69.56	64.41	65.50	67.46
Elba Way	66.6	68.7	68.54	69.40	70.02	64.65	65.76	68.01

With the proposed improvements, none of the bridges would be overtopped during the 100-yr storm event (Fig. 4-1). Flood levels would remain below low chord at all bridges for the 10-yr and 25-yr events.

The cost of improving the channel would depend upon the type of material chosen for channel lining in the 1,000-ft narrow reach of the river. Five alternative materials are available: Aluminum sheetpiles with keystone shoring, aluminum sheetpile bulkhead, steel sheetpile bulkhead, 12-in concrete, and lining with 3 ft x 3 ft gabions. The following table gives the differences in costs for these materials:

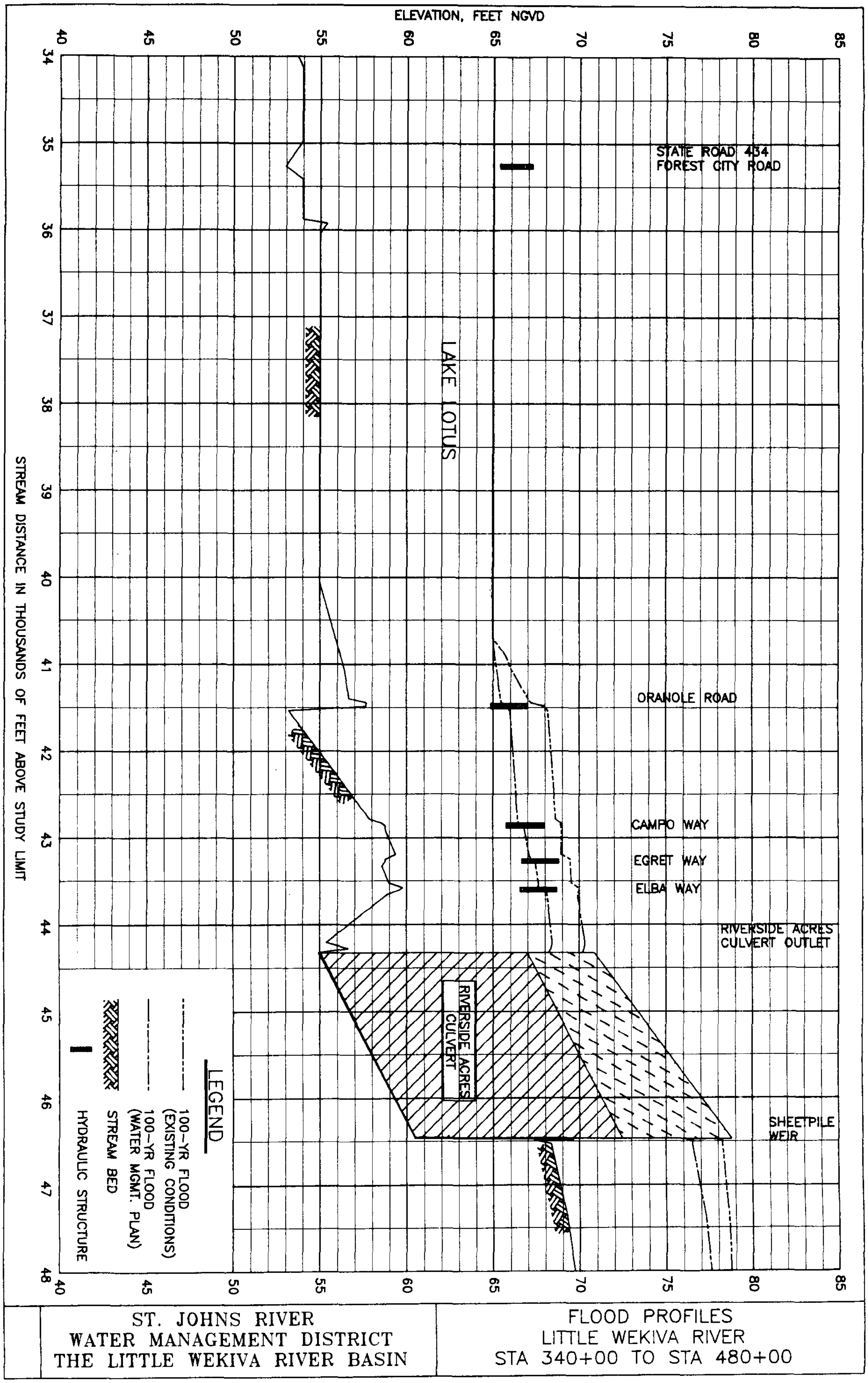


Figure 4-1. Computed 100-yr flood profiles for the reach of Little Wekiva River near the Riverside Acres subdivision, Orange County

Alternatives for Riverside Acres Narrow Reach	Total Cost** (Thousand Dollars)	Annual Cost** (Thousand Dollars)	Benefit/ Cost Ratio
Aluminum sheetpile w/ Keystone shoring	783	64.0	1.60
Aluminum sheetpile*	1,151	94.1	1.09
Steel sheetpile*	947	77.4	1.32
Lining w/gabions	875	71.5	1.43

*Natural channel bed with sides protected by bulkheads
**Includes the cost of other channel improvements

Gabions have the shortest life span (about 20 years). All other materials considered may last for about 50 years.

A third alternative for the vicinity of Oranole Road is to acquire the 13 houses (in Riverside Acres narrow reach of the channel) threatened by channel erosion and provide the necessary channel improvements.

The total value of the houses as per tax rolls is $665,140. With a resale profit of 15 percent, the cost of acquiring these houses would be about $765,000. Possession of these houses would provide a right of way of about 200 ft. The river can be restored to a natural channel of 41.5 ft bottom width with banks at a 2:1 side slope. With channel improvements between Campo Way and Lake Lotus above, this alternative is estimated to cost about $1,060,-000. The annual cost is $87,300, which gives a benefit/cost ratio of 1.17.

4.2.6 Problem Area VI: Lakes Gandy and Lockhart

Outflow from Lakes Gandy and Lockhart (Exhibit A, Sheet 1), which are interconnected at elevations above 70.00 ft NGVD, occurs only when lake levels exceed the culvert invert downstream (at Rundle Road not shown on Exhibit A). This invert has an elevation of 72.54 ft NGVD. Stage records for Lake Gandy show that this elevation has been exceeded during only three years since 1971 (72.91 ft NGVD in 1976, 72.74 ft NGVD in 1986 and 73.17 ft NGVD in 1987). However, these lakes are ordinarily landlocked. For computing flood elevations in the lakes, the floodplain study (Rao, Ziegler, and Clapp, 1989) conservatively assumed that the lake would be at 72.00 ft NGVD at the onset of storm events. An elevation of this magnitude or greater occurred during four years since 1971. Flood stages in the lakes can be reduced by maintaining the lake at lower elevations, as shown by the following results:

Flood Elevations in Lakes Gandy/Lockhart, ft NGVD

Stage at the onset of storm	10-yr	25-yr	100-yr
72.0 ft NGVD	74.49	75.29	76.57
70.0 ft NGVD	73.03	73.96	75.45
68.0 ft NGVD	71.30	72.59	74.21

The first floor elevations of all houses except one are above 76.00 ft NGVD. The lowest first floor elevation is 75.58 ft NGVD. Thus, flood damages near these lakes would be insignificant if the lakes were maintained between 68.00 ft NGVD and 70.00 ft NGVD during the wet period of the year.

4.3 SEMINOLE COUNTY FLOOD PROTECTION

4.3.1 Problem Area VII: Confluence of Tributary F with Little Wekiva River

Seven single family houses, a storage building, and two horse stables would suffer flood damages in this area (Exhibit A, Sheet 2). A low footbridge located about 300 ft from the confluence causes an increase in flood levels. The channel in this reach also is narrow.

There are three flood protection alternatives for this area:

- o Reduce flood stages in the channel
  - widen the channel
  - widen the channel and remove the footbridge downstream
- o Local levee protection
- o Floodproofing

Reduce Flood Stages in the Channel. The current channel has a bottom width of 6-10 ft in this reach. Widening the channel to a trapezoidal section with 30 ft bottom width and 2:1 side slopes reduces the 100-yr flood stage by 0.25 ft. No significant reduction in damages occurs by this measure. Improving the channel and removing the footbridge downstream would lower the flood elevations by 0.5 ft (for a 10-yr event) to 1.4 ft (for a 100-yr event). Flood damages are not completely eliminated by this measure, but only partially reduced. Annual benefits from this alternative are estimated as $5,480. Annual cost of improvements is approximately $5,830, giving a benefit/cost ratio of 0.94.

Local Levee Protection. The seven single-family houses located south (upstream) of the confluence (Area B, Table 2-3) can be protected by a 550-ft levee. The levee with an average height of 7 ft, a 15-ft top width and 2:1 side slopes, would cost approximately $40,000 (annual cost = $3,690). Annual benefits due to protection of the seven houses are estimated as $10,400, which gives a benefit/cost ratio of 2.81.

Two horse stables and a storage building stand isolated on the north side of the confluence. The damages to these structures are not significant.

4.3.2 Problem Area VIII: Tributary C

Although 29 structures are located in the 100-yr floodplain (Exhibit A), flood damages would occur at only two structures, and street flooding would occur at isolated locations in this subbasin. The damages are not significant, thus no evaluation was performed.

4.3.3 Problem Area IX: Subdivision West of Montgomery Road, Altamonte Springs

The low lying areas in the subdivision west of Montgomery Road (Exhibit A, Sheet 2) experience flooding during 25-yr and 100-yr storm events. About 50 single family houses are located within the 100-yr floodplain extending along a 3,300 ft river reach; 29 of these houses might suffer damages. The entire subdivision is located east of the Little Wekiva River (1982 conditions). Development, however, has also occurred on the west bank since 1982. The west bank development is not taken into account in this study.

There are two flood protection alternatives for this area:

- o Local protection by levee or sheet piles
- o Reducing flood stages by channel improvements

Levee or Sheet Piles. A levee built along the 3,300 ft reach of the river adjoining the subdivision west of Montgomery Road can eliminate flood damages, but is expensive. A levee with a height of 8 ft, a top width of 10 ft, 2:1 side slopes, fully sodded, would cost about $310,000. The annual cost is $23,300, which gives a benefit/cost ratio of 0.2. In addition to being expensive, this alternative may not be fully feasible because houses were built close to the river, which would prevent building a levee along the entire reach. Providing protection by sheetpile instead of a levee would cost about four times the cost of the levee.

Channel Improvements. The Little Wekiva River is narrow and irregular in cross-section for most of its length between S.R.434 and its confluence with Tributary B, near the subdivision. It is possible to reduce flood stages in the river by widening the bed wherever it is narrow. Several alternative schemes of improving the channel were modeled by the HEC-2 program, including widening the bridge at Montgomery Road. In general, all schemes were found to be very expensive and produced only low benefits. Widening the Montgomery Road bridge would reduce flood stages only locally, i.e., for a few hundred feet from the bridge with no significant impact near the subdivision. Modeling also indicated that channel improvements should start at S.R.434 to obtain significant stage reduction near the subdivision. The following schemes would provide a major reduction in flood damages:

- Improve the channel from S.R.434 through the western end of the subdivision (about 9,400 ft) by increasing the bottom width to 30 ft (approx.) with 2:1 side slopes. The 100-yr flood stage would reduce by about 1.2 ft near the subdivision by the above improvements. Annual flood damages would reduce from $4,940 to $119. The total cost of the improvements is estimated to be $374,000 at an annual cost of $31,000, giving a benefit/cost ratio of 0.16.

- Improve the channel from Montgomery Road through the end of the subdivision (about 4,400 ft). The 100-yr flood stage would reduce by about 0.7 to 1.0 ft near the subdivision. Annual flood damages would reduce from $4,940 to $1,870. The cost of these improvements is estimated as $277,000 total or $22,700 annual cost, giving a benefit/cost ratio of 0.14.

4.3.4 Problem Area X: Tributary B

A mobile home park located in the upper reaches of Tributary B (Exhibit A, Sheet 2) would experience flooding. The expected damages, however, are not significant. Therefore, no flood protection measures are suggested.

4.3.5 Problem Area XI: Springs Development North of S.R.434

Four single family homes and an expensive country clubhouse (Exhibit A, Sheet 2) would suffer damages during major storm events. Five decorative footbridges might be washed away during a 100-yr flood event. Flood damages for the four single family houses, however, would not be significant, with no damages occurring during a 10-yr event, and $19,500 during a 100-yr event. Therefore, this area is excluded from further consideration. The clubhouse would be under 1.8 ft of water during a 100-yr storm event. Channel improvements are found to be ineffective to reduce flood stages because water stretches over a wide area in this reach during flooding. Floodproofing of the structure is suggested as a flood protection measure. No cost estimate was made.

4.3.6 Problem Area XII: Tributary A

Major street and area flooding and damages to five expensive homes would occur on Tributary A (Exhibit A, Sheet 2) during a 100-yr event. The primary cause for flooding is the existence of culverts and/or bridges of inadequate capacity at Springs Landing Boulevard and upstream (at Wisteria Drive north and south, not shown in Exhibit A.) There are two flood protection alternatives for this area:

- Expand culverts at Springs Landing Boulevard and Wisteria Drive north and south. Provide other necessary improvements.
- Create a storage area upstream of the subdivision.

Expand culverts. A number of options with various combinations of culvert sizes and locations were evaluated by HEC-2 modeling. Detailed evaluation by HEC-1 and HEC-2 modeling was performed for the following options:

- A 5-ft x 9.5-ft box culvert at Springs Landing Boulevard
- Double box culverts of 4-ft x 5-ft at Wisteria Drive north and south
- Channel improvements upstream and/or downstream culvert improvements
- A levee separating the residential area from the swamp in the upper reaches of Tributary A

The above improvements would reduce the 100-yr flood stage by 0.4 to 0.6 ft in the area, decreasing annual damages from $5,060 to $1,660. The total cost of the improvements is estimated to be $140,000, with an annual cost of $11,400. This gives a benefit/cost ratio of 0.3.

Create Storage. About 150 acres of vacant land, partially swamp, exists in the upper reaches of Tributary A (Exhibit A, Sheet 2). Under existing conditions, about 40 acres of this land would be inundated during a 100-yr flood event. Additional storage can be attained by developing more adjacent area into a swamp. Expanding the adjacent area into a 100-acre swamp with an average bed elevation of 27.00 ft NGVD would reduce the 100-yr flood elevation from 33.05 ft to 30.00 ft NGVD at Wisteria Drive south, and from 28.74 ft to 27.20 ft NGVD at Wisteria Drive north. This measure would practically eliminate flooding problems in the area. No cost estimate is made for this alternative.

4.4 EROSION CONTROL MEASURES

High velocities of flow develop near bridges and culverts due to channel constriction. Appendix B presents velocities produced by the 10-, 25-, and 100-yr storm runoff at various locations on the Little Wekiva River and tributaries. Bridge designs address scour and erosion problems near piers and abutments and make appropriate provision for safety, i.e., protection by riprap, provision of concrete or masonry wing walls, etc. The counties should perform periodic inspection of bridges and culverts and carry out repairs if any of the protection devices are damaged.

Channel reaches experience erosion if the conveyance capacity is inadequate. If no action is taken, bank and/or bed erosion will continue until the channel section expands to sufficient dimensions so that the flow velocity is reduced to non-scouring velocity. Such erosion is undesirable in urbanized areas because there may not be sufficient margin on either side of the river channel section to allow uncontrolled channel erosion. Houses may be close to the river banks. The existing natural channel should be replaced by a designed channel in the reaches of the Little Wekiva River where erosion problems are indicated. A designed channel with 30 ft bottom width and 2:1 side slopes has been found (by HEC-2 modeling) to reduce flow velocities by nearly 3 feet per second (fps) in the erosion problem reaches of the Little Wekiva River (Table 4-2). To arrive at the final design section, however, it will be necessary to determine the non-scouring and non-silting velocities for various problem reaches based on bed material and other channel properties. The channel section is then dimensioned based on these velocities and design discharges.

Table 4-2. Velocities of flow (in feet per second) for the existing channel and proposed channel in reaches of the Little Wekiva River mainstem with erosion problems

Location* (Station)	Existing Channel			Proposed Channel with 30 ft bottom width and 2:1 side slopes		
	10 yr	25 yr	100 yr	10 yr	25 yr	100 yr
Seminole County						
160 + 66	5.10	6.10	7.34	3.31	3.90	4.88
200 + 51	4.33	5.08	4.47	3.40	3.74	4.49
297 + 35	3.66	4.00	3.92	1.84	2.15	2.66
308 + 54	5.23	4.95	4.58	3.30	3.66	3.68
313 + 84	2.54	2.63	3.24	1.47	1.60	2.10
406 + 98	5.86	6.11	5.33	2.27	2.65	2.89
Orange County						
465 + 28	6.08	6.88	4.41	3.34	3.80	2.87
494 + 44	5.53	5.90	5.00	3.41	3.64	2.70
515 + 47	5.63	6.01	5.66	2.19	2.48	2.76
534 + 59	5.21	5.48	5.20	2.42	2.58	2.62

Note: Refer to Plate III for channel locations and discharges discharges at these locations

* Station	Description
160 + 66	Little Wekiva River (LWR) channel between S.R.434 and Montgomery Rd.
200 + 51	Confluence of LWR and Tributary B
297 + 35	LWR at Wethersfield Ave.
308 + 54	Covered bridge over LWR downstream from Tributary F confluence
313 + 84	Between Northwestern Ave. and Tributary F confluence
406 + 98	Downstream of Oranole Rd.
465 + 28	Channel between Riverside Park Road and the sheetpile weir
494+ 44	Channel between Sherry Drive and Tributary G confluence
515 + 47	Channel between Gusty Lane and Wallington Drive
534 + 59	Channel Between Gusty Lane and Edgewater Drive

5.0 CONCLUSIONS AND RECOMMENDATIONS

A number of flood protection alternatives were considered for each problem area with significant damages (Table 5-1). In general, costs of flood control measures are found to be much greater than the direct benefits accruing from a given measure. Therefore, an optimal flood protection alternative is not obvious from the economic analysis alone. For most problem areas, if flood protection measures are to be provided now, the justification has to come from considerations other than direct benefits. Important other considerations include: major indirect and intangible benefits; environmental impact; possible improvement to public health; availability of funds for a specific cause (e.g., preserving wetlands); and local government liability and responsibility.

The flooding problem areas in the Little Wekiva River basin fall into various categories of potential damages (Table 5-2). An opinion poll (citizen survey) of the area residents should be conducted in problem areas with low expected damages or where the cost of providing flood protection is not commensurate with the benefits obtained. The residents should be made aware of the flooding problem and flood protection measures available, including flood insurance.

Water quality and environmental assessments indicate that the river suffers from low dissolved oxygen concentrations and elevated levels of biological oxygen demand, nutrients, turbidity, total and fecal coliforms, and heavy metals. The river is highly influenced by urban stormwater runoff, which is probably the source of most pollutants. Sewage treatment plant effluent and contamination from septic tank leachate are other possible pollutant sources. The basin has lost 48 percent (about 2,000 acres) of its wetlands since 1947 due to urban development. The flood control measures implemented should strive to improve the foregoing conditions wherever feasible.

Table 5-1. Major problem areas and flood protection alternatives
(See Exhibit A for locations of problem areas)

PROBLEM AREAS ORANGE COUNTY	ESTIMATED DAMAGES IN THOUSAND DOLLARS				FLOOD PROTECTION ALTERNATIVES	BENEFIT/COST RATIO
	ITEMS	10 YR	25 YR	100 YR		
I. Lawne Lake and Vicinity						
A. Tributary I	Homes Streets	0.0 0.0	0.0 0.0	15.3 0.5		
B. Multi-Family Units on Lawne Lake East Shore	Homes Streets	0.0 0.0	0.0 0.0	9.7 0.3		
C. Subdivision North of Lawne Lake	Homes Streets	0.0 0.0	0.0 0.2	39.4 0.5	1. Local Levee Protection 2. Reduce Flood Stages in Lawne Lake ** i) Create Storage on Tributary I ii) Increase Discharge Capacity of Lawne Lake	0.43 *
D. Commercial Unit North of Silver Star Rd	Building	0.2	0.6	0.9		
II. Lake Orlando and Vicinity	Homes Streets Bridges	6.3 1.5 5.0	14.2 2.0 10.0	32.2 2.4 10.0	1. Reduce Flood Stages in Lake Orlando ** i) Expand Bridge at Edgewater Dr. ** ii) Maintain Lake Orlando at low Elevations iii) Create Storage Areas Upstream iv) Replace Butterfly Valve with Box Culverts v) Regulate Discharges from Lake Fairview and Lawne Lake @ 2. Floodproofing/Raise Mobile Home Floor Elevations	 Very low * * 1.15
III. Lake Fairview & Little Lake Fairview	Homes Streets Bridges	13.1 0.5 0.0	26.1 0.8 10.0	99.5 1.0 10.0	1. Reduce Flood Stages in Lake Fairview i) Maintain Lake at Low Stages During Wet Period ii) Increase Discharge Capacity of Lake Fairview Weir iii) Create Additional Storage 2. Local Levee Protection 3. Floodproofing	 * * * *
IV. Tributary G	Homes Streets Bridges	0.0 0.8 0.0	1.0 1.0 5.0	45.3 1.2 10.0	**1. Reduce Flood Stages in Eatonville Borrow Pit 2. Local Levee Protection	 0.35
V. Oranole Rd. Vicinity	(Flooding) Homes Streets Bridges (Erosion) Homes	 4.4 5.0 96.0 112.0	 11.4 10.0 384.0 448.0	 18.9 15.0 480.0 560.0	1. Reduce Flood Stage ** i) Create Storage upstream of Sheetpile Weir ii) Improve Channel and Expand Bridges iii) Acquire 13 Houses and Restore Channel	 1.60 1.17
VI. Lakes Gandy and Lockhart	Homes Streets Bridges	0.6 0.5 0.0	16.5 0.8 0.0	60.8 1.0 0.0	1. Maintain Lakes at Low Elevations	

* Not evaluated
** This measure will not provide the necessary protection
@ This alternative will not reduce areal flooding

Table 5-1. Major problem areas and flood protection alternatives (See Exhibit A for location)

PROBLEM AREAS SEMINOLE COUNTY	ESTIMATED DAMAGES IN THOUSAND DOLLARS				FLOOD PROTECTION ALTERNATIVES	BENEFIT/COST RATIO
	ITEMS	10 YR	25 YR	100 YR		
VII. Tributary F Confluence						
A. Area Down-stream of Confluence	Homes Streets	1.4 0.2	2.4 0.4	3.8 0.5		
B. Area Upstream of Confluence	Homes Streets	19.4 1.2	59.9 1.4	125.3 1.5	1. Reduce Flood Stage @@ i) Improve Channel @@ ii) Remove Footbridge 7 and Improve Channel 2. Local Levee Protection 3. Floodproofing	 0.26 0.87 2.81 *
C. Bridges	Bridges	5.0	5.0	10.0		
VIII. Tributary C	Homes Streets Bridges	0.0 0.5 0.0	0.2 0.8 10.0	5.9 1.0 20.0		
IX. Montgomery Road Vicinity	Homes Streets Bridges	0.0 0.5 0.0	13.4 0.8 0.0	169.0 1.0 0.0	1. Local Levee Proctection 2. Improve Channel	0.20 0.14
X. Tributary B	Homes Streets Bridges	0.0 0.0 0.0	0.0 0.0 0.0	0.3 1.0 0.0		
XI. Springs North of S.R. 434						
A. Subdivision on West Bank of River	Homes Streets	0.0 0.5	1.8 0.8	19.5 1.0		
B. Footbridges	Bridges	0.0	0.0	25.0		
C. Recreational Area on East Bank of River	Building Streets	17.5 0.0	29.9 0.0	43.1 0.0	** 1. Channel Improvements to Reduce Flood Stages 2. Floodproofing	 *
XII. Trib. A	Homes Streets	40.0 0.8	81.5 1.0	125.0 1.2	@@ 1. Expand Culverts at Springs Landing Boulevard, and Wisteria Drive North 2. Create Storage Area Upstream	0.30 Very low

* Not evaluated
** This measure will not provide the necessary protection
@@ This measure provides only partial protection

Table 5-2. Categories of flood damage areas and recommendations

Category	Recommendation	Problem Areas Orange County	Problem Areas Seminole County
Areas w/low damages (not exceeding $25K during 100-yr event)	Re-evaluate the area. Conduct citizen survey. Collect information on actual flood incidence and damages	I-A I-B I-D	VIII X XI-A XI-B
Areas w/no damages during the 10-yr & 25-yr events	Give lowest priority in providing flood protection. Conduct citizen survey. Collect information on actual flood incidence and damages	I-C IV	None
Areas w/un-favorable benefit-cost ratio	Consider other possible alternatives. Evaluate indirect and intangible benefits, and uncertainty cost. Conduct citizen survey. Collect information on actual flood incidence and damages. Evaluate local government liability. Any funds avaible for a specific cause?	II*	IX XII
Areas that can be protected by operation of lakes	Perform detailed analysis and determine lake operation schedule. Any auxilary structures necessary? Go for public hearing.	III IV	None
Areas with favorable benefit cost raito	Perform detailed analysis modify previously considered alternative(s) to achieve further evonomy. determine financial feasibility. Go public hearing.	II** V	VII

* Unfavorable benefit/cost ratio for the alternative that prevents both area flooding and property damages

** Favorable benefit/cost ratio for the flood-control alternative that prevents property damages but does not reduce area flooding

5.1 RECOMMENDED FLOOD PROTECTION ALTERNATIVES: ORANGE COUNTY

Flooding problem areas are presented in order of decreasing severity of the flood threat.

Oranole Road Vicinity (Problem Area V). Portions of Riverside Acres subdivision have a major flood threat. Since the expected damages are high, the two alternatives with structural measures have favorable benefit/cost ratios. The solutions presented, however, are typical. Further economies are possible by optimizing them with various other flood protection measures. Indirect and intangible benefits, such as environmental benefits, should be weighed carefully in making a choice between the two cost effective alternatives: channel and bridge improvements or acquiring houses and restoring the channel. Channel improvements may have adverse environmental effects (see section 4.1) but these can be minimized by employing "Best Management Pratices." Restoration of the channel through wetland construction will increase wetland acreages with resultant water quality, flood, and erosion control benefits.

Lakes Fairview, Gandy, and Lockhart (Problem Areas III and VI). Flood protection to buildings near Lake Fairview and Lakes Gandy and Lockhart can be achieved by suitable regulation of water levels in the respective lakes. Some scenarios for lake operation are presented in this report. Additional scenarios can be modeled to determine optimal lake regulation schedules. Construction of some auxiliary structures may be necessary to maintain the lakes at the required elevations. Lowering lake stages may have minor ecological benefits (see seciton 4.1) through rejuvenation of lakeshores and oxidation of organic sediments.

Lake Orlando and Vicinity (Problem Area II). The Lake Orlando area might experience major area flooding with no commensurable direct damages. Consequently, this area defies a solution on economic grounds. Direct flood damages can be eliminated by floodproofing the houses threatened and by raising the mobile homes to higher elevations. The only possible solution to reduce area flooding appears to be the creation of additional storage areas upstream, which is very expensive. This should be considered if funds are available. Construction of wetlands for storage would result in water quality benefits.

Lawne Lake and Vicinity and Tributary G (Problem Areas I and IV). Areas near Lawne Lake and the Eatonville Borrow Pit may experience damages during severe flood events (return periods exceeding 25 years). These areas should be re-evaluated based on actual flood experience.

General Measures. Inspect bridges periodically. Provide/maintain erosion protection measures. For river reaches where erosion is observed, or erosion potential is indicated by this study, determine non-scouring and nonsilting velocities. Provide a design channel to convey 100-yr discharge or greater.

5.2 RECOMMENDED FLOOD PROTECTION ALTERNATIVES: SEMINOLE COUNTY

Major flood damage areas in Seminole County include the Tributary F confluence, the subdivision west of Montgomery Road on the east bank of the Little Wekiva River, Tributary A, and the recreational area on the east bank of the river in the Springs development (Problem areas VII, IX, XII, and XI-C, respectively, Table 5-1 and Exhibit A). Minor damages can occur at isolated locations in Tributary B and C basins and in the Springs development.

Tributary F (Problem Area VII-B). Build a levee to protect the seven expensive houses at the Tributary F confluence. Employing "Best Management Pratices" during levy construction will minimize adverse environmental effects (section 4.1).

Recreational Area (Problem Area XI-C). Floodproofing appears to be the only solution to protect the recreational area in the Springs Development.

The Subdivision West of Montgomery Road and Tributary A (Problem areas IX and XII). This study finds costs of flood protection measures much greater than the benefits. Perform detailed analyses for these areas as recommended in Table 5-2.

General Measures. Perform special studies based on actual flood experience for areas where minor damages are indicated. Inspect bridges periodically. Provide/maintain erosion protection measures. For river reaches where erosion is observed, or erosion potential is indicated by this study, determine non-scouring and non-silting velocities. Provide a design channel to convey 100-yr discharge or greater.

5.3 ENVIRONMENTAL RECOMMENDATIONS

The following recommendations should be implemented to monitor potential water quality/environmental problems indicated in this report.

Water Quality Monitoring of Lake Orlando--Orange County. An extensive hardwood swamp surrounding Lake Orlando has been replaced by a golf course. Removal of the hardwood swamp, runoff from the golf course, and water level control of the lake could lead to water quality problems. No current water quality data exist for this lake, a short-term monitoring program should be initiated to assess water quality. Any potential environmental problems would be identified so that actions may be taken to protect the ecological balance of the lake.

Water quality monitoring of the Little Wekiva River--Seminole County. Nutrient samples should be continued at least at stations LW1, LW3, and LW6. Sampling for heavy metals and coliforms should be added since no data exist for Seminole County. The effects of the loss of high quality dilution water from the Hi-Acres Citrus plant, the elevated levels of heavy metals present in the river in Orange County, and any possible contamination from septic tank leachate should be evaluated by testing for these parameters. An expanded water quality assessment is needed immediately upstream of the aquatic preserve to determine pollutant loads entering it.

Bioassay Fish. Elevated levels of lead, zinc, and cadmium in the river in Orange County indicate the possibility of bioaccumulation of the metals in fish throughout the Little Wekiva River. Fish tissue samples should be collected at and below sites with elevated levels of metals to evaluate potential health risk from eating the fish.

5.4 PERMIT REQUIREMENTS

MSSW (Management and Storage of Surface Waters) and Wetland Resource Management (WRM) permits would be required prior to construction of flood protection alternatives. Demonstration would be required that no degradation of water quality below the standards set forth in Chapters 17-3 and 17-4, F.A.C. would occur as a result of the project. The proposed alternatives are all potentially permittable provided various permit requirements are met, as described in the District's MSSW Applicant's Handbook. The counties would be required to perform additional calculations and provide additional measures to meet some of the MSSW criteria. MSSN and WRM permits are described below:

Management and Storage of Surface Waters (MSSW) permit. A permit would likely be required from SJRWMD under Chapter 40C-4 F.A.C. for construction and operation of flood control alternatives. To obtain a permit, the applicant must provide reasonable assurance that the proposed activity will not harm the water resources or be inconsistent with the objectives of the SJRWMD (see section 9.0, MSSW Applicants Handbook, SJRWMD 1990). In addition, the District has adopted basin-specific design criteria for the Wekiva River basin under Chapter 40C-41 F.A.C. (see section 11.3, MSSW Applicant Handbook, SJRWMD 1990). Two relevant basin-specific criteria are erosion/sediment control and floodplain storage. A detailed and stringent erosion and sediment control plan should be implemented when construction occurs within the Water Quality Protection zone (within one-half mile of the Wekiva or Little Wekiva Rivers north of S.R.436) to prevent violation in water quality standards and retain sediment within the construction area. Projects must not result in a net loss of the floodplain storage within the 100-yr floodplain of the Wekiva and Little Wekiva rivers.

Wetland Resource Management (WRM) Permit. Permits are required by both the federal government (U.S. Army Corps of Engineers, USACOE) and the state (Florida Department of Environmental Regulation) for dredging, filling, or other activities to be conducted within the waters of the state. Joint application can be made to both DER and the USACOE for a permit; however, permits from both agencies must be issued. Under the existing operating agreement with DER and SJRWMD, WRM permits will be processed and issued by SJRWMD for most projects that also require an MSSW permit.

The Department of Resource Management at SJRWMD has reviewed the various flood control alternatives described in this report. The data on water quantity impacts from each alternative provided by this report will be suitable to use in the permit application process to address MSSW water quantity criteria. The recommended alternatives are all potentially permittable; however, some alternatives may have potential adverse impact on water quality or wetlands that must be evaluated in detail prior to determining if the applicable permit rule criteria can be met. Counties will need to complete detailed investigations to demonstrate that the plan meets the MSSW review criteria concerning wetlands and water quality impacts, including the issues related to environmental impacts discussed in Section 4.1 of this report.

Flood control alternatives that result in the loss of existing wetland habitat for aquatic and wetland dependent species will require mitigation measures to offset these losses, such as wetland creation, enhancement of degraded wetlands, or other means. Consideration of this additional cost should be factored into the benefit/cost analysis presented in this report.

Water quality impacts also will be an important consideration in determining if the proposed plan can be permitted. DER has identified portions of the Little Wekiva River as not meeting its designated Class III use (recreation, fish and wildlife propagation) due to degraded water quality primarily from nonpoint source pollution of existing urban land use (Florida Department of Environmental Regulation 1990). The reach of the Little Wekiva River downstream of Sanlando Springs and the Wekiva River have been designated as Outstanding Florida Waters by (OFW) DER, with no further degradation of ambient water quality conditions allowed. The county must provide reasonable assurance that both short-term (during construction) and long-term impacts from the selected alternatives will not cause degradation that would violate Class III and OFW water quality standards in the Little Wekiva River system, as set forth in Chapters 17-301, 17-302, and 17-4 F.A.C. The counties should first consider alternatives with potential water quality benefits (such as creation of new offline or online flood detention areas and lowering wet season regulation levels in lakes) in order to address existing water quality problems through regional stormwater controls.

District permitting rules and Chapter 120 F.S. provide interested parties with the opportunity to comment and request an administrative hearing on any proposed agency action on a permit application. The final outcome of a permit application for any particular proposed flood control alternative cannot be determined until the District Governing Board makes a decision based on a technical review and recommendation prepared by the SJRWMD staff as well as comments from all interested parties. County governments should seek to work closely with interested parties (such as affected property owners, governmental agencies, and environmental action groups) to develop specific proposals that are mutually beneficial.

6.0 REFERENCES

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Appendix A

RESIDENTIAL DAMAGES

STRUCTURE INVENTORY				FLOOD ELEVATION							EXPECTED DAMAGE DURING FLOOD EVENT		
TRIBUTARY	ID NUMBER	STATION	FF ELEVATION	10 YR	DELTA	25 YR	DELTA	100 YR	DELTA	STRUCTURE VALUE	10 YR	25 YR	100 YR
A	421	13 + 77	27.66	26.95	0.29	27.84	1.18	28.74	2.08	$113,830.00	$3,466.12	$13,068.82	$18,711.38
A	422	14 + 2	28.36	26.95	N/A	27.84	0.48	28.74	1.38	$199,010.00	$0.00	$10,030.10	$25,017.55
A	423	15 + 67	30.99	26.95	N/A	27.84	N/A	28.74	N/A	$158,260.00	$0.00	$0.00	$0.00
A	420	16 + 2	29.84	26.95	N/A	27.84	N/A	28.74	N/A	$208,420.00	$0.00	$0.00	$0.00
A	424	16 + 77	30.99	26.95	N/A	27.84	N/A	28.74	N/A	$0.00	$0.00	$0.00	$0.00
A	419	17 + 27	30.16	26.95	N/A	27.84	N/A	28.74	N/A	$119,240.00	$0.00	$0.00	$0.00
A	425	18 + 47	29.75	26.95	N/A	27.84	N/A	28.74	N/A	$254,600.00	$0.00	$0.00	$0.00
A	418	18 + 57	30.06	26.95	N/A	27.84	N/A	28.74	N/A	$101,600.00	$0.00	$0.00	$0.00
A	417	24 + 67	31.00	26.95	N/A	27.84	N/A	28.74	N/A	--------	$0.00	$0.00	$0.00
A	416	25 + 32	31.37	26.95	N/A	27.84	N/A	28.74	N/A	--------	$0.00	$0.00	$0.00
A	410	25 + 47	30.47	26.95	N/A	27.84	N/A	28.74	N/A	$72,200.00	$0.00	$0.00	$0.00
A	415	25 + 67	31.38	26.95	N/A	27.84	N/A	28.74	N/A	--------	$0.00	$0.00	$0.00
A	414	26 + 7	31.66	26.95	N/A	27.84	N/A	28.74	N/A	--------	$0.00	$0.00	$0.00
A	413	26 + 92	30.95	26.95	N/A	27.84	N/A	28.74	N/A	$24,850.00	$0.00	$0.00	$0.00
A	412A	27 + 87	30.96	26.95	N/A	27.84	N/A	28.74	N/A	$185,490.00	$0.00	$0.00	$0.00
A	412	27 + 87	31.15	26.95	N/A	27.84	N/A	28.74	N/A	--------	$0.00	$0.00	$0.00
A	411	29 + 27	31.47	26.95	N/A	27.84	N/A	28.74	N/A	$180,740.00	$0.00	$0.00	$0.00
A	409	31 + 7	30.59	27.84	N/A	28.36	N/A	28.97	N/A	$156,770.00	$0.00	$0.00	$0.00
A	408	33 + 52	32.39	31.72	0.33	32.24	0.85	33.05	1.66	$136,920.00	$4,744.28	$12,220.11	$19,301.61
A	407	33 + 67	32.10	31.72	0.62	32.24	1.14	33.05	1.95	--------			
A	407A	33 + 67	31.17	31.72	1.55	32.24	2.07	33.05	2.88	$157,030.00	$21,195.12	$25,716.80	$33,475.66
A	405	33 + 72	34.34	31.72	N/A	32.24	N/A	33.05	N/A	$118,490.00	$0.00	$0.00	$0.00
A	406	33 + 92	32.19	31.72	0.53	32.24	1.05	33.05	1.86	$190,250.00	$10,587.41	$20,494.68	$28,893.27
A	404	40 + 97	34.11	31.72	N/A	32.24	N/A	33.05	N/A	$93,760.00	$0.00	$0.00	$0.00
A	403	42 + 82	34.88	31.72	N/A	32.24	N/A	33.05	N/A	$138,740.00	$0.00	$0.00	$0.00
A	402	48 + 42	36.95	31.72	N/A	32.24	N/A	33.05	N/A	$87,580.00	$0.00	$0.00	$0.00
										TOTAL	$39,992.94	$81,530.52	$125,399.46

STRUCTURE INVENTORY				FLOOD ELEVATION							EXPECTED DAMAGE DURING FLOOD EVENT		
TRIBUTARY	ID NUMBER	STATION	FF ELEVATION	10 YR	DELTA	25 YR	DELTA	100 YR	DELTA	STRUCTURE VALUE	10 YR	25 YR	100 YR
B	387	35 + 22	43.06	41.14	N/A	42.06	N/A	42.92	N/A	$12,150.00	$0.00	$0.00	$0.00
B	386A	35 + 77	45.37	41.14	N/A	42.06	N/A	42.92	N/A	$7,400.00	$0.00	$0.00	$0.00
B	319	35 + 77	44.01	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	386	36 + 37	45.67	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	318	36 + 57	44.01	41.14	N/A	42.06	N/A	42.92	N/A	$6,720.00	$0.00	$0.00	$0.00
B	385	36 + 97	43.04	41.14	N/A	42.06	N/A	42.92	N/A	$6,940.00	$0.00	$0.00	$0.00
B	317	37 + 42	44.01	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	384	37 + 47	45.64	41.14	N/A	42.06	N/A	42.92	N/A	$10,480.00	$0.00	$0.00	$0.00
B	316	38 + 22	43.74	41.14	N/A	42.06	N/A	42.92	N/A	$4,210.00	$0.00	$0.00	$0.00
B	320	38 + 37	44.00	41.14	N/A	42.06	N/A	42.92	N/A	$6,610.00	$0.00	$0.00	$0.00
B	383	38 + 77	45.04	41.14	N/A	42.06	N/A	42.92	N/A	$4,980.00	$0.00	$0.00	$0.00
B	382	39 + 42	43.87	41.14	N/A	42.06	N/A	42.92	N/A	$11,850.00	$0.00	$0.00	$0.00
B	321	39 + 52	42.74	41.14	N/A	42.06	N/A	42.92	N/A	$2,400.00	$0.00	$0.00	$0.00
B	315	39 + 57	43.38	41.14	N/A	42.06	N/A	42.92	N/A	$4,120.00	$0.00	$0.00	$0.00
B	381A	39 + 92	43.64	41.14	N/A	42.06	N/A	42.92	N/A	$8,730.00	$0.00	$0.00	$0.00
B	322	40 + 57	42.53	41.14	N/A	42.06	N/A	42.92	N/A	$13,530.00	$0.00	$0.00	$0.00
B	314	40 + 57	42.74	41.14	N/A	42.06	N/A	42.92	N/A	$8,560.00	$0.00	$0.00	$0.00
B	381	41 + 7	43.70	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	323	41 + 62	43.30	41.14	N/A	42.06	N/A	42.92	N/A	$9,930.00	$0.00	$0.00	$0.00
B	313	41 + 62	REMOVED										
B	379A	41 + 67	44.38	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	380	41 + 67	42.39	41.14	N/A	42.06	N/A	42.92	N/A	$15,240.00	$0.00	$0.00	$0.00
B	380A	41 + 77	43.91	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	379	41 + 77	42.31	41.14	N/A	42.06	N/A	42.92	N/A	$22,110.00	$0.00	$0.00	$0.00
B	378	41 + 97	44.68	41.14	N/A	42.06	N/A	42.92	N/A	$13,000.00	$0.00	$0.00	$0.00
B	312	42 + 57	43.29	41.14	N/A	42.06	N/A	42.92	N/A	$7,410.00	$0.00	$0.00	$0.00
B	324	42 + 67	44.18	41.14	N/A	42.06	N/A	42.92	N/A	$20,200.00	$0.00	$0.00	$0.00
B	377B	42 + 67	43.75	41.14	N/A	42.06	N/A	42.92	N/A	$12,940.00	$0.00	$0.00	$0.00
B	377A	42 + 87	44.62	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	366	42 + 92	41.41	41.14	N/A	42.06	N/A	42.92	0.65	$3,350.00	$0.00	$0.00	$76.21
B	309	43 + 47	43.91	41.14	N/A	42.06	N/A	42.92	N/A	$720.00	$0.00	$0.00	$0.00
B	377	43 + 67	43.90	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	311	43 + 67	43.74	41.14	N/A	42.06	N/A	42.92	N/A	$11,580.00	$0.00	$0.00	$0.00
B	365	43 + 72	42.45	41.14	N/A	42.06	N/A	42.92	N/A	$4,740.00	$0.00	$0.00	$0.00
B	325	43 + 77	43.75	41.14	N/A	42.06	N/A	42.92	N/A	$10,230.00	$0.00	$0.00	$0.00
B	334	43 + 77	42.12	41.14	N/A	42.06	N/A	42.92	N/A	$7,580.00	$0.00	$0.00	$0.00
B	367	43 + 87	43.57	41.14	N/A	42.06	N/A	42.92	N/A	$7,850.00	$0.00	$0.00	$0.00
B	376A	44 + 17	43.88	41.14	N/A	42.06	N/A	42.92	N/A	$13,180.00	$0.00	$0.00	$0.00
B	333A	44 + 42	41.43	41.14	N/A	42.06	N/A	42.92	0.63	$500.00	$0.00	$0.00	$11.03
B	335	44 + 42	42.87	41.14	N/A	42.06	N/A	42.92	N/A	$19,430.00	$0.00	$0.00	$0.00
B	368	44 + 47	44.98	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	376	44 + 52	42.58	41.14	N/A	42.06	N/A	42.92	N/A	$11,310.00	$0.00	$0.00	$0.00
B	364	44 + 52	47.36	41.14	N/A	42.06	N/A	42.92	N/A	$12,060.00	$0.00	$0.00	$0.00
B	310	44 + 57	43.64	41.14	N/A	42.06	N/A	42.92	N/A	$4,370.00	$0.00	$0.00	$0.00
B	375B	44 + 62	43.57	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	333	44 + 72	43.72	41.14	N/A	42.06	N/A	42.92	N/A	$2,180.00	$0.00	$0.00	$0.00
B	375A	44 + 72	43.77	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	326	44 + 82	42.86	41.14	N/A	42.06	N/A	42.92	N/A	$2,450.00	$0.00	$0.00	$0.00

STRUCTURE INVENTORY				FLOOD ELEVATION							EXPECTED DAMAGE DURING FLOOD EVENT		
TRIBUTARY	ID NUMBER	STATION	FF ELEVATION	10 YR	DELTA	25 YR	DELTA	100 YR	DELTA	STRUCTURE VALUE	10 YR	25 YR	100 YR
B	368A	44 + 87	44.90	41.14	N/A	42.06	N/A	42.92	N/A	$5,720.00	$0.00	$0.00	$0.00
B	336	45 + 7	43.07	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	363	45 + 27	46.71	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	369	45 + 57	42.76	41.14	N/A	42.06	N/A	42.92	N/A	$6,940.00	$0.00	$0.00	$0.00
B	363A	45 + 62	43.69	41.14	N/A	42.06	N/A	42.92	N/A	$16,840.00	$0.00	$0.00	$0.00
B	327	45 + 82	42.69	41.14	N/A	42.06	N/A	42.92	N/A	$3,870.00	$0.00	$0.00	$0.00
B	332	45 + 87	43.63	41.14	N/A	42.06	N/A	42.92	N/A	$13,460.00	$0.00	$0.00	$0.00
B	371	45 + 87	45.62	41.14	N/A	42.06	N/A	42.92	N/A	$8,730.00	$0.00	$0.00	$0.00
B	337	45 + 87	43.07	41.14	N/A	42.06	N/A	42.92	N/A	$13,020.00	$0.00	$0.00	$0.00
B	375	45 + 97	43.48	41.14	N/A	42.06	N/A	42.92	N/A	$1,260.00	$0.00	$0.00	$0.00
B	374A	46 + 7	44.54	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	362	46 + 27	44.28	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	374	46 + 52	43.65	41.14	N/A	42.06	N/A	42.92	N/A	$7,090.00	$0.00	$0.00	$0.00
B	370	46 + 52	45.03	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	362A	46 + 57	43.89	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	338	46 + 97	43.02	41.14	N/A	42.06	N/A	42.92	N/A	$8,380.00	$0.00	$0.00	$0.00
B	331	46 + 97	42.75	41.14	N/A	42.06	N/A	42.92	N/A	$24,660.00	$0.00	$0.00	$0.00
B	353	47 + 2	45.49	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	354	47 + 2	43.63	41.14	N/A	42.06	N/A	42.92	N/A	$5,940.00	$0.00	$0.00	$0.00
B	353A	47 + 7	45.49	41.14	N/A	42.06	N/A	42.92	N/A	$7,340.00	$0.00	$0.00	$0.00
B	373	47 + 22	44.58	41.14	N/A	42.06	N/A	42.92	N/A	$4,180.00	$0.00	$0.00	$0.00
B	344	47 + 42	43.60	41.14	N/A	42.06	N/A	42.92	N/A	$6,100.00	$0.00	$0.00	$0.00
B	352	47 + 42	45.25	41.14	N/A	42.06	N/A	42.92	N/A	$2,500.00	$0.00	$0.00	$0.00
B	371A	47 + 62	43.87	41.14	N/A	42.06	N/A	42.92	N/A	$8,730.00	$0.00	$0.00	$0.00
B	345	47 + 67	42.09	41.14	N/A	42.06	N/A	42.92	N/A	$34,880.00	$0.00	$0.00	$0.00
B	361	47 + 87	46.12	41.14	N/A	42.06	N/A	42.92	N/A	$0.00	$0.00	$0.00	$0.00
B	339	47 + 92	43.67	41.14	N/A	42.06	N/A	42.92	N/A	$6,930.00	$0.00	$0.00	$0.00
B	330	47 + 92	43.81	41.14	N/A	42.06	N/A	42.92	N/A	$6,820.00	$0.00	$0.00	$0.00
B	372	48 + 32	44.63	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	309A	48 + 37	43.20	41.14	N/A	42.06	N/A	42.92	N/A	$2,770.00	$0.00	$0.00	$0.00
B	346	48 + 47	43.57	41.14	N/A	42.06	N/A	42.92	N/A	$2,000.00	$0.00	$0.00	$0.00
B	351A	48 + 47	44.57	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	358	48 + 57	43.15	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	351	48 + 62	45.12	41.14	N/A	42.06	N/A	42.92	N/A	$1,940.00	$0.00	$0.00	$0.00
B	343	48 + 67	43.70	41.14	N/A	42.06	N/A	42.92	N/A	$4,830.00	$0.00	$0.00	$0.00
B	360	48 + 82	45.19	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	329	48 + 92	REMOVED										
B	347	49 + 12	43.57	41.14	N/A	42.06	N/A	42.92	N/A	$11,920.00	$0.00	$0.00	$0.00
B	359	49 + 47	44.76	41.14	N/A	42.06	N/A	42.92	N/A	$4,900.00	$0.00	$0.00	$0.00
B	357	49 + 52	45.43	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	328	49 + 57	43.69	41.14	N/A	42.06	N/A	42.92	N/A	$102,120.00	$0.00	$0.00	$0.00
B	342	49 + 62	43.00	41.14	N/A	42.06	N/A	42.92	N/A	$19,040.00	$0.00	$0.00	$0.00
B	357A	49 + 72	43.45	41.14	N/A	42.06	N/A	42.92	N/A	$4,570.00	$0.00	$0.00	$0.00
B	348	49 + 77	43.59	41.14	N/A	42.06	N/A	42.92	N/A	$23,580.00	$0.00	$0.00	$0.00
B	350	50 + 2	42.50	41.14	N/A	42.06	N/A	42.92	N/A	$16,640.00	$0.00	$0.00	$0.00
B	356	50 + 22	43.61	41.14	N/A	42.06	N/A	42.92	N/A	$29,500.00	$0.00	$0.00	$0.00
B	356A	50 + 27	43.61	41.14	N/A	42.06	N/A	42.92	N/A	--------			
B	349	50 + 42	42.40	41.14	N/A	42.06	N/A	42.92	N/A	$20,200.00	$0.00	$0.00	$0.00
B	355	50 + 77	43.09	41.14	N/A	42.06	N/A	42.92	N/A	$4,830.00	$0.00	$0.00	$0.00
B	341	51 + 32	42.27	41.14	N/A	42.06	N/A	42.92	N/A	$21,800.00	$0.00	$0.00	$0.00
										TOTAL	$0.00	$0.00	$261.71

TRIBUTARY/ BRANCH	STRUCTURE ID NUMBER	FLOOD ELEVATION									EXPECTED DAMAGE DURING FLOOD EVENT		
		STATION	FF ELEVATION	10 YR	DELTA	25 YR	DELTA	100 YR	DELTA	STRUCTURE VALUE	10 YR	25 YR	100 YR
C	261	43 + 8	53.75	50.93	N/A	51.31	N/A	52.31	N/A	$37,750.00	$0.00	$0.00	$0.00
C	260	81 + 15	64.49	53.34	N/A	55.88	N/A	56.08	N/A	$0.00	$0.00	$0.00	$0.00
C	259	104 + 35	60.45	55.97	N/A	56.68	N/A	57.70	N/A	$1,214.00	$0.00	$0.00	$0.00
C	257	108 + 65	64.49	55.97	N/A	56.68	N/A	57.70	N/A	$29,870.00	$0.00	$0.00	$0.00
C	255	111 + 5	?							$7,750.00			
C	254	111 + 35	REMOVED										
C	256	111 + 90	57.92	55.97	N/A	56.68	N/A	57.70	0.78	$19,030.00	$0.00	$0.00	$1,558.56
C1	253	0 + 45	69.92	46.88	N/A	47.50	N/A	48.25	N/A	$31,600.00	$0.00	$0.00	$0.00
C1	249	0 + 45	64.11	46.88	N/A	47.50	N/A	48.25	N/A	$24,410.00	$0.00	$0.00	$0.00
C1	247	0 + 45	64.42	46.88	N/A	47.50	N/A	48.25	N/A	$28,940.00	$0.00	$0.00	$0.00
C1	246	1 + 10	63.87	47.30	N/A	47.94	N/A	48.70	N/A	$26,470.00	$0.00	$0.00	$0.00
C1	248	1 + 10	63.19	47.30	N/A	47.94	N/A	48.70	N/A	$33,110.00	$0.00	$0.00	$0.00
C1	252	1 + 95	69.75	47.84	N/A	48.51	N/A	49.30	N/A	$26,960.00	$0.00	$0.00	$0.00
C1	245	1 + 95	62.92	47.84	N/A	48.51	N/A	49.30	N/A	$27,650.00	$0.00	$0.00	$0.00
C1	244	2 + 75	63.58	48.36	N/A	49.04	N/A	49.86	N/A	$39,590.00	$0.00	$0.00	$0.00
C1	250	2 + 75	70.74	48.36	N/A	49.04	N/A	49.86	N/A	$29,190.00	$0.00	$0.00	$0.00
C1	251	9 + 55	70.01	52.73	N/A	53.61	N/A	54.63	N/A	$26,780.00	$0.00	$0.00	$0.00
C1	243	9 + 55	63.75	52.73	N/A	53.61	N/A	54.63	N/A	$26,470.00	$0.00	$0.00	$0.00
C1	236	9 + 65	71.06	52.79	N/A	53.67	N/A	54.70	N/A	$30,520.00	$0.00	$0.00	$0.00
C1	242	10 + 40	MISSING DATA										
C1	237	10 + 50	71.74	53.34	N/A	54.24	N/A	55.30	N/A	$29,050.00	$0.00	$0.00	$0.00
C1	241	11 + 20	73.81	53.79	N/A	54.71	N/A	55.79	N/A	$25,930.00	$0.00	$0.00	$0.00
C1	238	11 + 65	68.00	54.08	N/A	55.02	N/A	56.10	N/A	$26,780.00	$0.00	$0.00	$0.00
C1	240	11 + 70	66.80	54.11	N/A	55.05	N/A	56.14	N/A	$29,190.00	$0.00	$0.00	$0.00
C1	239	12 + 75	68.58	54.75	N/A	55.72	N/A	56.84	N/A	$27,450.00	$0.00	$0.00	$0.00
C1	234	14 + 80	78.94	54.75	N/A	55.72	N/A	56.84	N/A	$40,490.00	$0.00	$0.00	$0.00
C1	235	15 + 50	67.67	54.75	N/A	55.72	N/A	56.84	N/A	$26,350.00	$0.00	$0.00	$0.00
C2	258	63 + 95	64.09	62.26	N/A	63.15	0.06	64.77	1.68	$30,460.00	$0.00	$191.90	$4,327.15
FLO	233	12 + 95	76.93	65.83	N/A	66.33	N/A	67.27	N/A	$133,550.00	$0.00	$0.00	$0.00
										TOTAL	$0.00	$191.90	$5,885.70

				FLOOD ELEVATION							EXPECTED DAMAGE DURING FLOOD EVENT		
TRIBUTARY	ID NUMBER	STATION	FF ELEVATION	10 YR	DELTA	25 YR	DELTA	100 YR	DELTA	STRUCTURE VALUE	10 YR	25 YR	100 YR
D	223	63 + 95	110.14	105.35	N/A	105.72	N/A	106.36	N/A	$5,530.00	$0.00	$0.00	$0.00
D	210	67 + 35	108.42	105.35	N/A	105.72	N/A	106.36	N/A	$18,600.00	$0.00	$0.00	$0.00
D	211	68 + 30	108.05	105.35	N/A	105.72	N/A	106.36	N/A	$44,700.00	$0.00	$0.00	$0.00
D	212	69 + 30	108.28	105.35	N/A	105.72	N/A	106.36	N/A	$23,420.00	$0.00	$0.00	$0.00
D	222	72 + 55	109.84	105.35	N/A	105.72	N/A	106.36	N/A	$6,260.00	$0.00	$0.00	$0.00
D	221	89 + 45	109.65	105.35	N/A	105.72	N/A	106.36	N/A	$29,460.00	$0.00	$0.00	$0.00
D	219	90 + 0	108.50	105.35	N/A	105.72	N/A	106.36	N/A	$78,220.00	$0.00	$0.00	$0.00
D	218	90 + 5	107.73	105.35	N/A	105.72	N/A	106.36	N/A	$40,670.00	$0.00	$0.00	$0.00
D	220	90 + 25	107.54	105.35	N/A	105.72	N/A	106.36	N/A	$53,740.00	$0.00	$0.00	$0.00
D	217	92 + 20	108.28	105.35	N/A	105.72	N/A	106.36	N/A	$32,620.00	$0.00	$0.00	$0.00
D	216	92 + 80	108.06	105.35	N/A	105.72	N/A	106.36	N/A	$48,050.00	$0.00	$0.00	$0.00
D	215	94 + 10	107.61	105.35	N/A	105.72	N/A	106.36	N/A	$38,550.00	$0.00	$0.00	$0.00
D	214	96 + 60	107.88	105.35	N/A	105.72	N/A	106.36	N/A	$55,280.00	$0.00	$0.00	$0.00
D	213	96 + 95	109.09	105.35	N/A	105.72	N/A	106.36	N/A	$85,880.00	$0.00	$0.00	$0.00
										TOTAL	$0.00	$0.00	$0.00

TRIBUTARY/ BRANCH	STRUCTURE ID NUMBER	FLOOD ELEVATION									EXPECTED DAMAGE DURING FLOOD EVENT		
		STATION	FF ELEVATION	10 YR	DELTA	25 YR	DELTA	100 YR	DELTA	STRUCTURE VALUE	10 YR	25 YR	100 YR
E2	209	12 + 40	77.95	74.67	N/A	75.48	N/A	76.83	N/A	$65,000.00	$0.00	$0.00	$0.00
E2	204	16 + 15	77.00	74.67	N/A	75.48	N/A	76.83	0.83	$37,000.00	$0.00	$0.00	$3,224.55
E2	203	16 + 75	77.99	74.67	N/A	75.48	N/A	76.83	N/A	$40,000.00	$0.00	$0.00	$0.00
E2	206	19 + 80	77.51	74.67	N/A	75.48	N/A	76.83	0.32	$45,000.00	$0.00	$0.00	$1,512.00
E2	205	19 + 80	76.61	74.67	N/A	75.48	N/A	76.83	1.22	$50,000.00	$0.00	$0.00	$5,849.50
E2	207	19 + 80	76.16	74.67	N/A	75.48	0.32	76.83	1.67	$50,000.00	$0.00	$1,680.00	$7,075.75
E2	208	19 + 80	77.62	74.67	N/A	75.48	N/A	76.83	0.21	$37,000.00	$0.00	$0.00	$815.85
E2	202	19 + 80	75.58	74.67	0.09	75.48	0.90	76.83	2.25	$60,000.00	$567.00	$5,670.00	$10,485.00
E2	201	22 + 25	76.18	74.67	N/A	75.48	0.30	76.83	1.65	$22,000.00	$0.00	$693.00	$3,089.35
E2	200	22 + 75	76.59	74.67	N/A	75.48	N/A	76.83	1.24	$20,000.00	$0.00	$0.00	$2,361.60
E2	199	23 + 5	77.11	74.67	N/A	75.48	N/A	76.83	0.72	$45,000.00	$0.00	$0.00	$3,402.00
E2	* 198	26 + 30	75.94	74.67	N/A	75.48	0.54	76.83	1.89	$150,000.00	$0.00	$8,505.00	$23,025.75
											$567.00	$16,548.00	$60,841.35

* Denotes Elevation at Ground Next to Structure

TRIBUTARY	STRUCTURE ID NUMBER	STATION	FF ELEVATION	10 YR	DELTA	25 YR	DELTA	100 YR	DELTA	STRUCTURE VALUE	10 YR	25 YR	100 YR
		FLOOD ELEVATION									EXPECTED DAMAGE DURING FLOOD EVENT		
F	225	6 + 10	62.20	60.86	N/A	61.76	0.56	63.08	1.88	$119,980.00	$0.00	$7,049.22	$18,352.14
F	224	7 + 30	62.41	60.99	N/A	61.79	0.38	63.05	1.64	$133,600.00	$0.00	$5,395.55	$18,704.70
										TOTAL	$0.00	$12,444.77	$37,056.84

TRIBUTARY/ BRANCH	STRUCTURE ID NUMBER	FLOOD ELEVATION									EXPECTED DAMAGE DURING FLOOD EVENT		
		STATION	FF ELEVATION	10 YR	DELTA	25 YR	DELTA	100 YR	DELTA	STRUCTURE VALUE	10 YR	25 YR	100 YR
G	158	1 + 90	81.41	76.54	N/A	77.46	N/A	79.50	N/A	$109,500.00	$0.00	$0.00	$0.00
G	156	12 + 70	82.73	80.61	N/A	81.03	N/A	81.70	N/A	$42,000.00	$0.00	$0.00	$0.00
G	157	12 + 95	82.75	80.61	N/A	81.03	N/A	81.70	N/A	$50,000.00	$0.00	$0.00	$0.00
G	155	24 + 20	84.36	80.61	N/A	81.03	N/A	81.70	N/A	$50,000.00	$0.00	$0.00	$0.00
G1	154	39 + 40	86.39	82.96	N/A	83.27	N/A	83.72	N/A	$60,000.00	$0.00	$0.00	$0.00
EBPO	140	61 + 90	96.27	94.40	N/A	95.02	N/A	96.08	0.81	$33,000.00	$0.00	$0.00	$2,806.65
EBPO	141	61 + 90	96.84	94.40	N/A	95.02	N/A	96.08	0.24	$30,000.00	$0.00	$0.00	$756.00
EBPO	137	63 + 35	96.68	94.65	N/A	95.26	N/A	96.32	0.64	$35,000.00	$0.00	$0.00	$2,352.00
EBPO	138	63 + 35	96.72	94.65	N/A	95.26	N/A	96.32	0.60	$30,000.00	$0.00	$0.00	$1,890.00
EBPO	139	63 + 35	96.08	94.65	N/A	95.26	0.18	96.32	1.24	$33,000.00	$0.00	$623.70	$3,896.64
EBPO	136	64 + 5	96.77	94.77	N/A	95.38	N/A	96.43	0.66	$30,000.00	$0.00	$0.00	$2,079.00
EBPO	142	64 + 5	96.63	94.77	N/A	95.38	N/A	96.43	0.80	$30,000.00	$0.00	$0.00	$2,520.00
EBPO	135	64 + 75	96.70	94.77	N/A	95.38	N/A	96.43	0.73	$30,000.00	$0.00	$0.00	$2,299.50
EBPO	143	64 + 75	97.00	94.77	N/A	95.38	N/A	96.43	0.43	$25,000.00	$0.00	$0.00	$1,128.75
EBPO	134	65 + 45	96.72	94.77	N/A	95.38	N/A	96.43	0.71	$35,000.00	$0.00	$0.00	$2,609.25
EBPO	144	65 + 45	96.83	94.77	N/A	95.38	N/A	96.43	0.60	$25,000.00	$0.00	$0.00	$1,575.00
EBPO	145	66 + 5	96.74	94.77	N/A	95.38	N/A	96.43	0.69	$33,000.00	$0.00	$0.00	$2,390.85
EBPO	133	66 + 5	96.70	94.77	N/A	95.38	N/A	96.43	0.73	$30,000.00	$0.00	$0.00	$2,299.50
EBPO	153	66 + 50	97.53	94.77	N/A	95.38	N/A	96.43	N/A	$25,000.00	$0.00	$0.00	$0.00
EBPO	146	66 + 55	97.06	94.77	N/A	95.38	N/A	96.43	0.37	$25,000.00	$0.00	$0.00	$971.25
EBPO	132	66 + 80	96.76	94.77	N/A	95.38	N/A	96.43	0.67	$30,000.00	$0.00	$0.00	$2,110.50
EBPO	147	67 + 10	96.68	94.77	N/A	95.38	N/A	96.43	0.75	$30,000.00	$0.00	$0.00	$2,362.50
EBPO	151	67 + 15	96.54	94.77	N/A	95.38	N/A	96.43	0.89	$29,000.00	$0.00	$0.00	$2,710.05
EBPO	149	67 + 15	96.77	94.77	N/A	95.38	N/A	96.43	0.66	$30,000.00	$0.00	$0.00	$2,079.00
EBPO	152	67 + 15	97.00	94.77	N/A	95.38	N/A	96.43	0.43	$25,000.00	$0.00	$0.00	$1,128.75
EBPO	148	67 + 15	96.27	94.77	N/A	95.38	0.11	96.43	1.16	$30,000.00	$0.00	$346.50	$3,411.60
EBPO	150	67 + 15	96.70	94.77	N/A	95.38	N/A	96.43	0.73	$22,000.00	$0.00	$0.00	$1,686.30
EBPO	131	95 + 90	97.05	94.77	N/A	95.38	N/A	96.43	0.38	$5,000.00	$0.00	$0.00	$199.50
											$0.00	$970.20	$45,262.59

TRIBUTARY/ BRANCH	STRUCTURE ID NUMBER	FLOOD ELEVATION									EXPECTED DAMAGE DURING FLOOD EVENT		
		STATION	FF ELEVATION	10 YR	DELTA	25 YR	DELTA	100 YR	DELTA	STRUCTURE VALUE	10 YR	25 YR	100 YR
H	59	91 + 90	REMOVED										
H	57	91 + 90	93.26	89.65	N/A	90.14	N/A	91.08	N/A	$1,000.00	$0.00	$0.00	$0.00
H	58	91 + 90	REMOVED										
H	60	94 + 65	REMOVED										
H	62	96 + 30	REMOVED										
H	61	97 + 0	92.53	89.65	N/A	90.14	N/A	91.08	N/A	$15,000.00	$0.00	$0.00	$0.00
H	63	97 + 60	94.15	89.65	N/A	90.14	N/A	91.08	N/A	$20,000.00	$0.00	$0.00	$0.00
H	56	97 + 90	93.16	89.65	N/A	90.14	N/A	91.08	N/A	$15,000.00	$0.00	$0.00	$0.00
H	55	98 + 15	92.13	89.65	N/A	90.14	N/A	91.08	N/A	$15,000.00	$0.00	$0.00	$0.00
H	54	98 + 65	91.02	89.65	N/A	90.14	0.12	91.08	1.06	$15,000.00	$0.00	$189.00	$1,624.05
H	53	99 + 5	91.04	89.65	N/A	90.14	0.10	91.08	1.04	$15,000.00	$0.00	$157.50	$1,607.70
H	52	99 + 40	92.27	89.65	N/A	90.14	N/A	91.08	N/A	$15,000.00	$0.00	$0.00	$0.00
H	51	99 + 80	91.56	89.65	N/A	90.14	N/A	91.08	0.52	$15,000.00	$0.00	$0.00	$819.00
H	50	100 + 10	92.09	89.65	N/A	90.14	N/A	91.08	N/A	$15,000.00	$0.00	$0.00	$0.00
H	47	100 + 40	93.02	89.65	N/A	90.14	N/A	91.08	N/A	$15,000.00	$0.00	$0.00	$0.00
H	49	100 + 70	91.08	89.65	N/A	90.14	0.06	91.08	1.00	$15,000.00	$0.00	$94.50	$1,575.00
H	44	101 + 0	92.58	89.65	N/A	90.14	N/A	91.08	N/A	$15,000.00	$0.00	$0.00	$0.00
H	46	101 + 0	92.83	89.65	N/A	90.14	N/A	91.08	N/A	$15,000.00	$0.00	$0.00	$0.00
H	48	101 + 0	91.70	89.65	N/A	90.14	N/A	91.08	0.38	$15,000.00	$0.00	$0.00	$598.50
H	45	101 + 0	92.38	89.65	N/A	90.14	N/A	91.08	N/A	$15,000.00	$0.00	$0.00	$0.00
H	43	103 + 10	93.23	89.65	N/A	90.14	N/A	91.08	N/A	$52,000.00	$0.00	$0.00	$0.00
H	42	103 + 50	92.17	89.65	N/A	90.14	N/A	91.08	N/A	$15,000.00	$0.00	$0.00	$0.00
H	41	103 + 65	92.43	89.65	N/A	90.14	N/A	91.08	N/A	$15,000.00	$0.00	$0.00	$0.00
H	40	103 + 80	92.94	89.65	N/A	90.14	N/A	91.08	N/A	$15,000.00	$0.00	$0.00	$0.00
H	64	117 + 40	91.81	89.65	N/A	90.14	N/A	91.08	0.27	$75,000.00	$0.00	$0.00	$2,126.25
H	65	118 + 40	90.85	89.65	N/A	90.14	0.29	91.08	1.23	$48,000.00	$0.00	$1,461.60	$5,641.68
H	66	119 + 5	91.18	89.65	N/A	90.14	N/A	91.08	0.90	$40,000.00	$0.00	$0.00	$3,780.00
H	38	119 + 15	91.72	89.65	N/A	90.14	N/A	91.08	0.36	$125,000.00	$0.00	$0.00	$4,725.00
H	67	119 + 90	91.03	89.65	N/A	90.14	0.11	91.08	1.05	$50,000.00	$0.00	$577.50	$5,386.25
H	39	120 + 0	91.76	89.65	N/A	90.14	N/A	91.08	0.32	$115,000.00	$0.00	$0.00	$3,864.00
H	68	120 + 45	92.01	89.65	N/A	90.14	N/A	91.08	0.07	$50,000.00	$0.00	$0.00	$367.50
H	69	121 + 60	92.33	89.65	N/A	90.14	N/A	91.08	N/A	$40,000.00	$0.00	$0.00	$0.00
H	72	122 + 80	91.56	89.65	N/A	90.14	N/A	91.08	0.52	$50,000.00	$0.00	$0.00	$2,730.00
H	71	122 + 80	91.71	89.65	N/A	90.14	N/A	91.08	0.37	$50,000.00	$0.00	$0.00	$1,942.50
H	70	122 + 80	91.46	89.65	N/A	90.14	N/A	91.08	0.62	$40,000.00	$0.00	$0.00	$2,604.00
H	39A	143 + 51	95.93	89.65	N/A	90.14	N/A	91.08	N/A	$102,000.00	$0.00	$0.00	$0.00
H1	79	7 + 10	94.08	92.03	N/A	92.12	N/A	92.26	N/A	$90,000.00	$0.00	$0.00	$0.00
H1	80	7 + 90	93.99	92.03	N/A	92.12	N/A	92.26	N/A	$100,000.00	$0.00	$0.00	$0.00
H2	73	10 + 0	92.76	90.16	N/A	90.69	N/A	91.67	N/A	$20,000.00	$0.00	$0.00	$0.00
H2	74	10 + 40	93.11	90.18	N/A	90.72	N/A	91.69	N/A	$20,000.00	$0.00	$0.00	$0.00
H2	75	12 + 50	92.83	90.28	N/A	90.83	N/A	91.81	N/A	$65,000.00	$0.00	$0.00	$0.00
H2	76	13 + 80	92.56	90.35	N/A	90.90	N/A	91.89	0.33	$75,000.00	$0.00	$0.00	$2,598.75
H2	77	14 + 35	92.92	90.38	N/A	90.93	N/A	91.92	N/A	$75,000.00	$0.00	$0.00	$0.00

TRIBUTARY/ BRANCH	STRUCTURE ID NUMBER	FLOOD ELEVATION									EXPECTED DAMAGE DURING FLOOD EVENT		
		STATION	FF ELEVATION	10 YR	DELTA	25 YR	DELTA	100 YR	DELTA	STRUCTURE VALUE	10 YR	25 YR	100 YR
H2	37	14 + 80	89.59	90.40	1.81	90.96	2.37	91.95	3.36	$15,000.00	$2,237.18	$2,731.05	$4,068.90
H2	36	15 + 30	93.90	90.42	N/A	90.99	N/A	91.98	N/A	$75,000.00	$0.00	$0.00	$0.00
H2	35	15 + 80	91.79	90.45	N/A	91.02	0.23	92.01	1.22	$100,000.00	$0.00	$2,415.00	$11,699.00
H2	34	16 + 35	90.65	90.48	0.83	91.05	1.40	92.04	2.39	$98,500.00	$8,584.27	$12,489.80	$18,054.07
H2	78	16 + 85	93.01	90.50	N/A	91.07	N/A	92.07	0.06	$50,000.00	$0.00	$0.00	$315.00
H2	33	17 + 0	91.93	90.81	N/A	91.08	0.15	92.08	1.15	$40,000.00	$0.00	$630.00	$4,527.00
H2	32	26 + 30	93.94	90.98	N/A	91.60	N/A	92.62	N/A	$75,000.00	$0.00	$0.00	$0.00
H2	31	26 + 30	91.55	90.98	0.43	91.60	1.05	92.62	2.07	$50,000.00	$2,257.50	$5,386.25	$8,188.50
H2	30	36 + 35	94.42	91.01	N/A	91.63	N/A	92.66	N/A	$60,000.00	$0.00	$0.00	$0.00
H2	25	48 + 75	92.67	91.01	N/A	91.63	N/A	92.66	0.99	$87,500.00	$0.00	$0.00	$9,095.62
H2	26	49 + 35	93.48	91.01	N/A	91.63	N/A	92.66	0.18	$60,000.00	$0.00	$0.00	$1,134.00
H2	28	50 + 30	93.95	91.01	N/A	91.63	N/A	92.66	N/A	$70,000.00	$0.00	$0.00	$0.00
H2	27	50 + 35	93.91	91.01	N/A	91.63	N/A	92.66	N/A	$60,000.00	$0.00	$0.00	$0.00
H2	29	54 + 95	93.57	91.01	N/A	91.63	N/A	92.66	0.09	$45,500.00	$0.00	$0.00	$429.98
											$13,078.95	$26,132.20	$99,502.24

				FLOOD ELEVATION							EXPECTED DAMAGE DURING FLOOD EVENT		
TRIBUTARY	ID NUMBER	STATION	FF ELEVATION	10 YR	DELTA	25 YR	DELTA	100 YR	DELTA	STRUCTURE VALUE	10 YR	25 YR	100 YR
I	6	64 + 0	96.01	92.50	N/A	93.47	N/A	95.22	N/A	$400,000.00	$0.00	$0.00	$8,820.00
I	5	65 + 60	98.44	92.50	N/A	93.47	N/A	95.22	N/A	$400,000.00	$0.00	$0.00	$0.00
I	4	65 + 60	96.12	92.50	N/A	93.47	N/A	95.22	N/A	$98,185.00	$0.00	$0.00	$1,030.94
I	3	67 + 0	95.95	92.50	N/A	93.47	N/A	95.22	N/A	$193,313.00	$0.00	$0.00	$5,480.42
I	2	69 + 70	97.17	92.50	N/A	93.47	N/A	95.22	N/A	$96,029.00	$0.00	$0.00	$0.00
I	1	72 + 85	96.48	92.50	N/A	93.47	N/A	95.22	N/A	$104,795.00	$0.00	$0.00	$0.00
											$0.00	$0.00	$15,331.37

(ORANGE COUNTY)						FLOOD ELEVATION					EXPECTED DAMAGE DURING FLOOD EVENT		
TRIBUTARY	ID NUMBER	STATION	FF ELEVATION	10 YR	DELTA	25 YR	DELTA	100 YR	DELTA	STRUCTURE VALUE	10 YR	25 YR	100 YR
MAIN STEM	197	416 + 92	66.18	65.98	0.80	67.34	2.16	68.28	3.10	$23,000.00	$1,921.18	$3,886.02	$5,383.87
MAIN STEM	196	417 + 32	65.90	65.99	1.09	67.35	2.45	68.29	3.39	$40,000.00	$4,405.79	$7,475.07	$11,021.86
MAIN STEM	171	422 + 37	71.59	66.23	N/A	67.52	N/A	68.47	N/A	$40,000.00	$0.00	$0.00	$0.00
MAIN STEM	180	422 + 62	71.49	66.24	N/A	67.53	N/A	68.48	N/A	$37,000.00	$0.00	$0.00	$0.00
MAIN STEM	181	422 + 62	71.01	66.24	N/A	67.53	N/A	68.48	N/A	$45,000.00	$0.00	$0.00	$0.00
MAIN STEM	195A	425 + 87	70.97	66.40	N/A	67.64	N/A	68.59	N/A	$37,000.00	$0.00	$0.00	$0.00
MAIN STEM	195	426 + 37	71.73	66.42	N/A	67.66	N/A	68.61	N/A	$40,000.00	$0.00	$0.00	$0.00
MAIN STEM	192	428 + 32	70.70	66.79	N/A	68.00	N/A	68.95	N/A	$45,000.00	$0.00	$0.00	$0.00
MAIN STEM	188A	428 + 32	71.05	66.79	N/A	68.00	N/A	68.95	N/A	$47,500.00	$0.00	$0.00	$0.00
MAIN STEM	191	428 + 32	70.27	66.79	N/A	68.00	N/A	68.95	N/A	$43,000.00	$0.00	$0.00	$0.00
MAIN STEM	194	428 + 32	69.85	66.79	N/A	68.00	N/A	68.95	0.10	$37,000.00	$0.00	$0.00	$388.50
MAIN STEM	193	428 + 32	70.48	66.79	N/A	68.00	N/A	68.95	N/A	$45,000.00	$0.00	$0.00	$0.00
MAIN STEM	189	428 + 32	70.54	66.79	N/A	68.00	N/A	68.95	N/A	$47,500.00	$0.00	$0.00	$0.00
MAIN STEM	190	428 + 32	70.23	66.79	N/A	68.00	N/A	68.95	N/A	$37,000.00	$0.00	$0.00	$0.00
MAIN STEM	182	429 + 63	70.94	66.92	N/A	68.09	N/A	68.98	N/A	$47,500.00	$0.00	$0.00	$0.00
MAIN STEM	184	429 + 63	70.10	66.92	N/A	68.09	N/A	68.98	N/A	$39,000.00	$0.00	$0.00	$0.00
MAIN STEM	188	429 + 63	71.04	66.92	N/A	68.09	N/A	68.98	N/A	$50,000.00	$0.00	$0.00	$0.00
MAIN STEM	183	429 + 63	70.46	66.92	N/A	68.09	N/A	68.98	N/A	$40,000.00	$0.00	$0.00	$0.00
MAIN STEM	185	429 + 63	70.27	66.92	N/A	68.09	N/A	68.98	N/A	$42,000.00	$0.00	$0.00	$0.00
MAIN STEM	187	430 + 33	71.33	66.99	N/A	68.11	N/A	68.98	N/A	$40,000.00	$0.00	$0.00	$0.00
MAIN STEM	186	431 + 3	71.10	67.07	N/A	68.13	N/A	68.97	N/A	$45,000.00	$0.00	$0.00	$0.00
MAIN STEM	179	432 + 28	72.46	67.46	N/A	68.46	N/A	69.34	N/A	$45,000.00	$0.00	$0.00	$0.00
MAIN STEM	177	432 + 28	70.10	67.46	N/A	68.46	N/A	69.34	0.24	$40,000.00	$0.00	$0.00	$1,012.20
MAIN STEM	178	432 + 28	70.77	67.46	N/A	68.46	N/A	69.34	N/A	$39,000.00	$0.00	$0.00	$0.00
MAIN STEM	175	432 + 28	70.11	67.46	N/A	68.46	N/A	69.34	0.23	$45,000.00	$0.00	$0.00	$1,091.47
MAIN STEM	176	432 + 33	70.60	67.50	N/A	68.50	N/A	69.39	N/A	$45,000.00	$0.00	$0.00	$0.00
MAIN STEM	174	433 + 89	71.73	67.71	N/A	68.83	N/A	69.52	N/A	$40,000.00	$0.00	$0.00	$0.00
MAIN STEM	173	433 + 89	71.52	67.71	N/A	68.83	N/A	69.52	N/A	$45,000.00	$0.00	$0.00	$0.00
MAIN STEM	172	435 + 69	72.70	67.80	N/A	69.15	N/A	69.96	N/A	$40,000.00	$0.00	$0.00	$0.00
MAIN STEM	169	436 + 99	72.82	68.07	N/A	69.23	N/A	69.94	N/A	$50,000.00	$0.00	$0.00	$0.00
MAIN STEM	170	436 + 99	72.93	68.07	N/A	69.23	N/A	69.94	N/A	$50,000.00	$0.00	$0.00	$0.00
MAIN STEM	168	445 + 47	77.87	68.36	N/A	69.58	N/A	70.96	N/A	$60,000.00	$0.00	$0.00	$0.00
MAIN STEM	166	446 + 77	78.23	68.43	N/A	69.67	N/A	71.43	N/A	$45,000.00	$0.00	$0.00	$0.00
MAIN STEM	167	447 + 42	78.47	68.46	N/A	69.72	N/A	71.66	N/A	$45,000.00	$0.00	$0.00	$0.00
MAIN STEM	165	447 + 92	77.66	68.49	N/A	69.75	N/A	71.84	N/A	$45,000.00	$0.00	$0.00	$0.00
MAIN STEM	164	448 + 82	78.57	68.54	N/A	69.82	N/A	72.17	N/A	$60,000.00	$0.00	$0.00	$0.00
MAIN STEM	163	449 + 82	78.63	68.59	N/A	69.89	N/A	72.53	N/A	$44,000.00	$0.00	$0.00	$0.00
MAIN STEM	162	458 + 97	79.36	69.05	N/A	70.53	N/A	75.82	N/A	$36,000.00	$0.00	$0.00	$0.00
MAIN STEM	161	483 + 29	80.34	75.63	N/A	76.46	N/A	78.84	N/A	$3,500.00	$0.00	$0.00	$0.00
MAIN STEM	160	485 + 34	79.75	75.82	N/A	76.65	N/A	78.92	0.17	$5,000.00	$0.00	$0.00	$91.47
MAIN STEM	159	485 + 54	81.54	75.84	N/A	76.67	N/A	78.93	N/A	$15,000.00	$0.00	$0.00	$0.00
MAIN STEM	125	582 + 76	90.86	86.41	N/A	87.14	N/A	88.42	N/A	$10,000.00	$0.00	$0.00	$0.00
MAIN STEM	130	582 + 76	REMOVED	86.41	N/A	87.14	N/A	88.42	N/A				
MAIN STEM	110	582 + 76	90.24	86.41	N/A	87.14	N/A	88.42	N/A	$15,000.00	$0.00	$0.00	$0.00
MAIN STEM	121	582 + 76	88.66	86.41	N/A	87.14	N/A	88.42	N/A	$15,000.00	$0.00	$0.00	$0.00
MAIN STEM	115	582 + 76	89.46	86.41	N/A	87.14	N/A	88.42	N/A	$15,000.00	$0.00	$0.00	$0.00
MAIN STEM	127	582 + 76	-----	86.41	N/A	87.14	N/A	88.42	N/A	$90,000.00			
MAIN STEM	109	582 + 76	89.60	86.41	N/A	87.14	N/A	88.42	N/A	$15,000.00	$0.00	$0.00	$0.00

(ORANGE COUNTY)				FLOOD ELEVATION							EXPECTED DAMAGE DURING FLOOD EVENT		
TRIBUTARY	ID NUMBER	STATION	FF ELEVATION	10 YR	DELTA	25 YR	DELTA	100 YR	DELTA	STRUCTURE VALUE	10 YR	25 YR	100 YR
MAIN STEM	120	582 + 76	90.06	86.41	N/A	87.14	N/A	88.42	N/A	$15,000.00	$0.00	$0.00	$0.00
MAIN STEM	108	582 + 76	89.90	86.41	N/A	87.14	N/A	88.42	N/A	$15,000.00	$0.00	$0.00	$0.00
MAIN STEM	129	582 + 76	90.65	86.41	N/A	87.14	N/A	88.42	N/A	$80,000.00	$0.00	$0.00	$0.00
MAIN STEM	107	582 + 76	90.31	86.41	N/A	87.14	N/A	88.42	N/A	$15,000.00	$0.00	$0.00	$0.00
MAIN STEM	123	582 + 76	87.50	86.41	N/A	87.14	N/A	88.42	0.92	$15,000.00	$0.00	$0.00	$1,449.00
MAIN STEM	112	582 + 76	90.70	86.41	N/A	87.14	N/A	88.42	N/A	$15,000.00	$0.00	$0.00	$0.00
MAIN STEM	116	582 + 76	89.04	86.41	N/A	87.14	N/A	88.42	0.38	$15,000.00	$0.00	$0.00	$0.00
MAIN STEM	114	582 + 76	89.73	86.41	N/A	87.14	N/A	88.42	N/A	$15,000.00	$0.00	$0.00	$0.00
MAIN STEM	118	582 + 76	89.73	86.41	N/A	87.14	N/A	88.42	N/A	$15,000.00	$0.00	$0.00	$0.00
MAIN STEM	117	582 + 76	89.55	86.41	N/A	87.14	N/A	88.42	N/A	$15,000.00	$0.00	$0.00	$0.00
MAIN STEM	113	582 + 76	90.64	86.41	N/A	87.14	N/A	88.42	N/A	$15,000.00	$0.00	$0.00	$0.00
MAIN STEM	119	582 + 76	89.73	86.41	N/A	87.14	N/A	88.42	N/A	$10,000.00	$0.00	$0.00	$0.00
MAIN STEM	122	582 + 76	86.88	86.41	N/A	87.14	0.26	88.42	1.54	$15,000.00	$0.00	$409.50	$2,016.45
MAIN STEM	126	582 + 76	89.30	86.41	N/A	87.14	N/A	88.42	0.12	$20,000.00	$0.00	$0.00	$252.00
MAIN STEM	111	582 + 76	90.79	86.41	N/A	87.14	N/A	88.42	N/A	$15,000.00	$0.00	$0.00	$0.00
MAIN STEM	128	582 + 76	-----	86.41	N/A	87.14	N/A	88.42	N/A	$90,000.00			
MAIN STEM	124	582 + 76	87.93	86.41	N/A	87.14	N/A	88.42	0.49	$15,000.00	$0.00	$0.00	$771.75
MAIN STEM	96	592 + 98	90.52	86.56	N/A	87.24	N/A	88.42	N/A	$105,000.00	$0.00	$0.00	$0.00
MAIN STEM	97	593 + 68	89.85	86.56	N/A	87.24	N/A	88.42	N/A	$80,000.00	$0.00	$0.00	$0.00
MAIN STEM	98	594 + 43	89.68	86.56	N/A	87.24	N/A	88.42	N/A	$107,000.00	$0.00	$0.00	$0.00
MAIN STEM	83	594 + 63	90.05	86.56	N/A	87.24	N/A	88.42	N/A	$150,000.00	$0.00	$0.00	$0.00
MAIN STEM	84	594 + 73	89.18	86.56	N/A	87.24	N/A	88.42	0.24	$110,000.00	$0.00	$0.00	$2,772.00
MAIN STEM	99	595 + 33	90.21	86.56	N/A	87.24	N/A	88.42	N/A	$100,000.00	$0.00	$0.00	$0.00
MAIN STEM	85	595 + 43	89.62	86.56	N/A	87.24	N/A	88.42	N/A	$120,000.00	$0.00	$0.00	$0.00
MAIN STEM	100	596 + 43	90.18	86.56	N/A	87.24	N/A	88.42	N/A	$115,000.00	$0.00	$0.00	$0.00
MAIN STEM	86	596 + 48	89.78	86.56	N/A	87.24	N/A	88.42	N/A	$100,000.00	$0.00	$0.00	$0.00
MAIN STEM	101	597 + 43	90.91	86.56	N/A	87.24	N/A	88.42	N/A	$90,000.00	$0.00	$0.00	$0.00
MAIN STEM	87	598 + 23	90.62	86.56	N/A	87.24	N/A	88.42	N/A	$120,000.00	$0.00	$0.00	$0.00
MAIN STEM	102	598 + 68	89.93	86.56	N/A	87.24	N/A	88.42	N/A	$85,000.00	$0.00	$0.00	$0.00
MAIN STEM	88	599 + 23	90.66	86.56	N/A	87.24	N/A	88.42	N/A	$105,000.00	$0.00	$0.00	$0.00
MAIN STEM	103	599 + 68	90.60	86.56	N/A	87.24	N/A	88.42	N/A	$115,000.00	$0.00	$0.00	$0.00
MAIN STEM	89	600 + 33	89.65	86.56	N/A	87.24	N/A	88.42	N/A	$100,000.00	$0.00	$0.00	$0.00
MAIN STEM	104	600 + 68	90.07	86.56	N/A	87.24	N/A	88.42	N/A	$95,000.00	$0.00	$0.00	$0.00
MAIN STEM	90	601 + 53	90.30	86.56	N/A	87.24	N/A	88.42	N/A	$130,000.00	$0.00	$0.00	$0.00
MAIN STEM	105	601 + 73	89.95	86.56	N/A	87.24	N/A	88.42	N/A	$70,000.00	$0.00	$0.00	$0.00
MAIN STEM	91	602 + 58	90.04	86.56	N/A	87.24	N/A	88.42	N/A	$115,000.00	$0.00	$0.00	$0.00
MAIN STEM	106	602 + 93	89.15	86.56	N/A	87.24	N/A	88.42	0.27	$120,000.00	$0.00	$0.00	$3,402.00
MAIN STEM	92	603 + 73	90.13	86.56	N/A	87.24	N/A	88.42	N/A	$115,000.00	$0.00	$0.00	$0.00
MAIN STEM	93	604 + 63	89.95	86.56	N/A	87.24	N/A	88.42	N/A	$110,000.00	$0.00	$0.00	$0.00
MAIN STEM	94	605 + 93	89.95	86.56	N/A	87.24	N/A	88.42	N/A	$117,000.00	$0.00	$0.00	$0.00
MAIN STEM	95	607 + 13	89.76	86.56	N/A	87.24	N/A	88.42	N/A	$150,000.00	$0.00	$0.00	$0.00
MAIN STEM	82	608 + 33	91.31	LIFT STATION									
MAIN STEM	81	643 + 98	87.06	86.56	0.50	87.24	1.18	88.42	2.36	$120,000.00	$6,300.00	$13,777.20	$21,775.20
MAIN STEM	24	699 + 48	96.47	89.41	N/A	89.94	N/A	90.35	N/A	$15,000,000.00	$0.00	$0.00	$0.00
MAIN STEM	23	701 + 18	90.15	89.41	0.26	89.94	0.79	90.35	1.20	$7,500.00	$204.75	$622.12	$869.25
MAIN STEM	22	719 + 98	92.88	89.94	N/A	90.87	N/A	92.38	0.50	$60,000.00	$0.00	$0.00	$3,150.00
MAIN STEM	21	720 + 73	93.18	89.94	N/A	90.87	N/A	92.38	0.20	$50,000.00	$0.00	$0.00	$1,050.00

(ORANGE COUNTY)				FLOOD ELEVATION							EXPECTED DAMAGE DURING FLOOD EVENT		
TRIBUTARY	ID NUMBER	STATION	FF ELEVATION	10 YR	DELTA	25 YR	DELTA	100 YR	DELTA	STRUCTURE VALUE	10 YR	25 YR	100 YR
MAIN STEM	16	721 + 23	93.67	89.94	N/A	90.87	N/A	92.38	N/A	$40,000.00	$0.00	$0.00	$0.00
MAIN STEM	20	721 + 48	92.83	89.94	N/A	90.87	N/A	92.38	0.55	$50,000.00	$0.00	$0.00	$2,887.50
MAIN STEM	15	722 + 38	92.98	89.94	N/A	90.87	N/A	92.38	0.40	$40,000.00	$0.00	$0.00	$1,680.00
MAIN STEM	19	722 + 38	93.00	89.94	N/A	90.87	N/A	92.38	0.38	$50,000.00	$0.00	$0.00	$1,995.00
MAIN STEM	18	723 + 83	92.67	89.94	N/A	90.87	N/A	92.38	0.71	$50,000.00	$0.00	$0.00	$3,727.50
MAIN STEM	17	724 + 78	92.14	89.94	N/A	90.87	N/A	92.38	1.24	$60,000.00	$0.00	$0.00	$7,084.80
MAIN STEM	14	724 + 83	93.86	89.94	N/A	90.87	N/A	92.38	N/A	$50,000.00	$0.00	$0.00	$0.00
MAIN STEM	13	724 + 83	93.31	89.94	N/A	90.87	N/A	92.38	0.07	$40,000.00	$0.00	$0.00	$294.00
MAIN STEM	11	726 + 53	92.37	89.94	N/A	90.87	N/A	92.38	1.01	$50,000.00	$0.00	$0.00	$5,277.25
MAIN STEM	12	726 + 53	92.95	89.94	N/A	90.87	N/A	92.38	0.43	$50,000.00	$0.00	$0.00	$2,257.50
MAIN STEM	10	738 + 42	93.53	89.94	N/A	90.87	N/A	92.38	N/A	$50,000.00	$0.00	$0.00	$0.00
MAIN STEM	8	739 + 27	93.26	89.94	N/A	90.87	N/A	92.38	0.12	$400,000.00	$0.00	$0.00	$5,040.00
MAIN STEM	9	739 + 30	93.49	89.94	N/A	90.87	N/A	92.38	N/A	$400,000.00	$0.00	$0.00	$0.00
MAIN STEM	7	740 + 2	93.27	89.94	N/A	90.87	N/A	92.38	0.11	$400,000.00	$0.00	$0.00	$4,620.00
											$2,831.72	$26,169.92	$91,108.57

(SEMINOLE COUNTY)				FLOOD ELEVATION							EXPECTED DAMAGE DURING FLOOD EVENT		
TRIBUTARY	ID NUMBER	STATION	FF ELEVATION	10 YR	DELTA	25 YR	DELTA	100 YR	DELTA	STRUCTURE VALUE	10 YR	25 YR	100 YR
MAIN STEM	232		REMOVED		N/A		N/A		N/A				
MAIN STEM	426		REMOVED		N/A		N/A		N/A				
MAIN STEM	231		REMOVED		N/A		N/A		N/A				
MAIN STEM	275A		42.05	THERE IS NO 275A									
MAIN STEM	401	102 + 40	27.07	26.65	0.58	27.06	0.99	27.89	1.82	$287,860.00	$17,530.67	$29,923.05	$43,089.76
MAIN STEM	400	102 + 90	29.84	26.70	N/A	27.12	N/A	27.95	N/A	$101,830.00	$0.00	$0.00	$0.00
MAIN STEM	399	103 + 0	30.60	26.71	N/A	27.13	N/A	27.96	N/A	$80,430.00	$0.00	$0.00	$0.00
MAIN STEM	398	103 + 15	29.60	26.72	N/A	27.15	N/A	27.98	N/A	$94,640.00	$0.00	$0.00	$0.00
MAIN STEM	397	103 + 50	29.60	26.76	N/A	27.20	N/A	28.02	N/A	$67,430.00	$0.00	$0.00	$0.00
MAIN STEM	396	103 + 85	30.16	26.79	N/A	27.24	N/A	28.06	N/A	$90,310.00	$0.00	$0.00	$0.00
MAIN STEM	395	104 + 35	28.49	26.84	N/A	27.31	N/A	28.12	0.63	$94,640.00	$0.00	$0.00	$6,279.60
MAIN STEM	394	105 + 5	29.83	26.91	N/A	27.40	N/A	28.21	N/A	$90,460.00	$0.00	$0.00	$0.00
MAIN STEM	393	107 + 0	28.83	27.41	N/A	28.01	0.18	28.85	1.02	$94,640.00	$0.00	$1,811.13	$10,047.01
MAIN STEM	392	107 + 70	30.14	27.47	N/A	28.08	N/A	28.93	N/A	$88,500.00	$0.00	$0.00	$0.00
MAIN STEM	391	108 + 10	29.95	27.49	N/A	28.12	N/A	28.98	0.03	$94,640.00	$0.00	$0.00	$263.96
MAIN STEM	390	108 + 35	29.63	27.51	N/A	28.13	N/A	29.00	0.37	$75,620.00	$0.00	$0.00	$2,962.65
MAIN STEM	389	122 + 51	41.24	30.30	N/A	31.57	N/A	33.03	N/A	$563,280.00	$0.00	$0.00	$0.00
MAIN STEM	388	169 + 71	37.85	PUMP STATION									
MAIN STEM	292	182 + 46	43.08	37.64	N/A	38.81	N/A	40.93	N/A	$60,310.00	$0.00	$0.00	$0.00
MAIN STEM	291	183 + 56	42.56	37.78	N/A	38.91	N/A	41.00	N/A	$48,590.00	$0.00	$0.00	$0.00
MAIN STEM	290	184 + 46	42.92	37.90	N/A	39.00	N/A	41.05	N/A	$59,860.00	$0.00	$0.00	$0.00
MAIN STEM	289	185 + 56	42.27	38.05	N/A	39.10	N/A	41.11	N/A	$57,230.00	$0.00	$0.00	$0.00
MAIN STEM	288	186 + 56	42.66	38.18	N/A	39.19	N/A	41.17	N/A	$55,800.00	$0.00	$0.00	$0.00
MAIN STEM	308	186 + 76	43.00	38.20	N/A	39.21	N/A	41.18	N/A	$52,230.00	$0.00	$0.00	$0.00
MAIN STEM	287	187 + 56	42.48	38.31	N/A	39.29	N/A	41.23	N/A	$77,290.00	$0.00	$0.00	$0.00
MAIN STEM	307	187 + 91	42.65	38.34	N/A	39.31	N/A	41.25	N/A	$54,580.00	$0.00	$0.00	$0.00
MAIN STEM	306	188 + 1	42.68	38.35	N/A	39.32	N/A	41.25	N/A	$67,560.00	$0.00	$0.00	$0.00
MAIN STEM	305	188 + 6	43.46	38.35	N/A	39.32	N/A	41.25	N/A	$49,080.00	$0.00	$0.00	$0.00
MAIN STEM	286	188 + 56	42.61	38.39	N/A	39.36	N/A	41.27	N/A	$72,780.00	$0.00	$0.00	$0.00
MAIN STEM	304	189 + 46	42.97	38.45	N/A	39.42	N/A	41.31	N/A	$46,930.00	$0.00	$0.00	$0.00
MAIN STEM	285	189 + 56	42.02	38.45	N/A	39.42	N/A	41.31	0.29	$57,090.00	$0.00	$0.00	$1,731.42
MAIN STEM	303	189 + 61	43.41	38.46	N/A	39.43	N/A	41.31	N/A	$54,000.00	$0.00	$0.00	$0.00
MAIN STEM	284	190 + 56	41.80	38.52	N/A	39.49	N/A	41.35	0.55	$65,230.00	$0.00	$0.00	$3,739.95
MAIN STEM	302	190 + 81	42.95	38.54	N/A	39.51	N/A	41.36	N/A	$55,780.00	$0.00	$0.00	$0.00
MAIN STEM	301	190 + 86	43.42	38.54	N/A	39.51	N/A	41.36	N/A	$53,650.00	$0.00	$0.00	$0.00
MAIN STEM	283	191 + 56	42.30	38.59	N/A	39.56	N/A	41.38	0.08	$57,890.00	$0.00	$0.00	$506.07
MAIN STEM	300	192 + 36	42.82	38.64	N/A	39.61	N/A	41.41	N/A	$57,800.00	$0.00	$0.00	$0.00
MAIN STEM	282	192 + 56	42.65	38.66	N/A	39.62	N/A	41.42	N/A	$56,340.00	$0.00	$0.00	$0.00
MAIN STEM	281	193 + 61	42.12	38.73	N/A	39.69	N/A	41.46	0.34	$72,200.00	$0.00	$0.00	$2,574.01
MAIN STEM	299	194 + 1	40.94	38.75	N/A	39.72	N/A	41.47	1.53	$55,900.00	$0.00	$0.00	$7,497.63
MAIN STEM	298	194 + 21	42.11	38.77	N/A	39.73	N/A	41.48	0.37	$55,060.00	$0.00	$0.00	$2,149.84
MAIN STEM	280	194 + 61	41.37	38.80	N/A	39.76	N/A	41.50	1.13	$72,200.00	$0.00	$0.00	$8,079.73
MAIN STEM	279	195 + 61	40.01	38.86	N/A	39.82	0.81	41.53	2.52	$57,200.00	$0.00	$4,886.51	$10,951.58
MAIN STEM	296	195 + 91	41.03	38.88	N/A	39.84	N/A	41.55	1.51	$52,700.00	$0.00	$0.00	$7,004.37
MAIN STEM	278	196 + 46	40.47	38.93	N/A	39.88	0.41	41.57	2.10	$69,540.00	$0.00	$3,018.26	$11,508.11
MAIN STEM	297	196 + 51	41.94	38.93	N/A	39.89	N/A	41.57	0.63	$48,130.00	$0.00	$0.00	$3,188.39
MAIN STEM	295	196 + 96	41.51	38.98	N/A	39.93	N/A	41.60	1.09	$56,000.00	$0.00	$0.00	$6,140.81
MAIN STEM	277	197 + 56	41.17	39.04	N/A	39.98	N/A	41.63	1.46	$60,360.00	$0.00	$0.00	$7,845.04
MAIN STEM	293	198 + 16	42.71	39.10	N/A	40.03	N/A	41.66	N/A	$69,150.00	$0.00	$0.00	$0.00

(SEMINOLE COUNTY)				FLOOD ELEVATION							EXPECTED DAMAGE DURING FLOOD EVENT		
TRIBUTARY	ID NUMBER	STATION	FF ELEVATION	10 YR	DELTA	25 YR	DELTA	100 YR	DELTA	STRUCTURE VALUE	10 YR	25 YR	100 YR
MAIN STEM	294	198 + 16	41.81	39.10	N/A	40.03	N/A	41.66	0.85	$73,530.00	$0.00	$0.00	$6,569.57
MAIN STEM	276	198 + 56	41.27	39.14	N/A	40.07	N/A	41.68	1.41	$54,840.00	$0.00	$0.00	$6,991.75
MAIN STEM	275	200 + 21	41.61	39.31	N/A	40.22	N/A	41.77	1.16	$54,840.00	$0.00	$0.00	$6,244.56
MAIN STEM	274	201 + 21	41.86	39.41	N/A	40.31	N/A	41.83	0.97	$62,340.00	$0.00	$0.00	$6,331.48
MAIN STEM	273	202 + 21	42.00	39.51	N/A	40.41	N/A	41.89	0.89	$59,140.00	$0.00	$0.00	$5,514.21
MAIN STEM	272	202 + 96	42.39	39.59	N/A	40.49	N/A	41.94	0.55	$49,310.00	$0.00	$0.00	$2,850.24
MAIN STEM	271	203 + 96	41.85	39.70	N/A	40.60	N/A	42.01	1.16	$51,820.00	$0.00	$0.00	$5,894.38
MAIN STEM	270	204 + 86	41.58	39.79	N/A	40.70	0.12	42.07	1.49	$60,010.00	$0.00	$775.82	$7,915.06
MAIN STEM	269	205 + 86	41.91	39.90	N/A	40.82	N/A	42.14	1.23	$62,560.00	$0.00	$0.00	$7,364.92
MAIN STEM	268	208 + 36	43.30	40.16	N/A	41.10	N/A	42.32	0.02	$87,150.00	$0.00	$0.00	$169.29
MAIN STEM	267	208 + 86	42.23	40.21	N/A	41.15	N/A	42.35	1.12	$77,010.00	$0.00	$0.00	$8,604.39
MAIN STEM	266	208 + 86	42.05	40.21	N/A	41.15	0.10	42.35	1.30	$54,840.00	$0.00	$593.81	$6,665.29
MAIN STEM	265	210 + 39	41.80	40.35	N/A	41.30	0.50	42.45	1.65	$79,010.00	$0.00	$4,139.47	$11,092.62
MAIN STEM	264	211 + 39	42.52	40.43	N/A	41.37	N/A	42.50	0.98	$56,880.00	$0.00	$0.00	$5,854.35
MAIN STEM	263	212 + 39	42.93	40.51	N/A	41.43	N/A	42.55	0.62	$72,700.00	$0.00	$0.00	$4,740.52
MAIN STEM	262	213 + 39	42.94	40.59	N/A	41.50	N/A	42.60	0.66	$49,600.00	$0.00	$0.00	$3,446.64
MAIN STEM	230	307 + 87	60.19	59.41	0.22	60.33	1.14	62.83	3.64	SEE 228 & 22			
MAIN STEM	229	308 + 37	62.37	59.23	N/A	60.21	N/A	62.74	1.37	SEE 228 & 23			
MAIN STEM	228	308 + 82	60.93	60.73	0.80	61.68	1.75	63.03	3.10	$16,150.00	$1,356.60	$2,352.01	$3,778.77
MAIN STEM	225B	310 + 87	60.07	60.76	1.69	61.71	2.64	63.06	3.99	$106,840.00	$15,261.03	$21,240.12	$38,479.55
MAIN STEM	225A	312 + 52	61.40	60.80	0.40	61.75	1.35	63.09	2.69	$79,980.00	$3,319.27	$9,902.81	$16,113.41
MAIN STEM	226	313 + 52	62.25	60.81	N/A	61.76	0.51	63.10	1.85	$95,480.00	$0.00	$5,153.06	$14,472.79
MAIN STEM	227	314 + 82	61.79	60.87	0.08	61.81	1.02	63.16	2.37	$105,420.00	$854.12	$11,204.04	$19,211.02
											$38,321.69	$95,000.09	$323,864.77

Appendix B

SUMMARY OF PEAK DISCHARGES, ELEVATIONS, AND VELOCITIES

Summary of Peak Discharges, Elevations, and Velocities.

STATION	LOCATION	DISCHARGE (cfs) 10 YR	25 YR	100 YR	ELEVATION (ft. NGVD) 10 YR	25 YR	100 YR	VELOCITY of FLOW (fps) 10 YR	25 YR	100 YR
LITTLE WEKIVA RIVER										
0 + 00	Limit of Study	1200	1810	3030	18.00	19.20	20.00	0.46	0.44	0.59
38 + 20	Confluence w/ Tributary A	1200	1810	3030	19.70	20.20	20.90	2.96	2.70	3.17
46 + 40	Springs Landing Blvd.	1200	1810	3030	20.24	20.65	21.31	2.28	3.01	4.14
60 + 96	Channel *	1170	1760	2950	20.88	21.48	22.40	4.23	4.17	4.34
95 + 84	Footbridge 1	1140	1720	2870	26.40	26.60	27.27	6.33	7.27	7.16
102 + 44	Channel *	1140	1720	2870	26.65	27.06	27.89	3.75	4.48	4.85
105 + 80	Footbridge 2	1110	1670	2780	27.35	27.94	28.77	4.26	4.95	5.72
107 + 85	Channel *	1110	1670	2780	27.48	28.10	28.95	3.17	3.76	4.59
111 + 01	Footbridge 3	1070	1620	2720	27.81	28.48	29.39	3.66	3.88	4.20
114 + 14	Footbridge 4	1040	1580	2640	28.56	29.34	30.26	4.75	5.78	6.72
116 + 56	Woodbridge Ave.	1010	1530	2560	30.11	31.35	32.69	3.34	3.71	4.66
118 + 86	Channel *	1010	1530	2560	30.19	31.44	32.84	2.69	3.18	4.19
120 + 66	S.R. 434	1010	1530	2560	30.59	31.85	33.36	3.04	3.15	3.73
160 + 66	Channel *	1010	1530	2560	34.55	35.73	37.55	5.10	6.10	7.34
170 + 21	Montgomery Road	809	1220	2040	36.09	37.71	40.25	4.58	4.06	5.63
200 + 51	Confluence w/ Tributary B	809	1220	2040	39.34	40.24	41.79	4.33	5.08	4.47
206 + 51	Footbridge 5 (Dismantled)	809	1220	2040	39.96	40.89	42.19	4.33	5.08	4.47
224 + 81	Confluence w/ Tributary C	712	1020	1570	41.60	42.55	43.70	4.76	4.96	5.66
261 + 95	Abandoned SCL RR Bridge	631	869	1410	48.79	49.54	51.23	9.37	9.94	10.15
273 + 45	Channel *	631	869	1410	52.07	52.94	54.39	3.42	3.75	4.41

NOTE: At all named streets, elevations refer to the upstream side of a bridge or culvert, velocities are the maximum values in the vicinity of the structure (i.e., either upstream, or downstream, or at the structure).
An asterisk (*) refers to a typical channel section between two structures (e.g., bridges); these locations are included mainly to indicate flow velocities in the channel.

STATION	LOCATION	DISCHARGE (cfs) 10 YR	25 YR	100 YR	ELEVATION (ft. NGVD) 10 YR	25 YR	100 YR	VELOCITY of FLOW (fps) 10 YR	25 YR	100 YR
LITTLE WEKIVA RIVER (CONTINUED)										
275 + 55	S.R. 436	631	869	1410	52.31	53.28	55.04	3.90	4.85	6.80
277 + 70	Orange Ave.	631	869	1410	52.56	53.65	55.71	5.34	6.22	7.88
283 + 90	Channel *	631	869	1410	53.94	54.95	56.85	5.43	5.79	6.30
290 + 20	Footbridge 6	609	833	1370	56.46	57.01	58.65	4.21	4.45	4.88
296 + 40	Channel *	609	833	1370	57.15	57.87	59.53	3.39	3.86	4.41
297 + 35	Weathersfield Ave.	609	833	1370	57.55	58.45	60.49	5.40	6.48	8.39
301 + 85	Channel *	609	833	1370	58.16	59.06	60.98	4.44	4.86	5.35
302 + 47	Footbridge 7	609	833	1370	58.69	59.57	62.32	6.32	6.64	6.96
307 + 87	Channel *	609	833	1370	59.41	60.33	62.83	1.55	1.64	1.45
308 + 54	Covered Bridge at Stables	609	833	1370	60.73	61.67	63.02	5.23	4.95	4.58
309 + 04	Confluence w/ Tributary F	609	833	1370	60.73	61.68	63.03	3.21	3.54	4.30
330 + 90	Northwestern Ave.	546	686	1080	62.49	63.27	64.91	3.80	4.16	5.39
341 + 20	D/S Side of Trout Lake	546	686	1080	62.49	63.27	64.91	2.00	2.11	2.38
349 + 80	U/S Side of Trout Lake	546	686	1080	62.49	63.27	64.91	0.98	1.10	1.33
352 + 63	Forest City Road (S.R. 434)	549	691	1030	62.66	63.47	64.99	0.98	1.10	1.33
359 + 23	D/S Side of Lake Lotus	549	691	1030	62.66	63.47	64.99	1.78	1.67	1.57
383 + 20	Confluence w/ Tributary D	549	691	1030	62.66	63.47	64.99	0.09	0.10	0.11
383 + 21	Confluence w/ Tributary E	549	691	1030	62.66	63.47	64.99	0.09	0.10	0.11
400 + 48	U/S Side of Lake Lotus	549	691	1030	62.66	63.47	64.99	5.86	6.11	5.33
414 + 82	Oranole Road	795	1080	1450	65.90	67.28	68.22	3.72	4.18	4.70
428 + 63	Campo Way	776	1050	1400	66.87	68.08	68.98	3.91	3.58	2.23
432 + 74	Egret Way	756	1010	1360	67.72	68.81	69.52	3.01	3.34	3.50
435 + 99	Elba Way	737	983	1310	68.26	69.20	69.90	3.45	3.90	4.54

STATION	LOCATION	DISCHARGE (cfs) 10 YR	25 YR	100 YR	ELEVATION (ft. NGVD) 10 YR	25 YR	100 YR	VELOCITY of FLOW (fps) 10 YR	25 YR	100 YR
LITTLE WEKIVA RIVER (CONTNUED)										
441 + 97	Channel *	737	983	1310	68.52	69.53	70.33	1.26	1.49	1.81
443 + 22	Riverside Acres Culvert Outlet	737	983	1310	68.45	69.42	70.15	3.10	3.82	4.84
464 + 57	Riverside Acres Culvert Inlet	718	951	1270	69.72	71.31	77.99	5.14	6.08	4.20
464 + 79	Sheet Pile Weir	718	951	1270	73.77	74.48	78.32	9.12	9.79	4.64
483 + 54	Channel *	583	775	1010	75.65	76.48	78.84	4.85	5.26	4.25
490 + 35	Riverside Park Road	583	773	1010	76.48	77.37	79.43	4.19	4.60	4.16
491 + 25	Confluence w/ Tributary G	583	773	1010	76.50	77.39	79.44	5.53	5.90	5.00
508 + 56	Sherry Drive	582	772	1010	78.87	79.69	81.25	5.33	5.70	5.27
511 + 87	Kelvington Drive	582	772	1010	79.33	80.15	81.76	5.65	6.14	5.72
514 + 98	Wallington Drive	582	772	1010	79.70	80.56	82.06	5.63	6.01	5.66
529 + 48	Gusty Lane	557	737	872	81.74	82.65	83.75	6.23	7.27	7.55
536 + 40	Edgewater Drive (S.R. 424)	557	737	872	83.52	85.27	87.02	5.68	6.62	6.90
545 + 22	Channel *	530	664	783	83.68	85.39	87.13	2.19	2.07	1.46
546 + 00	SCL R.R. Bridge	530	664	783	83.75	85.45	87.16	2.62	2.22	1.90
555 + 50	Channel *	502	592	695	83.76	85.45	87.16	2.57	2.11	1.49
564 + 19	U.S. 441	475	519	606	84.45	85.83	87.36	3.42	4.06	3.61
564 + 79	Confluence w/ Tributary H	475	519	606	84.45	85.83	87.36	1.12	0.97	0.90
569 + 52	Rosewood Way	375	471	552	86.41	87.14	88.42	4.33	5.09	5.37
591 + 14	Channel *	375	471	552	86.41	87.14	88.42	0.55	0.56	0.04
591 + 68	Lake Orlando Weir	375	471	552	86.56	87.24	88.42	3.58	3.31	0.86
593 + 33	Lake Orlando Parkway North	375	471	552	86.56	87.24	88.42	2.15	2.24	1.76
593 + 93	D/S Side of Lake Orlando	375	471	552	86.56	87.24	88.42	2.15	2.24	1.76

STATION	LOCATION	DISCHARGE (cfs) 10 YR	25 YR	100 YR	ELEVATION (ft. NGVD) 10 YR	25 YR	100 YR	VELOCITY of FLOW (fps) 10 YR	25 YR	100 YR
LITTLE WEKIVA RIVER (CONTNUED)										
644 + 93	U/S Side of Lake Orlando	562	702	1059	86.56	87.24	88.42	1.44	1.30	1.19
647 + 03	Golf Cart Bridge	562	702	1059	86.56	87.24	88.42	3.16	3.15	2.97
650 + 87	Golf Cart Crossing	562	702	1059	87.40	87.90	88.59	3.17	3.48	3.10
656 + 22	Channel *	562	702	1059	87.51	87.99	88.64	2.80	3.29	4.25
657 + 10	Lake Orlando Parkway South	562	702	1059	88.03	88.64	89.08	2.99	3.16	4.25
678 + 10	Channel *	562	702	1059	88.03	88.64	89.08	2.56	2.53	3.10
678 + 84	SCL R.R. Bridge	425	487	617	88.03	88.63	89.07	3.18	3.31	3.87
680 + 14	Culverted Crossing	425	487	617	89.31	89.84	90.23	2.76	2.04	1.83
687 + 34	Seaboard Road	425	487	617	89.35	89.88	90.28	1.31	1.36	1.55
699 + 78	Channel *	354	403	494	89.41	89.94	90.35	1.72	1.84	2.15
702 + 88	Old Silver Star Road (SR-438)	354	403	494	89.94	90.87	92.38	1.51	1.53	1.56
705 + 78	New Silver Star Road	354	403	494	89.94	90.87	92.38	1.86	1.77	1.58
718 + 18	Lawne Lake Weir	354	403	494	89.94	90.87	92.38	2.57	1.74	0.63
734 + 62	D/S Side of Lawne Lake	354	403	494	89.94	90.87	92.38	0.47	0.33	0.24
745 + 58	Confluence w/ Tributary I	354	403	494	89.94	90.87	92.38	0.04	0.04	0.05
759 + 12	U/S Side of Lawne Lake	354	403	494	89.94	90.87	92.38	0.06	0.06	0.07
TRIBUTARY A										
0 + 00	Confluence w/ Little Wekiva R.	141	198	289	19.70	20.20	20.90	2.61	3.09	3.62
7 + 61	Springs Landing Blvd.	99	147	227	25.79	26.88	28.53	7.15	9.28	11.08
12 + 57	Wisteria Drive	99	147	227	26.95	27.84	28.74	4.74	4.31	2.25
25 + 57	Channel *	99	147	227	26.95	27.84	28.74	0.25	0.24	0.26
32 + 42	Wisteria Drive	122	177	260	31.72	32.24	33.05	8.37	9.42	6.23
36 + 92	Upper Limit of Tributary A	122	177	260	31.72	32.24	33.05	3.50	3.95	4.22

STATION	LOCATION	DISCHARGE (cfs) 10 YR	25 YR	100 YR	ELEVATION (ft. NGVD) 10 YR	25 YR	100 YR	VELOCITY of FLOW (fps) 10 YR	25 YR	100 YR
TRIBUTARY B										
0 + 00	Confluence w/ Little Wekiva R.	264	372	559	39.34	40.24	41.79	2.21	2.26	2.09
21 + 47	Jamestown Blvd.	108	143	197	41.12	42.05	42.92	2.65	3.07	2.64
39 + 87	Upper Limit of Tributary B	108	143	197	41.14	42.06	42.92	0.08	0.09	0.11
TRIBUTARY C										
0 + 00	Confluence w/ Little Wekiva R.	171	282	445	41.60	42.55	43.70	1.44	2.05	2.77
9 + 73	S.R. 434	171	282	445	46.59	47.20	47.93	3.73	4.66	5.71
20 + 13	Channel *	151	228	370	46.59	47.20	47.93	0.23	0.29	0.40
31 + 43	Confluence of Branch C1 w/ Tributary C	151	228	370	46.59	47.20	47.93	2.14	2.64	3.49
31 + 93	Alder Ave.	21	34	69	49.40	49.79	50.66	5.85	6.84	8.64
38 + 73	Willow Ave.	21	34	69	50.08	50.66	51.95	3.42	2.67	2.15
42 + 23	Channel *	21	34	69	50.90	51.26	52.26	1.31	1.60	1.83
44 + 73	Culvert D/S of Lake Brantley Road.	21	34	69	51.00	51.44	52.35	2.05	2.74	2.63
53 + 13	Channel *	21	34	69	51.25	51.78	52.75	2.32	2.70	3.57
54 + 28	Lake Brantley Road	21	34	69	52.26	52.94	54.76	6.14	7.26	10.04
58 + 98	Channel *	21	34	69	52.26	52.95	54.76	0.05	0.07	0.10
63 + 38	Dirt Road	21	34	69	52.51	53.55	54.77	4.60	2.20	2.12
72 + 08	Channel *	21	34	69	52.53	53.56	54.78	0.13	0.12	0.15
81 + 15	Dirt Road	21	34	69	53.77	55.89	56.11	7.68	2.56	3.07
93 + 00	Channel *	21	34	69	53.78	55.89	56.11	0.04	0.03	0.06
97 + 30	Confluence of Branch C2 w/ Tributary C	21	34	69	55.18	56.04	56.48	1.28	1.17	1.89
101 + 85	Dirt Road	**	2	20	55.97	56.68	57.70		3.58	2.02
105 + 15	Channel *	**	2	20	55.97	56.68	57.70		0.00	0.01

** Discharge not significant.

STATION	LOCATION	DISCHARGE (cfs) 10 YR	25 YR	100 YR	ELEVATION (ft. NGVD) 10 YR	25 YR	100 YR	VELOCITY of FLOW (fps) 10 YR	25 YR	100 YR
TRIBUTARY C (CONTINUED)										
112 + 90	Upper Limit of Tributary C				55.97	56.68	57.70			
BRANCH C1										
0 + 00	Confluence w/ Tributary C	137	197	337	46.59	47.20	47.93	----	----	----
12 + 70	D/S Side of Lake Harriet	137	197	337	54.75	55.72	56.84	----	----	----
16 + 70	U/S Side of Lake Harriet	137	197	337	54.75	55.72	56.84	----	----	----
24 + 85	D/S Side of Little Pearl Lake	28	49	68	60.31	60.72	61.59	----	----	----
27 + 65	Confluence of Forest Lake Outlet w/ Branch C1	28	49	68	60.31	60.72	61.59	----	----	----
31 + 05	U/S Side of Little Pearl Lake	28	49	68	60.31	60.72	61.59	----	----	----
35 + 40	D/S Side of West Pearl Lake	28	49	68	60.31	60.72	61.59	----	----	----
46 + 30	U/S Side of West Pearl Lake	28	49	68	60.31	60.72	61.59	----	----	----
46 + 95	Pearl Lake Causeway & D/S Side of Pearl Lake	28	49	68	60.31	60.72	61.59	----	----	----
62 + 20	U/S Side of Pearl Lake (Upper Limit of Branch C1)				60.31	60.72	61.59			
BRANCH C2										
0 + 00	Confluence w/ Tributary C	32	50	79	55.18	56.04	56.48	----	----	----
0 + 75	Dirt Road	32	50	79	56.56	57.38	57.43	5.35	6.20	7.20
22 + 70	Channel *	21	27	36	56.57	57.39	57.44	0.01	0.02	0.02
43 + 00	S.R. 436	21	27	36	62.26	63.15	64.77	7.00	7.60	8.37
46 + 50	D/S Side of Mirror Lake	21	27	36	62.26	63.15	64.77	0.04	0.04	0.03
79 + 95	U/S Side of Mirror Lake (Upper Limit of Branch C2)				62.26	63.15	64.77			
FOREST LAKE OUTLET										
0 + 00	Confluence w/ Branch C1	8	12	19	60.31	60.72	61.59	----	----	----

STATION	LOCATION	DISCHARGE (cfs) 10 YR	25 YR	100 YR	ELEVATION (ft. NGVD) 10 YR	25 YR	100 YR	VELOCITY of FLOW (fps) 10 YR	25 YR	100 YR
FOREST LAKE OUTLET (CONTINUED)										
6 + 25	D/S Side of Forest Lake	8	12	19	65.83	66.33	67.27	----	----	----
15 + 30	U/S Side of Forest Lake (Upper Limit of Forest Lake Outlet)				65.83	66.33	67.27			
TRIBUTARY D										
0 + 00	Confluence w/ Little Wekiva R.	41	54	82	62.66	63.47	64.99	0.04	0.04	0.04
11 + 80	Country Creek Parkway	41	54	82	87.58	87.75	88.06	2.33	2.57	3.04
21 + 30	Channel *	41	54	82	95.66	95.85	96.16	1.43	1.58	1.85
29 + 80	Eden Park Road	41	54	82	101.99	102.36	103.05	2.27	2.68	3.46
30 + 30	Channel *	41	54	82	102.02	102.40	103.11	2.60	2.93	3.50
30 + 90	Seaboard Coast Line	41	54	82	102.27	102.72	103.57	2.45	2.74	3.24
40 + 40	D/S Side of Cub Lake	41	54	82	102.92	103.22	103.92	0.01	0.01	0.01
47 + 90	U/S Side of Cub Lake	41	54	82	102.92	103.22	103.92	0.02	0.02	0.03
55 + 30	Little Bear Lake Outlet Confluence w/ Tributary D	41	54	82	103.04	103.36	104.07	2.60	2.91	3.29
55 + 31	D/S Side of Bear Lake Road	16	21	37	103.04	103.36	104.07	4.05	4.42	5.67
62 + 89	D/S Side of Bear Lake	16	21	37	105.35	105.72	106.36	0.01	0.01	0.02
113 + 09	U/S Side of Bear Lake (Upper Limit of Tributary D)	16	21	37	105.35	105.72	106.36	0.02	0.02	0.03
LITTLE BEAR LAKE OUTLET										
0 + 00	Confluence w/ Tributary D	22	23	25	103.04	103.36	104.07	1.39	1.24	1.00
3 + 80	D/S Side of Little Bear Lake	22	23	25	105.35	105.72	106.36	0.02	0.02	0.02
25 + 55	U/S Side of Little Bear Lake (Upper Limit of Little Bear Lake Outlet)				105.35	105.72	106.36			
TRIBUTARY E										
0 + 00	Confluence w/ Little Wekiva R.	7	16	35	62.66	63.47	64.99	0.00	0.00	0.01

STATION	LOCATION	DISCHARGE (cfs) 10 YR	25 YR	100 YR	ELEVATION (ft. NGVD) 10 YR	25 YR	100 YR	VELOCITY of FLOW (fps) 10 YR	25 YR	100 YR
TRIBUTARY E (CONTINUED)										
25 + 68	D/S Side of Lake Bosse	7	16	35	62.66	63.47	64.99	0.00	0.00	0.00
31 + 20	Confluence of Branch E1 w/ Tributary E	7	16	35	62.66	63.47	64.99	0.00	0.00	0.00
37 + 35	U/S Side of Lake Bosse	7	16	35	62.66	63.47	64.99	0.00	0.00	0.00
47 + 38	Rundle Road	7	16	35	74.67	75.41	76.83	4.09	5.15	6.42
57 + 58	D/S Side of Lake Gandy	5	10	20	74.67	75.41	76.83	0.00	0.00	0.00
61 + 48	Confluence of Branch E2 w/ Tributary E	5	10	20	74.67	75.41	76.83	0.00	0.00	0.00
64 + 98	U/S Side of Lake Gandy	5	10	20	74.67	75.41	76.83	0.28	0.21	0.15
73 + 03	Dirt Road	5	10	20	80.38	80.81	81.19	2.66	5.31	6.89
76 + 03	Channel *	5	10	20	80.70	80.87	81.13	3.03	3.72	4.52
77 + 03	Magnolia Home Road	5	10	20	81.88	82.27	83.03	3.04	4.42	6.71
91 + 13	D/S Side of Lake Eve	5	10	20	81.88	82.27	83.03	0.00	0.00	0.01
96 + 75	U/S Side of Lake Eve (Upper Limit of Tributary E)				81.88	82.27	83.03			
BRANCH E1										
0 + 00	Confluence w/ Tributary E & U/S Side of Lake Bosse	5	10	20	62.64	63.68	64.96	----	----	----
0 + 40	Eden Park Road & D/S Side of Lake Hill	5	10	20	62.64	63.68	64.96	----	----	----
17 + 15	U/S Side of Lake Hill (Upper Limit of Branch E1)				62.64	63.68	64.96			
BRANCH E2										
0 + 00	Confluence w/ Tributary E	5	10	20	74.67	75.48	76.83	----	----	----
17 + 10	U/S Side of Lake Gandy	5	10	20	74.67	75.48	76.83	----	----	----
30 + 60	D/S Side of Lake Lockhart	5	10	20	74.67	75.48	76.83	----	----	----

STATION	LOCATION	DISCHARGE (cfs) 10 YR	25 YR	100 YR	ELEVATION (ft. NGVD) 10 YR	25 YR	100 YR	VELOCITY of FLOW (fps) 10 YR	25 YR	100 YR
BRANCH E2 (CONTINUED)										
31 + 85	U/S Side of Lake Lockhart (Upper Limit of Branch E2)	----	----	----	74.67	75.48	76.83	----	----	----
TRIBUTARY F										
0 + 00	Confluence with the Little Wekiva River.	210	268	319	60.73	61.68	63.03	0.56	0.46	0.35
1 + 59	Footbridge	210	268	319	60.74	61.69	63.04	0.76	0.62	0.45
1 + 79	Rock Weir	210	268	319	60.75	61.70	63.05	0.95	0.69	0.46
2 + 84	Channel *	210	268	319	60.76	61.71	63.05	0.80	0.62	0.43
4 + 49	Horse Lovers Lane	210	268	319	60.82	61.74	63.08	4.74	2.63	1.23
9 + 54	Channel *	210	268	319	61.23	61.86	63.08	4.44	4.73	4.25
14 + 77	Spring Valley Road	210	268	319	64.54	66.16	67.98	5.99	6.82	7.19
14 + 84	Spring Lake Weir	210	268	319	65.98	66.64	68.06	4.70	4.64	4.40
16 + 92	D/S Side of Spring Lake	210	268	319	65.98	66.64	68.10	1.85	1.98	1.67
44 + 32	U/S Side of Spring Lake (Upper Limit of Tributary F)				65.98	66.64	68.10			
TRIBUTARY G										
0 + 00	Confluence w/ Little Wekiva R.	109	176	291	76.50	77.39	79.44	1.46	1.88	2.00
2 + 45	Footbridge	109	176	291	76.62	77.72	79.52	2.86	3.50	4.01
8 + 15	Channel *	109	176	291	77.42	78.46	80.05	4.31	4.19	4.08
9 + 05	Forest City Road	109	176	291	80.61	81.03	81.70	6.41	7.79	9.15
16 + 45	D/S Side of Lake Lovely	109	176	291	80.61	81.03	81.70	0.01	0.02	0.03
23 + 45	U/S Side of Lake Lovely	124	184	282	80.61	81.03	81.70	0.04	0.05	0.07
36 + 45	Confluence of Branch G1 w/ Tributary G	124	184	282	82.91	83.21	83.61	0.13	0.16	0.19
39 + 45	D/S Side of Lake Shadow	124	184	282	82.96	83.27	83.72	0.09	0.13	0.17

STATION	LOCATION	DISCHARGE (cfs) 10 YR	25 YR	100 YR	ELEVATION (ft. NGVD) 10 YR	25 YR	100 YR	VELOCITY of FLOW (fps) 10 YR	25 YR	100 YR
TRIBUTARY G (CONTINUED)										
55 + 70	U/S Side of Lake Shadow	124	184	282	82.96	83.27	83.72	0.01	0.02	0.02
67 + 90	Keller Road	52	73	93	90.74	91.23	92.17	6.79	7.96	3.92
68 + 80	D/S Side of Harvest Lake	52	73	93	90.74	91.23	92.17			
75 + 75	U/S Side of Harvest Lake	52	73	93	90.74	91.23	92.17	0.03	0.04	0.04
81 + 40	D/S Side of Lake Lucien	52	73	93	90.76	91.24	92.17	0.02	0.02	0.02
90 + 90	U/S Side of Lake Lucien	15	38	110	90.76	91.24	92.17	0.00	0.00	0.01
97 + 50	Maitland Colonnades Control Structure	15	38	110	91.52	91.57	92.24	1.17	2.12	0.95
99 + 75	D/S Side of Lake Hungerford	15	38	110	94.72	94.92	95.12	0.01	0.02	0.07
122 + 60	U/S Side of Lake Hungerford (Upper Limit of Tributary G)	15	38	110	94.72	94.92	95.12	0.02	0.06	0.16
BRANCH G1										
0 + 00	Confluence w/ Tributary G	69	89	122	82.91	83.21	83.62	0.00	0.00	0.00
7 + 30	Lake Avenue	69	89	122	83.75	84.52	85.92	2.29	2.85	3.73
9 + 00	D/S Side of Lake Weston	69	89	122	83.75	84.52	85.92	0.07	0.05	0.03
10 + 00	Confluence of Eatonville Borrow Pit Outlet w/ Branch G1	69	89	122	83.75	84.52	85.92	0.02	0.02	0.02
23 + 20	U/S Side of Lake Weston				83.75	84.52	85.92			
36 + 20	Upper Limit of Branch G1				83.75	84.52	85.92			
EATONVILLE BORROW PIT OUTLET										
0 + 00	Confluence w/ Branch G1	9	12	16	83.75	84.52	85.92			
64 + 05	Culvert	9	12	16	94.77	95.38	96.43			
70 + 35	D/S Side of Eatonville Borrow Pit	9	12	16	94.77	95.38	96.43			
95 + 90	U/S Side of Eatonville Borrow Pit (Upper Limit of Eatonville Borrow Pit Outlet)				94.77	95.38	96.43			

STATION	LOCATION	DISCHARGE (cfs) 10 YR	25 YR	100 YR	ELEVATION (ft. NGVD) 10 YR	25 YR	100 YR	VELOCITY of FLOW (fps) 10 YR	25 YR	100 YR
TRIBUTARY H										
0 + 00	Confluence w/ Little Wekiva R.	101	122	140	84.45	85.83	87.36			
1 + 21	Butterfly Valve D/S Side of Winter Rose Drive	101	122	140	84.74	87.19	88.48	1.47	1.25	@
4 + 91	Winter Rose Drive	101	122	140	84.88	87.19	88.48	2.33	1.71	@
19 + 74	Rosewood Way	101	122	140	85.16	87.19	88.48	2.12	0.89	@
27 + 49	Rosemont Drive	101	122	140	85.25	87.19	88.48	2.30	1.86	@
39 + 19	Golf Course Culvert No. 1	101	122	140	85.39	87.19	88.48	2.35	1.85	@
45 + 49	Golf Course Culvert No. 2	101	122	140	85.50	87.45	88.48	2.46	1.83	@
49 + 21	Golf Course Culvert No. 3	101	122	140	85.59	87.58	88.48	2.64	3.18	@
51 + 66	Lake Breeze Road	101	122	140	85.69	87.67	88.48	2.40	2.84	@
53 + 13	Lake Orlando Parkway	101	122	140	85.82	87.79	88.48	2.91	3.20	@
59 + 20	Confluence of Branch H1 w/ Tributary H	101	122	140	85.97	87.84	88.48	1.01	0.72	@
61 + 64	Bay Breeze Road	102	125	140	86.37	88.35	88.54	4.49	3.54	3.72
72 + 16	John Young Parkway	102	125	140	87.19	88.68	89.43	7.28	5.05	4.27
86 + 62	U.S. 441	102	125	140	88.36	89.39	90.64	4.79	5.32	3.78
89 + 62	Channel *	102	125	140	88.56	89.77	90.89	1.29	1.06	0.88
91 + 72	Culvert Inlet U/S of U.S. 441	102	125	140	89.39	90.11	91.07	5.51	4.86	4.48
91 + 90	Lake Fairview Discharge Control Structure	102	125	140	89.65	90.14	91.08	2.49	2.46	2.01
124 + 95	U/S Side of Lake Fairview (Confluence of Branch H2 w/ Tributary H)	80	102	145	89.65	90.14	91.08			
134 + 80	D/S Side of Lake Sarah	80	102	145	89.65	90.14	91.08	0.70	0.65	0.44
142 + 41	U/S Side of Lake Sarah	60	80	144	89.65	90.14	91.08			

@ - Tributary H will not function as a distinct channel.

STATION	LOCATION	DISCHARGE (cfs) 10 YR	25 YR	100 YR	ELEVATION (ft. NGVD) 10 YR	25 YR	100 YR	VELOCITY of FLOW (fps) 10 YR	25 YR	100 YR
TRIBUTARY H (CONTINUED)										
144 + 07	Private Drive Between lakes Sarah & Daniel	60	80	144	93.21	93.57	94.42	7.57	8.33	5.49
147 + 71	D/S Side of Lake Daniel	60	80	144	93.21	93.57	94.42	0.02	0.02	0.04
153 + 86	U/S Side of Lake Daniel	28	49	144	93.21	93.57	94.42	1.08	1.72	3.98
155 + 86	Maury Road	28	49	144	93.43	93.96	94.67	1.44	2.14	5.19
156 + 41	Channel into Lake Silver	28	49	144	93.43	93.96	94.67	1.77	2.55	6.04
159 + 36	D/S Side of Lake Silver	28	49	144	93.43	93.96	94.67			
182 + 86	U/S Side of Lake Silver (Upper Limit of Tributary H)				93.43	93.96	94.67			
BRANCH H1										
0 + 00	Confluence w/ Tributary H	22	80	202	86.48	87.84	88.48			
7 + 10	D/S Side of Bay Lake	22	80	202	92.03	92.12	92.26	----	----	----
119 + 41	U/S Side of Bay Lake (Upper Limit of Branch H1)				92.03	92.12	92.26	----	----	----
BRANCH H2										
0 + 00	Confluence w/ Tributary H	117	131	147	89.65	90.14	91.08	----	----	----
26 + 90	D/S Side of Little Lake Fairview	117	131	147	91.01	91.63	92.66	----	----	----
54 + 05	U/S Side of Little Lake Fairview (Upper Limit of Branch H2)				91.01	91.63	92.66	----	----	----
TRIBUTARY I										
0 + 00	Confluence w/ Lawne Lake	189	187	191	89.94	90.87	92.38			
9 + 50	Channel *	189	187	191	89.94	90.87	92.38	0.77	0.68	0.58
11 + 04	Mercy Drive	189	187	191	92.50	93.47	95.22	3.78	3.36	2.95
11 + 54	Channel *	189	187	191	92.50	93.47	95.22	0.27	0.24	0.20
57 + 20	John Young Parkway (Upper Limit of Tributary I)				92.50	93.47	95.22			

Appendix C

WATER QUALITY DATA

STATION: LW10N LOCATION: NORTH LOBE OF LAWNE LAKE SOURCE: ORANGE CO. ENVIRONMENTAL PROTECTION DEPT.

STA. NAME	DATE	TIME	TEMP C 10	DEP M	D.O. mg/l 299	BOD mg/l 310	pH 403	T.ALK mg/l 410	TP/f mg/l 666	PO4 mg/l 70507	TP mg/l 665	NOX mg/l 630	NH3 mg/l 610	TN mg/l 600	TKN mg/l 625	COND. mmhos 95	Cl mg/l 940	TS mg/l 500	TURB FTU 76	SEC.D M 78
LW10N	01/07/80	0900	10.0	0.5	9.00	2.8	7.5	61.0	0.130		0.170	0.040	0.410	1.550	1.510	259	21.0	198.0	4.7	0.7
LW10N	02/04/80	0820	9.0	0.5	9.50	1.5	7.3	58.0	0.160		0.180	0.010	0.110	1.320	1.310	275	19.0	191.0	5.7	0.3
LW10N	03/03/80	0830	12.0	0.5	9.00	3.3	7.5	60.0	0.140		0.180	0.220	0.060	1.680	1.460	260	18.0	181.0	6.4	0.5
LW10N	03/31/80	0900	21.0	0.5	7.20	1.2	7.7	59.0	0.160		0.190	0.010	0.050	1.360	1.350	270	19.0	181.0	5.0	0.5
LW10N	06/02/80	0830	25.5	0.5	7.70	5.4	8.0	62.0	0.190		0.230	0.010	0.110	1.720	1.710	225	18.0	218.0	2.6	0.7
LW10N	06/30/80	0755	26.0	0.5	5.80	2.0	6.7	39.0	0.200		0.220	0.010	0.110	1.420	1.410	220	17.0	188.0	3.6	
LW10N	09/08/80	0820	27.5	0.5	5.20	2.5	7.2	55.0	0.170		0.210	0.010	0.050	0.800	0.790	190	16.0	132.0	2.7	1.1
LW10N	10/06/80	0825	27.0	0.5	5.90	2.3	7.2	57.0	0.220		0.240	0.010	0.070	1.080	1.070	195	14.6	148.0	2.8	1.0
LW10N	10/29/80	0840	23.0	0.5	6.50	3.6	7.3	57.0	0.200		0.220	0.010	0.060	1.310	1.300	222	15.0	150.0	3.5	0.9
LW10N	12/01/80	0830	19.0	0.5	7.50	1.7	7.3	52.0	0.210		0.210	0.010	0.080	0.910	0.900	177	17.0	140.0	2.4	1.1
LW10N	03/09/81	0745	17.0	0.5	7.20	3.6	7.4	53.0	0.180		0.170	0.030	0.050	1.730	1.700	195	17.0	135.0	3.0	1.1
LW10N	06/15/81	0900	29.5	0.5	5.40	5.6	7.4	48.0	0.130		0.190	0.010	0.070	1.310	1.300	160	18.0	121.0	1.3	2.0
LW10N	03/22/82	0830	24.0	0.5	4.20	11.0	6.7	61.0	0.167		0.199	0.040	0.090	1.340	1.300	195		137.0	3.0	1.7
LW10N	06/22/82	0820	27.0	0.5	4.40	5.6	6.2	52.0	0.102		0.137	0.120	0.130	0.990	0.870	180		128.0	1.8	1.0
LW10N	08/09/82	0905	30.0	0.5	2.10	16.0	6.2	62.0	0.067		0.096	0.040	0.050	1.440	1.400	205		163.0	1.8	
LW10N	11/01/82	0845	22.0	0.5	6.20	2.1	7.0	63.0	0.078		0.116	0.040	0.160	1.440	1.400	300		197.0	4.1	0.7
LW10N	01/28/86	0830	10.0	0.5	7.60	4.4	6.6	50.6	0.060		0.119	1.020	0.140	2.550	1.530	260		188.0	5.4	0.5
LW10N	04/01/86	0800	21.0	0.5		1.9	7.6	75.6	0.040		0.099	0.360	0.090	1.680	1.320	250		220.0	3.5	0.8
LW10N	07/01/86	0735	29.0	0.5	7.50	1.4	7.6	49.4	0.100		0.103	0.040	0.110	1.000	0.960	190		152.0	1.6	1.7
LW10N	10/07/86	0800	28.0	0.5	4.00	3.9	7.3	42.9	0.052		0.095	0.040	0.110	0.880	0.840	200		182.0	1.8	1.7
LW10N	01/28/87	0800	11.0	0.5	9.20	3.9	8.1	70.0	0.069		0.126		0.050	1.140	1.140	270		170.0	4.7	0.5
LW10N	04/07/87	1120	17.0	0.5	8.70	6.8	7.6	45.2	0.038	0.016	0.095	1.583	0.040	2.218	0.635	220		187.0	3.0	0.4
LW10N	10/05/87	0900	25.0	0.5		3.4	7.3	56.2	0.074	0.022	0.100	0.071	0.049	1.009	0.938	150		139.0	1.9	0.8
LW10N	03/28/88	0857	23.3	0.5	8.90	2.3	7.5	54.5	0.020	0.020	0.059	0.069	0.046	0.753	0.684	260		176.0	2.7	
LW10N	06/13/88	0900	27.0	0.5	6.50	2.0	7.4	55.1	0.035	0.028	0.066	0.030	0.040	0.173	0.143	210		179.0	2.0	
LW10N	09/14/88	0950	28.2	0.5	7.08	3.0	7.8	54.0	0.038	0.023	0.083	0.030	0.040	0.530	0.500	200		152.0	1.8	
LW10N	12/14/88	0827	15.0	0.5	8.07		6.9	40.3	0.070	0.048	0.073	0.175	0.089	0.555	0.380	355		139.5	1.4	2.4
AVG.			21.6	0.5	6.81	4.0	7.3	55.3	0.115	0.026	0.147	0.155	0.091	1.255	1.106	226	17.5	166.4	3.1	1.0
STD			6.6	0.0	1.84	3.2	0.5	8.1	0.062	0.010	0.056	0.349	0.071	0.500	0.397	45.5	1.7	27.3	1.4	0.6

Na mg/l 929	Ca mg/l 916	Mg mg/l 927	K mg/l 937	Fe ug/l 1045	Cu ug/l 1042	Pb ug/l 1051	Zn ug/l 1092	Cd ug/l 1027	Al ug/l 1105	Ni ug/l 1067	Mn ug/l 1055	Cr ug/l 1034	T.Coli /100ml 31501	F.Coli /100ml 31616	Chl.a F mg/m3 32211	Chl.a NF mg/m3 32218	Chl.a mg/m3 32210	Chl.b mg/m3 32212	Chl.c mg/ml 32214	DATE	STA. NAME
13.00	38.00	4.80	4.80	150	10								120	20	14.46	19.50	25.82	4.84	4.93	01/07/80	LW10N
13.00	37.00	4.70	4.40	150	10								48	20	15.29	4.88	18.10	3.28	2.14	02/04/80	LW10N
13.00	30.00	4.60	4.20	150	20								54	20	14.11	8.56	18.97	4.52	2.78	03/03/80	LW10N
13.00	33.00	4.90	4.20	100	10								20	20	14.99	8.54	19.81	4.94	1.57	03/31/80	LW10N
12.00	31.00	4.00	3.80	50	10								20	20	42.34	0.47	42.86	4.25	1.91	06/02/80	LW10N
13.00			3.00										800	120	14.26	6.97	18.38	2.62	0.80	06/30/80	LW10N
11.00	21.00	3.60	2.00	50	10								140	32	11.58	7.43	16.00	1.86	2.98	09/08/80	LW10N
11.00	18.00	3.50	1.60	50	90								84	64	13.54	8.88	18.32	2.40	3.28	10/06/80	LW10N
12.00	25.00	3.90	1.60	50	10								20	20	17.14	4.75	19.88	3.24	5.88	10/29/80	LW10N
11.00	22.00	3.60	1.80	50	10								800	120						12/01/80	LW10N
12.00	22.00	4.00	2.00	50	10								1200	250	4.70	3.19	6.57	1.03	1.11	03/09/81	LW10N
12.00	25.00	3.20	0.80	50	10								20	20	1.92	1.27	2.54	1.61	0.56	06/15/81	LW10N
11.00	20.00	3.50	1.80	50	20		5	5		40	10	50	72	22	4.82	1.04	5.32	1.41	3.73	03/22/82	LW10N
9.00	22.00	3.20	2.00	100	20		5	5		40	10	50	70	20	11.72	6.21	15.22	3.25	1.36	06/22/82	LW10N
11.00	40.00	4.50	1.40	50	20		5	5		40	10	50	102	32	13.74	3.50	15.80	1.93	0.23	08/09/82	LW10N
13.00	38.00	5.00	3.60	100	20		5	5		40	10		20	20						11/01/82	LW10N
7.41	19.84	4.67	9.20	113	23		11	8		11	14	29	160	60	7.30	5.30	10.40	1.20	2.70	01/28/86	LW10N
12.67	22.34	4.26	7.34	35	8		7	18		39	2	29	22	20	9.40	6.70	13.60	0.10	2.00	04/01/86	LW10N
11.52	20.46	4.15	3.37	121	16		6	1		122	9	9	20	20	5.30	1.90	6.60	0.40	1.00	07/01/86	LW10N
9.96	18.10	3.44		53	5		11	1		97	30	2	20	20	7.40	4.00	9.80	0.30	1.50	10/07/86	LW10N
													126	20	20.70	7.40	25.20	2.60	3.50	01/28/87	LW10N
													160	56	43.20	12.50	50.90	3.50	13.90	04/07/87	LW10N
							20	2		19	14				21.20	7.60	26.00	0.70	9.60	10/05/87	LW10N
10.37	24.00	4.22	2.83	129	208	2	145	2	40	62	12	9	64	4	7.40	5.70	10.90	0.50	1.00	03/28/88	LW10N
10.45	17.70	4.24	3.71	55	1	1	1	41	120	51	24	1	10	2	13.30	3.60	15.60	0.50	3.00	06/13/88	LW10N
7.13	23.87	3.03	2.14	99	17	90	197	3	180	1	18	20	160	10	36.60	7.10	40.70	6.80	18.80	09/14/88	LW10N
													36	8	1.90	1.20	2.70	0.20	0.00	12/14/88	LW10N
11.28	25.83	3.87	3.25	82	25	31	35	8	113	46	14	25	168	40	14.73	5.90	18.24	2.32	3.61		AVG.
1.35	7.04	1.00	1.95	38.6	43.3	41.7	62.0	10.9	57.3	33.4	7.1	18.8	287.9	51.3	10.89	3.98	11.85	1.76	4.31		STD

STATION: LWA LOCATION: SILVER STAR RD. AND LITTLE WEKIVA RIVER SOURCE: ORANGE CO. ENVIRONMENTAL PROTECTION DEPT.

STA. NAME	DATE	TIME	TEMP C 10	DEP M	D.O. mg/l 299	BOD mg/l 310	pH 403	T.ALK mg/l 410	TP/f mg/l 666	PO4 mg/l 70507	TP mg/l 665	NOX mg/l 630	NH3 mg/l 610	TN mg/l 600	TKN mg/l 625	COND. mmhos 95	Cl mg/l 940	TS mg/l 500	TURB FTU 76
LWA	02/06/80	08:35	9.5	0.5	6.6	1.0	7.1	70.0	0.090		0.100	0.070	0.090	1.070	1.000	285	20	176	3.70
LWA	05/06/80	07:50	20.0	0.5	3.1	5.0	7.2	116.0	0.220		0.240	0.140	0.210	1.650	1.510	290	22	239	16.00
LWA	11/03/80	10:50	22.0	0.5	6.4	1.4	7.4	100.0	0.190		0.370	0.150	0.270	1.250	1.100	295	17	205	3.70
LWA	01/19/81	07:55	7.0	0.5	11.0	3.5	7.6	108.0	0.070		0.070	0.080	0.200	1.040	0.960	331	22	193	3.30
LWA	04/20/81	07:50	21.0	0.5	0.6	9.5	7.1	92.0	0.370		0.500	0.010	0.210	1.610	1.600	277	24	198	5.90
LWA	08/03/81	07:40	25.0	0.5	1.1	5.1	7.0	102.0	0.180		0.220	0.040	0.280	2.440	2.400	230			8.30
LWA	10/26/81	07:50	23.0	0.5	1.6	10.4	6.5	61.0	0.285		1.060	0.040	0.100	1.240	1.200	220		155	9.50
LWA	01/11/82	08:00	11.0	0.5	6.6	3.4	7.2	63.0	0.092		0.116	0.070	0.160	1.210	1.140	230		137	2.40
LWA	05/17/82	08:00	24.0	0.5	2.4	20.0	6.5	77.0	0.196		0.304	0.100	0.220	1.600	1.500	270		176	
LWA	08/24/82	07:30	26.0	0.5	1.8	6.6	6.5	63.0	0.075		0.106	0.040	0.130	1.140	1.100	210		164	1.70
LWA	11/22/82	10:55	23.0	0.5	2.2	3.0	6.7	70.0	0.094		0.118	0.070	0.240	2.370	2.300	265		202	3.80
LWA	02/07/83	08:45	15.5	0.5	5.4	2.2	6.6	69.0	0.126		0.154	0.040	0.100	1.340	1.300	260		180	4.25
LWA	05/24/83	08:00	24.0	0.5	0.8	6.0			0.241		0.420	0.040	0.270	1.000	0.960	320		278	2.60
LWA	08/22/83	08:05	28.0	0.5	1.1	10.2	6.8	65.0	0.192		0.237	0.120	0.330	1.590	1.470	195		152	2.70
LWA	11/15/83	07:55	16.0	0.5	3.8	4.2	7.4	128.0	0.164		0.189	0.120	0.160	1.140	1.020	210		172	4.60
LWA	02/14/84	12:30	20.0	0.5	5.3	3.3	7.4	63.0	0.152		0.191	0.040	0.100	1.030	0.990	225		163	2.40
LWA	05/16/84	08:20	25.0	0.5	2.0	5.4	7.3	86.9	0.109		0.243	0.040	0.160	1.540	1.500	310		256	8.10
LWA	08/22/84	11:20	27.5	0.5	5.0	3.5	8.0	45.0	0.053		0.114	0.040	0.140	1.480	1.440	170		160	4.40
LWA	11/20/84	08:05	21.0	0.5	2.4	5.4	7.8	74.0	0.097		0.181	0.100	0.880	2.170	2.070	270		189	6.80
LWA	01/23/85	08:00	6.0	0.5	8.4	3.8	7.3	67.2	0.107		0.127	0.090	0.180	1.260	1.170	210		173	3.00
LWA	05/28/85	08:05	25.0	0.5	3.6	6.0	7.0	47.0	0.134		0.190	0.040	0.560	1.380	1.340	220		135	3.60
LWA	08/20/85	07:30	27.0	0.5	3.0	0.9	7.2	39.4	0.100		0.110	0.070	0.060	1.170	1.100	400		122	3.50
LWA	11/05/85	07:35	17.0	0.5	4.5	1.7	6.9	53.0	0.103		0.117	0.330	0.780	1.620	1.290	260		177	2.50
LWA	02/12/86	08:25	16.0	0.5	4.0	1.4	7.2	60.7	0.074		0.098	0.810	0.150	2.070	1.260	235		218	4.70
LWA	05/07/86	07:35	23.0	0.5	3.5	2.7	7.0	75.4	0.027		0.160	0.070	0.660	1.330	1.260	235		152	7.20
LWA	08/13/86	08:30	27.5	0.5	3.6	0.5	7.2	43.2	0.057		0.080	0.060	0.660	1.290	1.230	170		136	2.00
LWA	11/12/86	07:35	23.0	0.5	2.7	2.7	7.2	67.8	0.061		0.081	0.240	0.210	1.440	1.200	225		192	2.20
LWA	02/11/87	07:35	12.0	0.5	6.2	6.0	7.8	72.4	0.058		0.080		0.190	1.050	1.050	290		168	3.90
LWA	05/06/87	08:20	22.5	0.5	2.8	6.0	7.0	68.9	0.042	0.020	0.060	0.284		0.784	0.500	260		220	3.00
LWA	07/27/87	10:10	30.0	0.5	4.2	5.7	6.8	42.2	0.049	0.050	0.063	0.047	0.040	0.469	0.422			178	2.20
LWA	10/19/87	08:00		0.5		5.4	7.3	73.5	0.100	0.064	0.130	0.187	0.114	0.644	0.457	170		153	3.50
LWA	01/27/88	09:30	11.0	0.5	11.8	4.3	7.2	47.7	0.027	0.020	0.071	0.100	0.096	0.674	0.574	195		126	4.80
LWA	05/25/88	09:45	24.5	0.5	4.5	2.2	6.7	67.7	0.036	0.034	0.080	0.050	0.040	0.509	0.459	155		164	4.10
LWA	08/29/88	08:37	29.0	0.5	2.8	4.5	7.5	58.2	0.034	0.020	0.052	0.055	0.049	0.477	0.422	175		145	2.10
LWA	11/30/88	08:11	18.0	0.5	1.6	7.5	6.8	43.5	0.095	0.079	0.097	0.169	0.027	0.799	0.630	170			1.90
AVG.			20.6	0.5	4.0	4.9	7.1	70.0	0.117	0.036	0.187	0.116	0.237	1.282	1.169	242	21	172	4.24
STD			6.4	0.0	2.6	3.6	0.4	21.2	0.077	0.025	0.182	0.141	0.213	0.483	0.472	54.1	2.4	46.0	2.85

STATION: LWA LOCATION: SILVER STAR RD. AND LITTLE WEKIVA RIVSOURCE: ORANGE CO. ENVIRONMENTAL PROTECTION DEPT.

Na mg/l 929	Ca mg/l 916	Mg mg/l 927	K mg/l 937	Fe ug/l 1045	Cu ug/l 1042	Pb ug/l 1051	Zn ug/l 1092	Cd ug/l 1027	Al ug/l 1105	Ni ug/l 1067	Mn ug/l 1055	Cr ug/l 1034	T.Coli /100ml 31501	F.Coli /100ml 31616	Chl.a F mg/m3 32211	Chl.a NF mg/m3 32218	Chl.a mg/m3 32210	Chl.b mg/m3 32212	Chl.c mg/ml 32214	DATE	STA. NAME
13.00	39.00	4.40	3.0	150	10								210	30	1.15	2.88	2.69	1.79	1.59	02/06/80	LWA
14.00	57.00	4.10	1.1	1100	20									48	5.88	11.33	11.72	8.90	14.18	05/06/80	LWA
8.40	40.00	3.40	5.0	600	10								4000	550						11/03/80	LWA
13.00	52.00	4.30	1.8	450	10								100	100	2.56	2.28	3.83	1.30	0.58	01/19/81	LWA
14.00	50.00	4.40	3.4	700	10								100	100	0.00	12.84	2.87	5.81	0.00	04/20/81	LWA
													250	24	3.36	4.54	5.95	1.71	0.73	08/03/81	LWA
															14.43	5.76	16.48	14.94	0.00	10/26/81	LWA
12.00	38.00	3.40		100	20		5	5		40	10	50	160	50	0.00	2.40	0.59	0.51	0.15	01/11/82	LWA
12.00	46.00	4.50	2.8	150	20		5	5		40	10	50	1000	20	1.32	5.15	4.18	2.50	0.00	05/17/82	LWA
9.90	33.00	4.00	1.2	50	20		5	5		40	10	50	2900	250	4.76	0.79	5.07	2.20	0.00	08/24/82	LWA
13.00	43.00	5.00	3.6	250	20		5	5		40	10	50	520	200	5.84	1.80	7.00	0.00	0.74	11/22/82	LWA
12.00	29.00	4.00	4.0	50	20		30	5		40	10	50	1300	100	12.57	6.86	16.10	7.18	1.49	02/07/83	LWA
18.00	43.00	6.70	12.0	150	20		5	5		40	4200	50	8000	600	7.11	5.68	10.14	4.59	0.64	05/24/83	LWA
10.00	25.00	3.20	4.6	150	20		5	5		40	10	50	140	100	11.20	7.60	15.10	8.10	0.00	08/22/83	LWA
11.00	31.00	3.70	4.0	150	20		5	5		40	10	50	800		10.90	0.00	9.70	3.00	2.50	11/15/83	LWA
9.93	35.00	3.40	3.8	80	20		5	5		40	10	50		600	15.60	0.00	15.30	4.90	0.00	02/14/84	LWA
11.60	55.20	4.00	3.1	100	20		10	5		40	10	50	2900	210	6.80	0.00	4.40	0.00	0.00	05/16/84	LWA
8.20	37.70	3.80	2.4	50	20		5	5		40	10	50	100	140	33.00	14.30	41.30	8.00	0.50	08/22/84	LWA
11.00	34.00	4.30	4.3	490	60		5	5		40	60	50	100	100	2.60	6.30	6.10	3.40	0.00	11/20/84	LWA
10.90	36.00	4.80	4.5	100	20		5	5		40	10	50	160	120	1.40	1.70	2.50	0.10	0.00	01/23/85	LWA
12.50	18.00	4.00	3.7	50	20		5	5		40	10	50	72	28	5.50	2.30	6.90	0.70	1.10	05/28/85	LWA
													62		0.90	1.30	1.70	0.00	0.50	08/20/85	LWA
													160	54	0.00	2.90	1.70	0.10	0.70	11/05/85	LWA
13.17	16.64	4.32	4.5	258	52		96	1		19	7	11	800	30	0.20	2.50	1.70	0.10	0.10	02/12/86	LWA
10.76	9.56	4.00	4.1	432	17		1	11		47	34	16		600	7.50	3.00	9.10	2.00	0.00	05/07/86	LWA
17.24	18.88	3.06	1.9	101	1		1	1		5	13	8	490	120	3.50	0.30	3.60	0.50	1.80	08/13/86	LWA
6.32	27.39	3.24	2.1	117	3		1	1		62	19	9	160	120	1.50	0.60	1.90	0.40	0.70	11/12/86	LWA
													260	20	4.60	5.60	7.90	0.40	2.70	02/11/87	LWA
													2	2	3.10	2.10	4.30	0.80	0.80	05/06/87	LWA
8.30	16.92	3.19	3.1	86	22		18	10		14	14	21	92		10.50	5.00	13.40	1.10	6.10	07/27/87	LWA
8.47	20.48	3.23	2.9	102	29			42		49	11	1			1.50	2.70	3.10	0.30	1.50	10/19/87	LWA
4.92	17.44	2.73	2.9	80	25		113	1		21	16	12	2800	190	12.20	3.80	14.50	1.60	7.30	01/27/88	LWA
4.84		3.75		136	15		21	28		1		1	160	120	1.30	0.00	0.40	0.10	0.00	05/25/88	LWA
9.10	19.34	3.65	2.4	59	16		23	35		64	7	12	800	140	6.20	2.00	7.40	0.90	2.00	08/29/88	LWA
													210	30	0.30	1.00	0.90	0.00	0.00	11/30/88	LWA
10.98	32.91	3.57	3.5	225	20		17	9		37	196	34	925	160	5.69	3.74	7.63	2.59	1.42		AVG.
3.05	12.82	1.37	2.0	241.6	11.7		28.8	10.7		15.0	854	19.8	1675.6	178.7	6.46	3.53	7.60	3.37	2.74		STD

STATION: LWB LOCATION: RTE. 441 AND LITTLE WEKIVA RIVER SOURCE: ORANGE CO. ENVIRONMENTAL PROTECTION DEPT.

STA. NAME	DATE	TIME	TEMP C 10	DEP M	D.O. mg/l 299	BOD mg/l 310	pH 403	T.ALK mg/l 410	TP/f mg/l 666	PO4 mg/l 70507	TP mg/l 665	NOX mg/l 630	NH3 mg/l 610	TN mg/l 600	TKN mg/l 625	COND. umhos 95	Cl mg/l 940	TS mg/l 500	TURB FTU 76
LWB	02/06/80	08:50	9.5	0.5	8.4	2.7	7.1	40.0	0.080		0.110	0.090	0.180	1.040	0.950	190	17	103	4.60
LWB	05/06/80	08:10	22.0	0.5	5.9	3.6	7.0	50.0	0.070		0.090	0.020	0.110	0.880	0.860	180	15	128	5.10
LWB	08/05/80	11:15	33.0	0.5	6.3	4.0	7.0	41.0	0.060		0.070	0.010	0.400	0.420	0.410	180	17	85	2.20
LWB	11/03/80	10:35	23.0	0.5	6.3	1.6	6.7	40.0	0.050		0.150	0.040	0.160	0.830	0.790	195	17	102	3.40
LWB	01/19/81	08:20	9.5	0.5	9.9	2.6	7.4	40.0	0.060		0.060	0.050	0.120	0.840	0.790	221	16	98	1.30
LWB	04/21/81	08:15	24.0	0.5	4.9	4.2	7.2	47.0	0.100		0.110	0.010	0.110	0.960	0.950	199	17	123	1.90
LWB	08/03/81	08:00	26.0	0.5	1.2	5.7	6.8	64.0	0.120		0.160	0.010	0.220	1.710	1.700	207			4.00
LWB	10/26/81	08:10	23.5	0.5	3.6	4.2	6.2	34.0	0.096		0.158	0.020	0.100	1.220	1.200	160		91	2.30
LWB	01/11/82	08:40	12.5	0.5	6.4	3.8	6.7	41.0	0.033		0.054	0.060	0.270	1.260	1.200	180		99	3.00
LWB	05/17/82	08:15	23.0	0.5	4.2	8.0	6.4	54.0	0.056		0.059	0.040	0.070	0.970	0.930	375		128	
LWB	08/24/82	07:45	28.0	0.5	4.2	3.0	6.5	54.0	0.030		0.070	0.040	0.160	0.970	0.930	195		129	2.80
LWB	11/22/82	07:50	20.0	0.5	4.6	1.6	6.2	43.0	0.044		0.060	0.130	0.340	1.630	1.500	190		137	2.40
LWB	02/07/83	09:00	15.0	0.5	6.0	2.7	6.6	52.0	0.065		0.101	0.090	0.150	1.290	1.200	195		132	5.60
LWB	05/24/83	08:20	25.0	0.5	0.4				0.011		0.257	0.040	0.230	0.121	0.081	270		162	3.20
LWB	08/22/83	08:25	28.0	0.5	3.1	4.5	6.8	45.0	0.054		0.087	0.050	0.110	0.770	0.720	170		115	3.50
LWB	11/15/83	08:10	17.5	0.5	4.2	2.1	7.4	80.0	0.054		0.062	0.060	0.130	0.690	0.630	185		114	3.50
LWB	02/14/84	08:25	18.0	0.5	6.2	1.8	7.2	60.0	0.055		0.075	0.040	0.220	0.850	0.810	190		131	6.90
LWB	05/16/84	08:35	25.0	0.5	2.3	2.4	7.1	56.1	0.184		0.374	0.050	0.160	1.220	1.170	215		222	46.00
LWB	08/22/84	08:10	25.0	0.5	4.4	14.4	7.5	48.0	0.026		0.098	0.040	0.100	1.210	1.170	170		129	6.10
LWB	11/20/84	08:20	21.0	0.5	3.4	2.7	7.7	38.0	0.062		0.080	0.180	0.390	1.050	0.870	200		147	2.60
LWB	01/23/85	08:10	6.0	0.5	8.2	1.6	7.2	58.8	0.069		0.082	0.260	0.260	1.250	0.990	215		135	3.50
LWB	05/28/85	08:25	26.0	0.5	4.3	4.6	7.3	63.0	0.025		0.123	0.040	0.070	1.660	1.620	215		153	7.30
LWB	08/20/85	07:45	27.0	0.5	3.2	0.6	7.2	47.9	0.038		0.086	0.200	0.060	2.990	2.790	185		108	2.40
LWB	11/05/85	07:55	20.0	0.5	3.7	2.7	7.1	47.3	0.027		0.050	0.080	0.400	0.980	0.900	210		127	2.40
LWB	02/12/86	08:35	14.0	0.5	3.9	2.1	7.2	63.1	0.030		0.101	0.150	0.120	0.960	0.810	190		166	6.40
LWB	05/07/86	07:50	23.0	0.5	3.2	3.6	7.0	67.6	0.089		0.148	0.040	0.270	1.210	1.170	220		138	7.00
LWB	08/13/86	08:45	28.0	0.5	2.6	0.4	7.0	57.2	0.023		0.070	0.040	0.520	1.090	1.050	170		124	2.60
LWB	11/12/86	08:00	23.0	0.5	3.0	2.1	6.9	58.3	0.037		0.054	0.090	0.220	1.350	1.260	235		164	1.50
LWB	02/11/87	08:15	13.0	0.5	5.8	3.2	7.4	59.2	0.029		0.071		0.070	1.110	1.110	250		137	4.90
LWB	05/06/87	08:35	24.0	0.5	4.8	6.6	7.1	59.9	0.030	0.020	0.104	0.236		0.802	0.566	175		169	6.40
LWB	07/27/87	09:00	30.0	0.5	4.0	6.6	6.7	48.3	0.028	0.033	0.064	0.041	0.040	0.618	0.577			172	3.30
LWB	10/19/87	08:30		0.5		4.8	6.8	53.5		0.022	0.035	0.163	0.093	1.000	0.837	150		115	1.50
LWB	01/27/88	09:50	11.0	0.5	10.3	3.9	7.2	56.6	0.020	0.020	0.062	0.105	0.072	0.676	0.571	235		127	4.70
LWB	05/25/88	10:15	26.0	0.5	2.4	5.4	6.4	54.4	0.041	0.043	0.113	0.041	0.053	0.434	0.393	135		115	3.50
LWB	08/29/88	08:56	29.0	0.5	3.8	4.5	6.9	49.4	0.020	0.020	0.080	0.059	0.040	0.493	0.434	145		119	4.20
LWB	11/30/88	08:31	19.0	0.5	1.8	6.3	6.7	29.7	0.019	0.006	0.075	0.040	0.045	0.487	0.447	140			4.10
AVG.			21.4	0.5	4.6	3.8	7.0	51.5	0.052	0.023	0.100	0.076	0.173	1.029	0.955	198	17	131	5.03
STD			6.5	0.0	2.2	2.5	0.4	10.2	0.034	0.011	0.062	0.063	0.119	0.480	0.464	42.2	0.8	27.1	7.22

Na mg/l 929	Ca mg/l 916	Mg mg/l 927	K mg/l 937	Fe ug/l 1045	Cu ug/l 1042	Pb ug/l 1051	Zn ug/l 1092	Cd ug/l 1027	Al ug/l 1105	Ni ug/l 1067	Mn ug/l 1055	Cr ug/l 1034	T.Coli /100ml 31501	F.Coli /100ml 31616	Chl.a F mg/m3 32211	Chl.a NF mg/m3 32218	Chl.a mg/m3 32210	Chl.b mg/m3 32212	Chl.c mg/ml 32214	DATE	STA. NAME
9.60	21.00	3.00	2.60	200	10								44	20	4.00	5.72	7.27	2.01	1.27	02/06/80	LWB
9.60	20.00	2.90	2.60	180	10								100	20	4.45	5.44	7.44	3.08	2.66	05/06/80	LWB
11.00	19.00	2.80	2.80	150	10								26	20	6.41	1.84	7.34	2.62	0.00	08/05/80	LWB
9.90	16.00	3.00	2.40	150	10								100	20						11/03/80	LWB
9.90	16.00	3.00	2.20	100	10								100	100	1.85	0.92	2.28	1.45	0.00	01/19/81	LWB
9.60	30.00	2.80	2.40	450	10								100	100	1.52	3.63	3.46	2.32	0.49	04/21/81	LWB
													800	600	11.47	4.58	14.03	3.29	4.12	08/03/81	LWB
													1000	1000	6.57	3.54	8.48	2.57	1.37	10/26/81	LWB
9.90	26.00	3.00		50	20	100	5	5	100	40	10	50	140	20	5.44	1.45	6.20	1.55	0.65	01/11/82	LWB
11.00	32.00	3.20	2.80	50	20		5	5		40	10	50	100	20	4.52	3.04	6.15	2.22	0.00	05/17/82	LWB
9.30	38.00	3.40	2.00	50	20		5	5		40	10	50	100	50	14.04	7.12	18.16	2.95	0.00	08/24/82	LWB
9.60	29.00	3.50	2.20	150	20		5	5		40	10	50	100	20	4.23	7.80	8.94	0.14	0.00	11/22/82	LWB
10.00	22.00	3.00	3.20	50	20		5	5		40	10	50	3300	28	12.83	11.48	18.80	9.77	2.95	02/07/83	LWB
12.00	31.00	3.40	3.00	350	20		5	5		40	50	50	100	20	29.55	3.17	30.02	17.98	0.20	05/24/83	LWB
9.00	19.00	2.70	3.60	50	20		5	5		40	10	50	100	100	11.60	4.10	13.60	6.40	0.00	08/22/83	LWB
10.00	20.00	2.90	2.70	100	20		10	5		40	10	50	100	20	4.10	0.00	2.40	0.70	0.60	11/15/83	LWB
8.67	26.00	2.80	3.20	80	20		5	5		40	10	50	100	100	1.40	0.00	1.30	0.80	1.60	02/14/84	LWB
8.16	33.30	3.00	2.69	400	20		10	5		40	10	50	1000	100	0.00	1.30	0.60	0.00	0.00	05/16/84	LWB
6.60	32.70	2.80	2.20	50	20		5	5		40	10	50		100	31.70	10.10	37.50	7.10	0.00	08/22/84	LWB
8.20	20.00	3.10	2.90	230	20		5	5		40	10	50	100	100	1.50	1.20	2.00	1.80	0.00	11/20/84	LWB
8.70	30.00	3.60	3.20	400	10		5	5		40	10	50	20	20	1.50	0.20	1.70	0.00	0.30	01/23/85	LWB
9.10	27.00	3.60	3.70	50	20		5	5		40	10	50	22	20	33.70	10.90	40.30	4.30	2.70	05/28/85	LWB
													26	20	6.60	3.20	8.60	0.80	0.80	08/20/85	LWB
													24	20	4.80	4.60	7.60	0.50	1.30	11/05/85	LWB
10.98	19.25	2.85	3.86	220	22		3	1		12	3	9	800	54	10.90	11.00	17.50	1.50	2.70	02/12/86	LWB
9.34	7.44	3.86	1.77	389	25		7	9		19	23	14	20	20	9.90	0.00	6.80	0.00	0.00	05/07/86	LWB
10.56	19.16	2.92	2.61	128	1		1	6		5	17	12	320	100	14.30	5.20	17.40	1.70	1.20	08/13/86	LWB
5.82	22.59	3.01	1.66	145	1	43	1	1	10	57	18	10	160	20	2.10	2.00	3.30	0.30	0.40	11/12/86	LWB
													300	20	11.80	6.30	15.10	1.10	2.90	02/11/87	LWB
													2	12	21.40	8.50	26.30	5.30	0.00	05/06/87	LWB
7.17	16.60	2.64	2.90	79	36	19	4	6	220	7	12	18			22.50	7.40	27.50	0.30	5.30	07/27/87	LWB
4.47	15.44	2.86	2.86	42	20	1	33	51	20	61	7	1	710	96	5.50	3.70	7.70	1.30	1.00	10/19/87	LWB
4.82	17.02	2.74	2.95	73	31	1	50	1	360	31	11	11	300	3	11.30	5.60	14.80	0.10	3.40	01/27/88	LWB
4.07		3.40		509	15	1	5	27		7		1	160	120	13.20	0.00	8.50	0.40	2.60	05/25/88	LWB
7.38	14.77	3.13	2.81	65	15	60	1	40	140	76	12	11	500	72	28.90	7.10	33.60	4.50	11.50	08/29/88	LWB
													160	160	23.80	6.30	27.40	4.50	11.70	11/30/88	LWB
8.77	22.87	3.07	2.73	170	17	32	8	10	142	36	13	34	356	95	10.82	4.54	13.14	2.72	1.83		AVG.
1.98	7.00	0.30	0.53	138.2	7.5	35.0	10.8	13.9	121	16.7	9.0	20.0	595.7	184.6	9.37	3.33	10.79	3.44	2.76		STD

STATION: LW28 LOCATION: LAKE FAIRVIEW SOURCE: ORANGE CO. ENVIRONMENTAL PROTECTION DEPT.

STA. NAME	DATE	TIME	TEMP C 10	DEP M	D.O. mg/l 299	BOD mg/l 310	pH 403	T.ALK mg/l 410	TP/f mg/l 666	PO4 mg/l 70507	TP mg/l 665	NOX mg/l 630	NH3 mg/l 610	TN mg/l 600	TKN mg/l 625	COND. umhos 95	Cl mg/l 940	TS mg/l 500	TURB FTU 76	SEC.D M 78
LW28	01/07/80	1000	11.0	0.5	9.30	1.20	7.70	60.0	0.010		0.020	0.000	0.000	0.650	0.570	200	17.0	112.0	0.6	5.5
LW28	02/04/80	0900	11.0	0.5	9.60	0.00	7.50	61.8	0.010		0.030	0.020	0.060	0.650	0.630	225	16.8	111.0	1.1	4.4
LW28	03/03/80	1015	14.0	0.5	9.50	1.80	7.70	66.0	0.020		0.030	0.000	0.070	0.810	0.730	235	17.0	118.0	1.9	2.5
LW28	03/31/80	0940	21.0	0.5	8.10	2.80	7.60	68.0	0.050		0.080	0.010	0.050	0.920	0.910	280	19.0	156.0	2.8	1.1
LW28	06/02/80	0930	25.5	0.5	9.40	0.80	7.80	54.0	0.010		0.020	0.010	0.050	0.580	0.570	200	17.0	176.0	0.5	3.3
LW28	06/30/80	0945	28.0	0.5	8.70	0.80	8.20	44.0	0.010		0.020	0.010	0.050	0.620	0.610	160	17.0	113.0	0.9	
LW28	09/08/80	0920	28.0	0.5	8.10	1.00	7.80	41.0	0.010		0.020	0.010	0.050	0.840	0.830	165	17.0	92.0		4.0
LW28	10/06/80	0920	27.5	0.5	7.20	0.85	7.70	46.0	0.010		0.010	0.010	0.050	0.630	0.620	176	16.5	115.0	0.7	4.2
LW28	10/29/80	1015	24.0	0.5	8.10	2.80	7.30	48.0	0.020		0.020	0.010	0.100	0.490	0.480	178	17.0	112.0	0.7	3.5
LW28	12/01/80	0925	18.0	0.5	8.00	1.10	7.50	55.0	0.030		0.030	0.010	0.050	0.720	0.710	196	19.0	121.0	0.3	4.1
LW28	03/09/81	0845	18.0	0.5	8.10	1.90	7.80	72.0	0.020		0.020	0.020	0.050	0.750	0.730	236	19.0	142.0	1.0	2.5
LW28	06/15/81	1020	30.0	0.5	8.40	1.40	8.00	63.0	0.010		0.070	0.010	0.060	1.110	1.100	220	25.0	128.0	0.9	3.0
LW28	09/14/81	0855	28.5	0.5	6.70	0.80	8.00	47.0	0.024		0.024	0.040	0.350	0.790	0.750	186			1.5	3.0
LW28	12/07/81	0955	16.5	0.5	8.40	1.20	7.70	53.0	0.019		0.012	0.040	0.390	0.850	0.810	210			4.2	4.6
LW28	03/22/82	1000	25.0	0.5	8.40	1.50	7.00	63.0	0.008		0.014	0.040	0.110	1.040	1.000	200		135.0	2.9	5.0
LW28	06/22/82	0925	28.0	0.5	8.10	1.50	7.00	51.0	0.012		0.016	0.040	0.050	0.850	0.810	180		114.0	1.3	2.3
LW28	08/09/82	1020	31.0	0.5	7.00	2.50	6.40	40.0	0.016		0.018	0.040	0.080	0.730	0.690	190		115.0	1.0	
LW28	11/01/82	1000	16.5	0.5	8.80	0.30	6.70	46.0	0.008		0.013	0.040	0.080	0.550	0.510	195		95.0	1.9	3.9
LW28	01/03/83	0940	20.0	0.5	8.80	1.90	6.30	60.0	0.008		0.018	0.040	0.220	0.880	0.840	220		132.0	2.6	3.5
LW28	04/19/83	0900	21.0	0.5	8.50	2.80	6.50	76.0	0.012		0.027	0.040	0.070	0.730	0.690	290		172.0	1.5	2.8
LW28	07/05/83	0855	30.0	0.5	8.80	1.70	8.30	38.0	0.008		0.025	0.040	0.160	0.760	0.720	210		120.0	0.7	3.0
LW28	10/25/83	0915	25.5	0.5	7.60	1.10	7.90	58.0	0.010		0.012	0.040	0.090	0.580	0.540	215		105.0	0.6	3.8
LW28	02/08/84	0910	14.0	0.5	9.90	1.80	7.64	67.0	0.015		0.016	0.050	0.090	0.200	0.150	275		121.0	1.4	3.0
LW28	03/06/84	0920	18.5	0.5	10.20	2.00	8.10	68.2	0.017		0.016	0.040	0.090	0.700	0.660			152.0	0.8	3.0
LW28	05/23/84	0945	26.5	0.5	8.60	1.10	8.00	65.0	0.011		0.018	0.040	0.120	0.610	0.570	235		114.0	0.7	3.0
LW28	06/26/84	1100	29.0	0.5	10.40	3.60	8.40	84.0	0.013		0.045	0.040	0.080	1.240	1.200	260		141.0	2.4	0.9
LW28	08/21/84	0850	28.5	0.5	7.00	1.00	7.90	46.0	0.017		0.020	0.040	0.080	0.490	0.450	170		102.0	0.6	3.5
LW28	11/14/84	0850	17.0	0.5	9.80	1.90	8.00	59.8	0.008		0.031	0.040	0.100	0.640	0.600	180		109.0	0.4	4.0
LW28	01/30/85	1005	14.0	0.5	9.90	1.50	7.80	68.3	0.010		0.009	0.050	0.090	0.410	0.360	230		89.0	0.5	4.0
LW28	02/25/85	0935	19.0	0.5	9.40															
LW28	03/04/85	0825	21.0	0.5	8.80															
LW28	04/15/85	1030	22.0	0.5	8.20															
LW28	05/07/85	0840	25.0	0.5	7.00	0.50	8.00	73.7	0.008		0.023	0.040	0.090	1.000	0.960	210		133.0	0.8	2.9
LW28	06/05/85	0910	30.0	0.5	7.80															3.2
LW28	07/22/85	0845	29.0	0.5	8.00															
LW28	08/12/85	0900	29.0	0.5	6.40															
LW28	09/24/85	1005	27.0	0.5	6.50	2.00	7.90	54.0	0.013		0.015	0.040	0.110	0.550	0.510	190		139.0	0.7	3.0
LW28	10/14/85	0900	26.0	0.5	8.00															
LW28	11/19/85	0835	24.0	0.5	8.30	2.00	7.60	57.8	0.008		0.023	0.040	0.120	1.300	1.260	190		132.0	0.7	2.3
LW28	12/09/85	0815	18.0	0.5	8.00															

STATION: LW28 LOCATION: LAKE FAIRVIEW SOURCE: ORANGE CO. ENVIRONMENTAL PROTECTION DEPT.

Na	Ca	Mg	K	Fe	Cu	Pb	Zn	Cd	Al	Ni	Mn	Cr	T.Coli	F.Coli	Chl.a F	Chl.a NF	Chl.a	Chl.b	Chl.c	DATE	STA.
mg/l	mg/l	mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	/100ml	/100ml	mg/m3	mg/m3	mg/m3	mg/m3	mg/ml		NAME
929	916	927	937	1045	1042	1051	1092	1027	1105	1067	1055	1034	31501	31616	32211	32218	32210	32212	32214		
10.00	29.00	2.70	2.20	50	10								460	120	2.67	0.69	3.02	1.06	0.00	01/07/80	LW28
10.00	31.00	2.90	2.60	50	10								160	200	3.08	0.96	3.62	0.90	0.00	02/04/80	LW28
11.00	27.00	2.90	2.80	50	10								122	66	5.49	6.52	8.79	6.50	1.63	03/03/80	LW28
12.00	39.00	3.30	4.00	50	10								56	20						03/31/80	LW28
11.00	28.00	2.80	2.60	50	10								20	20	1.22	1.69	2.15	1.06	0.00	06/02/80	LW28
													20	20	1.74	0.87	2.12	1.62	0.00	06/30/80	LW28
11.00	16.00	2.70	2.00	50	10								20	20	2.13	0.48	2.50	0.00	0.50	09/08/80	LW28
11.00	16.00	2.70	2.20	50	70								20	20	1.75	2.81	3.27	1.78	1.01	10/06/80	LW28
12.00	22.00	3.00	2.00	50	10								44	10	3.07	1.87	4.05	1.57	3.45	10/29/80	LW28
11.00	27.00	3.00	2.40	50	10								76	110						12/01/80	LW28
													160	120	5.05	0.73	5.37	1.92	0.71	03/09/81	LW28
													20	20	35.97	6.39	39.09	4.00	6.61	06/15/81	LW28
													20	20	1.83	1.86	2.90	0.74	0.00	09/14/81	LW28
14.00			3.60	50	20	100	5	5	100	40	10		160	120	0.55	1.56	1.42	0.69	0.00	12/07/81	LW28
13.00	21.00	3.40	3.20	50	20		5	5		40	10	50	20	20	1.54	0.44	1.70	0.82	3.02	03/22/82	LW28
13.00	20.00	3.10	3.00	50	20		5	5		40	10	50	20	20	3.34	2.23	4.64	0.81	0.00	06/22/82	LW28
12.00	24.00	3.50	3.00	50	20		5	5		40	10	50	20	20	1.57	2.09	2.73	1.04	0.18	08/09/82	LW28
11.00	29.00	3.60	2.40	50	20		5	5		40	10		20	20						11/01/82	LW28
12.00	30.00	3.00	2.60	50	20		5	5		40	10	50	160	120	0.27	0.00	0.00	3.87	2.76	01/03/83	LW28
11.00	25.00	2.90	2.60	50	20		5	5		40	10	50	20	10	4.32	0.22	4.34	1.82	0.00	04/19/83	LW28
11.00	20.00	2.80	2.60	50	20		5	5		40	10	50	20	20	1.78	1.24	2.41	1.25	0.66	07/05/83	LW28
11.00	18.00	2.60	2.80	50	20		5	5		40	10	50	20	20	0.80	2.20	2.00	0.90	0.00	10/25/83	LW28
10.00	26.00	5.00	3.00	50	20		100	5		40	20	50	46	26	1.50	1.80	2.60	0.10	0.40	02/08/84	LW28
9.62	26.30	2.68	3.25	50	20		5	5		40	10	50	142	120	5.50	0.00	3.30	0.30	0.00	03/06/84	LW28
11.30	30.30	2.80	3.00	50	20		60	5		40	10	50	20	20	0.60	2.90	2.30	0.10	0.30	05/23/84	LW28
10.50	30.00	2.70	3.10	50	20		5	5		40	10	50								06/26/84	LW28
9.40	29.70	2.60	1.60	50	20		5	5		40	10	50	20	20	1.00	3.50	2.90	2.30	0.00	08/21/84	LW28
9.80	24.00	2.60	2.20	50	30		10	5		40	10	50	20	20	1.20	1.20	1.80	1.50	0.00	11/14/84	LW28
10.00	34.00	3.20	2.70	50	40	10	5	5		40	10	50	200	120	2.80	0.40	3.00	0.80	2.10	01/30/85	LW28
10.00	28.00	3.20	3.10	50	20	10	5	5		40	10	50		82						02/25/85	LW28
10.60	30.00	3.40	2.90	50	20	10	20	5		40	10	50		60						03/04/85	LW28
10.90	34.00	3.00	3.10	50	20	10	5	5		40	10	50								04/15/85	LW28
11.90	30.00	4.10	1.60	50	20	10	5	5		40	10	50	20	20	3.80	0.00	3.50	0.10	0.00	05/07/85	LW28
10.20			2.90	50	20		5	5		40	10	50								06/05/85	LW28
																				07/22/85	LW28
				21	14		2	10		9	58									08/12/85	LW28
				39	3		23	10		45	84		20	20	3.60	0.30	3.80	0.50	0.10	09/24/85	LW28
														10						10/14/85	LW28
20.50			5.50	45	19		28	10		32	15		58	20	9.00	2.80	10.70	1.00	3.20	11/19/85	LW28
			5.70	22	21		21	3		13	4	4		10						12/09/85	LW28

STATION: LW28 LOCATION: LAKE FAIRVIEW SOURCE: ORANGE CO. ENVIRONMENTAL PROTECTION DEPT.

STA. NAME	DATE	TIME	TEMP C 10	DEP M	D.O. mg/l 299	BOD mg/l 310	pH 403	T.ALK mg/l 410	TP/f mg/l 666	PO4 mg/l 70507	TP mg/l 665	NOX mg/l 630	NH3 mg/l 610	TN mg/l 600	TKN mg/l 625	COND. umhos 95	Cl mg/l 940	TS mg/l 500	TURB FTU 76	SEC.D M 78
LW28	02/05/86	0930	17.0	0.5	9.90	1.40	7.40	69.0	0.012		0.015	0.040	0.250	0.670	0.630	200		114.0	0.8	2.8
LW28	04/02/86	0900	22.0	0.5		1.80	8.20	86.8	0.008		0.019	0.040	0.130	0.610	0.570	220		112.0	1.4	2.5
LW28	07/01/86	0855	29.0	0.5	7.40	2.50	7.70	64.0			0.021	0.040	0.120	0.670	0.630	215		122.0	0.8	2.8
LW28	10/07/86	0815	28.5	0.5	6.20	2.40	7.40	44.2	0.004		0.025	0.040	0.050	0.550	0.510	210		136.0	1.4	1.1
LW28	01/07/87	1015	15.0	0.5	8.20	1.40	7.90	71.9	0.008		0.022	0.017	0.120	0.727	0.710	290		155.0	1.3	2.8
LW28	02/03/87	0930	15.0	0.5	9.00		7.80	69.2	0.011		0.030	0.016	0.050	1.366	1.350	240				3.0
LW28	03/04/87	1120	19.0	0.5	8.30	1.60	7.80	72.2	0.008		0.026	0.200	0.140	0.710	0.510	210		143.0	1.0	3.0
LW28	04/01/87	1100	19.0	0.5	8.60		7.90	66.1	0.020		0.020	0.248	0.040	1.766	1.518	200		110.0	1.0	2.5
LW28	05/13/87	1010	26.0	0.5	8.20	5.50	8.00	63.8	0.026	0.020	0.022				0.409	200		152.0		1.8
LW28	06/10/87	0945	28.0	0.5	6.70	1.10	8.00	66.0	0.020	0.020	0.020	0.074	0.040	0.347	0.273	260		132.0	1.0	2.0
LW28	07/08/87	0945	29.0	0.5	7.10	1.20	7.70	81.8	0.020	0.020	0.020	0.030	0.040	0.623	0.593	205		119.0	0.9	2.1
LW28	12/09/87	1015	17.8	0.5	9.80	2.15	7.00	34.3	0.020	0.023	0.020	0.048	0.040	0.501	0.453	210		93.0	0.9	2.5
LW28	02/15/88	0800	14.7	0.5		1.10	7.30	28.3	0.020	0.020	0.020	0.088	0.040	0.453	0.365	230		108.0	0.8	
LW28	03/30/88	0916	24.5	0.5	6.30	1.80	5.70	34.9	0.020	0.020	0.037	0.030				180		100.0		2.4
LW28	06/20/88	0822	28.2	0.5	10.30	2.40	6.60	33.3	0.020	0.020	0.029	0.030	0.040	0.378	0.348	155		100.0	1.5	
LW28	09/14/88	1025	28.6	0.5	7.49	1.20	7.20	28.7	0.020	0.020	0.026	0.030	0.040	0.473	0.443	150		89.5	1.4	
LW28	12/12/88	0825	18.6	0.5	7.96		6.70	19.8	0.110	0.008	0.027	0.020	0.056	0.112	0.092	230		76.5	1.4	2.4
AVG.			22.7	0.5	8.31	1.63	7.40	56.9	0.017	0.019	0.024	0.044	0.095	0.715	0.666	211	18.1	121.3	1.2	3.0
STD			5.7	0.0	1.08	0.93	1.20	15.2	0.016	0.004	0.013	0.042	0.073	0.294	0.283	32.9	2.3	21.6	0.8	1.0

STATION: LW28 LOCATION: LAKE FAIRVIEW SOURCE: ORANGE CO. ENVIRONMENTAL PROTECTION DEPT.

Na	Ca	Mg	K	Fe	Cu	Pb	Zn	Cd	Al	Ni	Mn	Cr	T.Coli	F.Coli	Chl.a F	Chl.a NF	Chl.a	Chl.b	Chl.c	DATE	STA.
mg/l	mg/l	mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	/100ml	/100ml	mg/m3	mg/m3	mg/m3	mg/m3	mg/ml		NAME
929	916	927	937	1045	1042	1051	1092	1027	1105	1067	1055	1034	31501	31616	32211	32218	32210	32212	32214		
9.22	25.12	2.51	4.12	28	17		33	14		33	11	8	160	44	6.10	0.00	6.00	0.00	1.50	02/05/86	LW28
7.44	23.76	2.61	5.30	88	36		4	15		32	2	49	20	20	5.00	1.80	6.10	1.70	0.60	04/02/86	LW28
10.08	24.78	3.14	3.61	67	7		1	2		101	11	7	20	20	4.20	1.20	4.90	0.80	0.70	07/01/86	LW28
4.02	22.48	2.80		14	2		12	8		77	13	11	160	58	13.00	2.80	14.80	1.00	2.50	10/07/86	LW28
8.56	20.38	3.00	3.40	43	2	20	6	16	840	25	26	20	40	30	5.00	0.70	5.50	0.40	0.90	01/07/87	LW28
9.13	28.00	2.61	3.06	19									160		3.40	2.10	4.70	0.00	0.30	02/03/87	LW28
													160	120	5.70	2.10	7.00	0.20	0.80	03/04/87	LW28
																				04/01/87	LW28
																				05/13/87	LW28
8.46	16.96	2.70	3.23	12	44	10	18	37	10	1	26	27	10	8	6.00	0.00	6.00	0.20	0.00	06/10/87	LW28
8.72	17.68	2.86	3.09	47	21	17	16	1	230	34	11	22	24	2	6.50	0.20	6.70	0.60	3.40	07/08/87	LW28
7.97	12.26	2.77	3.07	6	25	1	3	1	210	9	8	5	54	28	2.50	3.50	0.50	1.50	1.50	12/09/87	LW28
7.78	13.47	2.79	2.91	31	18	5	1	6	40	1	5	13	100	68	3.20	0.70	3.70	0.00	0.20	02/15/88	LW28
5.35	13.19	2.17	2.86	38	17	6	241	1	60	81	16	17	32	8	4.20	1.10	5.00	0.00	0.00	03/30/88	LW28
9.00	9.05	3.01	3.90	107	20	1	78	12	70	47	38	816	6	10	10.20	0.00	10.30	0.80	2.00	06/20/88	LW28
7.52	9.82	2.55	2.62	19	4	30	19	1	170	1	14	8	2	2	11.80	2.50	13.60	0.00	1.80	09/14/88	LW28
													30	12	6.00	1.10	6.60	1.20	0.00	12/12/88	LW28
10.34	23.93	2.97	3.03	46	19	17	21	7	192	37	15	59	69	42	4.65	1.57	5.38	1.10	1.00		AVG.
2.43	6.85	0.47	0.86	17.0	11.6	24.1	41.9	6.2	240	19.6	15.1	135	82.5	44.6	5.63	1.47	6.06	1.22	1.38		STD

STATION: LW1 LOCATION: ORANOLE RD. AND LITTLE WEKIVA RIVER SOURCE: SEMINOLE CO. ENVIRONMENTAL SERVICES

STA.	DATE	TIME	TEMP.	DEPTH	D.O.	BOD	COD	pH	T.ALK	TP	PO4	NO2	NO3	NOX	NH3+NH4	TOT.ORGN	TN	TKN	COND.	Cl	TURB	SD
NAME			C	M	mg/l	mg/l	mg/l		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mmhos	mg/l	FTU	M
			10		299	310	335	403	410	665	70507	615	620	630	610	605	600	625	95	940	76	78
LW1	02/04/80		15.0	0.30	8.50		27.40	7.7	34.00	0.100	0.070		0.470	0.470			0.470	0.000	160		2.20	0.30
LW1	03/26/80		21.0	0.30	8.20			7.0	38.00	0.130	0.100		0.520	0.520	0.060	0.610	1.190	0.670	160		2.80	0.30
LW1	04/29/80	1145	18.0	0.30	6.20		15.70		35.80	0.100	0.070		0.620	0.620	0.130	0.360	1.110	0.490	180		3.00	0.30
LW1	05/23/80		24.0	0.30	3.20		27.00	6.7	42.00	0.100	0.080		0.370	0.370	0.090	0.670	1.130	0.760	165		2.60	0.30
LW1	06/19/80		24.0	0.15	3.50			6.9	46.00	0.070	0.060		0.530	0.530	0.080	0.500	1.110	0.580	190		1.50	0.15
LW1	08/01/80		25.0	0.30	2.90		12.70	7.0		0.080	0.070											0.30
LW1	09/19/80		26.0	0.30	2.20			7.0					0.020	0.020			0.020		180		2.70	0.30
LW1	10/15/80		20.0	0.15	2.50		19.50	6.9		0.050	0.040											0.15
LW1	11/07/80		23.0	0.30	4.60				44.00				0.660	0.660	0.030	0.470	1.160	0.500	195		0.30	0.30
LW1	03/04/81		21.0		7.50			8.0	106.00	0.131	0.095	0.014	0.299	0.313	0.024	0.280	0.617	0.304	217		0.35	0.80
LW1	04/06/81		22.0	0.30	3.10	1.60	3.00	7.7	47.50	0.079	0.057	0.003	0.016	0.019	0.120	1.400	1.539	1.520	165		1.00	0.30
LW1	06/23/81		27.0	0.15	0.70			6.7	57.00			0.004	0.014	0.018	0.140	2.930	3.088	3.070	130		6.70	0.15
LW1	10/03/81		23.0	0.15	3.70	1.50		7.2		0.090	0.060		0.536	0.536	0.090	0.450	1.076	0.540	220		1.00	0.15
LW1	03/25/82		24.0	0.30	1.70	2.10			47.00		0.131	0.025	0.640	0.665	0.130	0.970	1.765	1.100	205		5.25	0.30
LW1	08/16/82		29.0	0.61	6.40			7.3	42.50	0.068	0.051	0.031	0.560	0.591	0.020	0.650	1.261	0.670	170		1.40	0.61
LW1	02/04/83		16.0		9.70	2.40		6.5	50.50	0.034	0.025	0.010	0.250	0.260	0.140	1.370	1.770	1.510	180		5.20	
LW1	06/13/83		28.0		6.70	2.40		7.1	53.00	0.095	0.027	0.010	0.250	0.260	0.090	1.320	1.670	1.410	185		3.40	
LW1	08/30/83		29.0		2.50		31.96	6.8		0.095		0.007	0.340	0.347	0.100	1.110	1.557	1.210	175		3.00	
LW1	01/04/84		11.0		9.80		29.42	6.6	47.50	0.200	0.165	0.016	0.300	0.316	0.040	0.700	1.056	0.740	270		7.40	
LW1	03/21/84		18.0		6.40		20.90	6.7	50.90	0.141		0.005	0.433	0.438	0.030	0.590	1.058	0.620	190	16.49	1.25	
LW1	07/16/84	1200				1.50	33.50	6.8	52.70	0.091	0.037	0.012	0.325	0.337			1.267	0.930	194	11.70	6.80	
LW1	09/26/84	1200	23.0		6.95		19.90	6.8	44.46	0.133	0.078	0.019	0.808	0.827			1.617	0.790	156		3.30	0.10
LW1	11/28/84	1200					20.30		44.95		0.070	0.016	0.649	0.665			1.135	0.470	165	15.20	2.20	0.50
LW1	02/18/85	1200	22.5		10.40		16.40	7.5	43.38	0.103	0.094	0.009	1.060	1.069			1.639	0.570	170	19.24	1.70	0.20
LW1	08/05/85	1200	29.0		6.10	1.15		7.3	43.40	0.126	0.045	0.007	0.094	0.101			1.181	1.080	165	15.50	4.30	
LW1	03/10/86	1200	21.0		8.30	1.35		6.8	42.20	0.135	0.082	0.022	0.650	0.672			1.592	0.920	210		3.10	0.30
AVG.			22.5	0.28	5.49	1.75	21.36	7.0	48.2	0.102	0.072	0.013	0.434	0.443	0.082	0.899	1.295	0.889	183	15.63	3.02	0.31
STD			4.5	0.11	2.79	0.45	8.17	0.4	14.0	0.035	0.033	0.008	0.255	0.258	0.042	0.631	0.553	0.595	27.4	2.43	1.97	0.17

STATION: LW3 LOCATION: SR 436 AND LITTLE WEKIVA RISOURCE: SEMINOLE CO. ENVIRONMENTAL SERVICES

STA. NAME	DATE TIME	TEMP	DEPTH	D.O.	BOD	COD	pH	T.ALK	TP	PO4	NOX	NO2	NO3	NH3N	TOTORGN	TN	TKN	COND	CL	TURB	SEC.D
		C	M	mg/l	mg/l	mg/l		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mmhos	mg/l	FTU	M
		10	97	299	310	335	403	410	665	70507	630	615	620	610	605	600	625	95	940	76	78
LW3	02/04/80	21.0	0.3	7.8		18.7	7.7	84.0	0.730	0.580	3.500		3.500			3.500		290		1.40	0.30
LW3	03/26/80	21.0	0.3	3.8			7.1	79.5	0.300	0.280	1.400		1.400	0.120	0.870	2.390	0.990	315		0.90	0.61
LW3	04/29/80 1130	24.0	0.3	6.4		15.5	7.4	70.8	0.440	0.430	2.290		2.290	0.380	0.520	3.190	0.900	300		0.80	0.61
LW3	05/23/80	29.0	0.2	4.5		19.7	6.9	76.0	0.190	0.160	0.520		0.520	0.160	0.660	1.340	0.820	290		1.20	0.61
LW3	06/19/80	26.0	0.3	5.9			7.4		0.270	0.270	0.460		0.460	0.130	0.520	1.110	0.650	350		0.60	0.30
LW3	08/01/80	27.0	0.3	6.0		12.5	7.3		0.260	0.240						0.000					0.30
LW3	09/19/80	28.0	0.2	6.2			7.5	87.5			0.870		0.870			0.870		350		0.70	0.61
LW3	10/15/80	25.0	0.3	6.3		14.5	7.3		0.270	0.260	0.000					0.000					0.61
LW3	11/07/80	25.0		6.2				99.5			1.230		1.230	0.050	0.700	1.980	0.750	390		0.70	0.61
LW3	03/04/81	20.0	0.3	4.7			7.9	103.0	0.105	0.089	0.165	0.009	0.156	0.027	0.260	0.452	0.287	250		0.38	1.60
LW3	04/06/81	27.0	0.2	6.9	3.0	9.0	8.1	36.0	0.428	0.387	0.331	0.105	0.226	0.760	4.400	5.491	5.160	330		1.10	0.30
LW3	06/23/81	30.0	0.2	5.2			7.4	83.5			1.106	0.386	0.720	0.450	3.770	5.326	4.220	390		1.80	0.60
LW3	10/03/81	23.0	0.3	3.7	1.5		7.2		0.090	0.060	0.536		0.536	0.090	0.450	1.076	0.540	220		1.00	0.15
LW3	03/25/82	25.0	0.6	5.0	2.6		6.3	91.0		0.548	1.875	0.145	1.730	0.340	1.410	3.625	1.750	420		0.88	0.60
LW3	08/16/82	28.0		6.0			7.5	43.5	0.263	0.248	1.669	0.159	1.510	0.190	1.310	3.169	1.500	185		1.50	0.30
LW3	02/04/83	16.0		7.0	2.3		6.5	70.0	0.053	0.033	0.592	0.072	0.520	0.470	1.350	2.412	1.820	285		2.10	
LW3	06/13/83	27.0		2.6	2.0		7.0	67.0	0.272	0.220	1.264	0.034	1.230	0.240	1.400	2.904	1.640	235		1.60	
LW3	08/30/83	29.0		5.6		32.0	6.4	70.5	0.577	0.519	0.825	0.025	0.800	0.330	1.070	2.225	1.400	260		1.20	
LW3	01/04/84	16.0		7.0		27.1	6.9	72.0	1.234	1.098	1.488	0.068	1.420	0.010	0.960	2.458	0.970	280		3.30	
LW3	03/21/84	22.5		5.4		18.1	7.2	92.6	0.488		1.420	0.300	1.120	0.340	0.900	2.660	1.240	344	26.99	1.60	
LW3	07/16/84 1200				1.2	31.1	7.2	74.6	0.094	0.725	2.437	0.082	2.355			3.567	1.130	308	20.40	3.40	
LW3	09/26/84 1200	26.0		6.2		17.1	7.5	89.2	0.484	0.393	1.271	0.031	1.240			2.107	0.836	298		1.40	0.50
LW3	11/28/84 1200					14.8		94.4		0.419	1.157	0.027	1.130			1.797	0.640	290	26.70	0.65	0.50
LW3	02/18/85 1200	24.0		7.7		18.1	7.4	96.5	0.701	0.630	3.925	0.125	3.800			5.225	1.300	400	35.40	1.40	0.70
LW3	08/05/85 1200	29.0		3.1	1.5		6.9	59.8	0.906	0.810	1.676	0.026	1.650			3.016	1.340	225	16.30	2.30	
LW3	03/10/86 1200	23.5		5.5	0.8		7.4	86.3	0.306	0.267	3.133	0.143	2.990			4.333	1.200	269		1.20	0.70
AVG.		24.7	0.3	5.6	1.9	19.1	7.2	78.5	0.403	0.394	1.406	0.109	1.392	0.255	1.284	2.547	1.413	303	25.16	1.38	0.55
STD		3.7	0.1	1.3	0.7	6.7	0.4	16.6	0.289	0.256	0.991	0.101	0.958	0.194	1.119	1.495	1.116	59.1	6.51	0.75	0.29

STATION: LW6 LOCATION: LITTLE WEKIVA RIVER OFF OF DELKS RD. SOURCE: SEMINOLE CO. ENVIRONMENTAL SERVICES

STA. NAME	DATE	TIME	TEMP C 10	DEPTH M 97	D.O. mg/l 299	BOD mg/l 310	COD mg/l 335	pH 403	T.ALK mg/l 410	TP mg/l 665	PO4 mg/l 70507	NOX mg/l 630	NO2 mg/l 615	NO3 mg/l 620	NH3N mg/l 610	TORGN mg/l 605	TN mg/l 600	TKN mg/l 625	COND. umhos 95	CL mg/l 940	TURB FTU 76	SEC.D M 78
LW6	02/04/80		20.0	1.22	8.5		8.20	7.6	98.00	0.210	0.190	0.700		0.700			0.700		230		1.00	1.22
LW6	03/26/80		20.0	1.22	5.6			8.0	103.50	0.190	0.180	0.470		0.470	0.000	0.310	0.780	0.310	285		0.40	1.22
LW6	04/29/80	1030	19.0	0.91	5.6		10.20	7.2	92.80	0.200	0.180	0.520		0.520	0.020	0.040	0.580	0.060	280		0.30	0.91
LW6	05/23/80		24.0	1.22	2.8		34.40	6.2	76.50	0.170	0.160	0.370		0.370	0.060	0.620	1.050	0.680	240		1.50	1.22
LW6	06/19/80		23.0	0.91	4.2			7.6		0.170	0.150	0.290		0.290	0.020	0.300	0.610	0.320	290		0.30	0.91
LW6	08/01/80		23.0	0.91	4.4		4.20	7.6		0.200	0.190	0.000										0.91
LW6	09/19/80		25.0	1.22	4.5			8.1	100.00			0.280		0.280			0.280		300		0.30	1.22
LW6	10/15/80		21.0	1.22	5.3		0.00	7.6		0.170	0.160	0.000										1.22
LW6	11/07/80		22.0	1.22	6.3				111.00			0.300		0.300	0.120	0.260	0.680	0.380	300		0.30	1.22
LW6	03/04/81		20.0	0.91	6.5			8.0	102.00	0.113	0.095	0.803	0.006	0.797	0.059	0.190	1.052	0.249	231		0.46	1.00
LW6	04/06/81		23.0	1.52	5.9	2.2	10.50	8.1	101.50	0.199	0.187	0.212	0.002	0.210	0.020	1.020	1.252	1.040	260		0.47	1.60
LW6	06/23/81		25.0	0.12	5.0			7.5	107.00			0.272	0.004	0.268	0.010	1.120	1.402	1.130	330		1.50	0.10
LW6	10/03/81		26.0	0.91	4.6	1.2		4.6	110.00	0.245	0.210	0.752		0.752	0.060	0.280	1.092	0.340	340		0.40	0.92
LW6	03/25/82		23.0	0.61	4.0	0.8		5.7	97.50		0.234	0.525	0.005	0.520	0.010	0.530	1.065	0.540	280		0.57	0.60
LW6	08/16/82	1400	25.0	0.76	5.0			5.8	96.00	0.012	0.000	0.490	0.010	0.480	0.140	1.880	2.510	2.020	280		0.45	
LW6	02/04/83		18.0		6.3	1.1		7.9	92.00	0.066	0.030	0.224	0.004	0.220	0.050	0.630	0.904	0.680	275		1.30	
LW6	06/13/83		25.0		3.8	0.9		7.1	94.00	0.183	0.168	0.743	0.003	0.740	0.000	0.660	1.403	0.660	255		0.60	
LW6	08/30/83		25.0		3.8		18.00	6.9	95.50	0.364	0.334	0.735	0.005	0.730	0.020	0.550	1.305	0.570	290		0.80	
LW6	01/04/84		17.0		6.7		13.25	6.9	81.00	0.459	0.435	0.728	0.018	0.710	0.080	0.770	1.578	0.850	330		1.30	
LW6	03/21/84		20.0		5.2		5.70	7.5	96.50	0.420		0.600	0.023	0.577	0.040	0.390	1.030	0.430	315	16.7	2.75	
LW6	07/16/84	1200				1.4	14.70	7.5	97.00	0.386	0.295	1.662	0.012	1.650			2.232	0.570	201	15.1	1.60	
LW6	09/26/84	1200	23.5		5.3		10.70	7.6	103.50	0.291	0.285	0.096	0.010	0.086			0.343	0.247	277		0.97	0.80
LW6	11/28/84	1200					8.90		108.36		0.304	0.754	0.006	0.748			0.754		248	16.4	0.49	0.50
LW6	08/05/85	1200	27.0		3.3	0.3		4.1	80.40	0.385	0.347	0.557	0.007	0.550			1.377	0.820	240	13.9	1.20	
LW6	03/10/86	1200	23.5		6.1	0.4		7.6	103.80	0.246	0.192	1.037	0.002	1.035			1.367	0.330	249		0.60	1.00
AVG.			22.5	0.99	5.2	1.0	11.56	7.1	97.63	0.234	0.206	0.525	0.008	0.565	0.044	0.597	1.102	0.611	275	15.5	0.85	0.98
STD			2.6	0.32	1.3	0.6	8.27	1.1	8.99	0.115	0.100	0.351	0.006	0.327	0.040	0.436	0.522	0.421	34.7	1.1	0.59	0.34

STATION: BL1 LOCATION: BEAR LAKE SOURCE: SEMINOLE CO. ENVIRONMENTAL SERVICES

STA.	DATE TIME	TEMP	DEPTH	D.O.	BOD	COD	pH	T.ALK	TP	PO4	NOX	NO2	NO3	NH3N	TOTORGN	TN	TKN	COND	Cl	TURB	SEC.D
NAME		C	M	mg/l	mg/l	mg/l		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mmhos	mg/l	FTU	M
		10	97	299	310	335	403	410	665	70507	630	615	620	610	605	600	625	95	940	76	78
BL1	02/07/80	12.0	5.0	9.00	1.00	14.90	6.80	9.5	0.020	0.000	0.060		0.060	0.000	0.440	0.500	0.440	95.0		0.9	3.7
BL1	04/22/80	22.0	3.7	7.80			7.40	9.5	0.030	0.000	0.100		0.100	0.090	0.390	0.580	0.480	120.0		1.0	1.8
BL1	07/01/80	28.0	7.3	7.00		32.80	7.70	9.0	0.020	0.000	0.060		0.060	0.060		0.120	0.060	115.0		0.6	4.3
BL1	10/21/80	24.0	3.7	5.80	1.20	21.50	8.00	12.0	0.003	0.003	0.030		0.030	0.090	0.650	0.770	0.740	120.0		1.5	2.1
BL1	03/31/81	22.0		8.70		14.50	9.10	10.0	0.041	0.011	0.048	0.003	0.045	0.000	2.240	2.288	2.240	108.0		3.2	5.0
BL1	08/18/81	29.0	1.5	6.20			6.70	9.0	0.061	0.018	0.184		0.184	0.067	0.510	0.761	0.577	135.0			1.4
BL1	12/29/81	19.0	2.0	9.40	0.20			9.0	0.032	0.002	0.022	0.002	0.020	0.000	0.450	0.472	0.450	138.0	16.7	1.5	1.9
BL1	06/03/82 1015	29.0	1.8	7.20	1.00		5.60	2.5	0.009		0.013	0.013	0.000	0.040	0.600	0.653	0.640	140.0		1.0	1.5
BL1	09/27/83	26.0		6.50	0.70	13.20	5.90	4.5	0.022	0.000	0.095	0.005	0.090	0.070	0.430	0.595	0.500	115.0		1.1	2.1
BL1	06/14/84	23.0		7.50	1.50	15.60	6.60	5.4	0.030	0.012	0.015	0.005	0.010			0.485	0.470	128.1	18.2	3.4	0.6
BL1	02/25/85	20.0		9.80			7.10	4.9	0.041	0.011	0.030	0.004	0.026	0.000		0.460	0.430	131.0	0.4	0.8	
BL1	07/16/85	31.0		6.80		16.10	6.00	3.2	0.020	0.015	0.007		0.007			0.417	0.410	136.0		1.5	2.3
AVG.		23.8	3.6	7.64	0.93	18.37	6.99	7.4	0.027	0.007	0.055	0.005	0.053	0.042	0.714	0.675	0.620	123.4	11.8	1.5	2.4
STD		5.1	1.9	1.25	0.41	6.38	0.98	3.0	0.015	0.007	0.049	0.004	0.050	0.037	0.583	0.513	0.513	13.1	8.1	0.9	1.3

Appendix D

WETLAND DIAGNOSTIC CHARACTERISTICS

WETLAND DIAGNOSTIC CHARACTERISTICS

FRESHWATER WETLANDS

Cypress (CY) - Forested wetlands dominated by bald cypress or pond cypress (Taxodium distichum or T. ascendens) and flooded annually for periods of long duration - typically 4 to 8 months in any given year. Includes cypress dome, stand, and lakeshore variants.

Hardwood Swamp (HS) - Forested wetlands dominated by one or more deciduous hardwood species typically including black gum, red maple, water ash, water elm, and willows. Cypress is often a significant component of this type. Subject to annual, seasonal periods of prolonged flooding.

Bayhead (BH) - Forested wetlands dominated by one or more species of broadleaved, evergreen bay trees (Gordonia lasianthus, Persea palustris, or Magnolia virginica). Dahoon holly (Ilex cassine) may occasionally be dominant. Soils usually organic and nearly constantly saturated as well as being at least occasionally flooded. The canopy of some sites may be dominated by pines, but bays and other indicators will be prevalent in the subcanopy and understory.

Baygall (BG) - Forested wetlands typically dominated by one or more species of evergreen bay trees or less commonly by dahoon holly, deciduous hardwoods, or pine. Located at the bases of sandy slopes and maintained by downslope seepage. Soils organic and nearly constantly saturated but infrequently flooded.

Hydric Hammock (HH) - Forested systems dominated by a mixture of broadleaved evergreen and deciduous tree species. Cabbage palmetto (CP) may be dominant in some variants of this type. Seldom inundated but with saturated soils during much of the year.

Bottomland Hardwoods (BL) - Deciduous forest communities lying in the floodplains of rivers and streams subject to rapid rise and fall of floodwaters. At other times, they may be relatively well drained, or at most, saturated by lateral seepage. Associated soils are alluvial.

Forested Flatwoods Depressions (FD) - Typically pond cypress, pine, deciduous hardwood, bay, or cabbage palm dominated communities occupying shallow depressions in mesic flatwoods sites. Understory vegetation consists of hydrophytic shrubs, grasses, and herbs. Saw palmetto, gallberry and other typical mesic flatwoods species generally absent. In the absence of fires, or as a result of forest management practices, understory or associated species (such as loblolly bay) may dominate these sites. Soils usually sandy and subject to brief (1 - 2 months) seasonal inundation or prolonged soil saturation.

Shrub Swamp (SS) - Dominated by willows, buttonbush, or similar appearing vegetation. Hydrology similar to that of cypress, hardwood swamp, or shallow marsh communities.

Shrub Bog (SB) - Dominated by shrubby vegetation occupying typical bayhead sites. Often developing in bayheads destroyed by fire or other disturbance. Hydrology similar to that of bayhead communities.

Shrubgall (SG) - Wetlands dominated by shrubby vegetation occupying typical baygall sites and having similar hydrologies and soils.

Transitional Shrub (TS) - Dominated by transitional shrubby vegetation at upland margins of wetter community types or on clear cut hydric sites. Also develops on wet prairie sites which have been protected from fire. Wax myrtle (Myrica cerifera) and Baccharis halimnifolia are typical species.

Deep Marsh (DM) - Deep water wetlands dominated by a mixture of water lilies and deep water emergent species. Semi-permanently to permanently flooded.

Lakeshore Emergents (DM-LS) - Emergent vegetation growing along lake shores and usually semi-permanently flooded. Panicum hemitomon and species of Scirpus are most common.

Water Lilies (DM-N) - Floating leaved species in the genera Nymphaea, Nuphar, Nelumbo, Brasenia and Nymphoides. Usually semi-permanently to permanently flooded.

Shallow Marsh (SM) - Herbaceous or graminoid communities dominated by species such as sawgrass, maidencane, cattails, pickerel weed, arrowhead, or other grasses and broad leaved herbs. Occurs most often on organic soils that are subject to lengthy seasonal inundation. Subject to occasional fire.

Wet Prairie (WP) - Communities of grasses, sedges, rushes, and herbs typically dominated by sand cordgrass, maidencane, or a mixture of species. Usually on mineral soils that are inundated for a relatively short duration each year, but with prolonged soil saturation. Subject to frequent fire.

Floating Marshes (F) - Communities of free-floating plants (such as water hyacinth, water lettuce, or lemna) or floating mats of rhizomatous species (such as alligator weed or various grasses and sedges).

Submerged Aquatic Beds (AB) - Communities of aquatic plants rooted in the sediments of shallow water bodies and having the majority of their photosynthetic tissues below the water surface. Generally permanently flooded.

Freshwater Flats and Barren Areas (BA) - Sandy or muddy sites subject to occasional or regular inundation with less than 33% vegetation cover during the growing season.

Water (W) - Unvegetated or sparsely vegetated sites subject to prolonged or semi-permanent flooding. Includes lakes, streams, ponds and other water bodies.

Appendix E

COST ESTIMATES OF VARIOUS FLOOD PROTECTION ALTERNATIVES

Capital-Recovery Factor

$$C = P \frac{i(1+i)^n}{(1+i)^n - 1}$$

C = Capital Recovery Factor (Annual Cost of Alternative)
i = 8.00%
n = 50 years
P = Present Worth of Alternative

Benefit-Cost Ratio

B/C = Benefit-Cost Ratio

B = Benefits = $EAD_p - EAD_a$

EAD_p = Expected Annual Damges Under Existing Conditions

EAD_a = Expected Annual Damages with Improvements

ORANGE COUNTY

I. C. (LEVEE)

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT
1.	EARTHWORK (HAUL/PLACE/STABILIZE)	3334 CY	$10.00 /CY	$33,340.00
2.	SEED & MULCH	29125 SF	$0.034 /SF	$990.25
3.	MOBILIZATION/ DEMOBILIZATION	1 LS	$1,029.91 /LS	$1,029.91
			SUB-TOTAL	$35,360.16
			10% CONTINGENCY	$3,536.02
			TOTAL	$38,896.17

B = $1,361.20 - $0.00 = $1,361.20
C = $3,179.48
B/C = 0.43

XII. (TRIBUTARY A - OPTION 5)

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT		
1.	BOX CULVERT (SPRINGS LANDING BLVD)	1 EA	$41,000.00 /EA	$41,000.00		
2.	BOX CULVERT (WYSTERIA DRIVE N & S)	2 EA	$17,550.00 /EA	$35,100.00		
3.	ROAD IMPROVEMENTS	1 LS	$2,500.00 /LS	$2,500.00		
4.	CHANNEL IMPROVEMENTS	6458 CY	5.00 /CY	$32,290.00		
5.	LEVEE	2400 CY	5.00 /CY	$12,000.00		
6.	MOBILIZATION/ DEMOBILIZATION	1 LS	$4,000.00 /LS	$4,000.00		
			SUB-TOTAL	$126,890.00		
			10% CONTINGENCY	$12,689.00	B = $5,063 - $1,660.58 =	$3,402.42
					C = $11,409.59	
			TOTAL	$139,579.00	B/C = 0.30	

IX. (MONTGOMERY VICINITY OPTION A)

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT		
1.	CHANNEL IMPROVEMENTS	67258 CY	5.00 /CY	$336,290.00		
2.	MOBILIZATION/ DEMOBILIZATION	1 LS	$4,000.00 /LS	$4,000.00		
			SUB-TOTAL	$340,290.00		
			10% CONTINGENCY	$34,029.00	B = $4,935 - $119.11 =	$4,815.89
					C = $30,597.90	
			TOTAL	$374,319.00	B/C = 0.16	

IX. (MONTGOMERY VICINITY OPTION B)

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT		
1.	CHANNEL IMPROVEMENTS	80165 CY	5.00 /CY	$400,825.00		
2.	MOBILIZATION/ DEMOBILIZATION	1 LS	$4,000.00 /LS	$4,000.00		
			SUB-TOTAL	$404,825.00		
			10% CONTINGENCY	$40,482.50	B = $4,935 - $112.30 =	$4,822.70
					C = $36,400.71	
			TOTAL	$445,307.50	B/C = 0.13	

IX. (MONTGOMERY VICINITY OPTION C)

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT		
1.	CHANNEL IMPROVEMENTS	83593 CY	5.00 /CY	$417,965.00		
2.	MOBILIZATION/ DEMOBILIZATION	1 LS	$4,000.00 /LS	$4,000.00		
			SUB-TOTAL	$421,965.00		
			10% CONTINGENCY	$42,196.50	B = $4,935 - $112.30 =	$4,822.70
					C = $37,941.89	
			TOTAL	$464,161.50	B/C = 0.13	

IX. (MONTGOMERY VICINITY OPTION 7)

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT		
1.	CHANNEL IMPROVEMENTS	40839 CY	5.00 /CY	$204,195.00		
2.	MOBILIZATION/ DEMOBILIZATION	1 LS	$4,000.00 /LS	$4,000.00		
			SUB-TOTAL	$208,195.00		
			10% CONTINGENCY	$20,819.50	B = $4,935 - $3,923.83 =	$1,011.17
					C = $18,720.30	
			TOTAL	$229,014.50	B/C = 0.05	

IX. (MONTGOMERY VICINITY OPTION 8)

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT		
1.	CHANNEL IMPROVEMENTS	40839 CY	5.00 /CY	$204,195.00		
2.	LEVEE	7040 CY	5.00 /CY	$35,200.00		
3.	MOBILIZATION/ DEMOBILIZATION	1 LS	$4,000.00 /LS	$4,000.00		
			SUB-TOTAL	$243,395.00		
			10% CONTINGENCY	$24,339.50	B = $4,935 - $2,082.50 =	$2,852.50
					C = $21,885.38	
			TOTAL	$267,734.50	B/C = 0.13	

IX. (MONTGOMERY VICINITY OPTION 9)

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT		
1.	CHANNEL IMPROVEMENTS	49612 CY	5.00 /CY	$248,060.00		
2.	MOBILIZATION/ DEMOBILIZATION	1 LS	$4,000.00 /LS	$4,000.00		
			SUB-TOTAL	$252,060.00		
			10% CONTINGENCY	$25,206.00	B = $4,935 - $1,867.09 =	$3,067.91
					C = $22,664.52	
			TOTAL	$277,266.00	B/C = 0.14	

IX. (MONTGOMERY VICINITY OPTION 4)

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT		
1.	CHANNEL IMPROVEMENTS	142481 CY	5.00 /CY	$712,405.00		
2.	MOBILIZATION/ DEMOBILIZATION	1 LS	$4,000.00 /LS	$4,000.00		
			SUB-TOTAL	$716,405.00		
			10% CONTINGENCY	$71,640.50	B = $4,935 - $493.44 =	$4,441.56
					C = $64,417.09	
			TOTAL	$788,045.50	B/C = 0.07	

IX. (MONTGOMERY VICINITY OPTION 5)

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT		
1.	CHANNEL IMPROVEMENTS	50116 CY	5.00 /CY	$250,580.00		
2.	MOBILIZATION/ DEMOBILIZATION	1 LS	$4,000.00 /LS	$4,000.00		
			SUB-TOTAL	$254,580.00		
			10% CONTINGENCY	$25,458.00	B = $4,935 - $3,923.83 =	$1,011.17
					C = $22,891.11	
			TOTAL	$280,038.00	B/C = 0.04	

IX. (MONTGOMERY VICINITY OPTION 6)

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT		
1.	CHANNEL IMPROVEMENTS	30352 CY	5.00 /CY	$151,760.00		
2.	MOBILIZATION/ DEMOBILIZATION	1 LS	$4,000.00 /LS	$4,000.00		
			SUB-TOTAL	$155,760.00		
			10% CONTINGENCY	$15,576.00	B = $4,935 - $4,934.35 =	$0.65
					C = $14,005.49	
			TOTAL	$171,336.00	B/C = 0.00	

IX. (MONTGOMERY VICINITY OPTION 1)

Some of these options are not described in the report

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT		
1.	CHANNEL IMPROVEMENTS	92366 CY	5.00 /CY	$461,830.00		
2.	MOBILIZATION/ DEMOBILIZATION	1 LS	$4,000.00 /LS	$4,000.00		
			SUB-TOTAL	$465,830.00		
			10% CONTINGENCY	$46,583.00	B = $4,935 - $2,614.50 =	$2,320.50
					C = $41,886.10	
			TOTAL	$512,413.00	B/C = 0.06	

IX. (MONTGOMERY VICINITY OPTION 2)

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT		
1.	CHANNEL IMPROVEMENTS	92719 CY	5.00 /CY	$463,595.00		
2.	MOBILIZATION/ DEMOBILIZATION	1 LS	$4,000.00 /LS	$4,000.00		
			SUB-TOTAL	$467,595.00		
			10% CONTINGENCY	$46,759.50	B = $4,935 - $1,830.15 =	$3,104.85
					C = $42,044.81	
			TOTAL	$514,354.50	B/C = 0.07	

IX. (MONTGOMERY VICINITY OPTION 3)

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT		
1.	CHANNEL IMPROVEMENTS	142834 CY	5.00 /CY	$714,170.00		
2.	MOBILIZATION/ DEMOBILIZATION	1 LS	$4,000.00 /LS	$4,000.00		
			SUB-TOTAL	$718,170.00		
			10% CONTINGENCY	$71,817.00	B = $4,935 - $379.73 =	$4,555.27
					C = $64,575.80	
			TOTAL	$789,987.00	B/C = 0.07	

SEMINOLE COUNTY

VII. B - OPTION 1

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT		
1.	CHANNEL IMPROVEMENTS	10053 CY	10.00 /CY	$100,530.00		
2.	MOBILIZATION/ DEMOBILIZATION	1 LS	$3,015.90 /LS	$3,015.90		
			SUB-TOTAL	$103,545.90		
			10% CONTINGENCY	$10,354.59	B = $10,379.15 - $7,974.23 =	$2,404.92
					C =	$9,310.55
			TOTAL	$113,900.49	B/C =	0.26

VII. B - OPTION 2

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT		
1.	CHANNEL IMPROVEMENTS	12081 CY	5.00 /CY	$60,405.00		
2.	REMOVE FOOTBRIDGE 7	1 EA	$2,500.00 /EA	$2,500.00		
3.	MOBILIZATION/ DEMOBILIZATION	1 LS	$1,887.15 /LS	$1,887.15		
			SUB-TOTAL	$64,792.15		
			10% CONTINGENCY	$6,479.22	B = $10,379.15 - $5,316.15 =	$5,063.00
					C =	$5,825.93
			TOTAL	$71,271.37	B/C =	0.87

VII. B - OPTION 3

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT		
1.	LEVEE	3985 CY	10.00 /CY	$39,850.00		
2.	MOBILIZATION/ DEMOBILIZATION	1 LS	$1,195.50 /LS	$1,195.50		
			SUB-TOTAL	$41,045.50		
			10% CONTINGENCY	$4,104.55	B = $10,379.15 - $0.00 =	$10,379.15
					C =	$3,690.69
			TOTAL	$45,150.05	B/C =	2.81

V. ACQUIRE PROPERTY

LOT NO.	JUST VALUE
Section 28 Township 21 Range 29	
Riverside Acres	
Block M	
4	$50,505.00
5	$53,905.00
Block N	
2	$50,302.00
3	$52,555.00
7	$52,996.00
8	$48,953.00
9	$57,360.00
Block O	
3	$50,886.00
4	$55,491.00
9	$48,882.00
10	$46,475.00
Block Q	
5	$49,538.00
6	$47,292.00
TOTAL JUST VALUE	$665,140.00
15% RESALE PROFIT	$99,771.00
TOTAL BUYOUT	$764,911.00

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT
1.	DEMOLITION OF STRUCTURES	13 EA	$5,000.00 /EA	$65,000.00
2.	EATHWORK IMPROVE EXISTING CHANNEL	14110 CY	$10.00 /CY	$141,100.00
		SUB-TOTAL (BUYOUT INCLUDED)		$971,011.00
			10% CONTINGENCY	$97,101.10
			TOTAL	$1,068,112.10

B = $102,525.00 - $0.00 = $102,525.00
C = $87,310.54
B/C = 1.17

V. (IMPROVE CHANNEL D/S OF ORANOLE BRIDGE TO LAKE LOTUS AND U/S THROUGH ELBA WAY)

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT		
1.	3' X 3' GABIONS	928 LF	$577.50 /LF	$535,920.00		
2.	STRUTTED SHORING	928 LF	$150.00 /LF	$139,200.00		
3.	TEMPORARY PLUG (CONSTRUCT/REMOVAL)	220 CY	$10.00 /CY	$2,200.00		
4.	EARTHWORK (EXCAVATE/HAUL)	5792 CY	$10.00 /CY	$57,920.00		
5.	TEMPORARY PLUG (CONSTRUCT/REMOVAL)	220 CY	$10.00 /CY	$2,200.00		
6.	EARTHWORK (EXCAVATE/HAUL)	5792 CY	$10.00 /CY	$57,920.00		
7.	CHANNEL IMPROVEMENTS (CAMPO WAY TO LAKE LOTUS)	10628 CY	5.00 /CY	$53,140.00		
8.	MOBILIZATION/ DEMOBILIZATION	1 LS	$5,000.00 /LS	$5,000.00		
			SUB-TOTAL	$853,500.00		
			10% CONTINGENCY	$85,350.00	B = $102,525.00 - $0.00 =	$102,525.00
					C = $76,744.28	
			TOTAL	$938,850.00	B/C = 1.34	

V. (IMPROVE CHANNEL D/S OF ORANOLE BRIDGE TO LAKE LOTUS AND U/S THROUGH ELBA WAY)

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT		
1.	STEEL SHEET PILE	1856 LF	$400.00 /LF	$742,400.00		
2.	TEMPORARY PLUG (CONSTRUCT/REMOVAL)	220 CY	$10.00 /CY	$2,200.00		
3.	EARTHWORK (EXCAVATE/HAUL)	5792 CY	$10.00 /CY	$57,920.00		
4.	CHANNEL IMPROVEMENTS (CAMPO WAY TO LAKE LOTUS)	10628 CY	5.00 /CY	$53,140.00		
5.	MOBILIZATION/ DEMOBILIZATION	1 LS	$5,000.00 /LS	$5,000.00		
			SUB-TOTAL	$860,660.00		
			10% CONTINGENCY	$86,066.00	B = $102,525.00 - $0.00 =	$102,525.00
					C = $77,388.09	
			TOTAL	$946,726.00	B/C = 1.32	

V. (IMPROVE CHANNEL D/S OF ORANOLE BRIDGE TO LAKE LOTUS AND U/S THROUGH ELBA WAY)

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT		
1.	12" CONCRETE WALLS (INCLUDES FOOTINGS)	1240 CY	$275.00 /CY	$341,000.00		
2.	12" CONCRETE FLOOR	1170 CY	$175.00 /CY	$204,750.00		
3.	STRUTTED SHORING	928 LF	$150.00 /LF	$139,200.00		
4.	FENCING	1856 LF	$25.00 /LF	$46,400.00		
5.	TEMPORARY PLUG (CONSTRUCT/REMOVAL)	220 CY	$10.00 /CY	$2,200.00		
6.	EARTHWORK (EXCAVATE/HAUL)	5792 CY	$10.00 /CY	$57,920.00		
7.	CHANNEL IMPROVEMENTS (CAMPO WAY TO LAKE LOTUS)	10628 CY	5.00 /CY	$53,140.00		
8.	MOBILIZATION/ DEMOBILIZATION	1 LS	$5,000.00 /LS	$5,000.00		
			SUB-TOTAL	$849,610.00		
			10% CONTINGENCY	$84,961.00	B = $102,525.00 - $0.00 =	$102,525.00
					C = $76,394.50	
			TOTAL	$934,571.00	B/C = 1.34	

V. (IMPROVE CHANNEL D/S OF ORANOLE BRIDGE TO LAKE LOTUS AND U/S THROUGH ELBA WAY)

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT		
1.	KEYSTONE SHORING	1856 LF	$320.00 /LF	$593,920.00		
2.	TEMPORARY PLUG (CONSTRUCT/REMOVAL)	220 CY	$10.00 /CY	$2,200.00		
3.	EARTHWORK (EXCAVATE/HAUL)	5792 CY	$10.00 /CY	$57,920.00		
4.	CHANNEL IMPROVEMENTS (CAMPO WAY TO LAKE LOTUS)	10628 CY	5.00 /CY	$53,140.00		
5.	MOBILIZATION/ DEMOBILIZATION	1 LS	$5,000.00 /LS	$5,000.00		
			SUB-TOTAL	$712,180.00		
			10% CONTINGENCY	$71,218.00	B = $102,525.00 - $0.00 =	$102,525.00
					C = $64,037.19	
			TOTAL	$783,398.00	B/C = 1.60	

V. (IMPROVE CHANNEL D/S OF ORANOLE BRIDGE TO LAKE LOTUS AND U/S THROUGH ELBA WAY)

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT		
1.	ALUMINUM SHEET PILE	1856 LF	$500.00 /LF	$928,000.00		
2.	TEMPORARY PLUG (CONSTRUCT/REMOVAL)	220 CY	$10.00 /CY	$2,200.00		
3.	EARTHWORK (EXCAVATE/HAUL)	5792 CY	$10.00 /CY	$57,920.00		
4.	CHANNEL IMPROVEMENTS (CAMPO WAY TO LAKE LOTUS)	10628 CY	5.00 /CY	$53,140.00		
5.	MOBILIZATION/ DEMOBILIZATION	1 LS	$5,000.00 /LS	$5,000.00		
			SUB-TOTAL	$1,046,260.00		
			10% CONTINGENCY	$104,626.00	B = $102,525.00 - $0.00 =	$102,525.00
					C = $94,076.71	
			TOTAL	$1,150,886.00	B/C = 1.09	

II. FLOODPROOFING/RAISE MOBILE HOMES

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	TOTAL AMOUNT
FOR A PROTECTIVE LEVEE AROUND STRUCTURE 81				
1.	EARTHWORK (HAUL/PLACE/STABILIZE)	2,975 CY	$5.00 /CY	$14,875.00
2.	SOD	3,487 SY	$1.25 /SY	$4,358.75
3.	MOBILIZATION/ DEMOBILIZATION	1 LS	$600.00 /LS	$600.00
			SUB-TOTAL	$19,833.75
			10% CONTINGENCY	$1,983.38
			TOTAL	$21,817.13
FOR A PROTECTIVE LEVEE AROUND STRUCTURE 84				
1.	EARTHWORK (HAUL/PLACE/STABILIZE)	209 CY	$5.00 /CY	$1,045.00
2.	SOD	501 SY	$1.25 /SY	$626.25
3.	MOBILIZATION/ DEMOBILIZATION	1 LS	$300.00 /LS	$300.00
			SUB-TOTAL	$1,971.25
			10% CONTINGENCY	$197.13
			TOTAL	$2,168.38
FOR A PROTECTIVE LEVEE AROUND STRUCTURE 104				
1.	EARTHWORK (HAUL/PLACE/STABILIZE)	156 CY	$5.00 /CY	$780.00
2.	SOD	501 SY	$1.25 /SY	$626.25
3.	MOBILIZATION/ DEMOBILIZATION	1 LS	$300.00 /LS	$300.00
			SUB-TOTAL	$1,706.25
			10% CONTINGENCY	$170.63
			TOTAL	$1,876.88
RAISING THE FF ELEVATIONS FOR STRUCTURES 122, 123, & 124				
1.	RAISE FF EL'S	3 LS	$500.00 /LS	$1,500.00
		TOTAL COST TO PROTECT STRUCTURES IN PROBLEM AREA II.		$25,794.00

B = $2,423.00 - $6.25 = $2,416.75
C = $2,108.48
B/C = 1.15

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