

Overview of TMDLs in Everglades West Coast Basin

Pat Fricano

FDEP

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EWC Cycle 2 Verified Impaired Waters

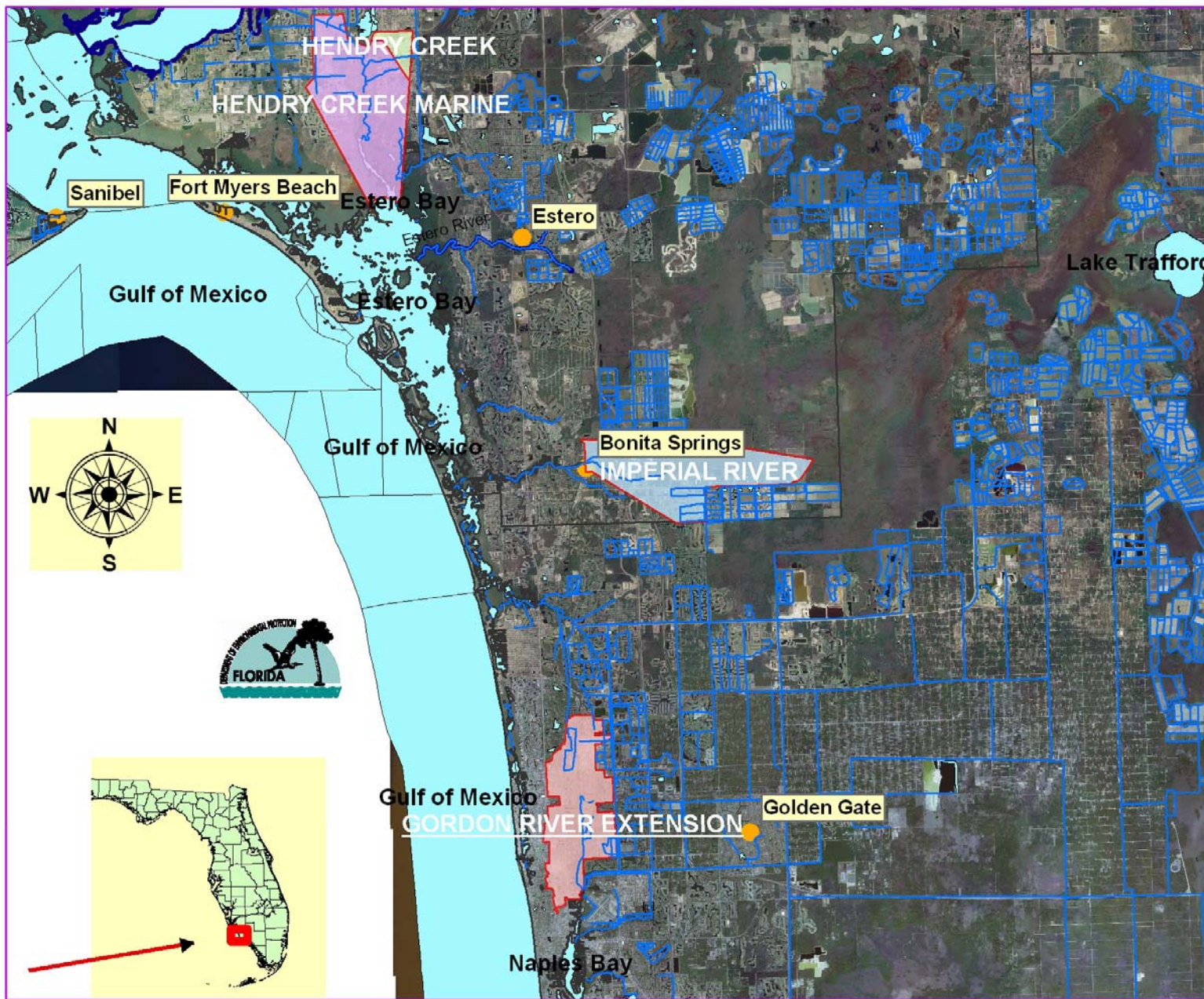
Planning Unit	WBID	WBID Name	VL	1998 List	TMDL
Estero Bay	3258B	HENDRY CREEK	DO	DO & Nut	DO
	3258B1	HENDRY CREEK MARINE	DO & FC	DO & Nut	DO & FC
	3258C	ESTERO BAY DRAINAGE	DO & FC & Iron		
	3258C1	ESTERO BAY DRAINAGE MARINE	DO		
	3258D	ESTERO RIVER	DO & FC		
	3258D1	ESTERO RIVER MARINE	DO		
	3258E	IMPERIAL RIVER	DO & FC	DO & Nut	DO
	3258E1	IMPERIAL RIVER MARINE	DO & FC & Nut		
	3258G	TENMILE CANAL	DO		
Interdrainage Area	3261C	BARRON RIVER CANAL	Iron		
	3278T	OKALOIA-COOCHIEE	DO		
	3278W	SILVER STRAND	DO		
Southwest Coast	3259A	COCO-HATCHEE RIVER	FC & Iron	DO & FC	FC
	3278D	COCO-HATCHEE INLAND	DO	DO & FC	
	3259W	LAKE TRAFFORD	DO & TSI & NH3	DO & TSI & NH3	DO & TSI & NH3
	3278F	CORKSCREW MARSH	DO		
	3278G	FAKA-HATCHEE STRAND	DO & FC		
	3278K (3259C)	GORDON RIVER EXTENSION	DO	DO	DO
	3278L	IMMOKALEE BASIN	DO		
	3278R (3259G)	NAPLES BAY COASTAL	Copper, DO, FC, Iron		
	3278S (3259D+3259E)	NORTH GOLDEN GATE	DO & Iron		
	3278U	ROOKERY BAY COASTAL	DO, Nut & FC		

TMDLs Completed

- Hendry Creek (3258B) – D.O
- Hendry Creek Marine (3258B1) – DO & Fecal Coliform
- Imperial River (3258E) - DO
- Cocohatchee River (3259A) - Fecal Coliform
- Gordon River Extension (3278K) - DO
- Lake Trafford (3259W) - DO, Nutrients & Un-ionized Ammonia

Dissolved Oxygen TMDLs

- Hendry Creek (3258B)
- Hendry Creek Marine (3258B1)
- Imperial River (3258E)
- Gordon River Extension (3278K)
- Lake Trafford (3259W)



Lee County

Hendry
Creek:
533 acre WBID

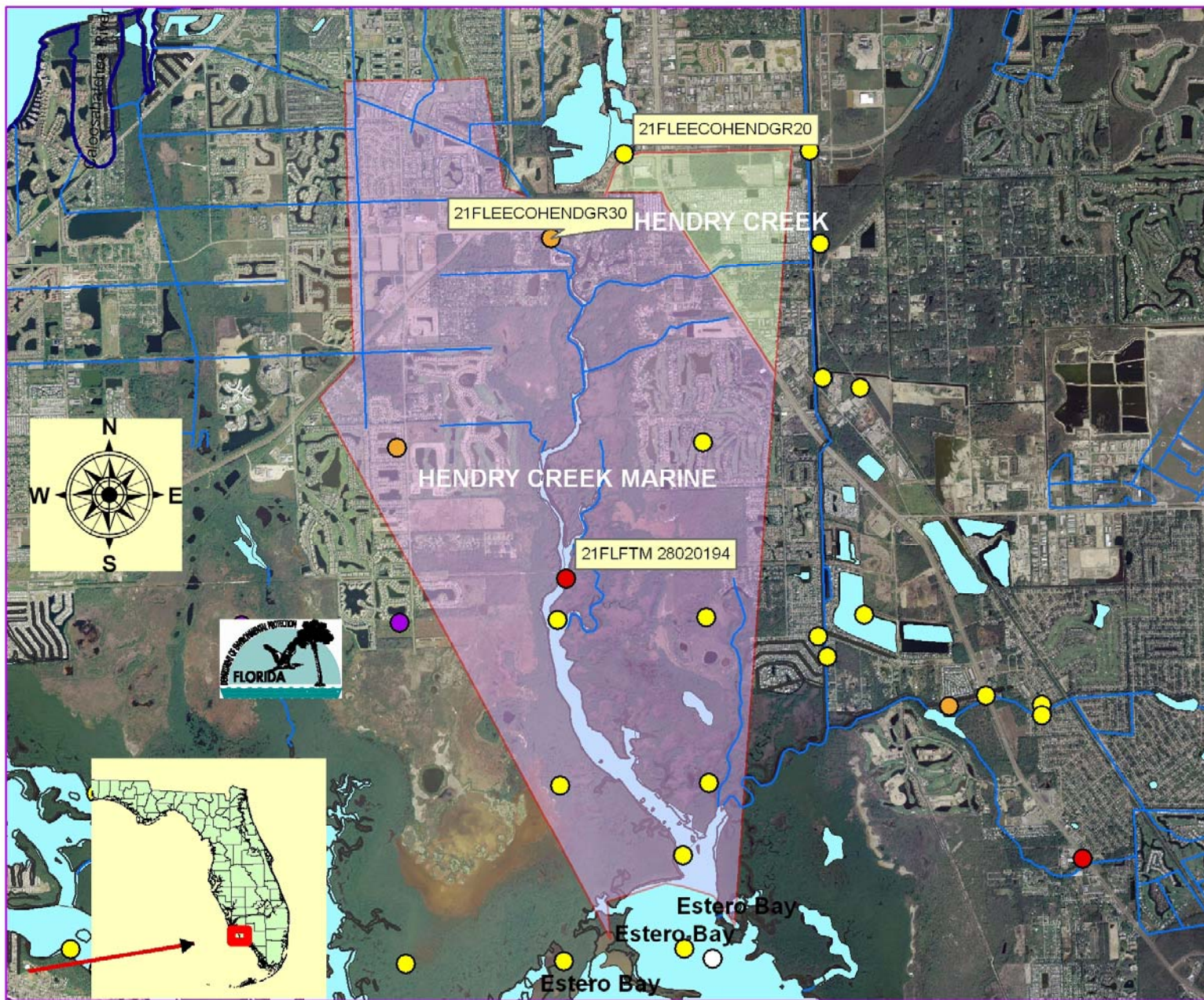
Hendry
Creek Marine:
6,920 acre WBID

Approx. 6
miles long

Imperial
River:
5,873 acre WBI

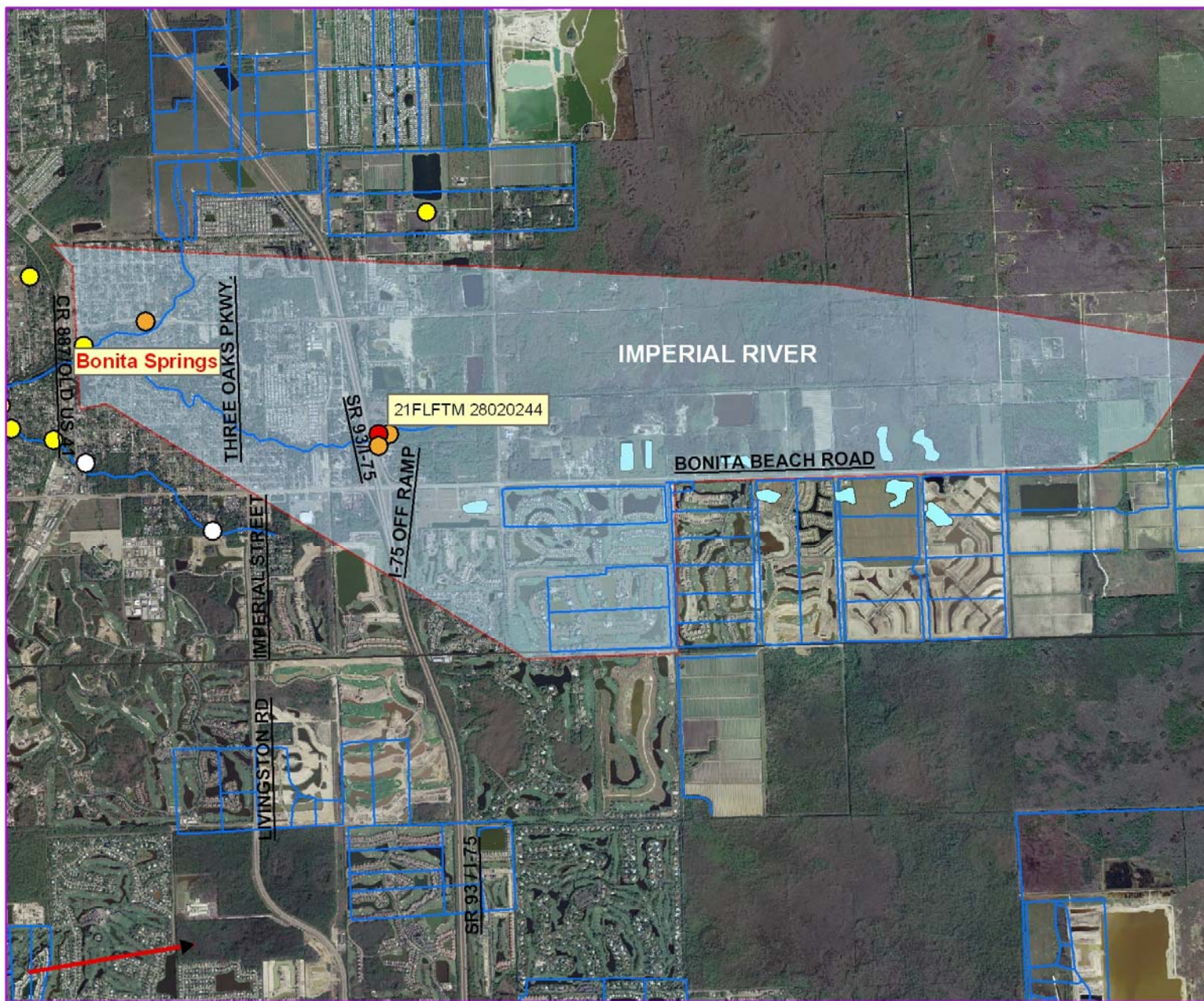
Collier County

Gordon River
Extension:
5,154 acre WBI



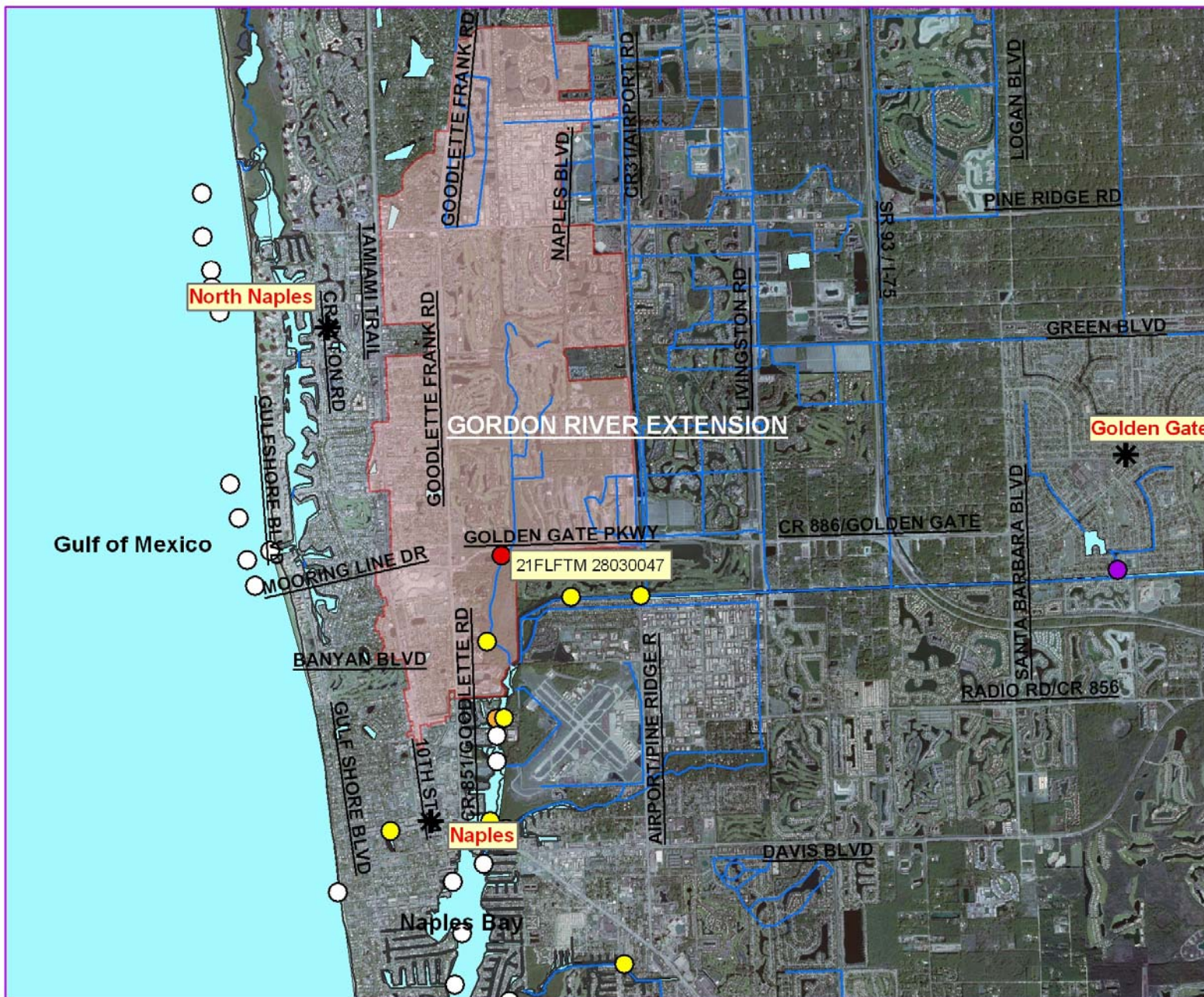
Hendry Creek & Hendry Creek Marine Sample Stations

Imperial River Sample Stations



0 0.45 0.9 1.8 Miles

Gordon River Extension Sample Stations



0 0.5 1 2 Miles

Land Use Overview

Landuse Description	Hendry 3258B		Hendry M 3258B1		Imperial 3258E		Gordon 3278K	
	Acres	%	Acres	%	Acres	%	Acres	%
Urban and Built up	336	63	1,730	25	1,884	32	3,602	70
Agriculture	*	*	267	4	187	3	57	1
Rangeland	17	3	267	4	511	9	193	4
Upland Forests	83	16	1,056	15	393	7	453	9
Water	12	2	531	8	232	4	194	4
Wetland	39	7	2,949	43	2,452	42	48	9
Barren Land	*	*	19	0	54	1	22	0
Transportation, Communication, & Utilities	45	9	98	1	158	3	147	3
Total	533	100	6,920	100	5,873	100	5,154	100

Assessment of TMDL Streams for DO

Waterbody	Total # of Samples	IWR Required Exceedances for impairment	Total Number of Exceedances (and %)	Conclusion
<i>Hendry Creek Marine</i>	39	7	34 (87%)	Impaired
<i>Hendry Creek</i>	59	10	31 (53%)	Impaired
<i>Gordon River Extension</i>	72	12	70 (97%)	Impaired
<i>Imperial River</i>	99	15	77 (78%)	Impaired

WBID:	<u>Hendry Creek</u> <u>Imperial River</u> <u>Gordon River Extension</u>	<u>Hendry Creek</u> <u>Marine</u>
Class.	3F	3M
DO	Dissolved Oxygen shall not be less than 5 mg/L; this includes normal daily and seasonal fluctuations.	Shall not average less than 5.0 mg/L in a 24-hour period and shall never be less than 4.0 mg/L. Normal daily and seasonal fluctuations above these levels shall be maintained.
BOD	Shall not be increased to exceed values which would cause dissolved oxygen to be depressed below the limit established for each class and, in no case, shall it be great enough to produce nuisance conditions.	
Nutrients	In no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance in natural populations of aquatic flora or fauna [Note: For Class III waters in the Everglades Protection Area, this criterion has been numerically interpreted for phosphorus in Section 62-302.540, F.A.C.].	

**Maximum Daily Loads for TN for the DO
Impaired WBIDs (based on Reference 75th Percentile)**

$$\text{TMDL} \cong \sum \text{WLAs Wastewater} + \sum \text{WLAs NPDES Stormwater} + \sum \text{LAs} + \text{MOS}$$

WBID	TMDL Total Nitrogen (mg/L)	WLA		LA Reduction	MOS
		Wastewater (lbs/year)	NPDES Stormwater (Percent Reduction)		
Imperial River	0.76	N/A	22 %	22 %	Implicit
Gordon River Extension	0.76	N/A	29 %	29 %	Implicit
Hendry Creek	*0.6	N/A	* 44%	* 44 %	Implicit
Hendry Creek Marine	0.6	N/A	44 %	44 %	Implicit

* Required to protect downstream marine segment

Recommendations

It is recommended that the following activities occur to advance the goals of the TMDLs described;

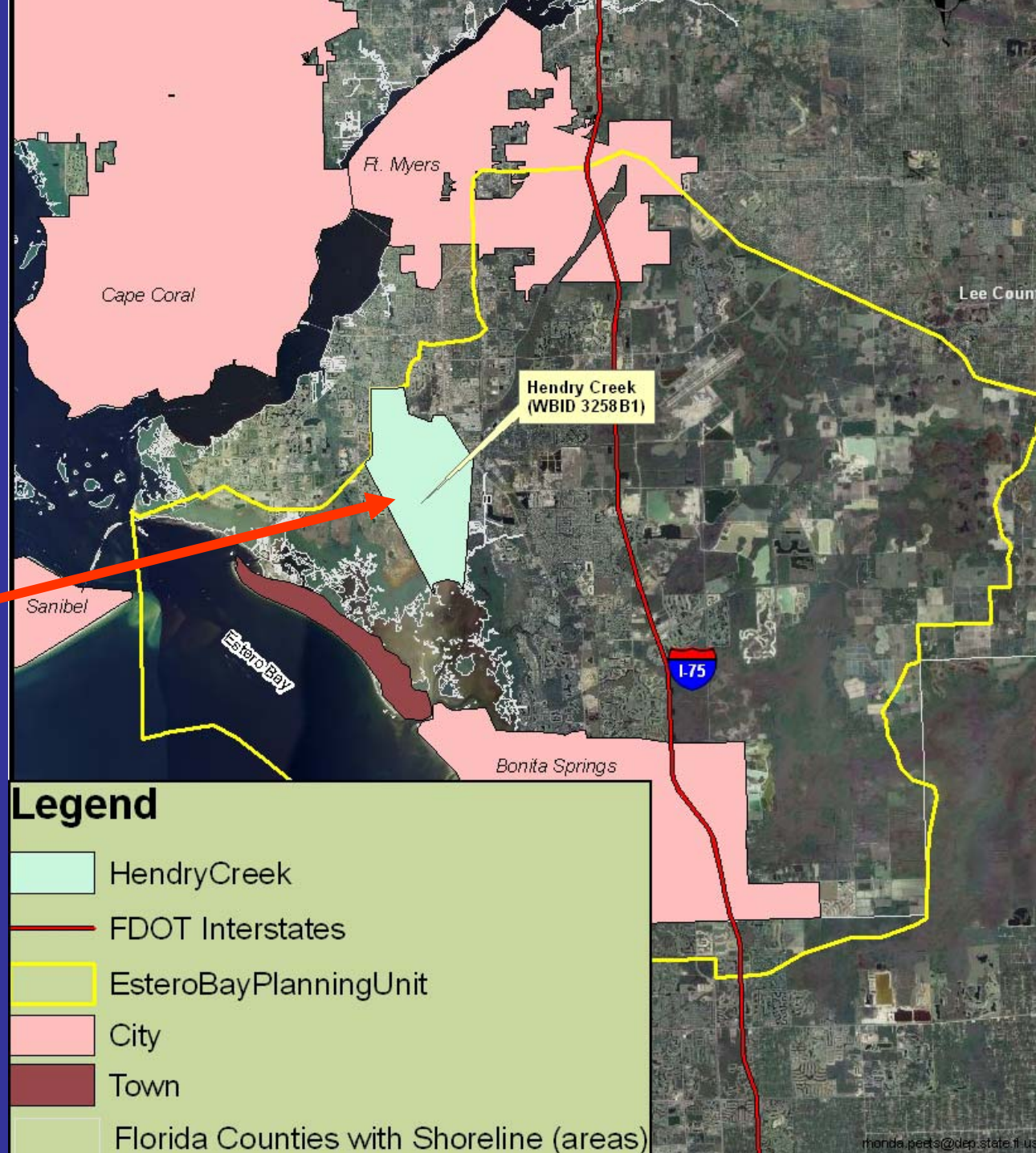
- Commence collection of stream flow data on Hendry Creek Marine, Imperial River, and the Gordon River Extension throughout the dry and wet seasons.
- Increase water quality sampling in those stations where there are higher concentrations.
- Utilize water quality computer models to simulate the watershed hydrology to increase understanding of the factors contributing to impairment conditions.
- Sample ground water quality and monitor ground water contribution to stream flow.

Fecal Coliform TMDLs

- Hendry Creek Marine (3258B1)
- Coccohatchee River (3259A)

**Everglades
West Coast
Basin
Geopolitical
features**

Hendry Creek
WBID

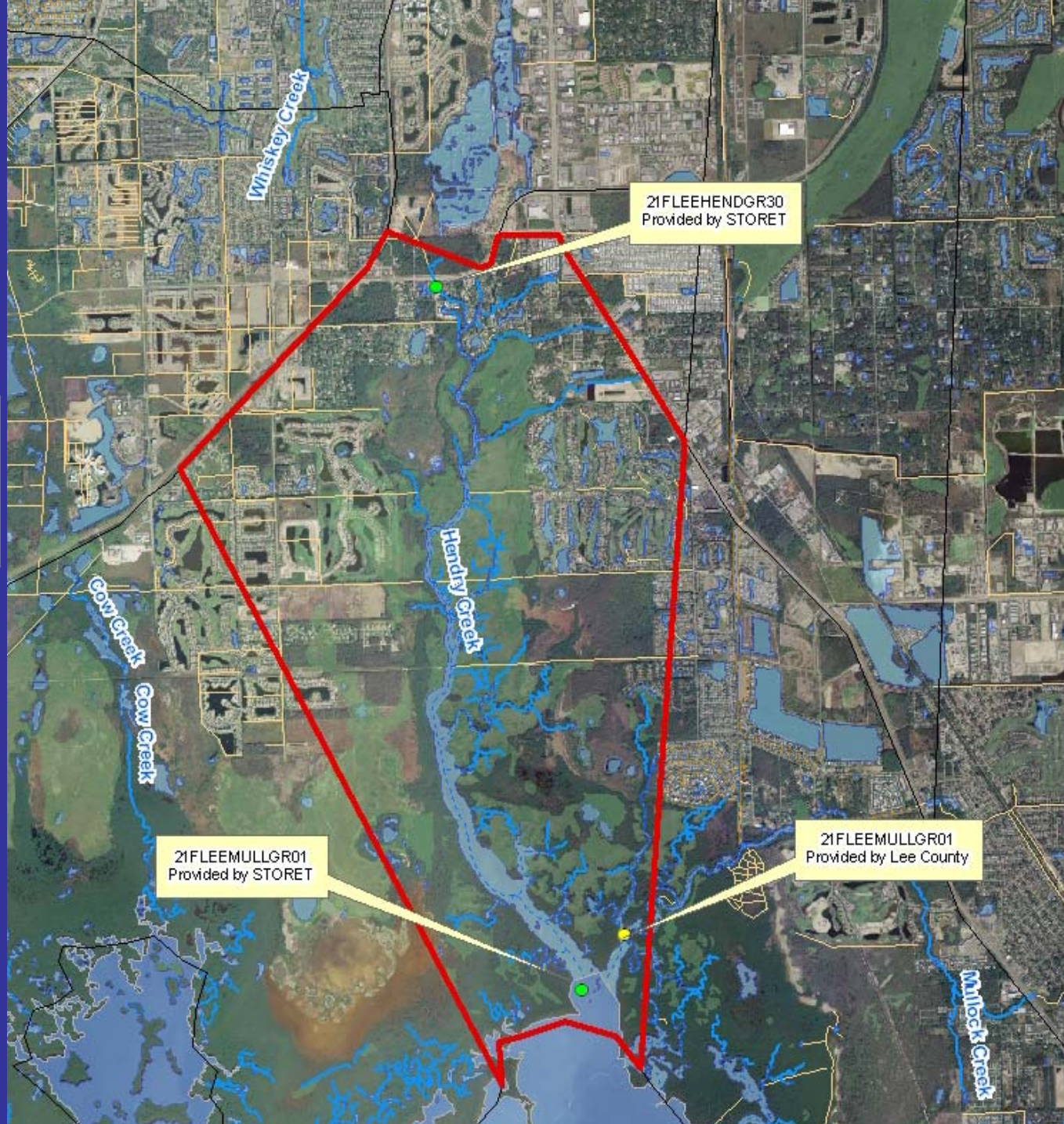


Hendry Creek (WBID 3258B1)

Legend

NHD Water body
Canal/Ditch
Stream/River
Swamp/Marsh
Estuary
Reservoir
Stream/River

(Station MULLGR01
(Hendry Creek STORET Stations
WBID 3258B1 Hendry Creek
WBID Run 33_2



Information on Verified Impairment

- The assessment is based on verified period (January 1, 2000 – June 30, 2007)
- The methodology used is based on IWR rule (62-303) F.A.C. (10 percent of the values exceeding criterion with a 90% confidence level)
- There are 26 out of 143 samples exceeding the criterion

Water Quality Target

Surface Water Quality Standards (62-302) F.A.C

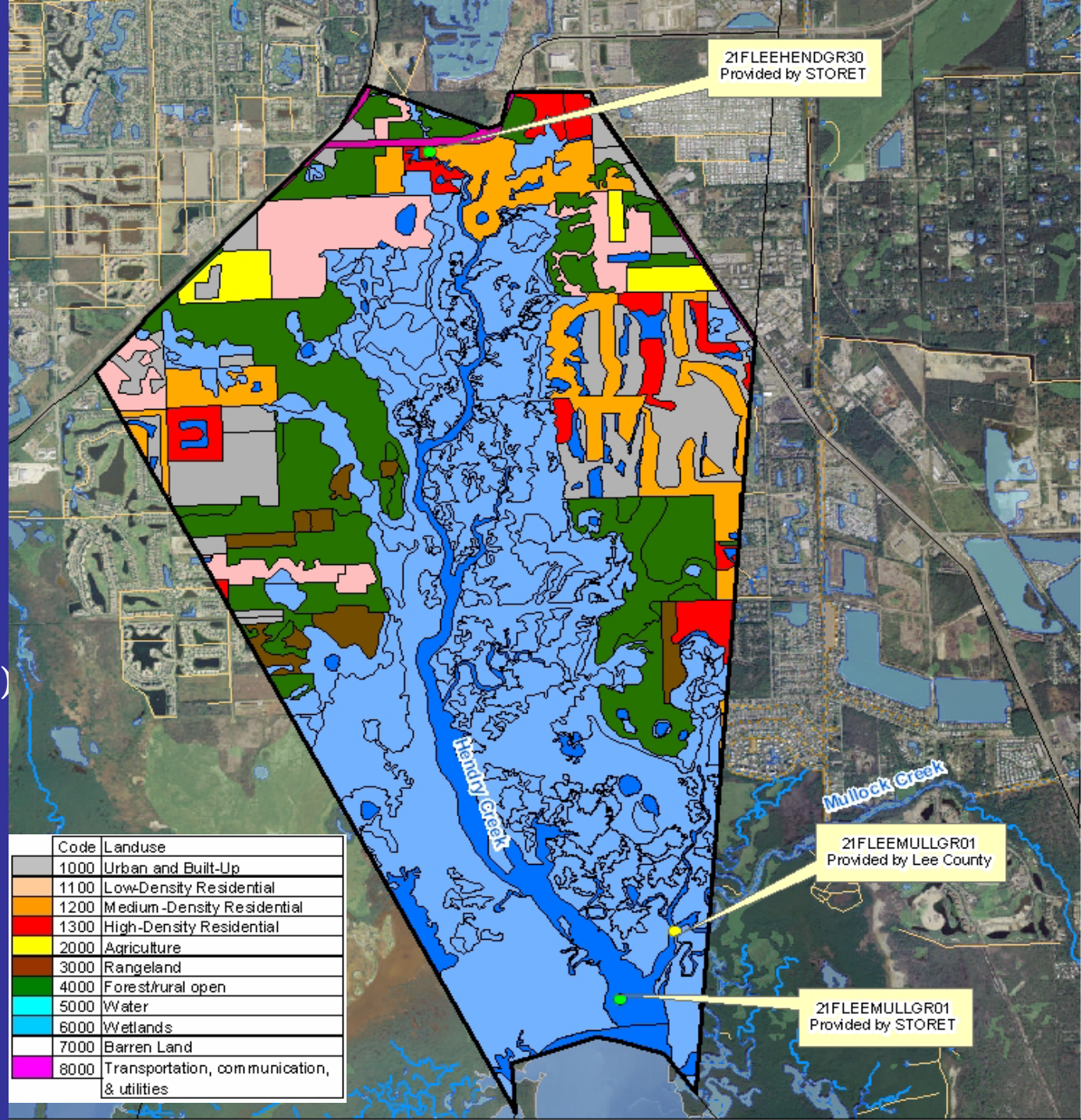
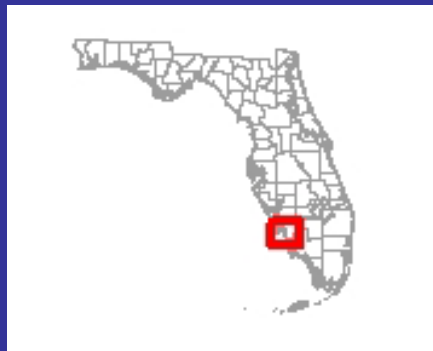
- Class III: Recreation, propagation and maintenance of healthy, well-balanced fish population and wildlife

Predominately Marine Waters Fecal Coliform Bacteria Criterion:

- Shall not exceed a monthly average of 200 counts/100ml (geometric mean based on a minimum of 10 samples in a given month)
- **Shall not exceed 400 counts/100ml in 10% of the samples**
- Shall not exceed 800 on any one day

Principal Land Uses in the Hendry Creek Watershed

- Residential (23%)
- Urban and Built-Up (12.3%)
- Forest/Rural Open (9.5%)
- **Water/Wetlands (50.4%)**



Code	Landuse
1000	Urban and Built-Up
1100	Low-Density Residential
1200	Medium-Density Residential
1300	High-Density Residential
2000	Agriculture
3000	Rangeland
4000	Forest/rural open
5000	Water
6000	Wetlands
7000	Barren Land
8000	Transportation, communication, & utilities

Potential Point Sources

- There are **no** NPDES Wastewater Permitted facilities in the Hendry Creek basin
- Lee County and the Florida Dept of Transportation are under a Phase I NPDES MS4 permit

Nonpoint Sources

Potential Nonpoint sources

- Runoff of coliform bacteria from storm events (e.g., surface runoff, wildlife, domesticated animals)
- Leaking or overflowing sewer lines
- Failed septic tanks

TMDL Components for the Hendry Creek

WBID	Parameter	TMDL (counts/day)	WLA		LA (Percent Reduction)	MOS
			Wastewater (counts/day)	NPDES Stormwater		
3258B1	Fecal Coliform	400 #/100 mL	N/A	57.4	57.4	Implicit

N/A – Not applicable

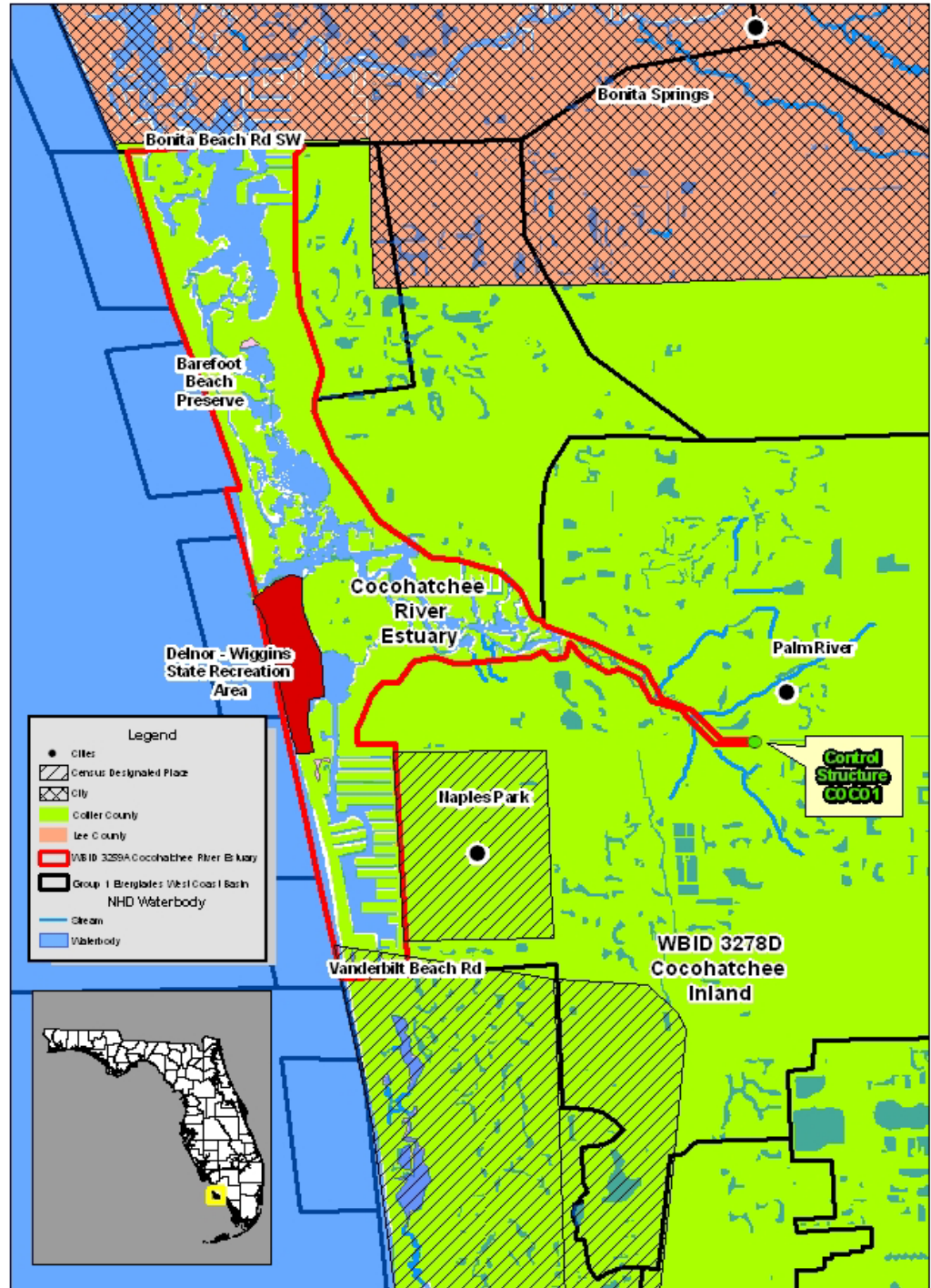
$$\text{TMDL} \cong \sum \text{WLAs}_{\text{wastewater}} + \sum \text{WLAs}_{\text{NPDES Stormwater}} + \sum \text{LAs} + \text{MOS}$$

Margin of Safety

- 400 counts/100 mL criterion instead of 800
- Not using the 10% exceedance allowance

Cocohatchee River Basin

Geopolitical features



Information on Verified Impairment

- Assessment based on data in verified period (January 1, 2000 – June 30, 2007)
- The methodology used is based on IWR rule (62-303) F.A.C (10 percent of the values exceeding criterion with a 90% confidence level)
- There are 101 out of 178 samples exceeding the criterion

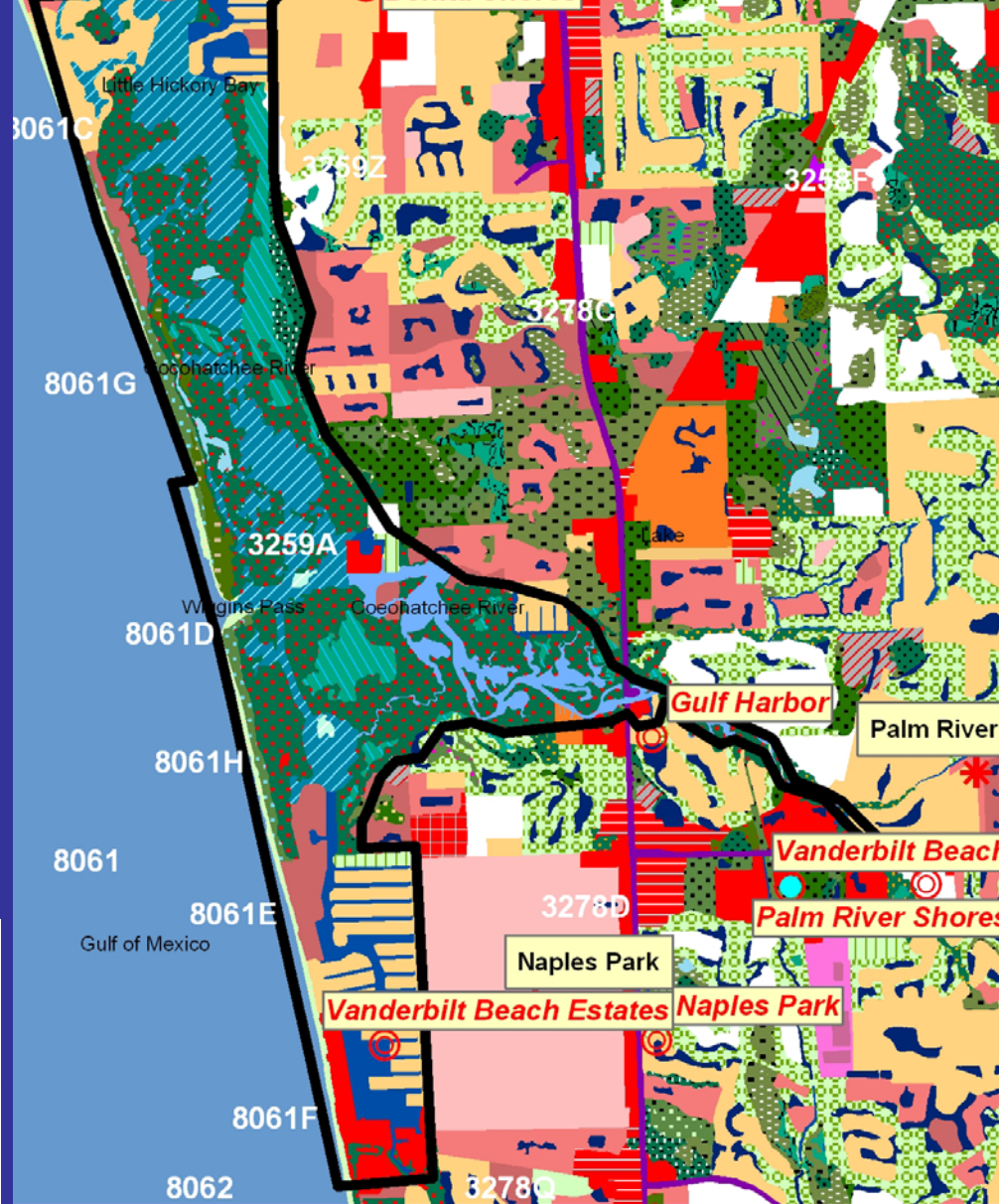
Water Quality Target

Surface Water Quality Standards (62-302) F.A.C.

- Class II: Shellfish harvesting and propagation
Predominately Marine Waters Fecal Coliform Bacteria Criterion:
- Shall not exceed a median value of 14 counts/100ml
- **Shall not exceed 43 counts/100ml in 10% of the samples**
- Shall not exceed 800 on any one day

Principal Land Uses in the Cocohatchee River Watershed

- Wetlands (41%)
- Water (32%)
- Urban and Built-Up (22%)



Potential Point Sources

Potential Point Sources

- There are **no** NPDES Wastewater Permitted facilities in the Cocohatchee River Estuary basin
- Collier County is under a Phase II NPDES MS4 permit

Nonpoint Sources

Potential Nonpoint Sources

- Runoff of coliform bacteria from storm events (e.g., surface runoff, wildlife, domesticated animals)
- Leaking or overflowing sewer lines
- Failing septic tanks

TMDL Components for the Cocohatchee River Estuary

WBID	Parameter	TMDL (counts/day)	WLA		LA (Percent Reduction)	MOS
			Wastewater (counts/day)	NPDES Stormwater		
3259A	Fecal Coliform	43 #/100 mL	NA	65	65	Implicit

N/A – Not applicable

$$\text{TMDL} \cong \sum \text{WLAs}_{\text{wastewater}} + \sum \text{WLAs}_{\text{NPDES Stormwater}} + \sum \text{LAs} + \text{MOS}$$

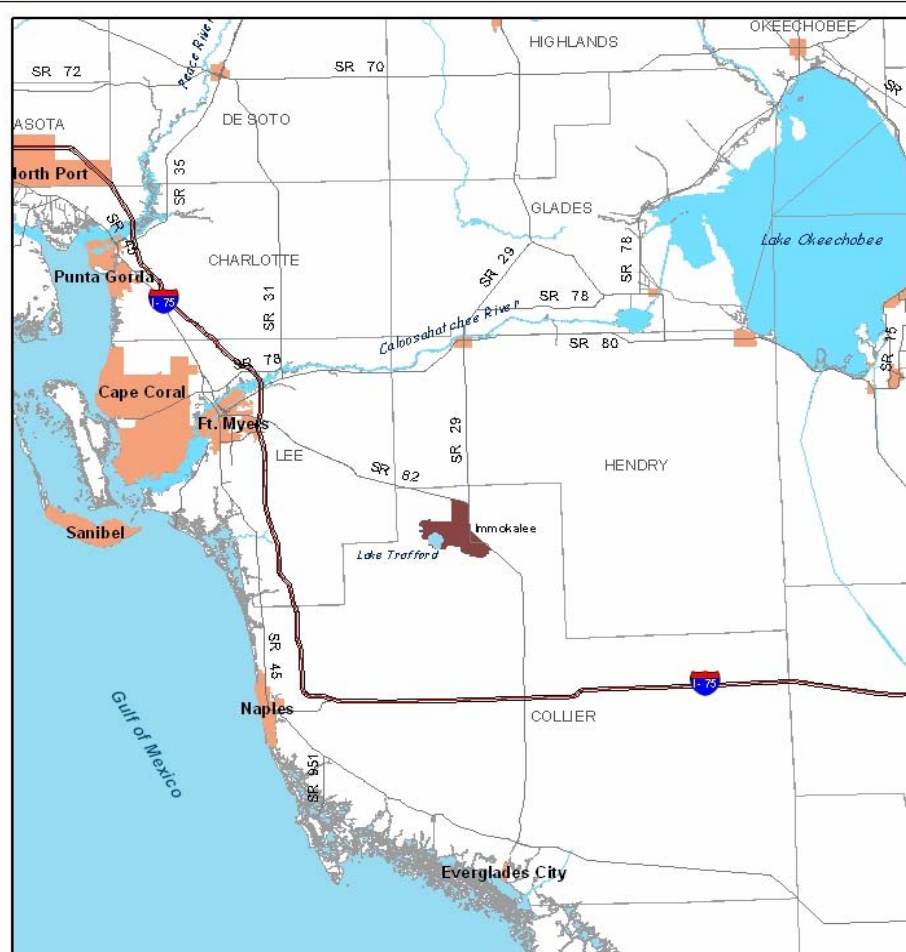
Margin of Safety

- 43 counts/100 mL criterion instead of 800
- Not using the 10% exceedance allowance

Nutrient & Un-ionized Ammonia TMDLs

- Lake Trafford (3259W)

Area Map adjacent to Lake Trafford



Legend

- Lake Trafford Watershed
- Major Rivers
- Major Lakes
- Cities
- Florida Counties
- Interstates
- State Routes

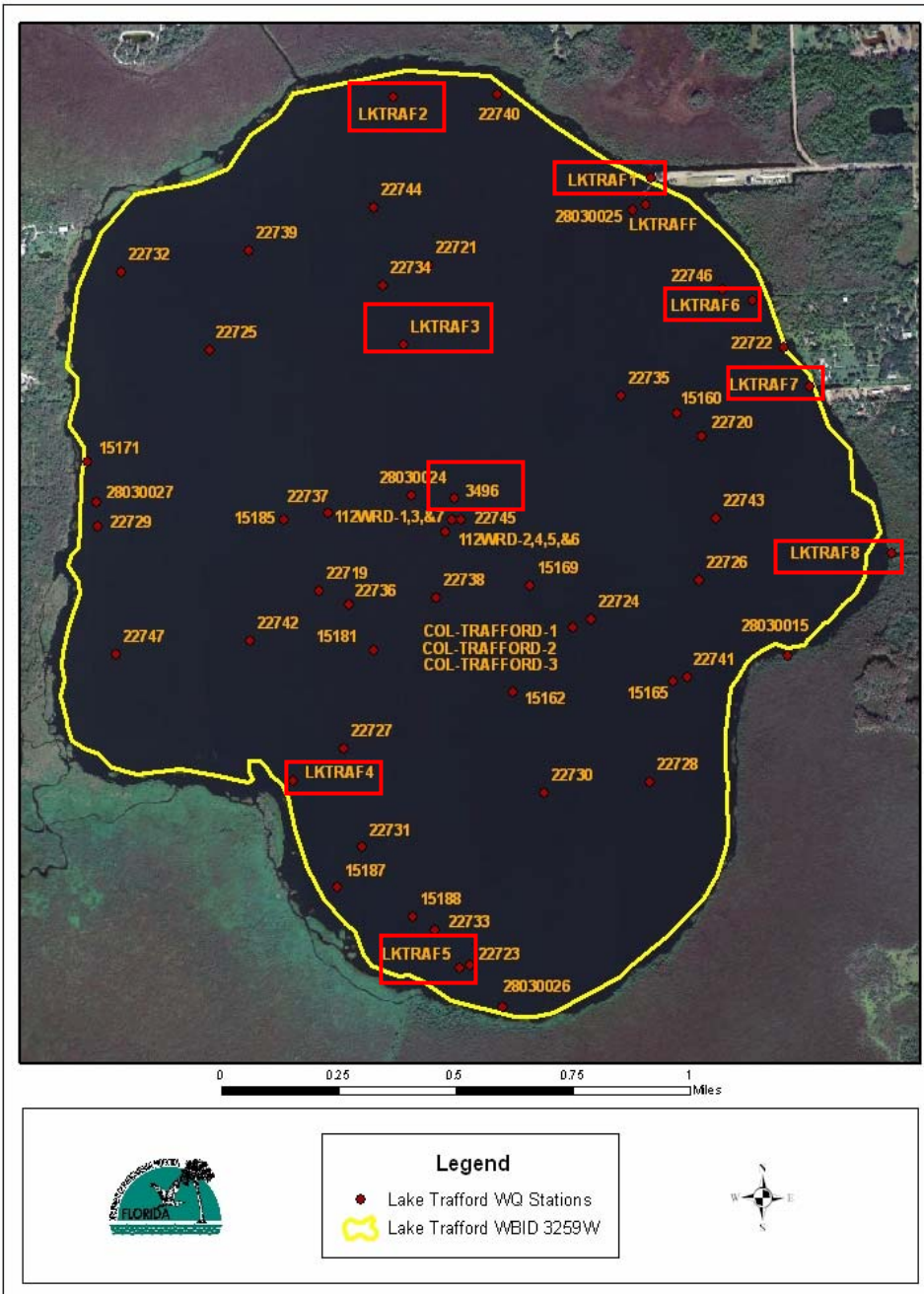


Background Information

- Lake Trafford has no defined tributaries with typically little outflow, and drains south through the Camp Keais Strand-Panther Preserve watershed at high water levels (Flaig, 2000).
- Phase I dredging began removing muck from the center of the lake in November 2005 and ended in May 2006 (In Your Region, 2007) and Phase II dredging efforts continued in 2007.
- A lake nutrient simulation model by Florida Gulf Coast University to investigate post-dredging management scenarios suggested that nutrient inputs from the landscape need to be controlled to increase the duration of the effect of the lake restoration (Everham, 2007).

Water Quality Monitoring Stations

- Total 63 water quality monitoring stations were listed in the FL STORET
- Some TN and TP data were shown in the early 1970s
- Recent (1998-2004) water quality data collected from 9 stations were used for the TMDL model calibration



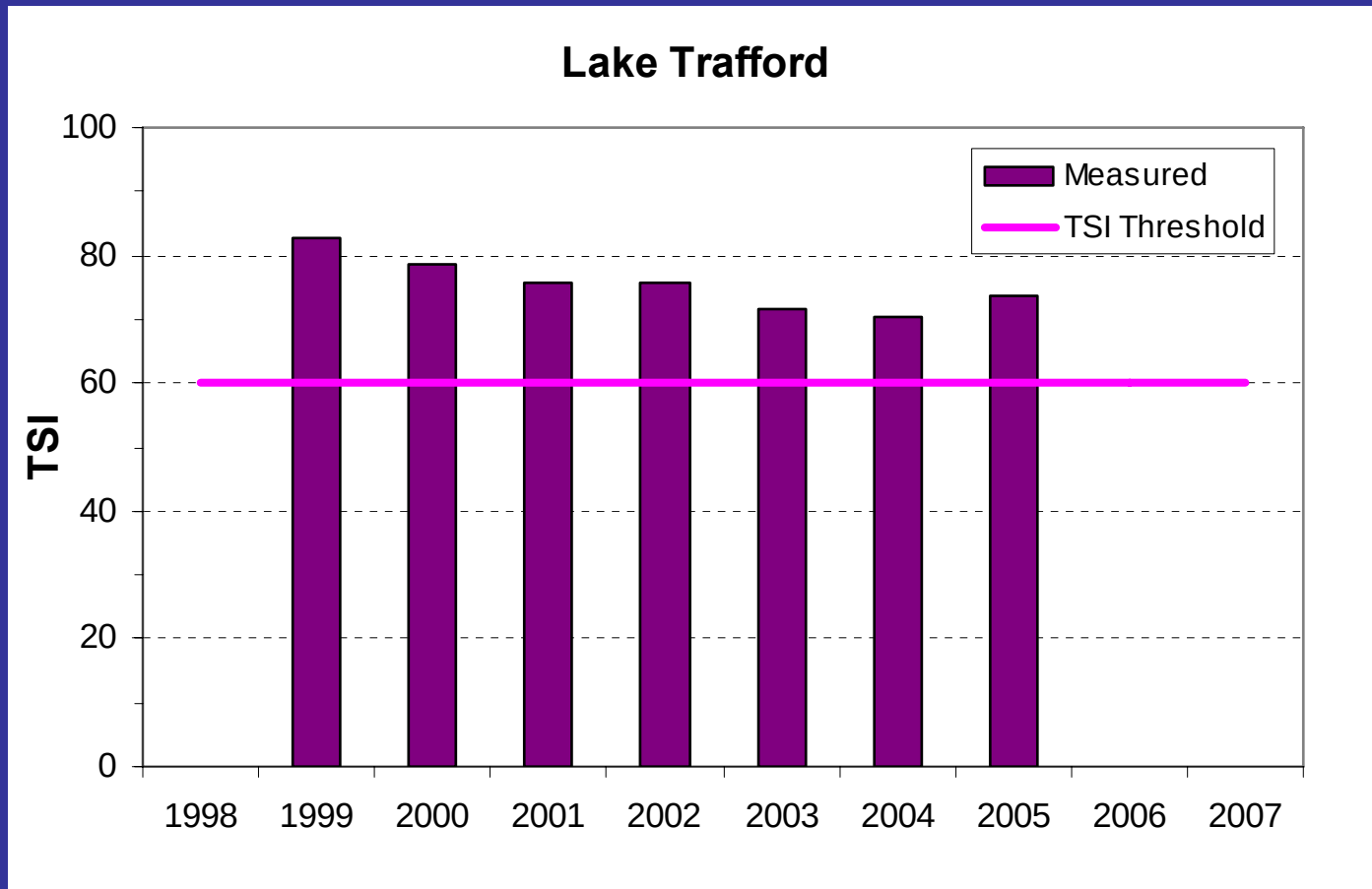
Statistics of Water Quality*

(1972-2004)

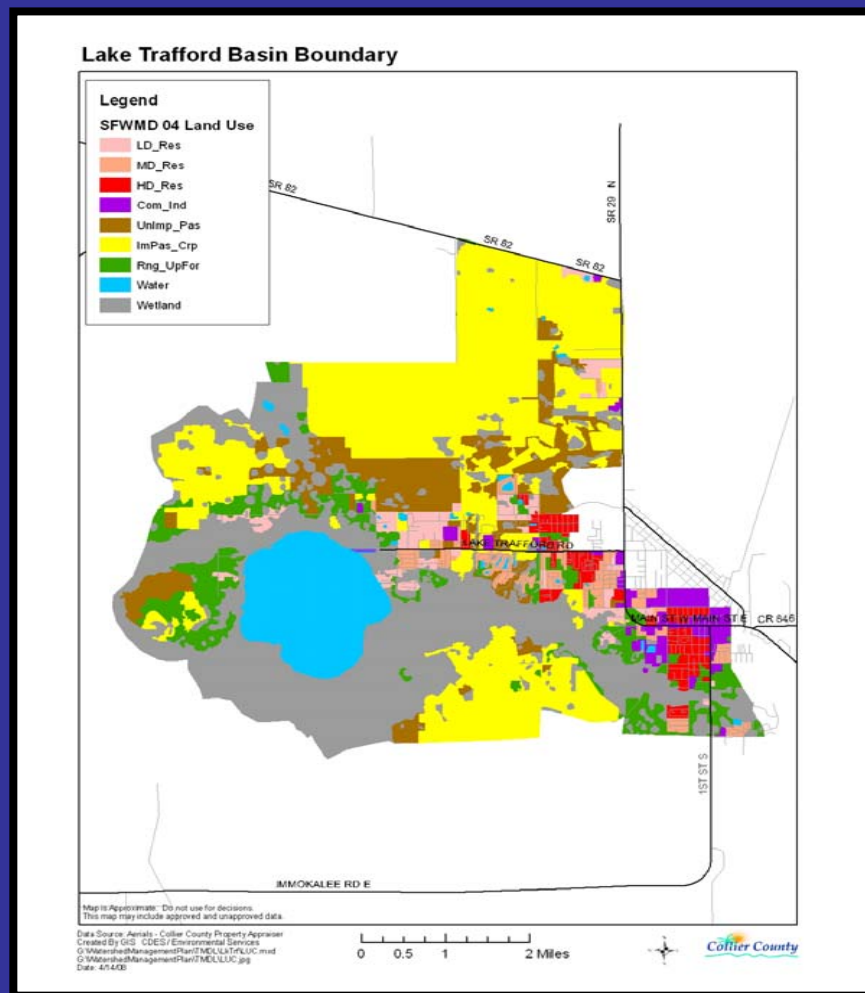
Water Quality Variable	Unit	1972-1989			1998-2004			Δ
		Number of Obs	Mean	Std	Number of Obs	Mean	Std	
Chlorophyll <u>a</u>	μg/L	7	18.8	11.5	91	56.2	51.1	+198%
Total N	mg/L	36	1.87	0.776	82	2.69	0.99	+44%
Total P	mg/L	39	0.088	0.077	90	0.221	0.122	+151%
DO	mg/L	39	6.1	2.6	93	8.5	2.8	+40%
BOD	mg/L	22	3.01	1.76	69	5.2	3.0	+73%
Color	Pt-Co	32	55	22.6	69	130	77.1	+136%
TN/TP Ratio	no unit	35	32.2	24.0	79	15.5	9.3	-52%

*The data retrieved from FLSTORET

Florida Trophic State Index (TSI)



Lake Trafford Watershed and Land Use Categories

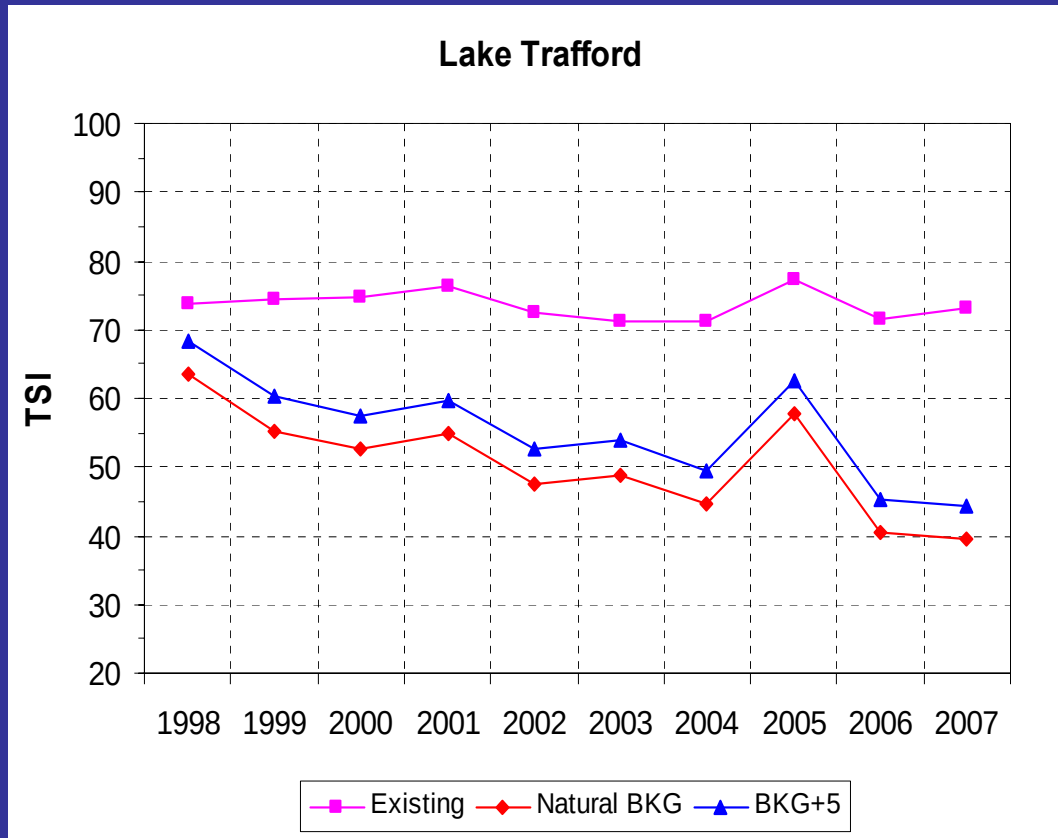


- The predominant land uses include agriculture (35.5%) and wetland (33.6%)
- Other land uses are pastureland (9.8%) forest/rangeland (8.4%) and low density residential (3.4%)

Setting the TSI Target

- HSPF was used to describe and evaluate the “natural land use background condition” for the Lake Trafford watershed. For this simulation, all current land uses were ‘reassigned’ to a mixture of forest, wetland, and water.
- The target for TMDL development is the background TSI plus 5 TSI units, making the target TSI for Lake Trafford as 56.0 ($51.0 + 5$ TSI units).

Existing, Natural BKG, BKG+5 TSI



Lake Trafford TMDL

WBID	Parameter	WLA		LA (lbs/yr)	MOS	TMDL (lbs/yr)	Percent Reduction
		Wastewater (lbs/yr)	Stormwater (% reduction)				
3259W	TN	NA	60	56,617	Implicit	56,617	60
3259W	TP	NA	77	3,348	Implicit	3,348	77