Technical Memorandum

To: **Mac Hatcher, PM Collier County**

From: **Moris Cabezas, PBS&J**
Preston Manning, DHI

Date: **February 7, 2011**

Re: **Watershed Model Update and Plan Development**
Contract 08-5122, PO 4500106318
Element 1, Task 3: Surface Water Pollutant Loads

1.0 Introduction

An approach that has been used by federal and state regulatory agencies to quantify the amount of pollutants discharged into a water body is to estimate the average annual pollutant loads. Land use based pollutant loading can serve as a useful accounting method for determining the relative contribution of various land use types to total pollutant load. In addition, establishing baseline and existing condition pollutant loads allows for a relative comparison as a performance of current pollutant loading to that resulting once improvement projects are implemented. The ccalculation of pollution loads for the management plans considered strictly anthropogenic loads as the focus of watershed protection and restoration is the mitigation of anthropogenic impacts.

Pollution loads discharged to the Collier County receiving water bodies were estimated using a Pollutant Loading and Removal Model. The model computes the loads using a variation of what is referred to as the USEPA Simple Method.

$\mathbf{L_I} = (0.227)(R)(EMC)(A)$

where:

L_I = Annual pollutant load (lb/yr)
R = Annual average runoff (in/yr)
EMC = Event mean concentration of a pollutant (mg/l)
A = Catchment area (acres)

Runoff volume was determined using flow data from the MIKE SHE / MIKE 11 hydrologic & hydraulic (H&H) existing conditions computer model. The EMC is the mean concentration of a chemical parameter expected in the stormwater runoff discharged from a particular land use category during a typical (average) storm event. The area was considered that of each grid cell in the model domain, which amounts to approximately 51.6 acres.

Anthropogenic pollutant loads were estimated for the pollutants listed below. These are the same pollutants identified as parameters of concern in the Southwest Florida Feasibility Study (SWFFS).

Conventional Pollutants	Heavy Metals
Total Suspended Solids (TSS)	Copper (Cu)
Total Nitrogen (TN)	Zinc (Zn)
Total Phosphorus (TP)	Lead (Pb)
5-Day Biological Oxygen Demand (BOD_5)	

Iron is also a parameter of water quality concern in Collier County. However, pollutant loads were not calculated because EMCs for iron are usually not available. Anthropogenic iron pollution is either site specific or sources are of natural origin.

The pollution loads calculated as described above represent the loads generated in the watershed (gross pollutant load). The pollutant loads discharged into the County's drainage system are referred to as net loads and they consider the effects of runoff treatment provided by the existing Best Management Practices (BMPs). The methodology used to estimate the pollutant removal capacity of the BMPs is described later in the report. It should be noted that pollutant loads should be not be compared to in-stream water quality measurements, as the land use base loading does not account for fate, transport and degradation of pollutants, nor ambient in-stream conditions and processes. Comparisons to in-stream data should be done in combination with a water quality model that incorporates in-stream chemical processes.

Following are descriptions of the land use analysis performed for estimating pollutant loads, as well as a detailed description of the pollutant load calculation methodology.

2.0 Land Use Analysis

The land use distribution for this analysis was made consistent with both the H&H model and the SWFFS. Therefore, it represents 2007 land use conditions. The land use maps incorporated in the H&H model were converted to a GIS-compatible format. The land use within each cell (1,500' x 1,500') within the model domain grid was set based on its dominant use. The land use categories are shown in **Table 1**.

3.0 Pollution Load Calculation Methodology

As indicated previously, pollutant load calculation is based on expected annual runoff volume, the stormwater event mean concentrations (EMC), and the area of each cell.

3.1 Expected Annual Runoff Volume

The H&H model results for the simulation period considered for the watershed analysis were used to generate water balance data for every model grid cell. Because the simulation period

includes a variety of rainfall conditions, it is reasonable to assume that it provides a reasonable estimate of annual average runoff volume.

Table 1. Land Use Categories in the H&H Model

Land Use Code	MIKE SHE Land Use	Land Use Type
1	Citrus	Agriculture
2	Pasture	Agriculture
5	Truck Crops	Agriculture
6	Golf Course	Agriculture
7	Bare Ground	Natural
8	Mesic Flatwood	Natural
9	Mesic Hammock	Natural
12	Hydric Flatwood	Natural
13	Hydric Hammock	Natural
14	Wet Prairie	Natural
16	Marsh	Natural
17	Cypress	Natural
18	Swamp Forest	Natural
19	Mangrove	Natural
20	Water	Natural
41	Urban Low Density	Urban
42	Urban Medium Density	Urban
43	Urban High Density	Urban

The runoff volume discharged from each cell was determined based on the product of expected runoff depth and the area of each cell (2,250,000 ft^2). Runoff depth was calculated as:

Runoff Depth = Overland flow to canals and rivers + drainage from the unsaturated zone.

The overland flow to canals and rivers includes cell to river flow and cell to cell boundary flow. The drainage from the unsaturated zone includes water that was captured by stormwater management features and agricultural drains and eventually discharges to the canals and rivers.

Because the MIKE SHE / MIKE 11 model includes a larger number of components than the typical surface water hydrologic model, errors are introduced when determining the runoff depth from a single cell. These errors are due primarily to the regional nature of some of the modelling processes and their spatial variations. For example, in the event that a cell represents a low area and ponds water, a certain volume of rainfall would go to storage and the runoff estimate from the cell may show as negative. To reduce the effects of these spatial variations, the runoff volume from each cell was adjusted by a smoothing process that consisted of averaging the

runoff using a 12-cell grid of neighbouring cells. This produced stable and satisfactory results for pollution load calculations.

3.2 Event Mean Concentrations (EMCs)

As indicated previously, the EMC is the mean concentration of a chemical parameter expected in the stormwater runoff discharged from a particular land use category during a typical (average) storm event. For consistency with previous work, the EMCs used in this analysis were obtained from the SWFFS Water Quality Model Development report. Because the focus of this analysis is on anthropogenic loads, the EMCs associated with the natural areas were assumed to be zero (0). **Table 2** lists the EMCs by land use category and chemical parameter.

3.3 Pollution Load Estimates By H&H Model Grid Cell

As described previously, gross pollutant loads were estimated for each cell in the model domain. Those loads were then modified to reflect the pollution removal effect of Best Management Practices (BMPs), such as detention ponds that exist throughout the County. The net loads are pollution loads that enter the drainage network, and therefore discharge into the estuary systems.

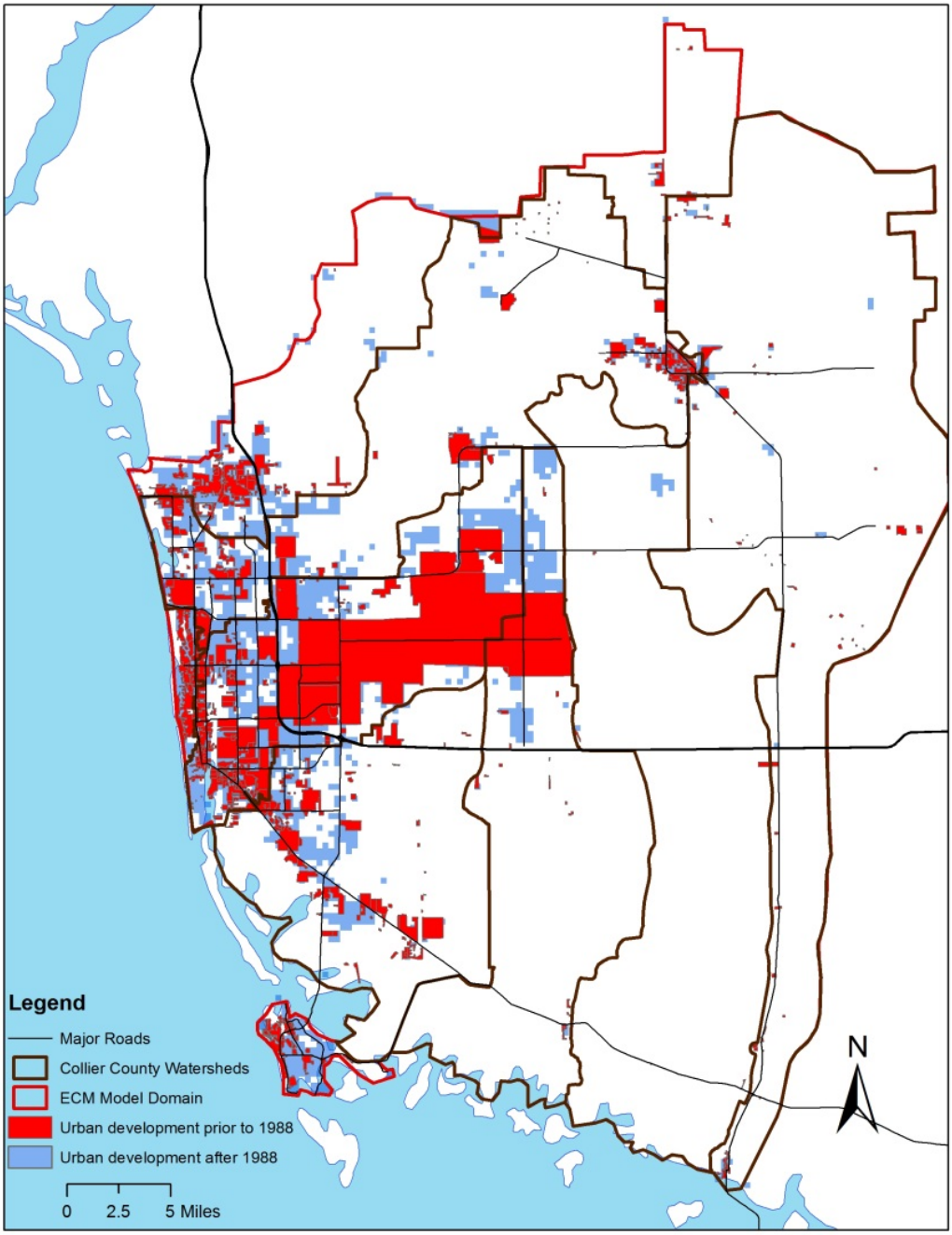
The methodology used to assess the extent of BMPs in the project area considered that current stormwater regulations in Florida came into effect in 1984. Therefore, development occurring since the mid to late 1980s includes treatment facilities that meet current regulatory standards.

To account for the presence of BMPs, a land use map from the 1980s was compared to the current land use map to identify the areas developed during the period. The SFWMD publishes land use data every number of years and the 1988 land use data base was determined to be the most appropriate for the analysis, as it was assumed that it would take a few years for the regulations to affect development. **Figure 1** illustrates the extent of urban development for the periods before and after 1988. Development from the period after 1988 was assumed to discharge stormwater runoff treated to current regulatory standards.

Table 2. Event Mean Concentrations (EMCs) by Land Use and Chemical Parameter

Land Use Code	H&H Model Land Use	SWFFS Land Use Category	Pollutant EMC's for Loading Analysis (mg/l)						
			TN	TP	BOD	TSS	CU	PB	ZN
1	Citrus	Agricultural/Pasture/Golf Course	3.18	0.64	4	13	0.004	0.005	0.023
2	Pasture	Agricultural/Pasture/Golf Course	3.18	0.64	4	13	0.004	0.005	0.023
5	Truck Crops	Agricultural/Pasture/Golf Course	3.18	0.64	4	13	0.004	0.005	0.023
6	Golf Course	Agricultural/Pasture/Golf Course	3.18	0.64	4	13	0.004	0.005	0.023
7	Bare Ground	Forest/Rural/Open	1.16	0.05	1	11	0.001	0.001	0
8	Mesic Flatwood	Forest/Rural/Open	0	0	0	0	0	0	0
9	Mesic Hammock	Forest/Rural/Open	0	0	0	0	0	0	0
12	Hydric Flatwood	Forest/Rural/Open	0	0	0	0	0	0	0
13	Hydric Hammock	Forest/Rural/Open	0	0	0	0	0	0	0
14	Wet Praire	Water/Wetlands	0	0	0	0	0	0	0
16	Marsh	Water/Wetlands	0	0	0	0	0	0	0
17	Cypress	Water/Wetlands	0	0	0	0	0	0	0
18	Swamp Forest	Water/Wetlands	0	0	0	0	0	0	0
19	Mangrove	Water/Wetlands	0	0	0	0	0	0	0
20	Water	Water/Wetlands	0	0	0	0	0	0	0
41	Urban Low Density	Low Density Residential	2.02	0.39	13	27	0.012	0.016	0.051
42	Urban Medium Density	Medium Density Residential	2.34	0.39	9	59	0.023	0.016	0.073
43	Urban High Density	Urban and Built Up	2.45	0.37	8	72	0.031	0.015	0.065

Figure 1
Areas of Development Before and After Current Stormwater Regulations
Base Year for Analysis 1988)



As the most commonly used BMP in Collier County is wet detention, net pollutant load calculations considered the typical pollutant reduction efficiency at this type of facility. They are listed in **Table 3**.

Table 3. Pollutant Removal Efficiency of Wet Detention Ponds

Chemical Parameter	Removal Efficiency (%)
Total Suspended Solids (TSS)	80
Total Nitrogen (TN)	30
Total Phosphorus (TP)	65
5-Day Biological Oxygen Demand (BOD-5)	80
Copper (Cu)	65
Lead (Pb)	80
Zinc (Zn)	80

The magnitude of the estimated pollutant loads by cell becomes meaningful when compared to a reference standard, which for this analysis was assumed to be the average pollutant load in the County from a medium density residential development not including treatment facilities. That standard was developed by averaging the annual runoff from all cells having a predominant medium density residential land use, which was determined to be 8.3 inches, and multiplying it by the corresponding EMC associated with a chemical parameter. Subsequently the ratios of total load from a cell to the standard were scored as shown in **Table 4**. The scoring system is consistent with the scoring used for the other analyses conducted as part of the overall study. A score of 10 indicates no anthropogenic pollution, whereas a score less than 2 indicates areas (urban or agriculture) that exhibit pollutant loads equal or larger than those from a typical residential development with no stormwater runoff treatment.

Table 4. Pollution Load Scores and Ratios

Score	Ratio of Net Load to Standard Load
10	< 10% of standard
9	10% < standard < 20%
8	20% < standard < 30%
7	30% < standard < 40%
6	40% < standard < 50%
5	50% < standard < 60%
4	60% < standard < 70%
3	70% < standard < 80%
2	80% < standard < 90%
Less than 2	> 90% of standard

Figures 2 through 8 show the distribution of pollution load scores in the study area. As shown the areas of low TSS scores are in the older urban developments located along the coast as TSS result from the resuspension of sediment accumulated on roads and drainage facilities. In terms of nutrient pollution, areas of interest are older developments, golf courses, and agriculture. The nutrient source is likely the excessive use of fertilizers. It must be noted that the largest EMC value used in the SWFFS analysis is for agricultural land uses. Further wet weather sampling is necessary to better define areas of agricultural nutrient concern.

Per the EMC table, areas of BOD-5 concern are primarily those of low and medium density residential land uses that do not incorporate treatment facilities. In terms of heavy metals, lead tends to accumulate in soils and sediment and has remained in the environment because of its former use as an additive in gasoline and paints. Primary sources of copper in urban runoff have been determined to be vehicle brake pads and the use of copper-containing herbicides and chemicals for algae control. Zinc commonly occurs due to its industrial uses as a rust preventative in iron-containing metals. These metals are also associated with urban land uses with no stormwater treatment.

3.4 Pollution Load Estimates by WBID and Watershed

The estimated annual pollutant loads by cell were aggregated to reflect loads by WBID and watershed. They are shown in **Tables 5 through 11**. In addition, the tables show the load by unit area (lbs/acre/year) and the pollution load score to better reflect areas of concern. Results show that the WBIDs of most concern in terms of nutrient pollution loads are in the Cocohatchee – Corkscrew and the Golden Gate – Naples Bay watersheds, particularly the coastal segment of Naples Bay and the Gordon River Extension. The Golden Gate – Naples Bay watershed received the lowest average scores for the other pollutants because of the presence of areas of urban development with no treatment. It should be noted that the Lake Trafford WBID shows a pollution load of zero (0). That is because the WBID includes only the lake itself. The drainage area contributing to Lake Trafford includes WBIDs 3278E, Cow Slough, and 3278L, the Immokalee Basin.

4.0 Surface Water Pollution Loads Performance Measures

The methodologies described in this memorandum, will also be used as performance measures to evaluate proposed watershed improvement projects. Anthropogenic pollution load reductions will be used to evaluate potential benefits. An important criterion for assessing project feasibility will be the estimated cost per pound of pollution load removed.

Figure 2. TSS Pollution Load Scores

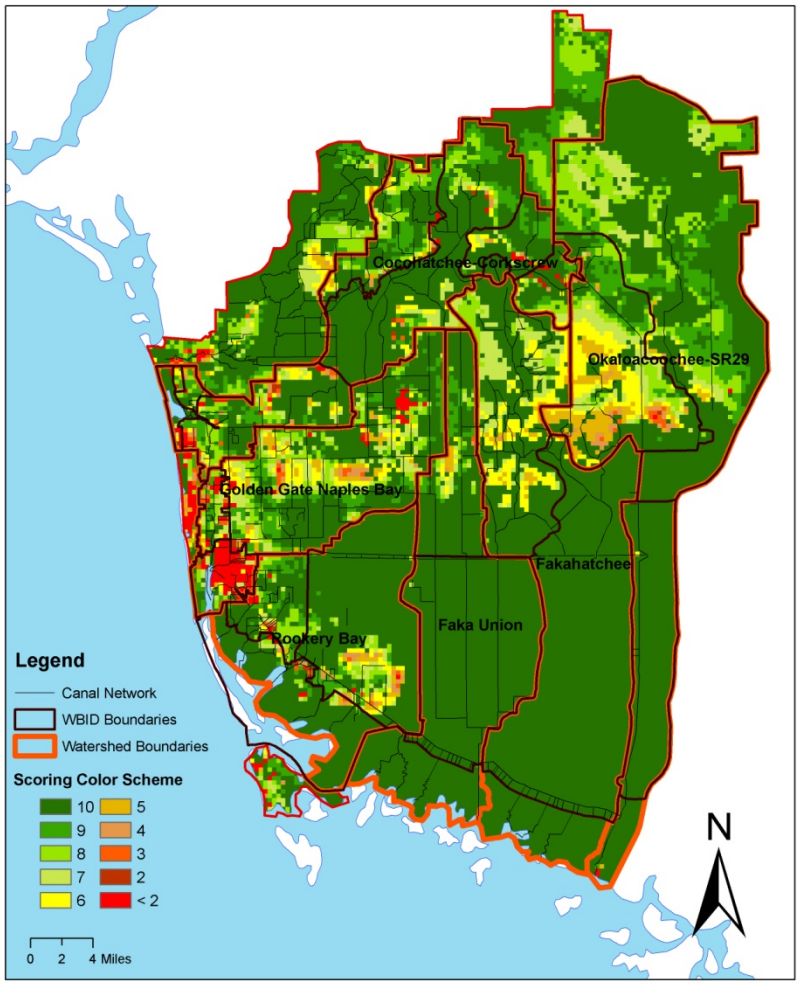


Figure 3. Total Nitrogen Pollution Load Scores

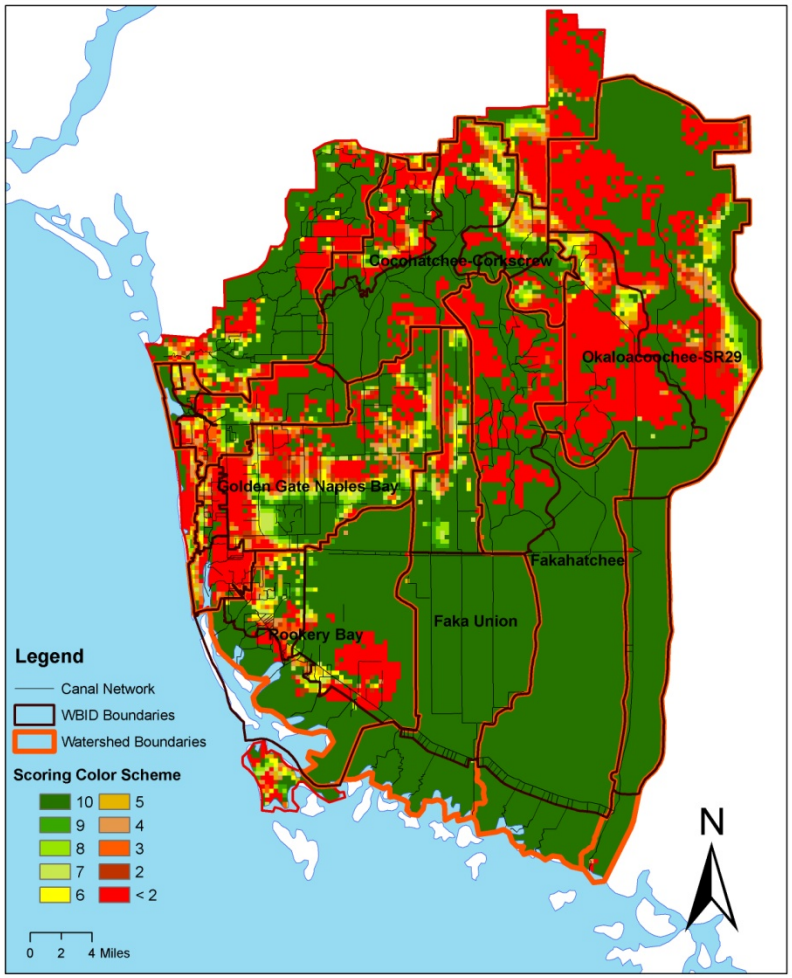


Figure 4. Total Phosphorus Pollution Load Scores

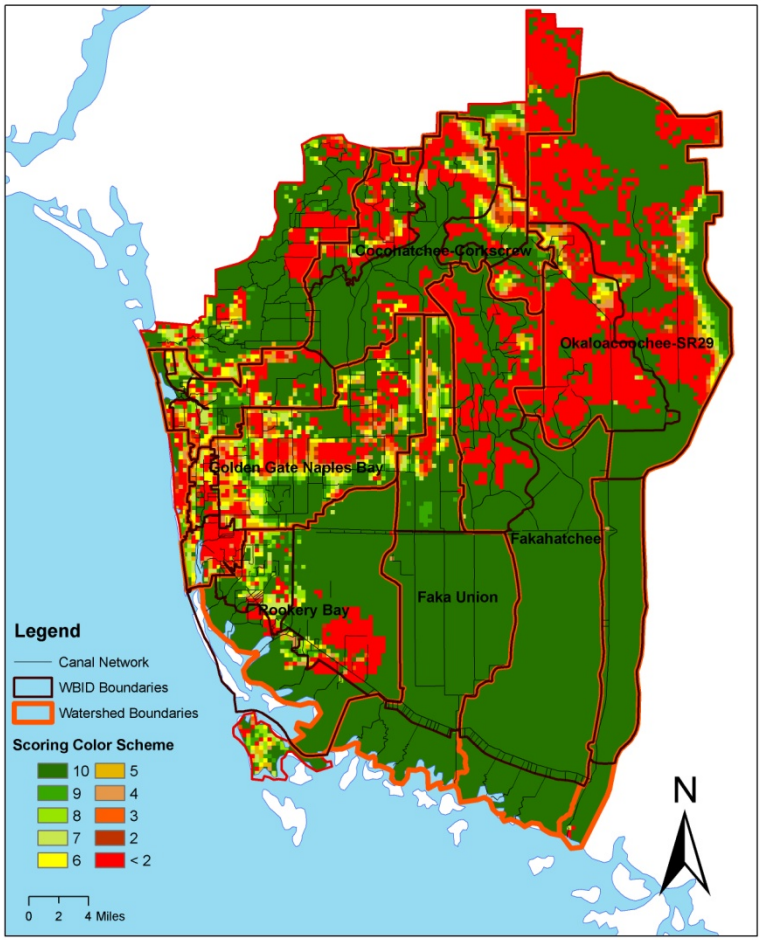


Figure 5. BOD-5 Pollution Load Scores

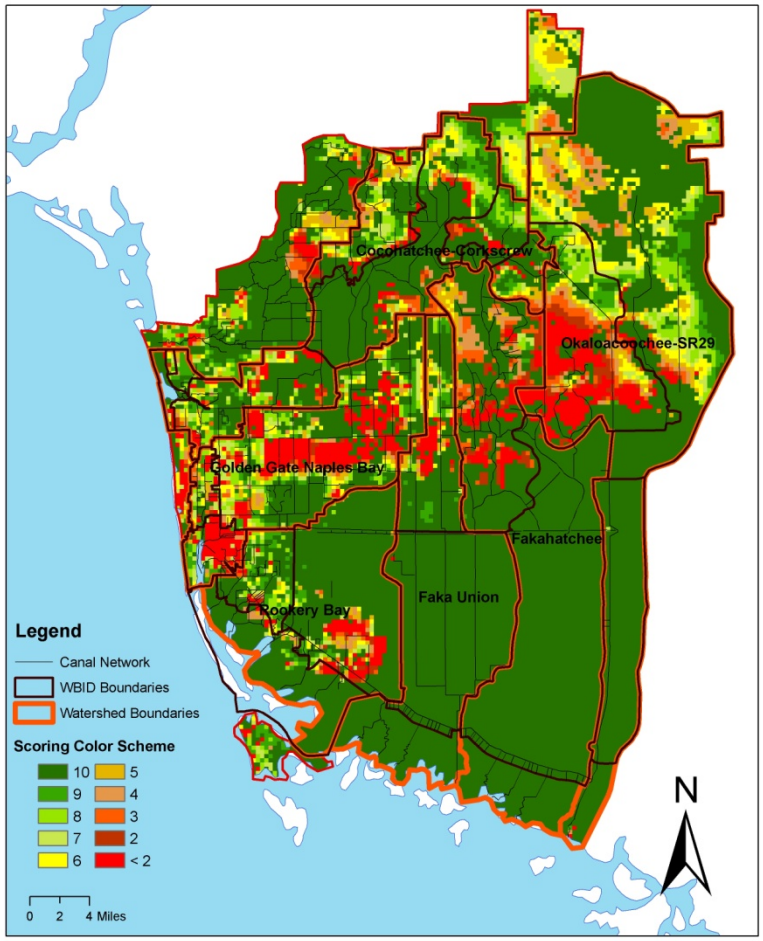


Figure 6. Copper (Cu) Pollution Load Scores

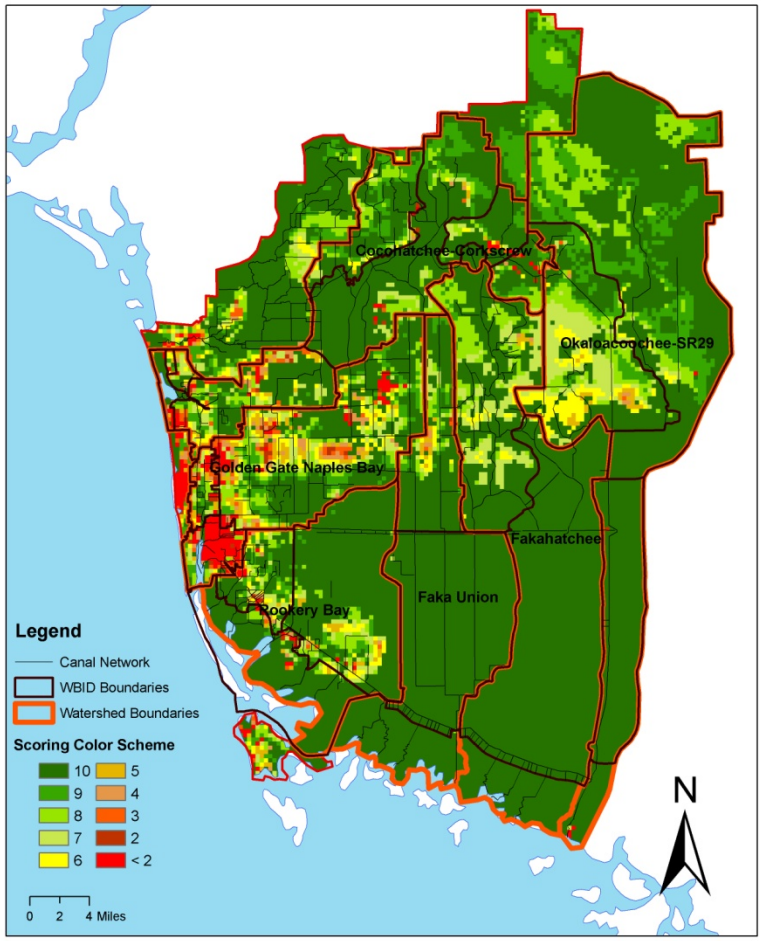


Figure 7. Lead (Pb) Pollution Load Scores

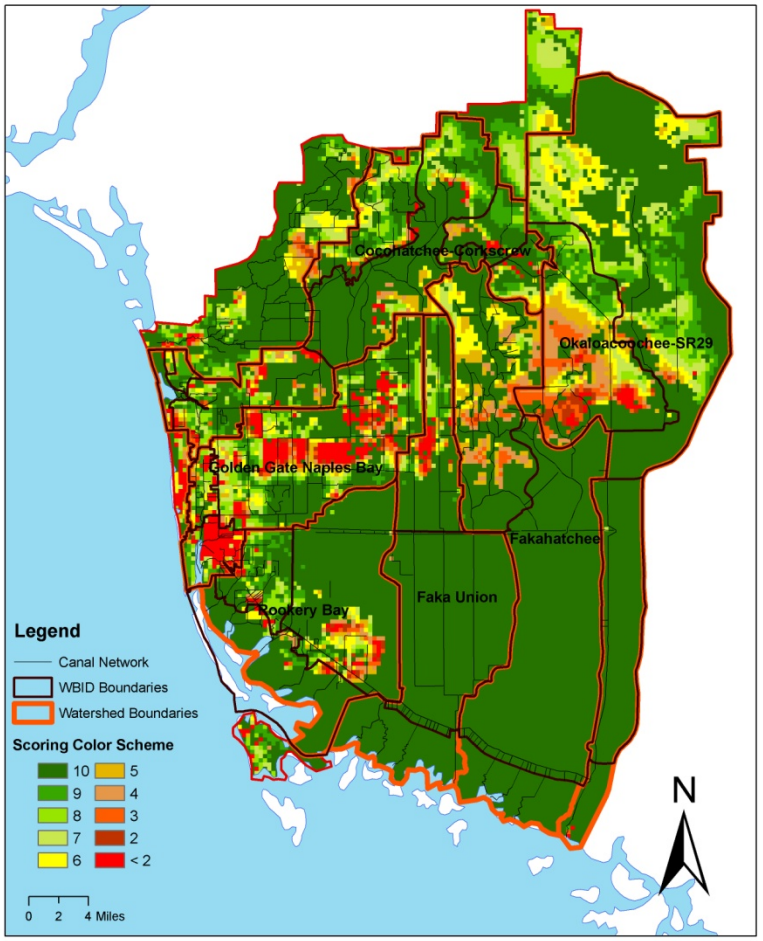


Figure 8. Zinc (Zn) Pollution Load Scores

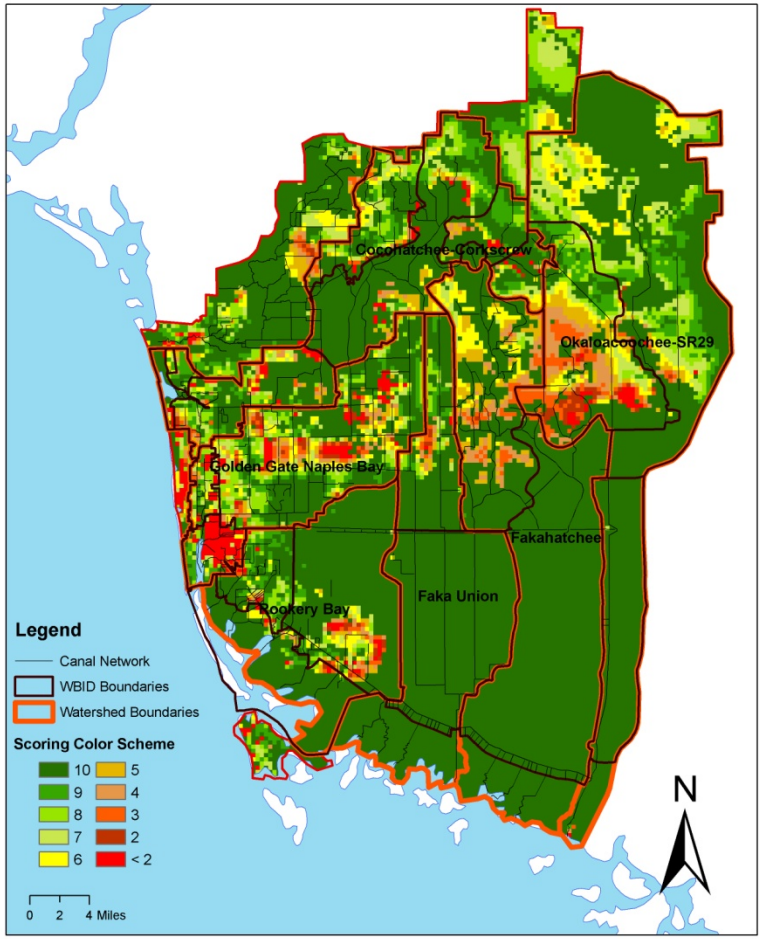


Table 5. Total Suspended Solids Pollution Loads by WBID and Watershed

Watershed	WBID	WBID Name	Area (acres)	Net Load (lbs/yr)	Net Load per Acre (lbs/ac/yr)	Performance Score
Cocohatchee-Corkscrew	3259A	COCOHATCHEE RIVER	2,996	84,097	28.1	8
	3259B	DRAINAGE TO CORKSCREW	21,436	348,098	16.2	9
	3259W	LAKE TRAFFORD	1,446	0	0.0	10
	3259Z	LITTLE HICKORY BAY	671	25,274	37.6	7
	3278C	COCOHATCHEE GOLF COURSE DISCHARGE	2,118	73,938	34.9	7
	3278D	COCOHATCHEE (INLAND SEGMENT)	25,775	530,548	20.6	9
	3278E	COW SLOUGH	11,674	166,862	14.3	9
	3278F	CORKSCREW MARSH	53,048	432,650	8.2	10
	3278L	IMMOKALEE BASIN	8,884	217,603	24.5	8
Total Watershed			128,048	1,879,071	14.67	9.3
Golden Gate - Naples Bay	3278K	GORDON RIVER EXTENSION	5,320	283,191	53.2	6
	3278R	NAPLES BAY (COASTAL SEGMENT)	9,194	1,209,223	131.5	0
	3278S	NORTH GOLDEN GATE	73,347	1,740,527	23.7	8
Total Watershed			87,862	3,232,941	36.80	7.0
Rookery Bay	3278U	ROOKERY BAY (COASTAL SEGMENT)	27,634	180,563	6.5	10
	3278V	ROOKERY BAY (INLAND EAST SEGMENT)	54,236	448,620	8.3	10
	3278Y	ROOKERY BAY (INLAND WEST SEGMENT)	15,186	273,241	18.0	9
Total Watershed			97,056	902,423	9.30	9.8
Faka Union - Fakahatchee Okaloacoochee SR29	3278H	FAKA UNION (NORTH SEGMENT)	27,583	251,311	9.1	10
	3278I	FAKA UNION (SOUTH SEGMENT)	58,884	1,725	0.0	10
	3259I	CAMP KEAIS	55,682	960,790	17.3	9
	3278G	FAKAHATCHEE STRAND	94,628	22,614	0.2	10
	3261C	BARRON RIVER CANAL	31,921	2,614	0.1	10
	3278T	OKALOACOOCHEE SLOUGH	122,779	1,197,966	9.8	10
	3278W	SILVER STRAND	54,132	1,570,484	29.0	8
Total Watershed			445,610	4,007,505	8.99	9.6

Table 6. Total Nitrogen Pollution Loads by WBID and Watershed

Watershed	WBID	WBID Name	Area (acres)	Net Load (lbs/yr)	Net Load per Acre (lbs/ac/yr)	Performance Score
Cocohatchee-Corkscrew	3259A	COCOHATCHEE RIVER	2,996	4,612	1.54	7
	3259B	DRAINAGE TO CORKSCREW	21,436	83,748	3.91	2
	3259W	LAKE TRAFFORD	1,446	0	0.00	10
	3259Z	LITTLE HICKORY BAY	671	1,602	2.39	5
	3278C	COCOHATCHEE GOLF COURSE DISCHARGE	2,118	4,797	2.27	5
	3278D	COCOHATCHEE (INLAND SEGMENT)	25,775	77,866	3.02	4
	3278E	COW SLOUGH	11,674	31,004	2.66	4
	3278F	CORKSCREW MARSH	53,048	99,867	1.88	6
	3278L	IMMOKALEE BASIN	8,884	31,820	3.58	2
Total Watershed			128,048	335,316	2.62	4.5
Golden Gate - Naples Bay	3278K	GORDON RIVER EXTENSION	5,320	21,885	4.11	1
	3278R	NAPLES BAY (COASTAL SEGMENT)	9,194	52,523	5.71	0
	3278S	NORTH GOLDEN GATE	73,347	166,652	2.27	5
Total Watershed			87,862	241,060	2.74	4.2
Rookery Bay	3278U	ROOKERY BAY (COASTAL SEGMENT)	27,634	23,551	0.85	9
	3278V	ROOKERY BAY (INLAND EAST SEGMENT)	54,236	94,760	1.75	7
	3278Y	ROOKERY BAY (INLAND WEST SEGMENT)	15,186	28,130	1.85	6
Total Watershed			97,056	146,442	1.51	7.4
Faka Union - Fakahatchee Okaloacoochee SR29	3278H	FAKA UNION (NORTH SEGMENT)	27,583	36,092	1.31	8
	3278I	FAKA UNION (SOUTH SEGMENT)	58,884	129	0.00	10
	3259I	CAMP KEAIS	55,682	231,302	4.15	1
	3278G	FAKAHATCHEE STRAND	94,628	5,532	0.06	10
	3261C	BARRON RIVER CANAL	31,921	311	0.01	10
	3278T	OKALOACOOCHEE SLOUGH	122,779	291,256	2.37	5
	3278W	SILVER STRAND	54,132	379,120	7.00	0
Total Watershed			445,610	943,743	2.12	6.2

Table 7. Total Phosphorus Pollution Loads by WBID and Watershed

Watershed	WBID	WBID Name	Area (acres)	Net Load (lbs/yr)	Net Load per Acre (lbs/ac/yr)	Performance Score
Cocohatchee-Corkscrew	3259A	COCOHATCHEE RIVER	2,996	594	0.20	8
	3259B	DRAINAGE TO CORKSCREW	21,436	16,729	0.78	0
	3259W	LAKE TRAFFORD	1,446	0	0.00	10
	3259Z	LITTLE HICKORY BAY	671	258	0.38	5
	3278C	COCOHATCHEE GOLF COURSE DISCHARGE	2,118	514	0.24	7
	3278D	COCOHATCHEE (INLAND SEGMENT)	25,775	12,532	0.49	4
	3278E	COW SLOUGH	11,674	5,978	0.51	4
	3278F	CORKSCREW MARSH	53,048	19,781	0.37	5
	3278L	IMMOKALEE BASIN	8,884	6,111	0.69	1
Total Watershed			128,048	62,498	0.49	3.8
Golden Gate - Naples Bay	3278K	GORDON RIVER EXTENSION	5,320	3,241	0.61	2
	3278R	NAPLES BAY (COASTAL SEGMENT)	9,194	7,686	0.84	0
	3278S	NORTH GOLDEN GATE	73,347	26,219	0.36	6
Total Watershed			87,862	37,145	0.42	5.1
Rookery Bay	3278U	ROOKERY BAY (COASTAL SEGMENT)	27,634	4,209	0.15	8
	3278V	ROOKERY BAY (INLAND EAST SEGMENT)	54,236	18,387	0.34	6
	3278Y	ROOKERY BAY (INLAND WEST SEGMENT)	15,186	3,633	0.24	7
Total Watershed			97,056	26,228	0.27	6.7
Faka Union - Fakahatchee Okaloacoochee SR29	3278H	FAKA UNION (NORTH SEGMENT)	27,583	5,856	0.21	8
	3278I	FAKA UNION (SOUTH SEGMENT)	58,884	25	0.00	10
	3259I	CAMP KEAIS	55,682	46,039	0.83	0
	3278G	FAKAHATCHEE STRAND	94,628	1,113	0.01	10
	3261C	BARRON RIVER CANAL	31,921	24	0.00	10
	3278T	OKALOACOOCHEE SLOUGH	122,779	58,503	0.48	4
	3278W	SILVER STRAND	54,132	76,061	1.41	0
Total Watershed			445,610	187,622	0.42	5.8

Table 8. Total BOD-5 Pollution Loads by WBID and Watershed

Watershed	WBID	WBID Name	Area (acres)	Net Load (lbs/yr)	Net Load per Acre (lbs/ac/yr)	Performance Score
Cocohatchee-Corkscrew	3259A	COCOHATCHEE RIVER	2,996	12,084	4.03	8
	3259B	DRAINAGE TO CORKSCREW	21,436	108,745	5.07	7
	3259W	LAKE TRAFFORD	1,446	0	0.00	10
	3259Z	LITTLE HICKORY BAY	671	4,723	7.03	6
	3278C	COCOHATCHEE GOLF COURSE DISCHARGE	2,118	9,196	4.34	8
	3278D	COCOHATCHEE (INLAND SEGMENT)	25,775	123,276	4.78	8
	3278E	COW SLOUGH	11,674	49,902	4.27	8
	3278F	CORKSCREW MARSH	53,048	139,950	2.64	9
	3278L	IMMOKALEE BASIN	8,884	47,296	5.32	7
Total Watershed			128,048	495,172	3.87	8.2
Golden Gate - Naples Bay	3278K	GORDON RIVER EXTENSION	5,320	46,485	8.74	5
	3278R	NAPLES BAY (COASTAL SEGMENT)	9,194	160,283	17.43	0
	3278S	NORTH GOLDEN GATE	73,347	592,065	8.07	6
Total Watershed			87,862	798,833	9.09	5.3
Rookery Bay	3278U	ROOKERY BAY (COASTAL SEGMENT)	27,634	38,732	1.40	10
	3278V	ROOKERY BAY (INLAND EAST SEGMENT)	54,236	131,321	2.42	9
	3278Y	ROOKERY BAY (INLAND WEST SEGMENT)	15,186	48,229	3.18	9
Total Watershed			97,056	218,282	2.25	9.3
Faka Union - Fakahatchee Okaloacoochee SR29	3278H	FAKA UNION (NORTH SEGMENT)	27,583	107,536	3.90	8
	3278I	FAKA UNION (SOUTH SEGMENT)	58,884	831	0.01	10
	3259I	CAMP KEAIS	55,682	290,002	5.21	7
	3278G	FAKAHATCHEE STRAND	94,628	6,958	0.07	10
	3261C	BARRON RIVER CANAL	31,921	290	0.01	10
	3278T	OKALOACOOCHEE SLOUGH	122,779	368,816	3.00	9
	3278W	SILVER STRAND	54,132	478,329	8.84	5
Total Watershed			445,610	1,252,762	2.81	8.6

Table 9. Total Copper (Cu) Pollution Loads by WBID and Watershed

Watershed	WBID	WBID Name	Area (acres)	Net Load (lbs/yr)	Net Load per Acre (lbs/ac/yr)	Performance Score
Cocohatchee-Corkscrew	3259A	COCOHATCHEE RIVER	2,996	38	0.013	8
	3259B	DRAINAGE TO CORKSCREW	21,436	110	0.005	9
	3259W	LAKE TRAFFORD	1,446	0	0.000	10
	3259Z	LITTLE HICKORY BAY	671	11	0.016	7
	3278C	COCOHATCHEE GOLF COURSE DISCHARGE	2,118	39	0.018	6
	3278D	COCOHATCHEE (INLAND SEGMENT)	25,775	253	0.010	8
	3278E	COW SLOUGH	11,674	61	0.005	9
	3278F	CORKSCREW MARSH	53,048	141	0.003	10
	3278L	IMMOKALEE BASIN	8,884	82	0.009	8
Total Watershed			128,048	734	0.01	9.1
Golden Gate - Naples Bay	3278K	GORDON RIVER EXTENSION	5,320	132	0.025	5
	3278R	NAPLES BAY (COASTAL SEGMENT)	9,194	526	0.057	0
	3278S	NORTH GOLDEN GATE	73,347	838	0.011	8
Total Watershed			87,862	1,497	0.02	7.0
Rookery Bay	3278U	ROOKERY BAY (COASTAL SEGMENT)	27,634	77	0.003	10
	3278V	ROOKERY BAY (INLAND EAST SEGMENT)	54,236	160	0.003	10
	3278Y	ROOKERY BAY (INLAND WEST SEGMENT)	15,186	145	0.010	8
Total Watershed			97,056	382	0.00	9.7
Faka Union - Fakahatchee Okaloacoochee SR29	3278H	FAKA UNION (NORTH SEGMENT)	27,583	115	0.004	10
	3278I	FAKA UNION (SOUTH SEGMENT)	58,884	1	0.000	10
	3259I	CAMP KEAIS	55,682	300	0.005	9
	3278G	FAKAHATCHEE STRAND	94,628	7	0.000	10
	3261C	BARRON RIVER CANAL	31,921	2	0.000	10
	3278T	OKALOACOOCHEE SLOUGH	122,779	371	0.003	10
	3278W	SILVER STRAND	54,132	489	0.009	8
Total Watershed			445,610	1,285	0.00	9.6

Table 10. Total Lead (Pb) Pollution Loads by WBID and Watershed

Watershed	WBID	WBID Name	Area (acres)	Net Load (lbs/yr)	Net Load per Acre (lbs/ac/yr)	Performance Score
Cocohatchee-Corkscrew	3259A	COCOHATCHEE RIVER	2,996	22	0.007	8
	3259B	DRAINAGE TO CORKSCREW	21,436	136	0.006	8
	3259W	LAKE TRAFFORD	1,446	0	0.000	10
	3259Z	LITTLE HICKORY BAY	671	8	0.011	7
	3278C	COCOHATCHEE GOLF COURSE DISCHARGE	2,118	17	0.008	8
	3278D	COCOHATCHEE (INLAND SEGMENT)	25,775	175	0.007	8
	3278E	COW SLOUGH	11,674	65	0.006	9
	3278F	CORKSCREW MARSH	53,048	174	0.003	9
	3278L	IMMOKALEE BASIN	8,884	67	0.008	8
Total Watershed			128,048	663	0.01	8.5
Golden Gate - Naples Bay	3278K	GORDON RIVER EXTENSION	5,320	75	0.014	6
	3278R	NAPLES BAY (COASTAL SEGMENT)	9,194	285	0.031	0
	3278S	NORTH GOLDEN GATE	73,347	779	0.011	7
Total Watershed			87,862	1,139	0.01	6.2
Rookery Bay	3278U	ROOKERY BAY (COASTAL SEGMENT)	27,634	55	0.002	10
	3278V	ROOKERY BAY (INLAND EAST SEGMENT)	54,236	168	0.003	9
	3278Y	ROOKERY BAY (INLAND WEST SEGMENT)	15,186	76	0.005	9
Total Watershed			97,056	300	0.00	9.3
Faka Union - Fakahatchee Okaloacoochee SR29	3278H	FAKA UNION (NORTH SEGMENT)	27,583	133	0.005	9
	3278I	FAKA UNION (SOUTH SEGMENT)	58,884	1	0.000	10
	3259I	CAMP KEAIS	55,682	364	0.007	8
	3278G	FAKAHATCHEE STRAND	94,628	9	0.000	10
	3261C	BARRON RIVER CANAL	31,921	1	0.000	10
	3278T	OKALOACOOCHEE SLOUGH	122,779	461	0.004	9
	3278W	SILVER STRAND	54,132	600	0.011	7
Total Watershed			445,610	1,568	0.00	9.0

Table 11. Total Zinc (Zn) Pollution Loads by WBID and Watershed

Watershed	WBID	WBID Name	Area (acres)	Net Load (lbs/yr)	Net Load per Acre (lbs/ac/yr)	Performance Score
Cocohatchee-Corkscrew	3259A	COCOHATCHEE RIVER	2,996	97	0.032	8
	3259B	DRAINAGE TO CORKSCREW	21,436	615	0.029	8
	3259W	LAKE TRAFFORD	1,446	0	0.000	10
	3259Z	LITTLE HICKORY BAY	671	32	0.048	7
	3278C	COCOHATCHEE GOLF COURSE DISCHARGE	2,118	75	0.035	8
	3278D	COCOHATCHEE (INLAND SEGMENT)	25,775	750	0.029	8
	3278E	COW SLOUGH	11,674	278	0.024	9
	3278F	CORKSCREW MARSH	53,048	766	0.014	9
	3278L	IMMOKALEE BASIN	8,884	303	0.034	8
Total Watershed			128,048	2,915	0.02	8.5
Golden Gate - Naples Bay	3278K	GORDON RIVER EXTENSION	5,320	322	0.061	6
	3278R	NAPLES BAY (COASTAL SEGMENT)	9,194	1,239	0.135	1
	3278S	NORTH GOLDEN GATE	73,347	2,749	0.037	8
Total Watershed			87,862	4,310	0.05	7.1
Rookery Bay	3278U	ROOKERY BAY (COASTAL SEGMENT)	27,634	239	0.009	10
	3278V	ROOKERY BAY (INLAND EAST SEGMENT)	54,236	741	0.014	10
	3278Y	ROOKERY BAY (INLAND WEST SEGMENT)	15,186	326	0.021	9
Total Watershed			97,056	1,306	0.01	9.8
Faka Union - Fakahatchee Okaloacoochee SR29	3278H	FAKA UNION (NORTH SEGMENT)	27,583	449	0.016	9
	3278I	FAKA UNION (SOUTH SEGMENT)	58,884	3	0.000	10
	3259I	CAMP KEAIS	55,682	1,668	0.030	8
	3278G	FAKAHATCHEE STRAND	94,628	40	0.000	10
	3261C	BARRON RIVER CANAL	31,921	2	0.000	10
	3278T	OKALOACOOCHEE SLOUGH	122,779	2,117	0.017	9
	3278W	SILVER STRAND	54,132	2,754	0.051	7
Total Watershed			445,610	7,034	0.02	9.0

5.0 References

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