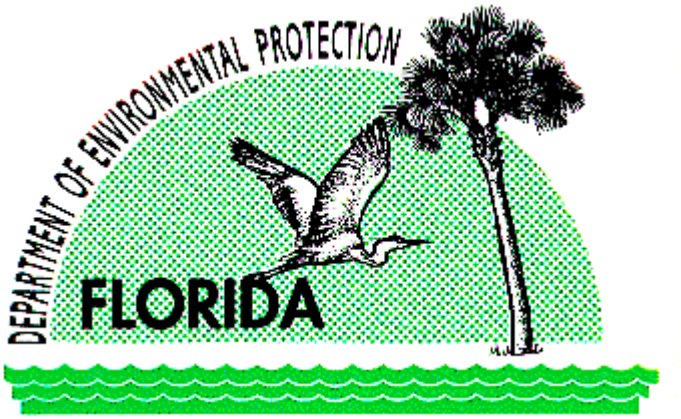



Physical, Chemical and Biological Assessment of Selected

# TMDL Waterbodies

in the

# Hillsborough, Tampa Bay, Alafia, Caloosahatchee, and Apalachicola Basins

Sampled November 2002
through April 2003

February 2004

**Environmental Assessment Section**
**Bureau of Laboratories**

## Executive Summary

FDEP's Bureau of Laboratories, with assistance from the Southwest District, was requested to assess the TMDL status of selected streams. Most of the streams included in this report ultimately flow into Tampa Bay, although also included were additional sites located in the Panhandle. Specifically, this study was conducted to determine if these waterbodies should remain on the 303(d) list or whether additional habitat, biological, and chemical data would provide scientifically defensible reasons for their removal from the 303(d) list. Department staff reviewed the planning and verified lists and selected waterbodies that were listed due to exceedances of physical or chemical parameters such as dissolved oxygen and nutrients. It was determined that biological assessment could provide further information on the appropriate TMDL status for twenty-seven (27) of these stream segments.

Stream Condition Index (SCI) results indicated that 8 of the 25 waterbodies sampled (WBIDs 1442, 1561, 1605, 1819, 1443B, 1443D, 1522C, and 3240F) were considered either in "Good" or "Excellent" condition (Table 1). Three of the sites (WBIDs 1402, 1627, 1507, and 1495B) had SCI scores indicating continued impairment (Table 1). In this study, 9 sites (WBIDs 175, 1474, 1482, 1534, 1543, 1639, 1507A, 1522A, and 51B) were not sampled sufficiently to produce any conclusions due to adverse hydrologic conditions (inaccessibility due to flooding). Further definitive sampling using the Stream Condition Index method should be performed on these sites at a later time. The four remaining sites (1286, 375D, 1462A, and 1443E) were not sampled during this study because it was determined that SCI methods were not applicable to these particular waterbodies.

Based on the data collected, it was concluded that WBIDs 1442, 1561, 1605, 1819, 1443B, 1443D, 1522C, and 3240F meet their designated use for supporting aquatic life (see Table 1).

Low-quality biological communities were found at WBIDs 1402, 1627, 1507, and 1495B, suggesting the current status of these WBIDs is consistent with their 303(d) listing.

It is recommended that WBIDs 175, 1474, 1482, 1534, 1543, 1639, 1507A, 1522A, and 51B be sampled in the future using SCI methods in order to establish biological community health.

**Table 1. Summary of Biological Results.**

| WBID | Station Description | Sample Date | SCI or (Bio-Recon) Score | SCI or (Bio-Recon) Word | Comment |
|---|---|---|---|---|---|
| | | | | | |
| 175 | Muddy Branch at CR 167 | 12/10/2002 | 23 | Good | Needs 1 more SCI |

| | | | | | |
|---|---|---|---|---|---|
| | Muddy Branch at CR 167 (DUPLICATE) | 12/10/2002 | 23 | Good | |
| 1286 | Apalachicola References site-Tilton Creek | 2/24/1998 | 13 | Very Poor | Wetland dominated sites, SCI not appropriate biological tool. Past data used for listing should be reconsidered. |
| | Apalachicola Test site-Huckleberry creek | 2/24/1998 | 13 | Very Poor | |
| | Huckleberry Creek | 7/25/1996 | (1) | (Suspect) | |
| 1402 | Cypress Creek at SR 581 | 11/20/2002 | 15 | Poor | Two failures for biology. Results consistent with current 303(d) status listing (low DO, but excellent habitat). |
| | | 1/28/2003 | 19 | Poor | |
| 1442 | New River at SR 579 | 9/14/1998 | 21 | Good | Results indicate WBID meets its designated use for supporting aquatic life. |
| | New River at Chancey Rd | 11/20/2002 | 23 | Good | |
| 1474 | Brooker Cr downstream of Tarpon Woods Blvd | 11/19/2002 | 23 | Good | Needs 1 more SCI |
| 1482 | Tiger Creek Canal on Cone Ranch off SR 39 | 10/14/1996 | 15 | Poor | Not sampled due to hydrology |
| | Blackwater Creek adjacent to Cone Ranch | 8/29/2000 | 19 | Poor | |
| 1507 | River Oaks FYI - Control Site | 10/14/2002 | 23 | Good | Needs 1 more SCI. Consider dividing WBID near discharge. |
| | River Oaks FYI - Test site | 10/14/2002 | 13 | Poor | |
| | Rocky Creek @ Gunn Hwy | 11/25/2002 | 25 | Good | |
| 1534 | Cow House Creek at Fishermans Landing Apts | 11/20/2002 | 17 | Poor | Needs 1 more SCI |
| | | 1/28/2003 | 23 | Good | |
| 1543 | Itchepackesassa Creek upstream of Old Tampa Hwy | 12/12/2002 | 11 | Very Poor | Needs 1 more SCI |
| | | 2/10/2003 | 23 | Good | |
| 1561 | Spartman Branch -TP107 (aka Sparkman Branch) | 8/26/1998 | (3) | (Healthy) | Results indicate WBID meets its designated use for supporting aquatic life. |
| | Spartman Branch at SR 574 | 8/27/1998 | 23 | Good | |
| | Spartman Branch -TP107 (aka Sparkman Branch) | 12/2/2002 | 29 | Excellent | |
| 1605 | Delaney Creek S of 34th Ave | 3/17/1997 | 23 | Good | Results indicate WBID meets its designated use for supporting aquatic life. |
| | Delaney Creek S of 36th Ave | 3/17/1997 | 25 | Good | |
| | Delaney Creek N of 34th Ave | 3/17/1997 | 27 | Excellent | |
| | Delaney Creek at 78th St. | 11/25/2002 | 27 | Excellent | |
| 1627 | Long Branch at Long Branch Apts | 3/7/2002 | (2) | (Suspect) | One biological failure. Results consistent with current 303(d) status listing (low DO, poor habitat). |
| | | 11/26/2002 | 15 | Poor | |
| 1639 | Guy Branch | 9/9/2002 | 13 | Poor | Needs 1 more SCI |
| | Thirty Mile Creek off Carey Rd. | 1/13/2003 | 27 | Excellent | |
| 1819 | Frye Canal, SE on CR 675 | 9/2/1997 | 29 | Excellent | Results indicate WBID meets its designated use for supporting aquatic life. |

| | | | | | |
|---|---|---|---|---|---|
| | Gamble Creek, East on Golf Course Rd. | 9/2/1997 | 23 | Good | |
| | Gamble Creek at Golf Course Rd. | 12/2/2002 | 21 | Good | |
| 1443B | Hillsborough River @ Morrisville Rd. (Morris bridge), SR579 | 12/2/2002 | 23 | Good | Results indicate WBID meets its designated use for supporting aquatic life. |
| | | 4/21/2003 | 23 | Good | |
| 1443D | Hillsborough River in Hills River State Park (TP5) | 8/6/1996 | 21 | Good | Results indicate WBID meets its designated use for supporting aquatic life. |
| | | 9/15/1998 | 23 | Good | |
| | | 9/15/1998 | (3) | (Healthy) | |
| | | 9/16/1998 | 27 | Excellent | |
| 1495B | Itchepackasassa Creek at CR 582 | 1/31/2002 | (3) | (Healthy) | Needs an additional SCI |
| | Itchepackesassa Creek downstream of Kraft Rd bridge | 2/7/2002 | (1) | (Suspect) | |
| | Itchepackasassa Creek at CR 582 | 10/25/2002 | (2) | (Suspect) | |
| 1507A | Rocky Creek/Channel A | 3/4/1996 | 29 | Excellent | Needs 1 more SCI |
| 1522A | Flint Creek at SR301, TP39 | 3/6/1996 | 17 | Poor | Needs 1 more passing SCI (past poor results may be due to desiccation). |
| | | 3/6/1996 | (2) | (Suspect) | |
| | | 1/29/2003 | 23 | Good | |
| 1522C | Baker Creek at McIntosh Road | 11/20/2002 | 23 | Good | Results indicate WBID meets its designated use for supporting aquatic life. |
| | | 1/29/2003 | 27 | Excellent | |
| 3240F | Daughtrey Creek at Bright Rd, North Ft. Myers | 8/7/1996 | 27 | Excellent | Results indicate WBID meets its designated use for supporting aquatic life. |
| | | 8/7/1996 | (3) | (Healthy) | |
| | | 7/28/1998 | 29 | Excellent | |
| 375D | Apalachicola River | - | - | - | Not sampled due to saline conditions |
| 51B | Chipola River | - | - | - | Not sampled due to hydrology |
| 1462A | Crystal Springs | - | - | - | Not sampled due to hydrology |
| 1443E | Hillsborough River | - | - | - | Not sampled due to saline conditions |

## Introduction

Waterbodies selected for biological sampling in this study are located primarily in the Tampa Bay watershed in the peninsula bioregion. However, a few waterbodies included in this report are located in the Florida panhandle bioregion. All waterbodies included in this study are currently on the 303(d) planning list for impaired waters. Additional data are collected for waterbodies on the planning list to determine if a Maximum Daily Load (TMDL) is needed. The purpose of the TMDL is to determine the amount of pollution reduction needed to restore the system to a condition suitable for its designated use. In this case, the designated use is for all sites is recreation and the maintenance of a healthy, well-balanced aquatic community.

The primary objective of this study was to assess the ecological integrity of selected waterbodies on the 303(d) list by conducting physical, chemical and biological sampling. The waterbodies selected for this study are on the list primarily for exceedances of physical and/or chemical parameters such as dissolved oxygen and nutrients.

A secondary objective of this study was to determine if waterbodies characterized with somewhat elevated nutrients or low dissolved oxygen levels could still maintain healthy biological communities. If these waterbodies, due to site-specific conditions, are able to sustain healthy benthic macroinvertebrate communities, then removal from the 303(d) list can potentially be justified.

## Methods

The focus of this investigation was to determine if human activities within each waterbody were affecting the health of the biological communities by collecting habitat, physical/chemical and biological information from selected streams in each waterbody. The FDEP Bureau of Laboratories and the Southwest District collected samples November 2002 through April 2003.

Habitat quality (DEP-SOP-001/01 FT 3100) and physical/chemical data (DEP-SOP-001/01 FT 3001) were evaluated at all 15 study sites. Water samples from all sites were analyzed for ammonia, total Kjeldahl nitrogen (TKN), nitrate-nitrite, and total phosphorus (TP). Periphyton communities (DEP-SOP-001/01 FS 7200) were also sampled, but currently DEP does not have any "formalized" algal indices to evaluate the results, so the results are presented for informational purposes only. Benthic macroinvertebrate communities were sampled and evaluated (DEP-SOP-001/01 FS 7420 and LT 7200) at the study sites using DEP's SCI methods.

Habitat quality was determined for each station during an *in situ* assessment. Eight attributes (substrate diversity, substrate availability, water velocity, artificial channelization, bank stability, habitat smothering, riparian zone buffer width, and riparian vegetation quality) known to have potential effects on the stream biota were evaluated and scored, with a total of 20 points possible for each parameter. Based on the sum of these individual scores, overall habitat quality is assigned to one of four categories: Optimal (120-160 points); Suboptimal (80-119 points); Marginal (40-79 points); and Poor (0-39 points). The biological communities at sites scoring in the "optimal" category should not be limited by habitat.

Benthic macroinvertebrate communities were evaluated using DEP's Stream Condition Index (SCI) technique. The SCI method consists of collecting 20 D-frame dip net sweeps (0.5 m in length) of the most productive habitats in a 100-meter reach of stream. In the laboratory, the organisms are sub-sampled, sorted, and identified to the lowest practical taxonomic level. Seven measurements of invertebrate health are calculated and compared with the expectations established by reference site sampling.

The SCI will rate a site as excellent, good, poor, or very poor, based upon a scale adjusted for geographical region (Panhandle, Peninsula, or Northeast) and season (winter vs. summer).

For some of the sites, historical data was included in the analysis. In addition to the SCI methods, some data was collected and evaluated using DEP's BioRecon technique (DEP-SOP-001/01 FS 7410 and LT 7100). BioRecon is a screening tool, designed to determine which systems are biologically healthy. Invertebrates are collected at each site from the most productive habitats (*e.g.*, snags, leaf packs, root mats, vegetation) using 4 discrete dip net sweeps. The samples are then field picked and brought back to the laboratory for identification under a dissecting microscope. Thresholds, specific to this method, have been established for taxa richness, the EPT Index, and the Florida Index. These thresholds vary slightly with geographic region. If a site passes all three thresholds, the site is considered healthy. A site that fails all three metrics is considered "impaired", while sites passing only one or two of the metrics are considered 'suspect", and it is suggested that follow-up, definitive sampling using the more rigorous Stream Condition Index method (SCI) be performed for further evaluation.

## Explanation of Measurements of Community Health

Selected measurements of macroinvertebrate community health were employed to assess a site. These are briefly discussed here.

**Taxa richness:** This measurement is based on the total number of taxa found at a site. Stress tends to reduce the number of different types of organisms present in a system, although moderate nutrient enrichment may sometimes be correlated with increased algal taxa richness.

**Numbers of pollution sensitive taxa:** Some organisms become rare or absent as the intensity or duration of disturbance increases. For example, the Florida Index assigns points to stream-dwelling macroinvertebrates based on their sensitivity to pollution (see Ross 1990). A site with a high Florida Index score is considered healthy.

**Ephemeroptera/Plecoptera/Trichoptera (EPT) Index:** This index is the sum of the number of larval mayfly, stonefly and caddisfly taxa present. Higher EPT values are associated with healthier systems.

**Percent Dominance:** Excessive numerical dominance of a single type of organism (a high % contribution of the dominant taxon) is generally associated with disturbance.

**Community Structure:** Substantial shifts in the proportions of major groups of organisms, compared to reference conditions, may indicate degradation.

**Trophic composition/feeding guilds:** Disturbance can shift the feeding strategies of invertebrates. In Florida, for example, pollution may be responsible for reducing the number of filter-feeders (Barbour et al. 1996).

## Description of Sampling Sites

This section provides detailed background information for each of the streams studied. During this investigation, the Bureau of Laboratories and the Southwest District sampled fifteen sites from November 2002 through April 2003 to determine the impact human activity has had on the aquatic habitat within the basin. These streams were sampled for biological parameters using the SCI methods and water quality parameters.

**Thirtymile Creek** is located in WBID 1639 in the Peninsula bioregion. It was sampled off of Carey Rd. in Hillsborough County.

**Muddy Branch** is located in WBID 175 in the Panhandle bioregion. It was sampled below the bridge on CR 167 in Jackson County.

**Baker Creek** is located in WBID 1522C in the Peninsula bioregion. It was sampled upstream of McIntosh Road in Hillsborough County.

**Brooker Creek** is located in WBID 1474 in the Peninsula bioregion. It was sampled downstream of Highway 593/77 (McMullen Booth Road) in Pinellas County.

**Long Branch** is located in WBID 1627 in the Peninsula bioregion. It was sampled at the Long Branch Apartment community in Pinellas County.

**Cypress Creek** is located in WBID 1402 in the Peninsula bioregion. It was sampled below SR 581 (Bruce B. Downs Blvd.) in Hillsborough County.

**Itchepackesassa Creek** is located in WBID 1543 in the Peninsula bioregion. It was sampled upstream of Old Tampa Highway in Polk County.

**Rocky Creek** is located in WBID 1507 in the Peninsula bioregion. It was sampled at Gunn Highway in Hillsborough County.

**Delaney Creek** is located in WBID 1605 in the Peninsula bioregion. It was sampled at 78$^{th}$ Street in Hillsborough County.

**Cow House Creek** is located in WBID 1534 in the Peninsula bioregion. It was sampled at the Fishermans Landing Apartment community in Hillsborough County.

**New River** is located in WBID 1442 in the Peninsula bioregion. It was sampled at Chancey Road in Hillsborough County.

**Gamble Creek** is located in WBID 1819 in the Peninsula bioregion. It was sampled at Golf Course Road in Manatee County.

**Hillsborough River** is located in WBID 1443B in the Peninsula bioregion. It was sampled at Morrisville Road (Morris bridge), SR579 in Hillsborough County.

**Spartman Branch** is located in WBID 1561 in the Peninsula bioregion. It was sampled above Highway 92 in Hillsborough County.

**Flint Creek** is located in WBID 1522A in the Peninsula bioregion. It was sampled upstream of SR301 in Hillsborough County.

Also included in this study, two sites were evaluated using previous biological data to determine their status on the 303(d) list. Sites were sampled in the past using the SCI and Bio-Recon techniques.

**Hillsborough River**, located in WBID 1443D in the Peninsula bioregion, was sampled in September 1998 in the Hillsborough River State Park in Hillsborough County.

**Daughtery Creek**, located in WBID 3240F in the Peninsula bioregion, was sampled in August 1996 and July 1998 at Bright Road in Lee County.

Eight streams were not sampled sufficiently to produce any conclusions due to either adverse hydrologic conditions (inaccessibility due to flooding) or other conditions (*e.g.*, salinity or swamp-like characteristics) that made the SCI method unsuitable for the waterbody. For the sites not sampled due to high water levels, it is recommended that further definitive sampling using the SCI methods be performed on these sites at a later time.

**Huckleberry Creek** and **Tilton Creek** in WBID 1286 are located in Franklin County in the Panhandle bioregion. These two sites were not sampled because it was determined during visits to the sites, that the SCI method was not suitable. These sites could better be characterized as wetlands, with shallow water, dense vegetation, and almost no water velocity.

The **Apalachicola River** in WBID 375D is located in the Panhandle bioregion in Liberty County. This site was characterized by saline conditions and was not sampled because the SCI method was not suitable to use for analysis.

The **Hillsborough River** in WBID 1443E is located in the Peninsula bioregion in Hillsborough County. This site is characterized by somewhat saline conditions and was not sampled because the SCI method was not suitable to use for analysis.

**Crystal Springs** in WBID 1462A is located in the Peninsula bioregion in Pasco County. This site is characterized by a short stream section of less than 100-meters and was not sampled because the SCI method was not suitable to use for analysis.

**Blackwater Creek** and **Tiger Creek** in WBID 1482 are located in the Peninsula bioregion in Hillsborough County. These sites were not sampled due to high water levels during the sample period.

The **Chipola River** in WBID 51B is located in the Panhandle bioregion in Calhoun County. This site was not sampled due to high water levels during the sample period.

Two sites need further analysis using the SCI sampling method. These sites were not sampled sufficiently to produce any conclusions.

**Itchepackesassa Creek** in WBID 1495B is located in the Peninsula bioregion in Polk and Hillsborough counties.

**Rocky Creek/Channel A** is in WBID 1507A is located in the Peninsula bioregion in Hillsborough County.

## Results and Discussion

Summary of Results by WBID

WBID 1639

**Thirtymile Creek** was sampled on January 13, 2003. This site had an overall habitat assessment in the "optimal" category (79%, 127 points out of 160). Dissolved oxygen (8.16 mg/L) complied with the Class III surface water quality standard of 5.0 mg/L. Conductivity was 335 μmhos/cm. Ammonia, nitrate-nitrite and total phosphorus levels

were all elevated (0.6 mg/L, 1.9 mg/L and 1.6 mg/L, respectively), measuring higher than the values found in approximately 95% of Florida streams (see *Typical Values for Selected Parameters in Florida Waters* in Appendix). Total Kjehldahl nitrogen was also elevated (1.4 mg/L), measuring in the 80th percentile of Florida streams. However, the biological communities were "excellent" according to the SCI, scoring 27 points out of 33 for the winter index in the Peninsula bioregion. **Guy Branch**, which is located in the same WBID, was sampled in September 2002 and was ranked in the "poor" category.

WBID 175

**Muddy Branch** was sampled on December 12, 2002. This site received an overall "suboptimal" rating on the habitat assessment (68%, 109 points out of 160). Dissolved oxygen levels (4.7 mg/L) were slightly below the Class III surface water quality standard of 5.0 mg/L. Conductivity was 259 μmhos/cm. Ammonia (0.031 mg/L), Total Kjehldahl nitrogen (0.33 mg/L), and total phosphorus levels (0.052 mg/L) were all in the 20$^{th}$ percentile of Florida streams, or lower. The nitrate-nitrite level (1.0 mg/L) was elevated, measuring in the upper 95$^{th}$ percentile. The biological communities were "good" according to the SCI, scoring 23 points out of 33 for the winter index in the Panhandle bioregion. A duplicate SCI sample was also collected, and it scored in the "good" range, with 23 points. A chemistry blank sample was also collected, where ammonia, nitrate-nitrite, Total Kjehldahl nitrogen, and total phosphorus were all undetected

WBID 1522C

**Baker Creek** was sampled on November 20, 2002 and January 29, 2003. The habitat assessment results decreased slightly from November (47%, 75 points out of 160) to January (41%, 66 points out of 160), but both assessments ranked in the "marginal" category. Dissolved oxygen levels for November and January (9.2 mg/L and 9.9 mg/L, respectively) were in compliance with Class III water quality standards. Conductivity varied slightly, with 209 μmhos/cm in November and 165 μmhos/cm in January. Ammonia levels remained lower than the 5$^{th}$ percentile for Florida streams for both sampling events. Nitrite-nitrate levels for both events (0.27 mg/L and 0.45 mg/L) were elevated, as was total phosphorus (0.43 mg/L and 0.38 mg/L). Both of these analytes measured higher than the values found in approximately 80-85% of Florida streams. Total Kjehldahl nitrogen levels dropped slightly between events (1.1 mg/L to 0.74 mg/L). According to the SCI, the biological community improved slightly, upgrading from "good" to "excellent" condition, with a score of 23 and 27, respectively.

WBID 1474

**Brooker Creek** was sampled on November 19, 2002. Brooker Creek had "suboptimal" habitat (66%, 106 points). Dissolved oxygen levels (4.4 mg/L) were slightly below acceptable limits. Conductivity was 385 μmhos/cm. Ammonia (0.043 mg/L) levels were lower than roughly 70% of Florida streams. TKN (1.5 mg/L) levels were elevated, measuring in the 80$^{th}$ percentile. The total phosphorus (0.054 mg/L) level was lower than 70% of other streams in the state. Nitrate-nitrite levels were fair, however, measuring 0.081 mg/L. SCI scores indicate Brooker Creek is in "good" condition, with 23 points out of 33 for the winter index in the Peninsula bioregion.

WBID 1627

**Long Branch** was sampled on November 26, 2002. This site had "marginal" habitat (44%, 70 points). Dissolved oxygen was 2.7 mg/L, which did not comply with the Class III surface water quality standard of 5.0 mg/L. Ammonia levels (0.16 mg/L) were higher than roughly 70% of Florida streams, but did not exceed surface water quality standards. TKN (0.75 mg/L), nitrite-nitrate (0.081 mg/L) and total phosphorus (0.09 mg/L) levels were all fair, measuring in the lower 40$^{th}$ percentile of Florida streams. SCI results indicate the creek has "poor" biological communities, scoring 15 out of 33 points. Furthermore, this site was also sampled in March 2002 using the Bio-Recon technique. The site passed only 2 of 3 metrics, which indicates the site was "suspect" of impairment.

WBID 1402

**Cypress Creek** was sampled on November 20, 2002 and January 28, 2003. The habitat assessment results decreased slightly from November (84%, 135 points out of 160) to January (81%, 129 points), but both assessments ranked in the "optimal" category. Dissolved oxygen for November (2.1 mg/L) was below surface water quality standards, but the January results (5.3 mg/L) were within limits. Conductivity varied somewhat, with 256 μmhos/cm in November and 94 μmhos/cm in January. Ammonia levels remained lower than the 5$^{th}$ percentile for Florida streams for both sampling events, as were nitrite-nitrate levels for both events (0.01 mg/L and 0.004 mg/L). Total phosphorus (0.061 mg/L and 0.035 mg/L) was in the good range, measuring in the 30$^{th}$ percentile or below. Total Kjehldahl nitrogen levels dropped slightly between events (1.6 mg/L to 1.1 mg/L), but both were in the poor to fair range compared to other Florida streams. According to the SCI, the biological community is in "poor" condition, improving only slightly between sampling events, with a score of 15 and 19, respectively.

WBID 1543

**Itchepackesassa Creek** was sampled on December 12, 2002 and February 10, 2003. The habitat assessment results remained similar from December (49%, 79 points out of 160) to February (50%, 80 points), ranking both sampling events in the "poor" and "marginal" categories, respectively. Dissolved oxygen levels for December (7.69 mg/L) and February (9.88 mg/L) were within limits for surface water quality standards. Conductivity varied somewhat, with 187 μmhos/cm in December and 254 μmhos/cm in February. Ammonia levels decreased slightly from December (0.088 mg/L) to February (0.051 mg/L), ranging from the 50$^{th}$ percentile to the 30$^{th}$ percentile for Florida streams. However, nitrite-nitrate levels for both events (0.5 mg/L and 2.9 mg/L) were elevated, measuring higher than 90-95% of Florida streams, as were total phosphorus levels (0.66 mg/L and 0.92 mg/L). Total Kjehldahl nitrogen levels remained similar between events (1.2 mg/L to 1.5 mg/L). Due to elevated water levels, this site could not properly be sampled for invertebrates during December, 2002. On February 10, 2003, the SCI indicated that the biological community was "good", with a score of 23.

WBID 1507

**Rocky Creek** was sampled on November 25, 2002. Rocky Creek had "optimal" habitat (84%, 135 points). Dissolved oxygen levels (8.1 mg/L) complied with Class III

surface water quality standards. Conductivity was 215 μmhos/cm. Ammonia (0.09 mg/L) and TKN (0.91 mg/L) levels were higher than roughly 50% of Florida streams. Total phosphorus (0.06 mg/L) levels were lower than 70% of other streams in the state. Nitrate-nitrite levels were elevated, measuring 0.21 mg/L. SCI scores indicate Rocky Creek is in "good" condition, with 25 points out of 33 for the winter index in the Peninsula bioregion. However, a test site for River Oaks, which is located in the same WBID, was sampled in October 2002 and ranked in the "poor" category. The control site for River Oaks (also in the same WBID) was sampled at the same time and scored in the "good" category.

WBID 1605

**Delaney Creek** was sampled on November 25, 2002. This site had "marginal" habitat (39%, 63 points). Dissolved oxygen levels (10 mg/L) complied with Class III surface water quality standards. Conductivity was 364 μmhos/cm. Ammonia (0.13 mg/L), total phosphorus (0.23 mg/L) and TKN (1.2 mg/L) levels were higher than roughly 70% of Florida streams. Nitrate-nitrite levels were also elevated, measuring 0.29 mg/L. However, SCI scores indicate Delaney Creek is in "excellent" condition, with 27 points out of 33 for the winter index in the Peninsula bioregion. Three additional sites on Delaney Creek, which are located in the same WBID, were sampled in March 1997 and all ranked in the "good" or "excellent" category.

WBID 1534

**Cow House Creek** was sampled on November 20, 2002 and January 28, 2003. The habitat assessment results remained the same for both sampling events (68%, 108 points out of 160) ranking in the "suboptimal" category. Dissolved oxygen levels for November and January (6.4 mg/L and 7.4 mg/L, respectively) were in compliance with Class III water quality standards. Conductivity varied somewhat, with 504 μmhos/cm in November and 212 μmhos/cm in January. Ammonia levels decreased slightly from 0.073 mg/L in November (in the 45$^{th}$ percentile for Florida streams) to 0.027 mg/L in January (in the 10$^{th}$ percentile). Nitrite-nitrate levels for both events (0.079 mg/L and 0.046 mg/L) were in the fair to good range, while total phosphorus (0.2 mg/L and 0.17 mg/L) levels were slightly elevated. Total Kjehldahl nitrogen levels remained similar between events (0.7 mg/L to 0.69 mg/L), but both were in the good range compared to other Florida streams. According to the SCI, the biological community improved slightly, upgrading from "poor" to "good" condition, with a score of 17 and 23, respectively.

WBID 1442

**New River** was sampled on November 20, 2002. This site received an overall "marginal" rating on the habitat assessment (43%, 68 points out of 160). Dissolved oxygen (6.7 mg/L) was in compliance with surface water quality standards. Conductivity was 89 μmhos/cm. Ammonia levels measured 0.062 mg/L, which is lower than roughly 60% of Florida streams. Total Kjehldahl nitrogen (2.2 mg/L), however, was elevated,

ranking in the upper 90th percentile for Florida streams. Total phosphorus levels (0.2 mg/L) were also slightly elevated, ranking in the upper 60th percentile. Nitrate-nitrite levels were elevated, measuring in the lower 90th percentile. The biological communities were "good" according to the SCI, scoring 23 points out of 33 for the winter index in the Peninsula bioregion.

WBID 1819

**Gamble Creek** was sampled on December 2, 2002. This site had "suboptimal" habitat (69%, 111 points). Dissolved oxygen levels (9.6 mg/L) complied with Class III surface water quality standards. Conductivity was 464 μmhos/cm. Ammonia (0.044 mg/L) and TKN (0.47 mg/L) levels were lower than roughly 80% of Florida streams. However, nitrate-nitrite levels were elevated, measuring 0.36 mg/L. Total phosphorus, 0.34 mg/L, was also elevated and scored in the lower 80th percentile for Florida streams. SCI scores indicate Gamble Creek is in "good" condition, with 21 points out of 33 for the winter index in the Peninsula bioregion. Two additional sites located in the same WBID were sampled in September 1997 and ranked in the "good" or "excellent" category.

WBID 1443B

**Hillsborough River** was sampled on December 2, 2002 and April 21, 2003. The habitat assessment results remained similar for both sampling events (86%, 137 points out of 160, and 87%, 139 points) ranking in the "optimal" category. Dissolved oxygen levels for December (7.4 mg/L) were in compliance with Class III water quality standards, but dropped to 4.76 mg/L in April. Conductivity remained similar, with 360 μmhos/cm in December and 340 μmhos/cm in April. Ammonia levels increased slightly from 0.036 mg/L in December (in the lower 20th percentile for Florida streams) to 0.059 mg/L in April (in the 40h percentile), but both remain below surface water quality standards. Nitrite-nitrate (0.59 mg/L and 0.75 mg/L) and total phosphorus (0.18 mg/L and 0.28 mg/L) levels for both events were elevated, measuring higher than 60% to 90% of Florida streams. According to the SCI, the biological community remained in "good" condition, with a score of 23 for both events.

WBID 1561

**Spartman Branch** was sampled on December 2, 2002. This site had "suboptimal" habitat (73%, 117 points). Dissolved oxygen levels (8.2 mg/L) complied with Class III surface water quality standards. Conductivity was 184 μmhos/cm. Ammonia (0.031 mg/L) levels were lower than roughly 80% of Florida streams. However, nitrate-nitrite levels were slightly elevated, measuring 0.22 mg/L. Total phosphorus, 0.39 mg/L, and TKN, 1.1 mg/L, were also elevated and scored between the 60th and 80th percentile for Florida streams. SCI scores indicate Spartman Branch is in "excellent" condition, with 29 points out of 33 for the winter index in the Peninsula bioregion. Two additional sites located in the same WBID were sampled in August 1998 and ranked in the "good" category for the SCI and "healthy" for the Bio-Recon.

WBID 1522A

**Flint Creek** was sampled on January 29, 2003. Flint Creek received an overall "optimal" rating on the habitat assessment (78%, 124 points out of 160). Dissolved oxygen (6.2 mg/L) was in compliance with surface water quality standards. Conductivity was 199 μmhos/cm. Ammonia levels measured 0.24 mg/L, which is higher than roughly 80% of Florida streams. Total Kjehldahl nitrogen (1.5 mg/L) and total phosphorus (0.38 mg/L) were also elevated, ranking in the 80$^{th}$ percentile for Florida streams. Nitrate-nitrite levels were elevated, measuring in the lower 90$^{th}$ percentile. The biological communities were "good" according to the SCI, scoring 23 points out of 33 for the winter index in the Peninsula bioregion. Flint Creek was also sampled in March 1996 and received a "poor" for the SCI and was "suspect" for the Bio-Recon.

WBID 1443D

The **Hillsborough River** was sampled in August 1996 and September 1998 using SCI methods and the Bio-Recon technique. These sampling events indicated that the Hillsborough River was in "good" or "excellent" condition for the SCI, and "healthy" according to the Bio-Recon. Scores for the SCI ranged from 21 to 27, and the Bio-Recon passed all 3 metrics.

WBID 3240F

**Daughtrey Creek** was sampled in August 1996 and July 1998. SCI results indicated this site was in "excellent" condition, with two sampling events scoring 27 and 29 points. Likewise, the Bio-Recon indicated "healthy" conditions.

WBID 1286

Two sites were sampled in this WBID between July 1996 and February 1998. **Tilton Creek** received a score of 13 for the SCI in 1998, indicating "very poor" biological conditions. A Bio-Recon assessment was performed in 1996 for **Huckleberry Creek**, and results indicated the site was "suspect" of impairment. In addition, according to SCI results in 1998, Huckleberry Creek was in "very poor" condition. Upon further site visits (November 2002 through April 2003) and evaluation of the existing natural conditions at these sites (sluggish wetlands), it was determined that SCI sampling, designed for streams, was not applicable at these sites due to existing wetland conditions.

WBID 375D

The **Apalachicola River** was not sampled for this study because SCI methods were not suitable for use. This site is characterized by saline conditions, which makes an SCI assessment not applicable.

WBID 1443E

The **Hillsborough River** located in this WBID was not sampled for this study because of saline conditions. The use of SCI methods is not applicable for saline waters.

WBID 1462A

**Crystal Springs** was not sampled for this study because this site is characterized by a relatively short stream section of approximately 50 meters. The SCI method, which uses a 100 meter reach of stream as the sampling unit, was not suitable to use for analysis. There would have been insufficient area and potential habitat for invertebrate recruitment between the sterile spring vent and the Hillsborough River.

WBID 1482

Several sites located in this WBID were sampled between 1996 and 2000. However, **Blackwater Creek** and **Tiger Creek** were not sampled for this study due to high water levels during the sampling period. The Bureau of Labs recommends that one or both of these sites be sampled using SCI methods at a later point in time when water levels are more suitable.

WBID 51B

The **Chipola River** was not sampled for this study due to high water conditions. The most recent historical data available for analysis dates from the early 1960s through the mid 1980s. Bureau of Labs recommends that this site be sampled using SCI methods at a later point in time when water levels are more suitable.

WBID 1495B

The **Itchepackesassa Creek** located in this WBID was not sampled for this study. Historical data available for streams located in this WBID indicated that the only recent assessments were performed using the Bio-Recon technique. In January 2002, one stream in this WBID was "healthy". However, in February and October 2002, two other sites in this WBID were listed as "suspect" for impairment. Bureau of Labs recommends that this site(s) be further analyzed using the SCI sampling method to determine its status on the 303(d) list.

WBID 1507A

**Rocky Creek/Channel A** was sampled in March 1996. According to the SCI results, the biological communities in this system are in "excellent" condition. The Bureau of Labs recommends that this site be further analyzed in the future using SCI sampling methods to determine its status on the 303(d) list.

# Table 2. Physical, Chemical and Biological Results

| Site | Baker Creek @ McIntosh Road | | Brooker Creek downstream of Tarpon Woods Blvd | Cow House Creek@ Fishermans Landing Apts | | Cypress Creek @ SR 581 | |
|---|---|---|---|---|---|---|---|
| STORET | 24030079 | | 24030150 | 280329782215268 | | 28051888224293 | |
| Sample Date | 11/20/2002 | 1/29/2003 | 11/19/2002 | 11/20/2002 | 1/28/2003 | 11/20/2002 | 1/28/2003 |
| **Macroinvertebrate Data** | | | | | | | |
| Number of Chironomid Taxa | 3 | 7 | 9 | 6 | 10 | 8 | 5 |
| % Diptera | 13.64 | 42.27 | 24.74 | 46.36 | 42.2 | 24.49 | 64.71 |
| Number of EPT Taxa | 3 | 4 | 1 | 1 | 2 | 1 | 0 |
| % Filter Feeders | 29.09 | 19.59 | 2.06 | 1.82 | 8.72 | 4.59 | 49.58 |
| TotalFLIndex | 8 | 9 | 6 | 2 | 3 | 4 | 6 |
| % Dominant Taxa | 23.64 | 19.59 | 29.9 | 20 | 16.51 | 30.61 | 44.54 |
| Total Taxa | 20 | 21 | 30 | 20 | 26 | 18 | 17 |
| SCI Score | 23 | 27 | 23 | 17 | 23 | 15 | 19 |
| SCI Evaluation | Good | Excellent | Good | Poor | Good | Poor | Poor |
| **Algal Data** | | | | | | | |
| % Bacillariophyta | 95.11 | 71.52 | 54.19 | 72.9 | 93.51 | 35.14 | 63.73 |
| % Chlorophycota | 1.3 | 13.27 | 5.81 | 4.19 | 4.55 | 6.07 | 3.59 |
| % Cyanophycota | 3.58 | 15.21 | 38.71 | 20 | 1.95 | 58.47 | 32.68 |
| % Diatom/Diatom+Blue-Green | 0.96 | 0.82 | 0.58 | 0.78 | 0.98 | 0.38 | 0.66 |
| % Dominant Taxa | 11.73 | 14.24 | - | 36.77 | 26.3 | 15.65 | 29.08 |
| Total Taxa | 51 | 49 | 51 | 44 | 36 | 43 | 41 |
| **Physical/Chemical Data** | | | | | | | |
| pH (SU) | 6.3 | 7.5 | 6.1 | 6.4 | 7.2 | 6.2 | 6.7 |
| Dissolved Oxygen (mg/L) | 9.2 | 9.9 | 4.4 | 6.4 | 7.4 | 2.1 | 5.3 |
| Specific Conductivity (umhos/cm) | 209 | 165 | 385 | 504 | 212 | 256 | 94 |
| Temperature (deg. C) | 15.9 | 12.9 | 15.1 | 16.3 | 13.5 | 17.1 | 10.6 |
| Ammonia (mg/L) | 0.019 I | 0.024 | 0.043 | 0.073 | 0.027 | 0.026 | 0.018 I |
| Nitrate-Nitrite (mg/L) | 0.27 | 0.45 | 0.081 | 0.079 | 0.046 | 0.01 I | 0.004 U |
| TKN (mg/L) | 1.1 | 0.74 | 1.5 | 0.7 | 0.69 | 1.6 | 1.1 |
| Total Phosphorus (mg/L) | 0.43 | 0.38 | 0.054 | 0.2 | 0.17 | 0.061 | 0.035 I |
| Habitat Score | 75 | 66 | 106 | 108 | 108 | 135 | 129 |

| Site | Long Branch at Long Branch Apts | Muddy Branch at CR 167 | | New River @ Chancey Rd | Rocky Creek @ Gunn Hwy | Spartman Branch -TP107 (aka Sparkman Branch) | Thirty Mile Creek off Carey Rd. |
|---|---|---|---|---|---|---|---|
| STORET | 275510508243111 | WQAS31020000005 | | 280954821553 | 24030128 | 24030126 | 27534558203044 |
| Sample Date | 11/26/2002 | 12/10/2002 | 12/10/2002 DUP | 11/20/2002 | 11/25/2002 | 12/2/2002 | 1/13/2003 |
| **Macroinvertebrate Data** | | | | | | | |
| Number of Chironomid Taxa | 4 | 14 | 12 | 14 | 8 | 7 | 6 |
| % Diptera | 6.31 | 60.91 | 50.44 | 75.73 | 73.74 | 18.87 | 43.86 |
| Number of EPT Taxa | 2 | 1 | 0 | 2 | 4 | 4 | 5 |
| % Filter Feeders | 0 | 14.09 | 11.5 | 15.05 | 17.68 | 14.62 | 15.79 |
| TotalFLIndex | 0 | 7 | 3 | 8 | 17 | 9 | 13 |
| % Dominant Taxa | 36.94 | 16.36 | 18.58 | 44.66 | 43.43 | 12.26 | 32.46 |
| Total Taxa | 20 | 24 | 31 | 24 | 26 | 27 | 21 |
| SCI Score | 15 | 23 | 23 | 23 | 25 | 29 | 27 |
| SCI Evaluation | Poor | Good | Good | Good | Good | Excellent | Excellent |
| **Algal Data** | | | | | | | |
| % Bacillariophyta | 79.41 | 88.78 | 83.39 | 52.48 | 23.34 | 61.69 | 88.1 |
| % Chlorophycota | 8.82 | 1.98 | 2.99 | 9.57 | 2.52 | 6.82 | 7.14 |
| % Cyanophycota | 10.78 | 8.91 | 13.62 | 36.63 | 72.87 | 31.49 | 4.17 |
| % Diatom/Diatom+Blue-Green | 0.88 | 0.91 | 0.86 | 0.59 | 0.24 | 0.66 | 0.95 |
| % Dominant Taxa | 15.36 | 20.79 | 23.26 | 13.86 | 33.44 | 26.3 | 14.29 |
| Total Taxa | 41 | 36 | 36 | 51 | 31 | 44 | 38 |
| **Physical/Chemical Data** | | | | | | | |
| pH (SU) | 7 | 6.8 | 6.8 | 5.5 | 7 | 6.3 | 7.19 |
| Dissolved Oxygen (mg/L) | 2.7 | 4.7 | 4.7 | 6.7 | 8.1 | 8.2 | 8.16 |
| Specific Conductivity (umhos/cm) | 845 | 259 | 259 | 89 | 215 | 184 | 335 |
| Temperature (deg. C) | 17.5 | 11.9 | 11.9 | 18 | 17.3 | 14.6 | 16.2 |
| Ammonia (mg/L) | 0.16 | 0.031 | 0.01 U (blank) | 0.062 | 0.09 | 0.031 A | 0.6 |
| Nitrate-Nitrite (mg/L) | 0.081 | 1 | 0.004 U (blank) | 0.049 | 0.21 | 0.22 | 1.9 |
| TKN (mg/L) | 0.75 | 0.33 A | 0.06 U (blank) | 2.2 | 0.91 | 1.1 A | 1.4 |
| Total Phosphorus (mg/L) | 0.091 | 0.052 A | 0.015 U (blank) | 0.2 | 0.061 | 0.39 A | 1.6 |
| Habitat Score | 70 | 109 | 109 | 68 | 135 | 117 | 127 |

*"U"- Value Reported is the Minimum Detection Limit; "I"- Less Than the Minimum Quantitation Limit and Greater Than or Equal to the Minimum Detection Limit; "A"- Mean of Two or More Determinations*

## Conclusions

FDEP Bureau of Laboratories and the Southwest District sampled and analyzed 25 WBIDs that are currently on the TMDL Planning or Verified 303(d) list for physical and/or chemical exceedances, such as dissolved oxygen and nutrients. Chemical, physical, habitat, and biological data were collected and analyzed to determine the current status of these Waterbodies for 303(d) listing purposes.

Chemical analysis conducted during this study concluded that several sites had elevated nutrient, ammonia, TKN, and total phosphorus levels during the sampling period.

Most physical parameters collected during this study were within limits for the Class III surface water quality standards. However, dissolved oxygen levels were slightly below the acceptance criteria for a few sites (WBID 1474 Brooker Creek, WBID 1443B Hillsborough River at Morrisville Road, and WBID 175 Muddy Branch). Cypress Creek (WBID 1402) and Long Branch (WBID 1627) had dissolved oxygen levels measuring near 2.0 mg/L. The biology for these two sites was "poor" with SCI scores of 19 and 15, respectively, which may be in part to the low dissolved oxygen levels. All other physical parameters (pH, conductivity and temperature) were within normal limits for the study sites.

Habitat assessment results during the sampling period indicated that 10 sites (WBID 1474 Brooker Creek, WBID 1534 Cow House Creek, WBID 1402 Cypress Creek, WBID 1522A Flint Creek, WBID 1819 Gamble Creek, 1443B Hillsborough River at Morrisville Road, WBID 175 Muddy Branch, WBID 1507 Rocky Creek, WBID 1561 Spartman Branch and WBID 1639 Thirtymile Creek) had a sufficient habitat quality to potentially sustain healthy biological communities. Most of these SCI sampling events indicated "good" or "excellent" biological communities. However, although the habitat assessment scores indicate there was sufficient habitat, the Cow House Creek November 2002 SCI assessment scored a 17 "poor", and Cypress Creek also scored in the "poor" category with a 15 and 19 for the November and January sampling events, respectively. These results suggest that some factor other than habitat (for example, water chemistry or physical parameters) is limiting the biological health of these two sites. Furthermore, the remaining 5 sites were characterized by either marginal or poor habitat (WBID 1522C Baker Creek, WBID 1605 Delaney Creek, WBID 1543 Itchepackesassa Creek upstream of Old Tampa Highway, WBID 1627 Long Branch, and WBID 1442 New River). SCI scores for Itchepackesassa Creek on November 2002 (11 "very poor") and Long Branch (15 "poor") correlate with the low habitat assessment scores. However, Baker Creek (23 "good" and 27 "excellent"), Delaney Creek (27 "excellent"), and New River (23 "good") all had passing SCI scores in spite of potential problems associated with habitat.

Based on the data collected, it was concluded that WBIDs 1442, 1561, 1605, 1819, 1443B, 1443D, 1522C, and 3240F meet their designated use for supporting aquatic life (see Table 1).

Low-quality biological communities were found at WBIDs 1402, 1627, 1507, and 1495B, suggesting the current status of these WBIDs is consistent with their 303(d) listing.

It is recommended that WBIDs 175, 1474, 1482, 1534, 1543, 1639, 1507A, 1522A, and 51B be sampled in the future using SCI methods in order to establish biological community health.

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