# The Hillsborough River at the Hillsborough River State Park, Hillsborough County, WBID 1635 March, 1993 to June, 2011



**Figure 1. Looking upstream from the rapids area trail inHillsborough River State Park**

## Purpose

DEP conducted water quality and biological sampling at the Hillsborough River within the Hillsborough River State Park a total of twelve times since 1993 to assess attainment of designated uses. This site is one of many minimally disturbed streams that have been sampled throughout Florida for the purpose of establishing biological community expectations of reference streams. Overall, the habitat assessment and macroinvertebrate community data indicated that the site is an appropriate reference site, clearly meeting aquatic life use support goals.

## Background

The SCI assesses how closely the macroinvertebrate community of a stream resembles the macroinvertebrate community of an undisturbed or "reference" condition. The SCI is based on ten measurements of aquatic macroinvertebrate community structure, eight of which decrease in response to human disturbance and two metrics (% very tolerant and % dominant) that increase with greater human disturbance. As described in DEP SOP LT 7000, the SCI score ranges and categories are: (68-100) Exceptional; (35-67) Healthy; and (0-34) Impaired. Note: Proposed biological health assessment criteria state that a site is considered to meet designated uses if the average of the two most recent SCI scores is 40 or higher and neither of those scores is less than 35

Each SCI includes an assessment of stream habitat, conducted per DEP SOP FT 3100. The stream and river habitat assessment evaluates the availability and quality of habitat for macroinvertebrates, and can help diagnose the cause of a low SCI score. Eight in-stream and riparian components are rated to estimate the influence of habitat factors on the resident aquatic organisms. Habitat Assessment scores range from 11-160 and overall habitat quality is assigned to one of four categories: Optimal (120-160 points), Suboptimal (80-119 points), Marginal (40-79 points), and Poor (11-39 points).

In the mid 1990s, the first version of the SCI was created based on the reference site expectations model (Barbour et al, 1996). The following decade, the SCI was recalculated using considerably more data and a human disturbance gradient to determine effective metrics. Impairment thresholds were calibrated using a Biological Condition Gradient approach (Fore et. al., 2004 and 2007).

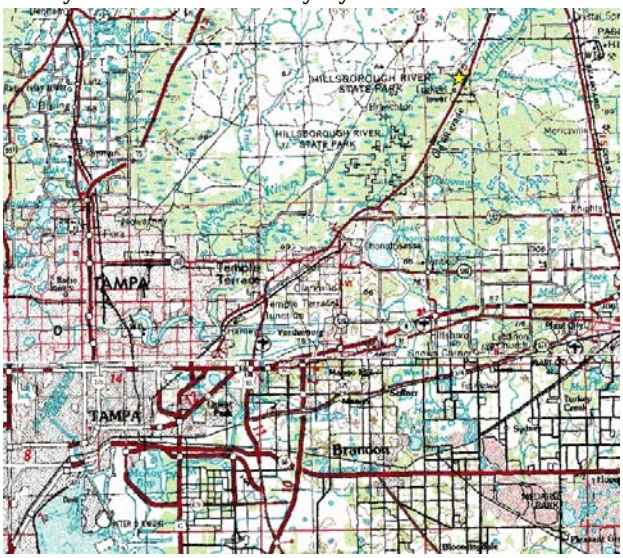
## Watershed Characteristics

The Hillsborough River arises in the Green Swamp at the Polk/Pasco County border and flows southwest through Tampa to Tampa Bay. The upper watershed is natural and relatively undisturbed, while the lower watershed is impounded and heavily urbanized. Several springs flow into the river, the largest being Crystal Springs, upriver from the Hillsborough River State Park. Elevated nitrate-nitrite levels are associated with the discharge from Crystal Springs (Southwest Florida Water Management District, 2001), and during periods of low rainfall, the spring

contributes relatively high levels of nitrate to the Hillsborough River.

The TP5 site is located at one of the rapids areas on State Park property (Figures 1 and 2). While the Hillsborough in general is a slow flowing, dark-colored, deep river, these areas contain limestone outcroppings, with rapid water velocity.

**Figure 1. Location of TP5 at the State Park in Hillsborough County. The site is denoted by a yellow star.**




The upper watershed of the Hillsborough River has a vast riparian zone because much is publicly owned (by FDEP and the Southwest Florida Water Management District) and the remainder is protected by the stewardship of a private owner. The riparian zone buffer provides protection from storm water runoff, food (from leaf litter) and physical substrates for fish and invertebrates (roots and snags).

## Methods

Twelve SCIs were collected between March 25, 1993 and June 1, 2011 at reference site TP5. Each SCI was sampled per DEP SOP FS7420 and calculated per DEP SOP LT7200. The SCI consists of collecting 20 D-frame dipnet sweeps (0.5 m in length) of the most productive habitats in a 100 m reach of stream. The organisms are sub-sampled, sorted, and identified to the lowest practical taxonomic level. Each SCI included habitat assessments per DEP SOP FT 3100. Habitat assessments from the 1990s were transformed in order to be comparable to currently accepted assessments.

## Results

The in-stream habitat was predominantly limerock, with optimal amounts of snag, root and macrophyte (*Potamegeton illinoense*) habitat; well over 30% of the stream reach contained substrate available for invertebrate and fish use.

The Habitat Assessment (HA) scores varied from 134 to 156, consistently falling in the Optimal or Suboptimal habitat categories (Table 1). The stream was always sampled when flowing steadily and when water levels allowed accessibility to in-stream substrates. The riparian zone was natural and extensive, but some recreational activities (hiking and bike riding) were common along the river bank.

**Table 1. Stream Condition Index (SCI) and Habitat Assessment Scores for TP5. Note that prior to 2004, the highest possible score was 33 points.**

| Sample Date | SCI Score | SCI Descriptor | Habitat Score | Habitat Descriptor |
|---|---|---|---|---|
| 3/25/1993 | 31 | Excellent | 136 | Optimal |
| 8/18/1993 | 27 | Excellent | 155 | Optimal |
| 2/16/1994 | 33 | Excellent | 155 | Optimal |
| 9/20/1994 | 27 | Excellent | 134 | Optimal |
| 8/6/1996 | 21 | Good | N/A* | N/A* |
| 9/15/1998 | 23 | Good | 154 | Optimal |
| 9/16/1998 | 27 | Excellent | N/A* | N/A* |
| 11/21/2005 | 63 | Fair | 155 | Optimal |
| 4/24/2008 | 55 | Healthy | 150 | Optimal |
| 10/9/2008 | 77 | Exceptional | 143 | Optimal |
| 3/24/2009 | 48 | Healthy | 153 | Optimal |
| 6/1/2011 | 64 | Healthy | 156 | Optimal |

* Data were either not collected or are unavailable

Results of the SCI assessments are shown in Table 2. The SCI scores from 1993 through 1998 were calculated with the 1992 version, on a scale of 0 to 33 possible points. Scores for site TP5 were consistently at the high end of the scale, with mostly “Excellent” ratings. With the recalibration in 2004

(SCI_2004), the range extended to 100 possible points. While the resulting scores can't be directly compared to those generated prior to 2004, the overall ratings are similar and indicate consistently healthy results, often in the "Exceptional" range. The variability in SCI scores is natural and most likely related to hydrological conditions, such as prolonged droughts or high flow scouring.

Water quality parameters are shown in Table 2. All variables are within ambient values typical of southwest Florida. Although variable, the nitrate-nitrite concentration at this site has increased since 1993, due to contributions from Crystal Springs, and is greater than the proposed spring vent nitrate-nitrite criterion of < 0.35 mg/L. While, land uses in the upper watershed have not changed much from 1988 to 2011 (DEP Protect Our Waters website http://www.protectingourwater.org/), this increase in nitrate probably reflects the nitrogen loading to the land surface within the Crystal Spring springshed.

**Table 2. Water quality results at TP5 from 1993 to 2011**

| Date | DO (mg/l) | Temp. (°C) | pH (NTU) | Conduct. (umhos/cm) | Nitrate-Nitrite (mg/l) |
|---|---|---|---|---|---|
| 3/25/1993 | 6.9 | 20.8 | 7.61 | 305 | 0.89 |
| 8/18/1993 | 6.5 | * | 7.22 | 290 | 1.2 |
| 2/16/1994 | 6.8 | 20.75 | 7.53 | 328 | 1.3 |
| 9/20/1994 | * | * | * | * | * |
| 8/6/1996 | 6.08 | 25.35 | 7.2 | 283 | 1.4 |
| 9/15/1998 | 5.9 | 24.3 | 7.04 | 311 | 1.6 |
| 3/27/2001 | 7.34 | 19 | 7.69 | 395 | * |
| 11/21/2005 | * | * | * | * | * |
| 4/24/2008 | 7.1 | 22.11 | 7.64 | 363 | 1.3 |
| 10/9/2008 | 6.97 | 24.44 | 7.87 | 383 | 1.7 |
| 3/24/2009 | 8.49 | 20.84 | 7.89 | 374 | 1.8 |
| 5/11/2011 | 4.16 | 22.54 | 7.01 | 237 | * |
| 6/1/2011 | 9.99 | 20.84 | 7.95 | 386 | 1.9 |

* Data were either not collected or are unavailable

## Significance

Biological sampling in the Upper Hillsborough River continues to indicate that the upper river is healthy and worthy of retaining its status as a reference site for peninsular Florida. It is important to keep monitoring this reference site in order to identify any possible changes or threats, particular impacts that may arise from the high nitrate levels coming from Crystal Springs. The Hillsborough River eventually flows into Tampa Bay via Hillsborough Bay where a Reasonable Assurance Plan to control nitrogen loading is currently being implemented.

## References


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