STREAM ECOSUMMARY

Owl Creek, March 1 & December 5, 2012

DEP conducted water quality and biological sampling at Owl Creek in Lee County on March 1 and December 5, 2012, to assess attainment of designated uses. This sampling was part of the DEP Strategic Monitoring program for the Caloosahatchee River drainage basin. Overall, the water quality and biological data indicated that the stream achieved water quality standards. This is a tidally fluctuating area, and therefore the SCI is not an appropriate assessment method and as provided in Chapter 62-302.531, F.A.C., the narrative nutrient criterion applies. The information presented in this report provides assurance that Owl Creek is healthy and that narrative nutrient standard is achieved.

Background

Although healthy, well-balanced stream and river communities may be maintained with some level of human activity, such activities may result in waterbody degradation. Human stressors may include increased inputs of nutrients, sediments, and/or pesticides from watershed runoff, adverse hydrologic alterations, undesirable removal of habitat or riparian buffer vegetation, and introduction of nuisance (generally exotic) plants and animals. DEP has methods to evaluate if human activities have resulted in the condition where a particular waterbody has exceeded water quality criteria (Chapter 62-302, Florida Administrative Code), including whether adverse impacts to biological communities have occurred. DEP water quality standards are designed to protect designated uses of the waters of the state (*e.g.,* recreation, aquatic life support), and exceedances of these standards is associated with interference with the designated use. The Stream Condition Index (SCI) assesses how closely the macroinvertebrate community (*e.g.,* aquatic insects, clams, crayfish) of a stream resembles the macroinvertebrate community of an undisturbed or "reference" condition. 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.

Methods

This stream was sampled on March 1 and December 5, 2012, by the DEP South District Office. Surface water samples were collected for analysis of nutrients, chlorophyll *a*, color, and other parameters following DEP Standard Operating Procedures (SOPs, see http://www.dep.state.fl.us/water/sas/sop/sops.htm for details). Sampling and analyses met FDEP quality assurance/ quality control standards (see http://www.dep.state.fl.us/water/sas/qa/index.htm) Chapter 62-302.531, F.A.C., provides that Numeric Nutrient Criteria are achieved in streams if: Information on chlorophyll *a* levels, algal mats or blooms, nuisance macrophyte growth, and changes in algal species composition do not indicate an imbalance in flora or fauna; AND EITHER

The average score of at least two temporally independent Stream Condition Indices (SCIs) is 40 or higher, with neither of the two most recent SCI scores less than 35, OR

The Nutrient Thresholds (expressed as annual geometric means) are not exceeded more than once in a three year period. The nutrient thresholds are found in Table 1. The floral and faunal measures are described below.

Table1. Nutrient thresholds for Florida Nutrient Regions, expressed as Annual Geometric Means (based on a minimum of four samples per year), not to be exceeded more than once in a consecutive three year period.

Nutrient Region	Total Phosphorus Threshold	Total Nitrogen Threshold
Panhandle West	0.06 mg/L	0.67 mg/L
Panhandle East	0.18 mg/L	1.03 mg/L
North Central	0.30 mg/L	1.87 mg/L
Peninsula	0.12 mg/L	1.54 mg/L
West Central	0.49 mg/L	1.65 mg/L
South Florida	No numeric nutrient threshold. The narrative criterion in paragraph 62-302.530(47)(b), F.A.C., applies.	

Dissolved Oxygen
Rule 62-302.533 (1), F.A.C., states that no more than 10 percent of the **daily average** percent dissolved oxygen (DO) saturation values shall be below 67 percent in the Panhandle West bioregion, 38 percent in the Peninsula and Everglades bioregions, or 34 percent in the Northeast and Big Bend bioregions. Percent saturation takes into account factors such as temperature, atmospheric pressure, and salinity.

Habitat Assessment
The Stream and River Habitat Assessment was conducted per DEP SOP FT 3100. The Habitat Assessment is a rapid field method in which a sampler scores eight in-stream and riparian components 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).

Floral Assessment
Evaluations of stream flora include the Rapid Periphyton Survey (RPS, DEP SOP FS 7230), community composition information associated with dominant algal taxa (where applicable), Linear Vegetation Survey (LVS, DEP SOP 7320), and chlorophyll *a*. The RPS assesses the extent and thickness of algae in the stream reach, while the LVS assesses how closely the in-stream plant community resembles a minimally disturbed condition. Results are assessed as described beginning on page 8 of "*Implementation of Florida's Numeric Nutrient Standards*," dated April 2013, using evidentiary thresholds derived from a population of minimally disturbed reference sites.

Faunal Assessment
The Stream Condition Index (SCI) assesses how closely the macroinvertebrate community (*e.g.*, aquatic insects, clams, crayfish) of a stream resembles the macroinvertebrate community of an undisturbed or "reference" condition. The SCI was sampled and calculated per DEP SOP SCI 1000. For the SCI, ten measures of macroinvertebrate health are calculated and summed to yield a final score from 0-100. Average SCI scores ≥ 40 are considered "Healthy" (as long as neither of the latest two SCI scores were < 35) with scores ≥ 64 considered "Exceptional."

Evaluation of Stream Exclusions for Applying Nutrient Criteria
When assessing a stream for compliance with numeric nutrient criteria (NNC) in Rule 62-302.531, F.A.C., it is important to note that several waterbody types are excluded from the stream definition in Rule 62-302.200(36), F.A.C. These include lake-like portions of rivers (where the lake NNC apply) and ditches/canals used for water management purposes, non-perennial streams, wetlands, and tidally fluctuating areas (where the narrative criterion, "no imbalances in natural populations of aquatic flora or fauna,"continues to apply). The NNC in Rule 62-302.531, F.A.C., were not applicable to this site.

Site Information

The sample site is in Owl Creek about 500 meters south of State Road 78, between the upper intermittent portion of the stream and the oligohaline, tidal, lower portion (Figures 1 and 2).

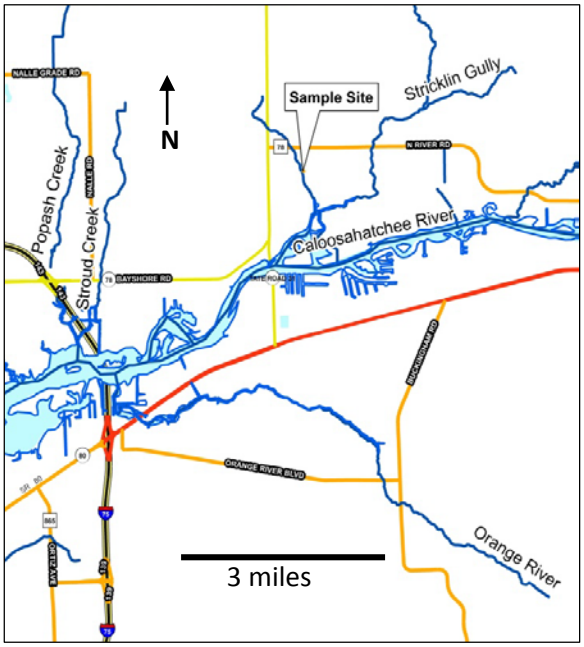


Figure 1. Location of Owl Creek in Lee County.



Figure 2. Stream Condition Index site for Owl Creek on March 1 and December 5, 2012.

Results

Water Quality

The water quality samples complied with water quality criteria (Table 2). Based on these two sampling events, the stream met the nutrient thresholds for the Peninsula Bioregion; however the thresholds represent annual geometric mean concentrations (minimum of four samples) not to be exceeded more than once in any three calendar year period, and are used in combination with floral and faunal information. Therefore even though the thresholds were not exceeded, additional nutrient sampling may be needed to meet data sufficiency requirements to calculate and assess attainment of the water quality standard. Dissolved oxygen levels were marginal, but did support a "Healthy" biological community.

Table 2. Water quality results from Owl Creek.

Analyte	Result 03/01/12	Result 12/05/12	Applicable Class III Water

			Quality Criteria
Field Temperature (°C)	21.3	17.3	
Field pH (SU)	5.27	7.34	
Field Dissolved Oxygen (mg/L)	3.5	3.6	see below
Field Dissolved Oxygen (% saturation)	38.3	37.3	≥38% saturation
Field Specific Conductance (µmhos/cm)	513	597	≤ 1275
Alkalinity (mg $CaCO_3$/L)	181	299	≥ 20
Color (PCU)	95	33	
Chlorophyll *a* (µg/L)	55 U	1.3 I	
Total Phosphorus (mg/L)	0.080	0.041	≤ 0.12*
Nitrate+Nitrite (mg/L)	0.024	0.085	
Ammonia (mg/L)	0.043	0.079	
Total Kejldahl Nitrogen (mg/L)	1.0	0.71	
Total Nitrogen (mg/L)	1.06	0.87	≤ 1.54*

* Federally promulgated numeric nutrient criteria for Peninsula nutrient region

I - The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.

U - Material was analyzed for but not detected. The reported value is the method detection limit for the sample analyzed.

Habitat Assessment

The mean stream and river habitat assessment score was 122, which is in the high suboptimal range. Water velocity (<0.1 m/sec) and habitat diversity (12 of 20 points) were low, and there was biological evidence of high conductivity during the dry season. The water was less than 0.3 m (~1 foot) deep in much of the sample area.

Stream Condition Index

The SCI scores for this site were 35 and 45 out of a possible 100 points, corresponding with a marginally "Healthy" designation. Considering the short length of the stream's headwaters and the evidence of saline water periodically intruding from the Caloosahatchee River, the SCI is actually higher than might be expected. The SCI is not an appropriate biological assessment tool for tidally-influenced streams. The presence of estuarine organisms indicates that during portions of the year, the specific conductance of Owl Creek is sufficiently increased by saline waters to adversely affect many freshwater macroinvertebrates.

Periphyton and Macrophytes

The attached algal community in the stream was sparse. Only one instance of algal filaments over 1 mm in length was found in two Rapid Periphyton Surveys, indicating that the stream achieves the floral component of the NNC. The stream was heavily shaded (90% covered), so thick algae growth would not be expected. Some growth of algae (typically diatoms) is expected in a fully functioning stream, but an over abundance of algae (especially filamentous algae) may reduce habitat quality (from smothering) and lead to excess organic matter production (and decomposition), which can harm fish and invertebrates. The stream shows no evidence of excessive algae. A Linear Vegetation Survey was conducted on December 5. Macrophytes were too rare to calculate a statistically valid score, but both higher Conservation of Conservatism plants (*Crinum americanum, Pontederia cordata, Acrostichum danaeifolium*) and lower CofC plants (*Hydrilla verticllata, Hydrocotyle sp.*) were present.

Summary

A salinity barrier at the marina at the mouth of Owl Creek slows but does not prevent the movement of estuarine water from the Caloosahatchee River up the creek. Tubes produced by *Ficopomatus miamiensis*, an oligohaline polychaete, were found during the SCI, indicating that brackish river water had moved that far upstream. The presence of *Acrostichum danaeifolium*, which is typical of slightly saline waters, reinforces the conclusion that estuarine water reaches the sample site periodically. This estuarine water adversely affects the freshwater community on which the SCI is based, so even a marginally healthy SCI score suggests that the creek supports a balanced biological community. This is a tidally affected area, and therefore the SCI is not an appropriate assessment method and as provided in Chapter 62-302.531, F.A.C., the narrative

nutrient criterion applies. The information presented in this report provides assurance that Owl Creek is healthy and that the narrative nutrient standard is achieved.

Thank you for your interest in maintaining the water quality of Florida's streams and rivers. Please feel free to contact us if you have any questions.

Contact and resources for more information

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DEP biological assessment resources:
http://www.dep.state.fl.us/water/bioassess/index.htm