



STREAM ECOSUMMARY

Howell Creek at SR 434

2012

DEP conducted water quality and biological sampling at Howell Creek upstream of State Road 434 in Seminole County on March 5 and December 10, 2012. Howell Creek was sampled as part of the strategic monitoring plan for the Middle St. Johns basin to verify potential biological impairments. Overall, the water quality and macroinvertebrate community data indicated that the stream met expectations for a healthy, well-balanced stream.



Figure 1. Howell Creek upstream of SR 434 bridge

Background

Although healthy, well-balanced stream and river communities may be maintained even with some level of human disturbance, human 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 are associated with interference with the designated use. The Stream Condition Index (SCI) assesses how closely the macroinvertebrate community (*e.g.*, aquatic insects, clams, and 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. The Rapid Periphyton Survey and Linear Vegetation Survey provide an assessment of the attached algae and plant community within the stream.

Methods

This stream was sampled on March 5 and December 10, 2012 by DEP Central District Office biologists. Surface water samples were collected for analysis of nutrients, chlorophyll-*a*, phaeophytin-*a*, color, turbidity, alkalinity, and chloride, and samples were collected following DEP Standard Operating Procedures (SOPs, see <http://www.dep.state.fl.us/water/sas/ga/sops.htm> for details). Sampling and analyses met FDEP quality assurance/ quality control standards (see <http://www.dep.state.fl.us/water/sas/ga/index.htm>). Field blanks were collected in conjunction with water quality samples. The Stream Condition Index (SCI) was sampled per DEP SOP FS7420 and calculated per DEP SOP LT7200. The SCI consists of collecting macroinvertebrates via 20 D-frame dipnet sweeps (0.5 m in length) in the most productive habitats in a 100 m reach of stream. The organisms are sub-sampled, and identified to the lowest practical taxonomic level. The SCI is composed of ten metrics, eight of which decrease in response to human disturbance, with two metrics (% very tolerant and % dominant) increasing in response to

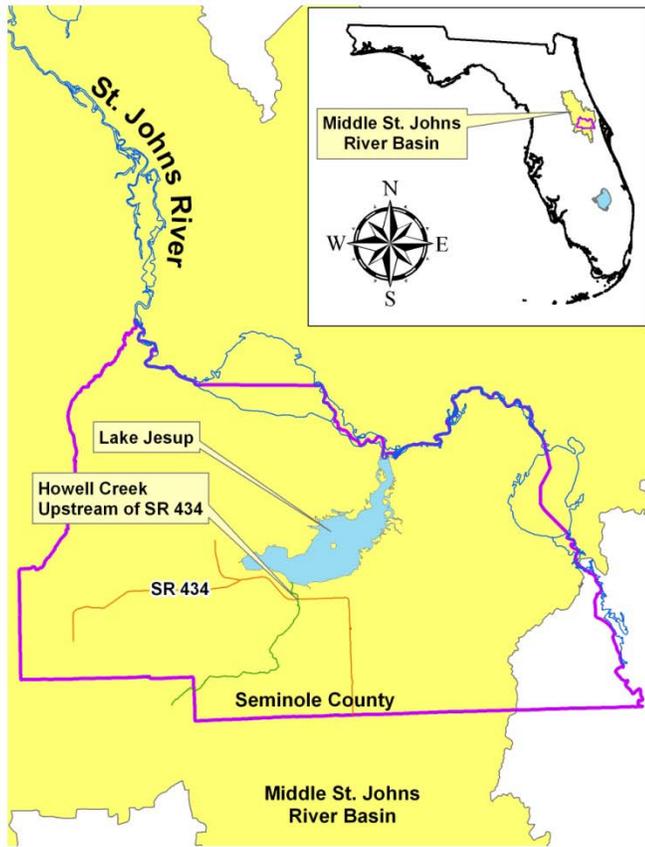


Figure 2. Location of Howell Creek at SR 434 in Seminole County.

Site Information

Howell Creek is located in Seminole County and is part of the middle St. Johns basin (Figure 1). Howell Creek originates in a series of small lakes in the vicinity of downtown Orlando. The stream then passes through Lake Howell at the southern edge of the city of Casselberry, and afterwards through the Winter Springs/Tuskawilla area before flowing into Lake Jesup. Land use in the area is approximately two-thirds residential development, with most of the remainder being commercial. Numerous sources of stormwater drain into Howell Creek, especially in the extensively urbanized upper reaches of the stream. FDEP biologists performed Habitat Assessment, Stream Condition Index, Rapid Periphyton Survey and collected water quality samples upstream of the SR 434 Bridge on March 5 and December 10, 2012 (Figure 2). In this area, the average width of the stream was 9 meters and the average depth was 0.5 meters. The sample site had velocity measured between 0.13 m/s and 0.17 m/s during both sample events. The stream bottom consisted primarily of sand with pockets of silt and fine organics. The shoreline vegetation community consisted of *Acer rubrum* (red maple), *Sabal palmetto* (sabal palmetto), *Taxodium* (cypress tree), *Salix caroliniana* (Carolina willow), *Quercus* (oak tree), *Liquidambar styraciflua* (Sweet Gum), *Serenoa repens* (saw palmetto), *Aster* (climbing aster), *Toxicodendron radicans* (poison ivy), *Wedelia trilobata* (creeping ox eye) and *Hydrocotyle* (pennywort). *Salvinia minima* was observed in the December sample event.



Figure 3. Howell Creek upstream of SR 434 bridge

human disturbance. According to DEP SOP LT 7000, the SCI score ranges and categories are: (68-100) Exceptional; (35-67) Healthy; and (0-34) Impaired. As part of numeric nutrient criteria development, DEP and EPA have concluded that a balanced faunal community is achieved if the average score of at least two temporally independent SCIs, performed at representative locations and times, is 40 or higher, with neither of the two most recent SCI scores less than 35.

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).

The Rapid Periphyton Survey (RPS) was conducted per DEP SOP FS 7230. The RPS quantifies the extent and abundance of attached algae in a 100 m stream reach.

Results

Water Quality

The water quality samples collected on March 5 and December 10, 2012, complied with all applicable water quality criteria in Chapter 62-302, Florida Administrative Code, except for an exceedance of the single sample limit for fecal coliforms on 12/10/12 (Table 1). Nutrient values were also compared to numeric nutrient thresholds for streams that were adopted in December 2011, but which are not yet in effect (note that compliance with numeric nutrient criteria involves an annual geometric mean not to be exceeded more than once in any three year period). Field blanks were all below detection limits for all analytes except for Phaeophytin-*a* in which the reported value was between the laboratory method detection limit and the laboratory practical quantitation limit.

Habitat Assessment

The Stream and River Habitat Assessment score was 101 on March 5, 2012, and 104 on December 10, 2012. Both scores reflect an overall "Suboptimal" condition. Two major productive macroinvertebrate habitats were identified in both assessments: snags (fallen branches) and roots originating from the stream banks. Leaf packs were also present and sampled, but were not in enough abundance to consider a major habitat. 25% of the productive habitats were considered smothered with sand or silt scoring in the "Suboptimal" category during the March and December sampling events. The stream had an adequate diversity of depths, and showed little evidence of channelization. The bank stability however, scored poor to marginal because of steep, high banks and presence of raw eroded areas. Riparian zone buffer width and vegetation quality components scored in the "Optimal" category for the right bank, but "Suboptimal" on the left bank because of the encroachment of human activities and disturbance to the expected plant community.

Table 1. Water quality results from 3/05/2012 and 12/10/2012 for Howell Creek.

Analyte	Result 3/5/12	Result 12/10/12	Class III Fresh Water Quality Criteria
Field Temperature (°C)	16.3	21.1	
Field pH (SU)	7.6	7.9	
Field Dissolved Oxygen (mg/L)	8.74	7.36	≥ 5.0
Field Specific Conductance (µmhos/cm)	275	272	Not to exceed 50% over background or 1275 µmhos/cm
Secchi Depth (m)	> 0.6	> 0.6	
Alkalinity (mg CaCO ₃ /L)	66 A	64	
Turbidity (NTU)	1.7	3.0	
Total Dissolved Solids (mg/L)	170 A	165	
Total Suspended Solids (mg/L)	2 I	5 I	
Chloride (mg/L)	36	35	
Fluoride (mg/L)	0.094 I	0.092	≤ 10
Sulfate (mg/L)	13	13	
True Color (PCU)	53 A	62	
Chlorophyll- <i>a</i> (µg/L)	2.3	1.3 I	
Phaeophytin- <i>a</i> (µg/L)	0.82 IV	0.82 I	
Organic Carbon (mg C/L)	8.7	11	
Biochemical Oxygen Demand	0.66 I	0.58 I	
Fecal Coliforms	111 B	410	< 400 [#]
Total Phosphorus (mg/L)	0.079	0.10	≤ 0.12*
Ortho-Phosphate	0.056	0.058	
Nitrate+Nitrite (mg/L)	0.20	0.31	
Ammonia (mg/L)	0.039	0.037	
Total Kjeldahl Nitrogen (mg/L)	0.48	0.65	
Total Nitrogen (mg/L)	0.68	0.96	≤ 1.54*

* F.A.C. Chapter 62-302 Surface Water Quality Standards

If 10 or fewer samples are taken within a month, the single sample limit is 400 CFU (62-302.530(6), F.A.C.)

A - Value reported is the mean of two or more determinations

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

U - Indicates that the compound was analyzed for but not detected.

V - Analyte was detected in both sample and method blank.

Stream Condition Index

The SCI scores for this site were 55 and 46, corresponding with a “Healthy” designation. In the March 5, 2012, SCI sample, two pollution-sensitive mayflies *Heptageniidae* and *Maccaffertium exiguum* were represented along with pollution-sensitive caddisfly *Triaenodes perna/helo*. Long-lived taxa *Palaemonetes*, grass shrimp, the bivalve *Corbicula fluminea* and Dobson fly larvae *Corydalus cornutus* were also represented. The snails *Micromenetus*, *Pyrgophorus platyrachis*, and *Physa*, along with the midge *Polypedilum illinoense*, considered very tolerant of poor water quality, were also represented (Table 2).

In the December 10, 2012, SCI sample, one pollution-sensitive mayfly, *Stenacron*, and one pollution-sensitive caddisfly, *Triaenodes*, were represented as well as the long-lived taxa *Palaemonetes*, grass shrimp, *Cambaridae*, crawfish, and the bivalve *Corbicula fluminea*. Very tolerant taxa represented were snails *Micromenetus* and worm *Limnodrilus hoffmeisteri* (Table 3).

The macroinvertebrates collected in these samples represent the expected macroinvertebrate diversity for a healthy stream community.

Rapid Periphyton Survey

On March 5, and December 10, 2012, periphyton was observed in relatively few areas and was not abundant or problematic.

Conclusion

Howell Creek, as sampled on March 5 and December 10, 2012, met most applicable State Water Quality Criteria. The December 10 fecal coliforms result exceeded the single sample limit that applies when fewer than ten samples are collected within a month. Habitat Assessment data indicated a suboptimal physical condition of the creek despite human disturbance in the watershed. Stream Condition Index data indicated the presence of a “healthy” macroinvertebrate community with sensitive and long-lived taxa that are indicative of good water quality

conditions. A Rapid Periphyton Survey revealed no abundance of periphyton.

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>

Implementation of Florida’s Numeric Nutrient Standards
http://www.dep.state.fl.us/water/wqssp/nutrients/docs/nnc_implementation.pdf

Seminole County Watershed Atlas
<http://www.seminole.wateratlas.usf.edu/>

Table 2. March 5, 2012 SCI taxa list

Scientific Name	Rep 1	Rep 2
Eclipidrilus	0	1
Gastropoda	0	1
Pyrgophorus platyrachis	12	8
Ancylidae	6	5
Micromenetus	1	2
Physa	1	0
Bivalvia	0	1
Corbicula fluminea	0	3
Sphaeriidae(mollusca)	4	2
Arrenurus	2	2
Amphipoda	5	3
Gammarus	7	3
Hyalella azteca	6	3
Palaemonetes	5	2
Heptageniidae	3	7
Caenis	4	4
Coenagrionidae	4	1
Enallagma	0	2
Argia	3	2
Scirtidae	1	2
Stenelmis	10	6
Dubiraphia vittata	4	5
Microcylloepus pusillus	22	33
Chrysomelidae	1	0
Trichoptera	0	1
Cheumatopsyche	2	3
Hydroptila	1	0
Neotrichia	6	2
Triaenodes	0	1
Oecetis	0	2
Oecetis georgia	3	0
Lepidoptera	1	0
Culicidae	1	0
Atrichopogon	1	0
Chironomidae	3	3
Cryptochironomus	1	2
Paralauterborniella nigrohalterale	1	0
Tribelos	0	1
Tribelos fuscicornis	1	0
Cladotanytarsus	0	1
Polypedilum scalaenum grp.	16	11
Polypedilum illinoense grp.	2	3
Polypedilum halterale grp.	1	0
Rheotanytarsus exiguus grp.	5	2
Tanytarsus sp. l epler	1	0
Tanytarsus sp. c epler	0	1
Climacia areolaris	1	1
Corydalis cornutus	1	0
Polypedilum flavum	3	3
Triaenodes perna/helo	1	0
Maccaffertium exiguum	0	1
Oecetis sphyra/morsei	0	7

Yellow: Sensitive Green: Long-lived Orange: Tolerant

Table 3. December 10, 2012 SCI taxa list

Scientific Name	Rep 1	Rep 2
Ablabesmyia mallochi	0	1
Amphipoda	3	2
Ancylidae	1	2
Argia	0	2
Baetidae	1	0
Bivalvia	1	0
Cambaridae	1	0
Cernotina	2	2
Cheumatopsyche	7	11
Chironomidae	2	1
Corbicula fluminea	0	1
Dubiraphia vittata	12	12
Elmidae	10	2
Enallagma	1	4
Eupera cubensis	2	0
Gammarus	11	15
Hyalella azteca	18	17
Hydropsychidae	2	0
Labrundinia pilosella	1	0
Leptoceridae	1	1
Libellulidae	1	0
Limnodrilus hoffmeisteri	2	1
Lumbriculidae	0	1
Microcylloepus pusillus	46	42
Micromenetus	1	2
Myzobdella	0	1
Neotrichia	1	1
Oecetis	0	1
Palaemonetes	5	8
Polypedilum fallax	0	1
Polypedilum flavum	9	8
Polypedilum illinoense grp.	0	1
Polypedilum scalaenum grp.	0	1
Pyrgophorus platyrachis	4	4
Rheotanytarsus exiguus grp.	2	2
Scirtidae	1	1
Sphaeriidae(mollusca)	1	0
Stenacron	0	1
Stenelmis	4	5
Stenochironomus	1	0
Triaenodes	0	2
Tribelos fuscicornis	2	2
Tubificidae	3	1

Yellow: Sensitive Green: Long-lived Orange: Tolerant