STREAM ECOSUMMARY

Avalon Branch

WBID 3037, Orange County

May 8, 2018 and October 31, 2018



Figure 1. Sampling reach along Avalon Branch in Orange County.

Physical, chemical, and biological sampling were conducted at Avalon Branch (WIN ID G2CE0168, DRAINLKLIV) in Orange County on May 8, 2018 and October 31, 2018 by Michael Linger and Lawrence Drennan of the DEP Central Regional Operations DEAR Field Office. This stream 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.

Background

Healthy, well-balanced stream and river communities may be maintained with some level of human activity, but excessive human disturbance may result in waterbody degradation. Human stressors may include increased inputs of nutrients, sediments, and/or other contaminants from watershed runoff, adverse hydrologic alterations, undesirable removal of habitat or riparian buffer vegetation, and introduction of nuisance (generally exotic) plants and animals. DEP evaluates if human activities have resulted in the condition where a waterbody has exceeded applicable water quality criteria (Chapter 62-302, Florida Administrative Code), including whether adverse impacts to biological communities have occurred. DEP water quality criteria are designed to protect designated uses of the waters of the state (*e.g.,* recreation, aquatic life use support), and exceedances of these criteria are associated with interference with the designated use. Additionally, DEP evaluates the health of floral (plants and algae) and faunal (animal) communities and conducts habitat assessments to diagnose potential physical impacts.

Site Description

The Avalon Branch sampling location (Figure 1) is in central eastern Orange County in the Avalon Branch Watershed (WBID 3037, Figure 2). It is a third order stream draining the Eastern Florida Flatwoods, a subecoregion of the Southern Coastal Plain ecoregion. Avalon Branch is a tributary of the Econlockhatchee River and has a Landscape Development Intensity (LDI) Index score of 4.50. The LDI is calculated for the 100 m buffer of the waterbody for 10 km upstream of the point of interest. The LDI quantifies the intensity of human activity in the surrounding watershed based on land use and land cover and is normalized on a scale from 1 to 10, where a natural land use has a coefficient of 1.0 and a central business district has a coefficient of

10.0. This site's score of 4.50 suggests moderate human activity in the 100m buffer surrounding the stream. The WBID is not currently on the current Impaired Waters Verified List. Additional information about this WBID is available in the TMDL Tracker application (http://prodenv.dep.state.fl.us/DearTmdl/welcomehz.do).

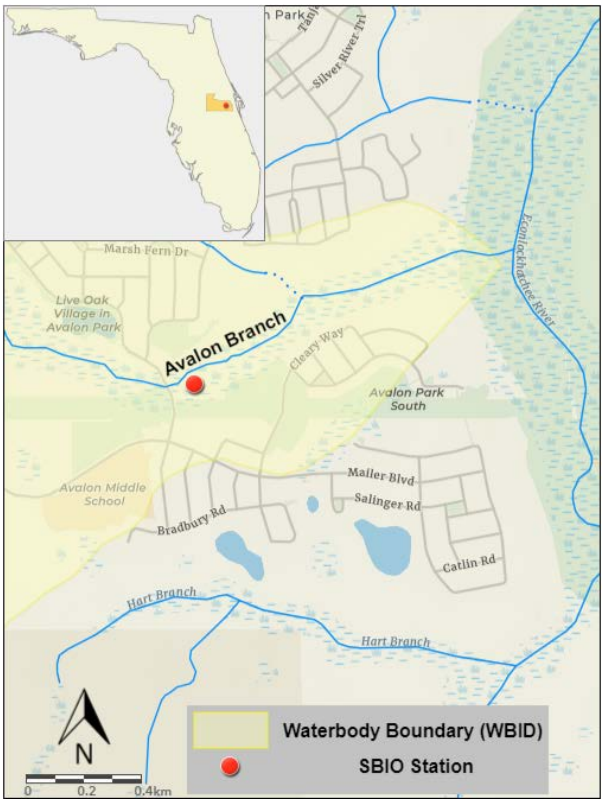


Figure 2. Location of Avalon Branch sampling point in Orange County.

Methods

Water Quality

Surface water samples were collected for analysis of chlorophyll *a*, alkalinity, color and nutrients following DEP Standard Operating Procedures (SOPs, see https://floridadep.gov/dear/quality-assurance/content/dep-sops for details) and met the requirements of the FDEP Quality Assurance Rule, Chapter 62-160, F.A.C. (https://www.flrules.org/gateway/ChapterHome.asp?Chapter=62-160). Results were compared with applicable Class III water quality criteria contained in 62-302, F.A.C., including nutrients, dissolved oxygen, and other indicators.

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 region-specific. This sampling site is in the Peninsular nutrient region. The floral and faunal measures are described below.

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. This site is in the Peninsular region for DO criteria assessment. Percent saturation accounts for factors such as temperature, atmospheric pressure, and salinity.

The daily average freshwater DO criteria is preferentially assessed using daily average values calculated from full days of diel (collected over a 24 hour period) monitoring data. If diel monitoring data are not available (as was the case for this report), Instantaneous samples are used to assess the DO criterion by comparing the instantaeous value with a time-of-day-specific translation of the daily average criterion (subsection 62-303.420(9), F.A.C.).

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." The SCI is part of the NNC evaluation for streams, as described above, and also serves as a biological health assessment tool in 62-303, F.A.C., DEP's Impaired Waters Rule.

Evaluation of Stream Exclusions for 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 applicable to Avalon Branch.

Results

Water Quality

The water quality results are shown in Table 1. Dissolved oxygen and pH are well within the standard requirement of a Class III waterbody.

Escherichia coli (*E. coli*) bacteria was detected in both sampling events; however, criteria were not exceeded. Bacteriological criteria are based on a monthly geometric mean based on a minimum of 10 samples taken over a 30-day period or a value not to be exceeded in more than ten percent of the values in a month (the Ten Percent Threshold Value or TPTV). Though there were insufficient data to assess the monthly geometric mean criterion, these samples did not exceed the TPTV.

NNC Threshold Assessment

Table 1 lists water quality parameters associated with the two SCI events described in this report. Additionally, there were 3 other water quality sampling events within the 2018 calendar year. The annual geometric mean for total nitrogen (1.09 mg/L) was well below the threshold (1.54 mg/L for the peninsular nutrient region). However, the annual geometric mean for total phosphorus (0.17 mg/L) did exceed the threshold (0.12 mg/L) for the peninsular nutrient region.

Based on the sampling events in 2018, the stream exceeded the numeric nutrient thresholds for the peninsular nutrient region; however, this data only represents the annual geometric mean for one year. 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 threshold for total phosphorus was exceeded, the passing status of the flora and fauna assessments described in this report indicate that this water body is not impaired.

Floral Assessment

Results of the floral metrics show that this site is within the reference stream distribution and therefore attains the floral component of the NNC (Table 2). All floral measures must pass for the stream to attain the NNC. Attached algae ranked 4-6 (>6mm thick) comprised 8% of the points sampled on 05/08/2018 and none was observed on 10/31/2018. Thick algae growth would not be expected as the stream is heavily shaded. These results indicate that the site achieves the RPS component of the stream floral metrics. Very few aquatic plants (<2m^2) were encountered during either sampling event. Water samples had 1.2 µg/L of chlorophyll *a* on 05/08/2019 and 2.9 µg/L on 10/31/2018. These results indicate the site also achieved the LVS and phytoplankton chlorophyll *a* components of the stream floral metrics.

Table 1. Water quality results from May 8, 2018 and October 31, 2018 at Avalon Branch.

Analyte	Result 5/8/18	Result 10/31/18	Applicable Class III Water Quality Criteria
Field Temperature (°C)	22.15	19.97	N/A
Field pH (SU)	7.99	7.86	Within 1 SU of natural background
Field Dissolved Oxygen (% saturation)	96.0	93.8	** Peninsular Criterion: 41% and 41%
Field Specific Conductance (µmhos/cm)	854	790	50% above background or 1275 µmhos/cm, whichever is greater
Alkalinity (mg $CaCO_3$/L)	177	174	Shall not be depressed below 20
Color (PCU)	60	54 A	N/A
Total Phosphorus (mg/L) as P	0.19	0.17	0.12 mg/L
Nitrate+Nitrite (mg/L) as N	0.15	0.17	0.35 mg/L for spring vents only
Ammonia (mg/L) as N	0.014	0.014	***1.72 mg/L and 2.36 mg/L
Total Kjeldahl Nitrogen (mg/L) as N	0.84	1.0	N/A
Total Nitrogen (mg/L) as N	0.99	1.17	**1.54 mg/L
Escherichia coli Bacteria (MPN/100 ml)	161	294	≤ 410 Count / 100 ml

* Instantaneous DO criterion calculated per DO Saturation Calculator and adjusted for time of day.

** Annual geometric numeric nutrient threshold for Peninsular nutrient region, used in combination with information on flora and fauna.

*** Total ammonia criterion calculated per Total Ammonia Nitrogen Calculator, for single sample maximum.

Table 2. Floral and faunal assessment results from May 8, 2018 and October 31, 2018 at Avalon Branch.

Floral/Faunal Metric	Evidentiary Threshold of No Imbalances	Result 05/8/18 SBIO# 78407	Result 10/31/18 SBIO# 79031
LVS C of C	Site average ≥ 2.5	Pass (<2m^2)	Pass (<2m^2)
LVS FLEPPC (%)	Site average ≤ 25%	Pass (<2m^2)	Pass (<2m^2)
RPS (%)	≤ 25% rank 4-6 (algae > 6 mm thick) coverage. If 20 to 25 % rank 4-6 coverage, evaluate algal species	8%	0%
Chlorophyll *a* (corrected; µg/L)	< 3.2 ug/L. If 3.2 to 20 ug/L, site specific evaluation	1.2 I	2.9 A
Algal Community Composition	No adverse shifts in dominant taxa	N/A	N/A
SCI	Average ≥ 40	70 A	59 A

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

A – Value reported is the arithmetic mean (average) of two or more discrete and separate samples.

Habitat Assessment

The stream and river habitat assessment scores were 107 and 116, which are in the suboptimal range. The typical velocity measured was 0.20 m/s on 05/08/2018 and 0.18 m/s on 10/31/2018, which resulted in suboptimal scores for stream flow. Fish and aquatic invertebrates rely on sufficient water velocity to maintain high dissolved oxygen concentrations in the stream; in this case the dissolved oxygen was more than adequate, averaging 95% saturation.

The average width within the assessment stretch was 3 m. The banks were well-armored with trees and had a low gradual slope, providing a good connection with the floodplain. The bank stability scores, as a result, were in the optimal range. Spatial heterogeneity was exemplified by a good degree of sinuosity, adequate number of stable pools and two productive habitats: woody debris and roots which comprised roughly 3% of the stream area. The macroinvertebrate habitat did have some sand, silt and algal smothering which lowered the score to the suboptimal category, but habitats were still productive. The riparian zone includes a mature tree canopy and good understory with few nuisance plants present. However, there was some minor human disturbance (trash) adjacent to the stream from the surrounding residential community.

Faunal Assessment (SCI)

The average SCI score for this site was 65 out of a possible 100 points, corresponding with an "Exceptional" designation (Table 2). The SCI sampling events presented in this report are the first for this stream, serving as a baseline of data for which to compare future sampling events.

Microcylloepus pusillus (Order: Coleoptera) was the dominant taxon encountered (20% contribution) in the first replicate for samples taken on 05/08/2018 and *Polypedilum flavum* (Order: Diptera) was the most commonly encountered organism in the second replicate (25%). At 34%, *Microcylloepus pusillus* was also dominant in the first replicate of the sample from 10/31/2019. *Pyrgophorus platyrachis* (Order: Neotaenioglossa) dominated the second replicate for this sampling event at 32%.

Conclusions

Results from these sampling events indicate that the stream met applicable state water quality criteria. Although the TP geometric mean did exceed the threshold, it does not appear to have a negative effect on the flora (RPS/LVS) or fauna (SCI) assessments.

While the stream is in close proximity to human activities, an in-tact riparian buffer coupled with an abundance of retention ponds, that intercept and reduce stormwater impacts, have likely contributed to near optimal habitat assessment scores. The SCI data indicated the presence of an "Exceptional" macroinvertebrate community, with sensitive and long-lived taxa indicative of good water quality conditions. The LVS and RPS assessments indicated that vascular plant and algal communities are consistent with expectations for minimally disturbed sites.

Thank you for your interest in maintaining the water quality of Florida's aquatic resources. Please contact us if you have any questions.

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DEP biological assessment resources: https://floridadep.gov/dear/bioassessment