STREAM ECOSUMMARY

Stoneridge Farms Inc. Property (formerly Northeast Solite Corporation)

Mill Log Creek, WBID 2423, Clay County, 6/21/2018



Figure 1. Sampling reach along the Mill Log Creek test site WIN ID 20030573 in Clay County.

Physical, chemical, and biological sampling was conducted at 3 sites on Mill Log Creek in Clay County (Figure 1), consisting of a control site above the former industrial impact area, and two test sites downstream from the former impact area, on June 21st, 2018, by Jeremy Parrish, Patrick O'Connor, Brian Davis, and Amy Kalmbacher of the Department of Environmental Protection Division of Environmental Assessment and Restoration Northeast Regional Operation Center. This stream was sampled to determine if previously detected low levels of dioxin and barium in creek sediments are causing an impairment of aquatic life uses. 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

Three sites were used to assess the water quality and biological condition of Mill Log Creek (Figure 2). The control site (WIN ID 20030572) is above the impact area on the Stoneridge Farms property. The test site (WIN ID 20030573) is on Stoneridge Farms property downstream of a small ditch draining a former borrow pit lake, 100 m downstream from the control site and approximately 1000 meters north of State Road 209. The further downstream site (WIN ID20030304) is on Stoneridge property before draining into Black Creek. Mill Log Creek is a third order stream and tributary of Black Creek that flows into the Lower St. Johns River. Mill Log Creek has a Landscape Development Intensity (LDI) Index score of 1.97 at the test site. 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 (20030573) score of 1.97 suggests minimal human activity in the 100 m buffer surrounding the stream. Mill Log Creek is currently listed for lead on the state's Verified List of Impaired Waters (2016 list).

Additional information about this waterbody is available in the TMDL Tracker application (http://prodenv.dep.state.fl.us/DearTmdl/welcomehz.do)

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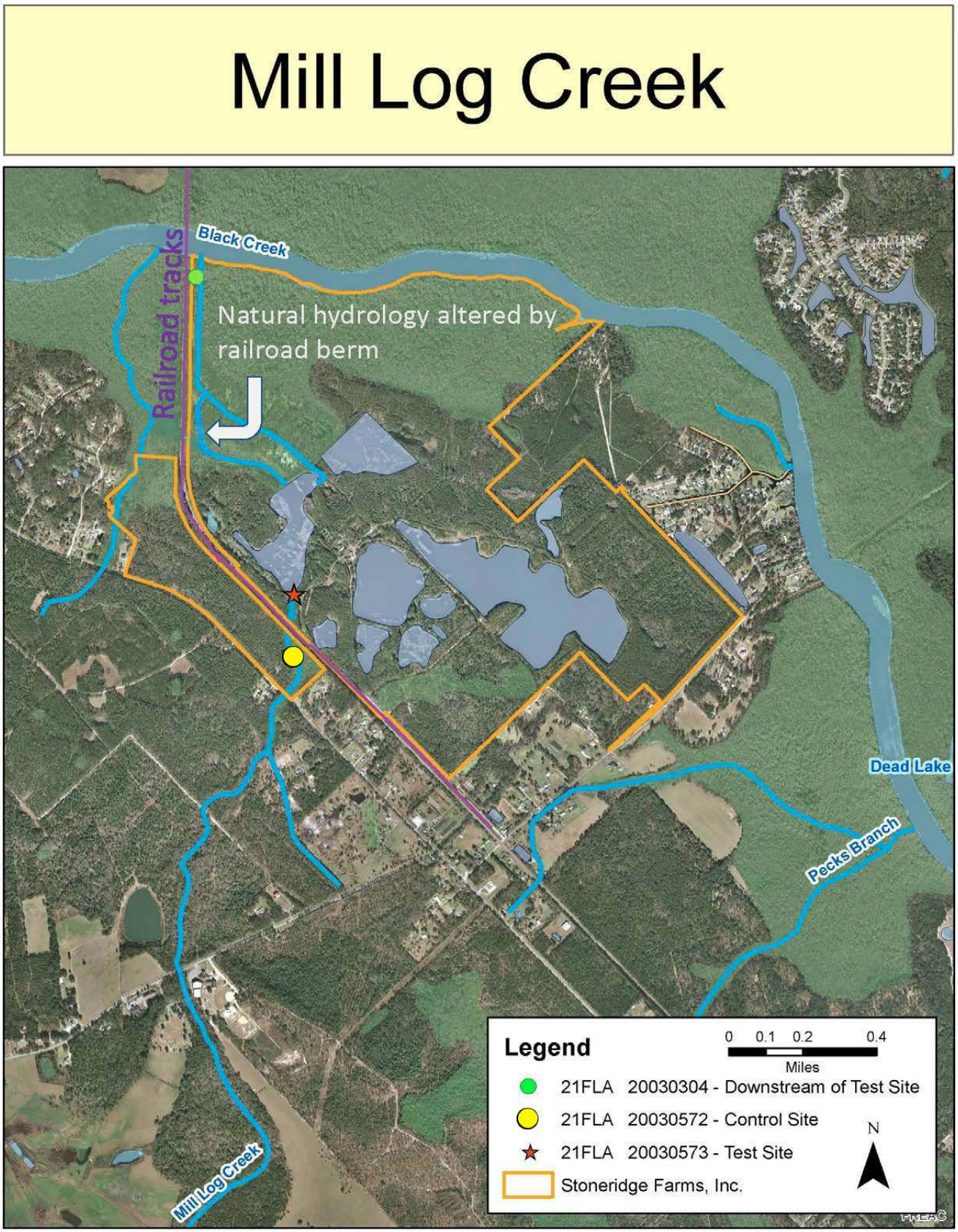


Figure 2. Location of Sample sites on Mill Log Branch in Clay County

Methods

Water Quality

Surface water samples were collected for analysis of nutrients, chlorophyll *a*, color, and metals 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 34%. Percent saturation takes into account factors such as temperature, atmospheric pressure, and salinity. These sites are in the Northeast Bioregion for DO criteria assessment.

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. Diel monitoring data are not available, so instantaneous samples are used to assess the DO criterion by comparing the instantaneous 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 numeric nutrient standard for streams, as described above, and serves as a biological health assessment tool in Chapter 62-303, F.A.C., DEP's Impaired Waters Rule.

Evaluation of Stream Exclusions for Applying Nutrient Criteria

When assessing a stream for compliance with the numeric nutrient standard for streams 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 numeric nutrient standard for streams in Rule 62-302.531, F.A.C., were applicable to Mill Log Creek.

Results

Water Quality

The water quality results are shown in Table 1.

NNC Standard Assessment

Based on this sampling event and a previous event in 2014, the stream met the numeric nutrient standard for the Peninsular nutrient region due to passing floral and faunal metrics (see below); however, the individual total phosphorus (TP) results exceeded the numeric TP threshold. Although the annual geometric mean concentrations are based on a minimum of four samples, additional nutrient sampling is not needed to assess the thresholds because Mill Log Creek passed the numeric nutrient standard for streams based on the passing SCI scores and passing floral metrics. The high TP concentrations may be due to natural conditions or human disturbances, but are not attributable to the former impacts on the property.

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). There were less than 2 m^2 of aquatic vegetation at the Control and Test Sites, which is considered to attain the LVS evidentiary thresholds. All floral measures must pass for the stream to attain the NNC.

Table 1. Water quality results from the control, test and downstream sites at Mill Log Creek on June 21st, 2018.

Analyte	Control Site	Test Site	Down-stream Site	Applicable Class III Water Quality Criteria
Field Temperature (°C)	24.7	25.2	25.3	
Field pH (SU)	6.9	6.9	6.4	Within 1 SU of natural background
Field Dissolved Oxygen (% saturation)	80	75	42	*Northeast Criterion: ≥32.4%, 31.9%, and 36.5% respectively.
Field Specific Conductance (µmhos/cm)	153	147	140	50% above background or 1275 µmhos/cm, whichever is greater
Alkalinity (mg $CaCO_3$/L)	26	28	24	Shall not be depressed below 20
Color (PCU)	360	310	340	N/A
Total Phosphorus (mg/L) as P	0.62	0.41	0.44	** Peninsula: ≤0.12 mg/L
Nitrate+Nitrite (mg/L) as N	0.062	0.046	0.056	N/A
Ammonia (mg/L) as N	0.025	0.031	0.049	***≤3.61, 3.49, 3.79 TAN respectively
Total Kjeldahl Nitrogen (mg/L) as N	1.3	1.1	1.2	N/A
Total Nitrogen (mg/L) as N	1.36	1.15	1.26	** Peninsula: ≤1.54 mg/L
Barium (µg/L)	15.4	15.8	15.1	N/A

* 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

Table 2. Floral and faunal assessment results from Mill Log Creek on June 21, 2018. N/A–not applicable.

Floral/ Faunal Metric	Evidentiary Threshold of No Imbalances	Control Site	Test Site	Down-stream Site
LVS C of C	Site average ≥ 2.5	< 2m² plants (attains)	< 2m² plants (attains)	2.5
LVS FLEPPC (%)	Site average ≤ 25%	< 2m² plants (attains)	< 2m² plants (attains)	25
RPS (%)	≤ 25% rank 4-6 (algae > 6 mm thick) coverage. If 20 to 25 % rank 4-6 coverage, evaluate algal species	0	0	0
Chlorophyll *a* (corrected; µg/L)	< 3.2 ug/L. If 3.2 to 20 ug/L, site specific evaluation	0.69	1.1	1.2
Algal Community Composition	No adverse shifts in dominant taxa	N/A	N/A	N/A
Habitat assessment		112	106	103
SCI	Average ≥ 40	55	51	56

Habitat Assessment

The stream and river habitat assessment scores were 112, 106, and 103 which are in the sub-optimal range. The typical velocity measured was 0.2 m/s, which resulted in a sub-optimal score for stream flow. Fish and aquatic insects require sufficient water velocity to maintain high dissolved oxygen concentrations in the stream; in this case, the dissolved oxygen was 42-80% saturation. The average width within the assessment stretch was 2 meters. For the control and test site, the banks were well armored and low with a gradual slope which provides a good connection to the floodplain. The banks were relatively steep and may lead to instability during high flow events at the downstream site. The bank stability scores were 8 at the test site, 7 at the control site, and 4 for the downstream site. The two productive habitats observed at the control and test site were woody debris (3%) and roots (10%). The following 4 productive habitats were observed at the downstream site: woody debris, rocks, roots, and vegetation.

Faunal Assessment (SCI)

The SCI scores for the control site, test site, and the downstream site were 55, 51, and 56, respectively, out of a possible 100 points, corresponding with a "healthy" (40-63) designation (Table 2). These results are within the range of previous scores (44-65) for this site collected April 2014.

Conclusions

Results from the June 21, 2018, sampling event at Mill Log Creek indicate that the stream met all applicable State Water Quality Criteria. Although the TP results exceeded the numeric nutrient threshold for the Peninsula region at each site, the floral and faunal components passed at all sites. Numeric thresholds must be evaluated as annual geometric means and in conjunction with floral and faunal information.

Habitat assessment data indicated a suboptimal physical condition of the creek with little disturbance in the watershed. Stream Condition Index (SCI) data indicates the presence of a "healthy" macroinvertebrate community with sensitive and long-lived taxa that are indicative of good water quality conditions. The LVS and RPS indicate vascular plant and algal communities, respectively, that are consistent with expectations for minimally disturbed sites. The downstream site has borderline values (2.5 average C of C and 25% FLEPPC) for the LVS score. This borderline LVS score was due in part to a small area of the invasive plant Alligator weed, *Alternanthera philoxeroides.*

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

Contact and resources for more information

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DEP biological assessment resources:
https://floridadep.gov/DEAR/Bioassessment