STREAM ECOSUMMARY

Stonderidge Farms

(formerly Florida Solite)

Mill Log Creek, WBID 2423

Clay County

April 7, 2014



Figure 1. Mill Log Creek Test Site

Physical, chemical, and biological sampling was conducted at Mill Log Creek Storet # 20030573, 20030572, and 20030304 in Clay County on April 7th, 2014 by Jeremy Parrish and Patrick O'Connor of the DEP DEAR Northeast Office. This stream was sampled as part of continued monitoring of the superfund site, Stoneridge Farms (formerly Florida Solite) property to determine if the observed high dioxin and barium levels detected in stream sediment 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 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 use support), and exceedances of these standards is 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 3). The upstream site was above the Stoneridge Farms ("Upstream"), where the creek is un-impacted. Two downstream sites were selected to represent the impacted area; the first was on the Stoneridge Farms downstream from ditch flow from the Stoneridge Farms ("Test"; Figure 1), and the second was further down in the watershed before Mill Log Creek leaves the property into Black Creek ("Downstream", Figure 2). Dioxin and barium have previously been detected at elevated levels in the sediments from the downstream sites.



Figure 2. Mill Log Creek farthest downstream site before entering Black Creek

Site History

Stoneridge Farms is a 903-acre property that housed a clay mining and processing operation from 1959 until 1995. An onsite scrubber pond received wastewater from the clay heating/expansion process. Reportedly, Mill Log Creek received undetermined volumes of wastewater from the scrubber pond in 1982 and early 1983 until a breach was repaired in March 1983. A third release occurred in January 1996, prompting the installation of the culvert to the overflow pond. Mill Log Creek was assessed with the Biological Reconnaissance and Habitat Assessment tool in January 1998 by the FDEP. The habitat assessment indicated the upstream scored 130, and downstream scored 117. The field physical chemical measurements were similar at both sites (dissolved oxygen was 8.3 and 10.1 mg/L, specific conductance was 102-118 µmhos, and pH was 6.6 SU at the upstream and downstream sites, respectively). The stream had small aggregate pebbles as well as iron sediment/flocculation. These physical and chemical conditions were found to be the same at Mill Log Creek approximately fifteen years later.

Methods

Water Quality

Surface water samples were collected for analysis of nutrients, chlorophyll *a*, color, turbidity, and metals following DEP Standard Operating Procedures (SOPs, see http://www.dep.state.fl.us/water/sas/sop/index.htm 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).



Figure 3. Location of sample sites on Mill Log Creek upstream from and on Stoneridge Farms in Clay County.

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. Mill Log Creek is in the Peninsula Region. The floral and faunal measures are described below.

Table 1. 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 http://www.dep.state.fl.us/water/wqssp/dissoxy.htm.

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. The equations to calculate the time-of-day-specific translation of the daily average criterion are cited in 62-303.420(9), F.A.C., and a spreadsheet calculator for this purpose is available at: http://www.dep.state.fl.us/water/wqssp/dissoxy.htm.

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, and 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."

Table 2. Water quality results from Mill Log Creek.

Analyte	Result Upstr.	Result Test	Result Down.	Applicable Class III Water Quality Criteria
Field Temperature (°C)	19.4	19.5	20.0	-
Field pH (SU)	6.5	6.6	6.7	-
Field Dissolved Oxygen (% saturation)	74.7	71.7	32	Big Bend and Northeast: 34%
Field Dissolved Oxygen (mg/L)	6.9	6.6	2.8	-
Field Specific Conductance (µmhos/cm)	106	111	125	50% above background or 1275 µmhos/cm, whichever is greater
Chlorophyll *a* (µg/L)	1.5 I	1.3 I	1.7 I	Maximum of 20 µg/L, assessed as AGM
Color (PCU)	280	260	250	-
Turbidity (NTU)	4.4	4.8	8.9	< 29 above background
Total Phosphorus (mg/L) as P	0.46	0.35	0.51	0.12*
Nitrate+Nitrite (mg/L) as N	0.27	0.2	0.22	-
Ammonia (mg/L) as N	0.091	0.077	0.66	-
Total Kjeldahl Nitrogen (mg/L) as N	0.94	0.91	1.6	-
Total Nitrogen (mg/L) as N	1.21	1.11	1.82	1.54*
Arsenic (µg/L)	0.67	0.72	0.76	≤ 50**
Cadmium (µg/L)	0.05 U	0.05 U	0.05 U	≤ 0.12**
Chromium (µg/L)	0.91	0.91	0.88	≤ 35 **
Lead (µg/L)	0.82	0.79	0.81	≤ 0.78, 0.78, 0.80**
Barium (µg/L)	11.8	14.2	11.6	-

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

** Metals criteria based on hardness

U – The result was less than the method detection limit

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 applicable to all sites on Mill Log Creek.

Results

Water Quality

The water quality results are shown in Table 2. The water quality was comparable at all three sites. The only water quality exceedance was for dissolved oxygen saturation at the farthest downstream site. The dissolved oxygen was thirty two percent and is below the thirty four percent minimum. This low dissolved oxygen is probably naturally occurring, but could be attributed to the channelization, which is typically related to slower water velocities. Heavy metal concentrations met water quality standards, with the possible exception of lead. Lead concentrations were approximately equal to the hardness-based criteria for lead. The total phosphorus at all three sites and the total nitrogen at one site exceeded the numeric nutrient thresholds for the Peninsula region; however, numeric thresholds must be evaluated as annual geometric means and in conjunction with floral and faunal information.

Table 3. Floral and faunal assessment results from 04-07-2014 sampling of Mill Log Creek at three sites.

Floral/Faunal Metric	Evidentiary Threshold of No Imbalances	Upstr.	Test	Down.
LVS C of C (mean score)	Site average ≥ 2.5	<2m²	<2m²	<2m²
LVS FLEPPC (%)	Site average < 25%	<2m²	<2m²	<2m²
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	1.5 I	1.3 I	1.7 I
SCI	Average ≥ 40, not any one < 35	65	48	44

I Indicates the value was above the minimum detection limit but below practical quantitation level

Floral Assessment

The results of floral surveys are shown in Table 3. There was minimal vegetation in the stream, or was below the 2m² threshold. There was very minimal algal growth in the stream, with zero percent of the stream with measured algal thickness greater than or equal to 6 mm (ranks 4-6). The chlorophyll values were below 3.2 µg/L thresholds. The SCI scores are from a single sample event, indicating all sites were above the 35 minimum for one time samples. Overall, there was no imbalance found in the floral and faunal measures.

Habitat Assessment

The habitat assessment for the Upstream site was 113 (suboptimal), with good diversity and water velocity. The habitat assessment for the Test site was 117 (suboptimal) which is very comparable to the upstream habitat conditions. The Downstream site scored an 87 (suboptimal) which reflected the channelization and less available productive habitat.

Stream Condition Index (Fauna)

The SCI score for the Upstream site was 65 out of a possible 100 points, corresponding with a Healthy designation (Table 2). The dominant taxon was *Rheotanytarsus pellucidus*. The SCI score for the Test site was 48 out of a possible 100 points, corresponding with a Healthy designation. The dominant taxon was also *Rheotanytarsus pellucidus*. The Upstream and Test sites shared many of the same invertebrates, including sensitive invertebrates from Ephemeroptera and Trichoptera groups. The Upstream segment had several representatives in these groups including *Chimarra sp*. and *Caenis sp*., which were not in the Test site sample. Three species were in both samples for Upstream and Test: *Labiobaetis frondalis, Acerpenna Pygmaea*, and *Cheumatopsyche*. The SCI score for the Downstream site was 44 out of a possible 100 points. The dominant taxon was *Caecidotea*. Ephemeropterans of the genus *Caenis* and *Stenacron* were in the Downstream sample. All three sites represented a healthy balanced invertebrate community.

Conclusions

Sampling at all three sites indicates that overall the stream met applicable State Water Quality Criteria. The total phosphorus at all three sites and the total nitrogen at one site exceeded the numeric nutrient thresholds for the Peninsula region; however, results of floral and faunal assessments indicated healthy aquatic life, suggesting that the stream nutrient

criteria would be met. Additional water quality and biological sampling would be required to fully assess attainment of stream nutrient criteria.

Habitat assessment data indicated a suboptimal physical condition of all three stream segments in Mill Log Creek. Stream Condition Index data for the sites indicated the presence of a "healthy" macroinvertebrate community with sensitive and long-lived taxa that are indicative of good water quality conditions. The Linear Vegetation Survey and Rapid Periphyton Survey indicated balanced vascular plant and algal communities, respectively.

On the sampling date, the dissolved oxygen at Mill Log Creek at the farthest downstream site was below the water quality standard. The biological community was found to be healthy, indicating that the existing DO regime fully supports aquatic life uses.

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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FDEP, NE-Regional Operational Center

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