EcoSummary

FLORIDA AMBIENT

Otter Creek at Steelfield landfill SW3 monitoring site

October 11, 2006

FAIL

BioRecon: A rapid, cost-effective screening mechanism for identification of biological impairment

For samples collected before June 8, 2004
All field and laboratory methods followed FDEP Standard Operating Procedures and met FDEP quality assurance/quality control standards.
For samples collected on or after June 8, 2004
All field and laboratory methods followed FDEP Standard Operating Procedures (SOPs) and met DEP quality assurance/quality control standards.

Purpose



A bioassessment was performed at this Otter Creek site to assess the impacts of the Steelfield Landfill on its biota and wildlife habitat. A January 5, 2006 Remedial Action Plan prepared for the Steelfield Road Landfill by their consultant indicated that Otter Creek is matted with red flocculent organic matter, and concluded that the Creek naturally exceeds the 1 mg/l iron surface water standard and target cleanup limit. A background bioassessment for comparative purposes was performed just down stream at a first order tributary we called Seminole Hills Branch . The background site is adjacent to Sunbelt sand mine next to the Steelfield Landfill. These bioassessments were technical support requested by the FDEP Northwest District's Waste Management Cleanup Section.

Watershed Characteristics

Otter Creek at the bioassessment site (STORET 32020162) is located approximately 5 miles northwest of the West Bay community in Bay County (Latitude N30 degrees 22

minutes 0.0 seconds; Longitude W85 degrees 55 minutes 4.7). It is a second order stream draining silviculture and wetland areas. The headwaters originate over 3 miles upstream of the sample site. Otter Creek flows to Choctawhatchee River before emptying into Choctawhatchee Bay. Otter Creek is designated Class III waters for recreation and maintenance of a healthy, well-balanced aquatic community. The watershed drains the Gulf Coast Flatwoods of subecoregion 75a. There was evidence the sample reach was at one time a mill site serving the abandoned Seminole Hills community. Many heartwood pine posts possibly used to support a water transport flume were still embedded in the stream bed.

Results

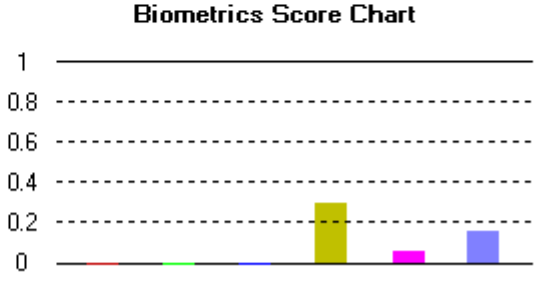
The bioassessment indicated a severely impaired biological community, scoring only 1 out of 10 for the BioRecon Score. All 6 biological indicators failed thresholds established for a healthy aquatic wildlife community:

Biometrics	Metric Score
# TOTAL TAXA	0
# EPHEMEROPTERA TAXA	0
# TRICHOPTERA TAXA	0
# LONG-LIVED TAXA	0.3
# CLINGER TAXA	0.06
# SENSITIVE TAXA	0.16
TOTAL METRIC SCORE :	0.52
/ Correction Factor :	0.6
= BIORECON SCORE :	1

Pass 6 - 10
Fail 0 - 5

OTTER CREEK @ SW3 STEELFIELD LANDFILL

BioRegion : Panhandle West
Sample Date : Oct 11, 2006



The macroinvertebrate community consisted of a total of only 16 taxa dominated by hundreds of pollution tolerant midges including bloodworms (chironomidae), sow bugs (Isopoda), and scuds (Amphipods). Mayflies (Ephemeroptera) and caddisflies (Trichoptera), major components of healthy panhandle streams, were noticeably missing. Only one taxa of stonefly (Plecoptera) was present with about a dozen individuals collected. The stonefly, Leuctra is a dominant taxa in low order Panhandle streams during the fall that shreds and feeds on hardwood leaves. Seminole Hills Branch, the background site had almost three times the taxa (47), mainly clean water indicators. About half the background's total taxa (22) were stoneflies (3), caddisflies (11), and mayflies (8) known as EPT, the foundation of a well-balanced stream

community.

The Otter Creek Habitat Assessment rated marginal (49%), down-graded by poor conditions of Habitat Smothering (100% iron/sulfur bacteria), Substrate Diversity, Substrate Availability, and Right bank Riparian Buffer Zone Width. Right bank Riparian Zone Vegetation Quality rated a marginal score. Water Velocity, Artificial Channelization, and Right Bank Stability rated suboptimal. Left bank Bank Stability, left bank Riparian Buffer Zone Width, and left bank Riparian Zone Vegetation Quality rated optimal.

The sediments were completely covered by iron/sulfur bacteria and were anaerobic with hydrogen sulfide odors. The water had a metallic iron odor with sheen of iron/sulfur bacteria. The iron concentration in the water at SW-3 was 2.58 mg/l in violation of the Florida Administrative Code 62-302.530(39) of 1 mg/l. Iron/sulfur bacteria were over-abundant at 100% area coverage. The dissolved oxygen (DO) concentration of 4.06 mg/l at 0.11 meters depth was in violation of the Florida Administrative Code 62-302.530(31), ("shall not be less than 5 mg/l"). The percent DO concentration was 46 %. The Seminole Hills Branch background was 6.44 mg/l DO and 73% saturation. Water temperature was 21.78 degrees centigrade compared to 21.97 degrees at Seminole Hills Branch. The Otter Creek DO concentration would be expected to drop during June through September as the water temperatures increase due to summer heat and microbial action. Conductivity was 108 umho/cm; background conductivity in area streams is less than 50 umho/cm (61 umho/cm at Seminole Hills Branch, which was receiving some Otter Creek water from a man-made connecting channel).

Conclusions

The Otter Creek site did not meet Class III State Water Quality Standards 62-302 for recreation and the propagation and maintenance of a healthy, well-balanced population of fish and wildlife. The bloom of iron bacteria fed by landfill leachate smothered 100% of aquatic wildlife habitat, which caused a severely imbalanced biological community. EPT, the basis for healthy panhandle streams had only 1 EPT taxa at Otter Creek SW3. In contrast, 22 taxa were found at Seminoles Hills Branch background, a small tributary a few hundred yards below the Otter Creek site. Iron/sulfur bacteria and the associated precipitated iron smother the gills of fish and wildlife. In addition, high concentrations of iron can disrupt cell membranes and damage DNA of aquatic animals and plants. The pollution load from the landfill leachate not only affects Otter Creek, but is transported down stream, eventually into Choctawhatchee Bay . Fish kills and algal blooms, including Red Tide has affected Choctawhatchee Bay. Gulf sturgeon, a federally listed endangered species were included in the dead fish observed washed upon the upper bay shoreline during Red Tide bloom complaint responses. Iron is a contributor to Red Tide blooms in marine waters and excessive iron loading may have been a contributing factor in Choctawhatchee Bay.

Of the thousands of Northwest District stream sites sampled over the past 30 plus

years, only a few were matted with red flocculent organic matter and those were affected by landfills (Coffee Creek-Beulah landfill, Majette Branch-Bay County landfill, Beaver Pond Creek and Rest Area Run-Perdido landfill, Pace Mill Creek-Pace landfill, Sandy Creek-Central landfill, Baggett Creek-Baker landfill, Turkey Creek-Niceville landfill, Harrison Branch-American Cyanamid landfill, Little Reedy Creek-Mudhill landfill, Mitchell Creek-Camp Five landfill, Goodwin Creek-Freeport C&D landfill, Eightmile Creek-Autoshred landfill, Muscogee Creek-International Paper landfill, Swampy Creek-Coyote landfill, and Klondike landfill-Klondike Branch). Evidence of iron/sulfur bacteria have been observed to a lesser extent in other disturbed small streams during low flow conditions (iron pipe-Ten Mile Creek, clay/sand mining/washing-Bottle Branch, and below dams-Wiggins Branch. Blooms of iron/sulfur bacteria are not natural in Florida Panhandle streams, although iron is naturally found in certain Panhandle soils. Iron/sulfur bacteria blooms that have been observed were the result of anthropogenic disturbance. For comparison, algae are normally present in Panhandle waters in low concentrations as are its main nutrients - nitrogen and phosphorus. Nuisance blooms do not occur unless there is anthropogenic input that increases the concentration of nutrients in the water. Sources of excessive bloom-causing nitrogen and phosphorus include fertilizers and domestic wastewater. Iron/sulfur bacteria reacts and blooms similarly to excessive iron and sulfur leachate from landfills as algae does to the addition of nitrogen and phosphorus fertilizer. The i ron and sulfur become an abundant and readily available food source for bacteria after being dissolved into ferrous iron and sulfides. The panhandle's low pH groundwater, the burying of iron containing metals and sulfur products (i.e. drywall), addition of organic material, and the anaerobic conditions of landfills are ideal for the proliferation of iron/sulfur bacteria.

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