STREAM ECOSUMMARY

Live Oak Creek above Eglin Road 234
February 26, 2008

FDEP conducted water quality and biological monitoring at Live Oak Creek in Okaloosa County on February 26, 2008, to assess attainment of designated uses. The monitoring documented stream restoration activities by Eglin Air Force Base and assisted with training and quality assurance for the Jackson Guard USFWS staff conducting the Base's biomonitoring program. Overall, the macroinvertebrate community and water quality data indicated that the stream met expectations for a healthy, well-balanced stream.



Figure 1. BioRecon Index site for Live Oak Creek above Eglin Road 234 on 02/26/2008.

Background

Although healthy, well-balanced stream and river communities may be maintained with some level of human activity, such 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. FDEP 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. FDEP 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 is associated with interference with the designated use. The Biological Reconnaissance (BioRecon) 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 BioRecon score.

Methods

This stream was sampled on 02/26/2008 by the FDEP Northwest District Office. Surface water samples were collected following FDEP Standard Operating Procedures (SOPs, see http://www.dep.state.fl.us/water/sas/sop/sops.htm for details). Sampling and analyses met FDEP quality assurance/ quality control standards (see http://www.dep.state.fl.us/water/sas/qa/index.htm). The BioRecon was sampled per FDEP SOP FS7410 and calculated per FDEP BioRecon_2004 scoring

(FDEP SOP version 2/1/04). BioRecon is a rapid community based biological assessment of stream health using benthic macroinvertebrates sampled via four sweeps of a D-frame dip net, with organisms (excluding worms, midges, and mites) identified to the lowest practical taxonomic level. The BioRecon_2004 is composed of six metrics, which decrease in response to human disturbance. These include Total # of Taxa, Ephemeroptera Taxa, Trichoptera Taxa, Long-Lived Taxa, Clinger Taxa, and Sensitive Taxa. The BioRecon rating categories were: "Pass" 6-10 score, "Fail" 0-5. The Stream and River Habitat Assessment was conducted per FDEP 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).

Site Information

Live Oak Creek (STORET #33030119) at the bioassessment site (Figure 2) (Lat. 30^{o} 30' 39.6 " Long. 86^{o} 42' 52.6") is a stream fed by numerous steephead springs along its course. It originates just above Eglin Air Force Base's weapons test range B-70. The sample site is about 5 miles northwest of Fort Walton Beach. Live Oak Creek flows into Pensacola Bay via East Bay River and drains the Southern Pine Plains and Hills subecoregion (65f).



Figure 2. BioRecon Location of Live Oak Creek on Eglin Air Force Base in Okaloosa County.

Two BioRecon samples on August 15, 2000, at this site failed thresholds for 2 of 3 biological indicators for a healthy stream wildlife community. The duplicate BioRecons were collected by Eglin and FDEP to determine impacts from Range B-70 military mission activities on Live Oak Creek. Management at Jackson Guard had asked FDEP staff for assistance with biological monitoring and aerial reconnaissance of Eglin watersheds to identify sediment sources and potential background areas. Aerial surveillance over Live Oak Creek on Range B-70 revealed many bomb craters in and around the stream and its riparian zone (Figure 3).



Figure 3. Eglin Range B-70 bridge bomb target site on Live Oak Creek.

Bridge targets were traditionally built on streams, which clearly caused damage to the stream and riparian zone. Discussions between FDEP and Eglin staff resulted in the relocation of these bridge targets to the uplands (Figure 4). Locating pre-fabricated bridge targets on the uplands would save much time and reconstruction cost each time the target was destroyed in addition to minimizing fish and wildlife destruction.

Results

Water Quality

The water quality samples complied with water quality criteria (Table 1). The winter water temperature (20.88°C) reflected the groundwater influence of the steephead springs feeding the system. The summer (08/15/2000) sample temperature was 22.05°C indicating the effect of the stable annual groundwater temperature. The low pH

(4.8 SU) and specific conductance (14 µmhos/cm) were typical of the quartz sand and gravel aquifer in the western Florida Panhandle. The percent dissolved oxygen saturation was 85.8%, which exceed the proposed minimum of 67% saturation for the western Panhandle. Fine organic particulate matter (FPOM) was observed on the stream bed, potentially associated with historical weapons testing and support (i.e. bomb explosions, clay mines, dirt roads) upstream in and below Range B-70.

Table 1. Water quality results from 02/26/2008 at Live Oak Creek above Eglin Road 234.

Analyte	Result	Remark	Applicable Class III Water Quality Criteria
Field Temperature (°C)	20.88		
Field pH (SU)	4.8		
Field Dissolved Oxygen (mg/L)	7.64		≥5.0
% Dissolved Oxygen Saturation	85.8		
Field Specific Conductance (µmhos/cm)	14		Not to exceed 50% of background or 1275 µmhos/cm

Habitat Assessment

The stream habitat assessment scored 94 in the suboptimal range. This score was identical to the 2000 stream habitat score. Water Velocity, Artificial Channelization, and Riparian Zone Vegetation Quality (Young Atlantic white cedar forest beginning to overshadow pioneer titi shrub community) were optimal. Substrate Diversity was suboptimal. Substrate Availability (lacked leaf pack//mat) and Bank Stability (increased width –impounded by road fill, logging, fire) were marginal. Habitat Smothering (silt, algae, impounding from sediment runoff) and Riparian Buffer Zone Width (clay road runoff in lower sample reach) were poor. Note that habitat conditions were adequate to support a healthy, well balanced biological community.

BioRecon Index

The BioRecon_2004 score for this site was 9 out of a possible 10 points. This sample passed all of six BioRecon 2004 metric thresholds, resulting in a "Pass" designation. This BioRecon showed significant improvement (Taxa 47, FI 35, EPT 27) compared to the FDEP and Eglin sampling conducted on 08/15/2000 (Taxa 31 & 32, FI 18 &14, EPT 16 & 13). The EPT, mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera), are the more sensitive orders (Florida Index or FI) of the stream community. The EPT made up 58% of this sample compared to 34% in 2000. The EPT normally comprise about 50% of the aquatic macroinvertebrate in the healthiest Panhandle streams. Stoneflies, the most sensitive to pollution increased to 3 species and 13% of the sample in 2008 from 1 species and 4% in 2000.

Periphyton

The attached algal community in the stream, which consisted of diatoms and filamentous green algae on wood, roots, and submerged vegetation, did not interfere with a healthy, well balanced invertebrate community.. The open canopy of the young riparian forest allowed for algal growth on most substrates. Some growth of algae (typically diatoms) is expected in a fully functioning stream, but an over abundance of algae (especially filamentous algae) may reduce habitat quality (from smothering) and lead to excess organic matter production (and decomposition), which can harm fish and invertebrates.



Figure 4. Range B-70 Bridge bombing target rebuilt on top of hill away from Live Oak Creek.

Conclusions

Removing the bridge bombing target at Live Oak Creek on Range B-70 to an upland site (Figure 4) appeared to have a noteworthy benefit to the health of the stream biota. Additionally, conscientious adherence to Best Management Practices for dirt

road, mine pit, and range activities contributed to the improved stream health. Continued improvement is expected as the riparian forest grows to maturity. It will provide shade, wood and leaves for habitat plus a food source to the stream. The observed FPOM should be assimilated by the riparian vegetation.

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. Previous Ecosummary Reports on Live Oak Creek and by this author are available from Devan Cobb devan.r.cobb@dep.state.fl.us

Contact and resources for more information

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