EcoSummary

Puddin Head Creek below dam in Rocky Bayou State Park

January 24, 2006

NPS BIOASSESSMENTS

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.

Introduction



This BioRecon was performed below the Puddin Head dam in the Rocky Bayou State Park. Determination of biological and water quality impacts from the Puddin Head dam on stream health were needed. Rocky Bayou State Park Aquatic Preserve http://www.dep.state.fl.us/coastal/sites/rocky/, http://www.dep.state.fl.us/coastal/sites/rocky/info.htm and Fred Gannon Rocky Bayou State Park management requested bioassessments in support of the 1991 Rocky Bayou Aquatic Preserve management plan http://www.dep.state.fl.us/coastal/downloads/management_plans/aquatic/RockyBayou.pdf .

This plan states the "Rocky Bayou State Park Aquatic Preserve was designated as such in 1970 for the primary purpose of preserving the biological resources in the area and maintaining these resources in an essentially natural condition. The main objective of the resource management program for the Rocky Bayou State Park Aquatic Preserve is to protect the preserve's natural resources for the benefit of future generations. The management of the preserve will be directed toward the maintenance of essentially natural conditions. On site management activities include actions by field personnel to protect plant communities, animal life, geologic features, archaeological sites, and water resources of the preserve. Management activities will also focus on cumulative

impacts and encroachments."

Chapter 18-20, Florida Administrative Code specifically addresses aquatic preserves. The intent of rule is contained in Section 18-20.001, F.A.C., which states in part (1) "All sovereignty lands within a preserve shall be managed primarily for the maintenance of essentially nature conditions, the propagation of fish and wildlife..." (2)"...established for the purpose of being preserved in essentially natural or existing condition so that their aesthetic, biological and scientific values may endure for the enjoyment of future generations."(3) "The preserves, shall be administered and managed in accordance with following goals: (a) to preserve, protect, and enhance these exceptional areas of sovereignty submerged lands by reasonable regulation of human activity within the preserves through the development and implementation a comprehensive management program; (e) to encourage the protection, enhancement, or restoration of the biological, aesthetic, or scientific values of the preserves, including but not limited to modification of existing man-made conditions towards their natural condition, and discourage activities which would degrade the aesthetic, biological, or scientific values, or the quality, or utility of a preserve, when reviewing applications, or when developing and implementing management plans for the preserves; (f) to preserve, promote, and utilize indigenous life forms and habitats... (h) to maintain those beneficial hydrologic and biologic functions..."

Watershed Characteristics

Puddin Head is a steephead stream/ravine, a unique geologic feature found in Rocky Bayou State Park. Steepheads are stream valley habitats formed when ground water emerges through porous sand on a hillside to form the head of a stream. "Because steepheads are highly localized phenomenon, known only from the Florida panhandle, they are rather isolated environments. Some species are uniquely adapted to the steephead environment, and are only found in the steephead stream/ravine" (Rocky Bayou Aquatic Preserve Management Plan, 1991).

The Puddin Head steephead stream had been dammed to create Puddin Head Lake. The dam blew-out in May 1991 filling the down stream channel and riparian wetlands with sediments. The dam was rebuilt to recreate the impoundment. The headwaters of Puddin Head have been disrupted by widening Highway 20. Contours have been re-graded and a stormwater pipe discharged into the headwater waters. A steephead stream to the east of Puddin Head, "Gannon" Creek also has been dammed. It has been converted to a residential impoundment (see attached USGS map for pre-development condition).

Puddin Head at the bioassessment site (STORET 32010090) was located less than a mile east of Niceville in Okaloosa County (Latitude N30 degrees 29 minutes 57.3 seconds; Longitude W-86 degrees 25 minutes 32.6). This stream drains the sandhills on the south shore of Rocky Bayou. Puddin Head flows directly to Rocky Bayou, which empties into Choctawhatchee Bay. The watershed is in the Gulf Coast Flatwoods of subecoregion 75a. Puddin Head is designated Class III Florida Outstanding Florida

Water (OFW) (DEP 2008 Surface Water Quality Standards 62-302.700 Special Protection, Outstanding Florida Waters, Outstanding National Resource Waters (9)(c) State Park 27. and (h) Aquatic Preserve 34.) for recreation a nd maintenance of a healthy, well-balanced aquatic community.

The Rocky Bayou Aquatic Preserve management plan states "Due to its natural attributes the Rocky Bayou Aquatic Preserve was designated as an "Outstanding Florida Water" on March 1, 1979. An OFW designation by the Department of Environmental Protection (DEP) places more stringent standards in the issuance of DEP permits. Permit applications for activities that lower ambient water quality within designated OFW's are normally denied."

Results

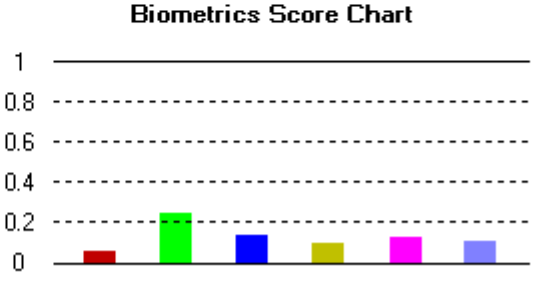
The bioassessment indicated a severely impaired biological community, scoring only one out of ten for the BioRecon Score. All six biological indicators failed thresholds established for a healthy aquatic wildlife community:

Biometrics	Metric Score
# TOTAL TAXA	0.06
# EPHEMEROPTERA TAXA	0.25
# TRICHOPTERA TAXA	0.14
# LONG-LIVED TAXA	0.1
# CLINGER TAXA	0.13
# SENSITIVE TAXA	0.11
TOTAL METRIC SCORE :	0.79
/ Correction Factor :	0.6
= BIORECON SCORE :	1

Pass 6 - 10
Fail 0 - 5

PUDDIN HEAD CREEK BELOW DAM
ROCKY BAYOU STATE PARK

BioRegion : Panhandle West
Sample Date : Jan 24, 2006



The benthic macroinvertebrates represented a typical pollution tolerant community found below impoundments. The Total Taxa Florida Index, and the EPT (Ephemeroptera - mayfly, Plecoptera - stonefly, Trichoptera - caddisfly) biometrics scored well below the expected values. Biometric scores to compare Puddin Head with some nearby Eglin Air Force Base steephead streams in the Choctawhatchee Bay drainage are listed below:

Site	Station Number	Total Taxa	Florida Index	EPT

Puddin Head Creek below dam	32010090	18	6	4
Loblolly Bay Branch Eglin Road 217	32010094	42	24	20
Sourwood Branch off Site C-6 Road	32010096	42	28	21
Long Creek ER 406	32010245	36	25	22
Long Creek ER 469	32010258	55	30	26
Swift Creek ER 626	32010072	33	24	19

Loblolly Bay Branch Eglin Road 217 was sampled two days later as a control and is located about 2,400 meters to the northeast (64 degrees) of the Puddin Head site. Another comparison for an Eglin steephead stream similar in size to Puddin Head, Sourwood Branch located about 15 miles to east northeast (75 degrees), had biometric scores akin to Loblolly Bry Branch. Long Creek ER 406, Long Creek ER 469, and Swift Creek ER 626 (before railroad trestle channelization restoration) are the other listed steephead stream systems found in the local Rocky Bayou drainage.

Out of the 70 total organisms collected in this Puddin Head sample, which was about half the expected number because of the sediment deposition, only 18 were EPT. EPT are the most diverse indicators of stream health in the panhandle steephead streams. They were depressed to four taxa, less than quarter of the expected community. Three taxa of tolerant mayflies, *Callibaetis* and two *Caenis* species were found. Stoneflies, the best indicator of healthy streams were absent, although common to abundant in the control sites. The only caddisfly taxa found, *Cheumatopsyche,* is usually the only EPT collected in severely polluted panhandle streams. The Asian clam, *Corbicula fluminea*, an invasive species was also collected, a very usual occurrence to find in a former soft water steephead habitat managed to maintain natural conditions.

This Puddin Head site Habitat Assessment rated suboptimal (60%). Habitat Smothering (mainly fine organic muck) rated Poor. Substrate Diversity and Riparian Zone Vegetation Quality rated marginal. Substrate Availability and Bank Stability rated suboptimal. Water Velocity, Artificial Channelization, and Riparian Buffer Zone Width, rated optimal. The stream channel was very braided from the past dam failure filling the original streambed with fine organic particulate matter (FPOM). The formerly forested riparian zone was represented by 90% coverage of shrub-size vegetation. The wetland trees were killed by sediment deposition from the historical dam failure.

The dissolved oxygen (DO) concentration was 7.1 mg/l at 0.1 meters depth and met

Water Quality Standards in the Florida Administrative Code 62-302.530(31), ("shall not be less than 5 mg/l"). The percent DO concentration was 75% lower than expected in panhandle streams, probably cause by the oxygen demand from bacteria consuming the FPOM. Conductivity was 50 umho/cm, typical of panhandle streams with very low salt concentrations in quartz sand soils. The pH was 7.49 standard units, much above the typical acidic waters (pH 4-6) of the non-buffered western panhandle sand hills. The increase pH allowed the exotic Asian clam to become established on the Aquatic Preserve. The pH increase probably was from the buffering capacity of the algae and plant growth in the impoundment and/or possible lime addition as an attempt to boost fish production. The small steephead on Puddin Head's east border had a more typical pH of 4.1,which is characteristic of local background conditions. Water temperature was 18.1 degrees centigrade.

Sediment had a hydrogen sulfide odor. Sediment and water surface oils (iron/sulfur bacteria cell metabolites) were moderate on the soil with sheen of iron/sulfur bacteria on the water surface. The water was clear, with no color or odor. The secchi disc reading was visible on the bottom at one meter. Iron/sulfur bacteria, periphyton, aquatic macrophytes, and fish were common. A pygmy sunfish and a few mosquito fish were observed. Frogs and salamanders typical components of steephead systems were not observed.

Conclusions

This Puddin Head 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 major reason for the impairment was habitat alteration by damming the Puddin Head steephead stream. Additional damage has been created by previous catastrophic dam failure that caused sediments to fill the stream channel and wetlands. The Highway 20 stormwater runoff needs to be directed away from the Puddin Head watershed to improve stream health. Best management practices are needed while using pesticides in or near the Aquatic Preserve to protect sensitive clean water dependent wildlife.

Proposals have been made by the Rocky Bayou Aquatic Preserve management to remove the dam and restore the Puddin Head steephead to natural conditions. This restoration project would support the Rocky Bayou Aquatic Preserve management plan's "primary purpose of preserving the biological resources in the area and maintaining these resources in an essentially natural condition. The main objective of the resource management program for the Rocky Bayou State Park Aquatic Preserve is to protect the preserve's natural resources for the benefit of future generations."

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For more information on the DEP Bioassessment programs, please visit
our web site at http://www.dep.state.fl.us/water/bioassess

Puddin Head Creek below dam in Rocky Bayou State Park

