Terrapin Creek at Cleburne County Road 202 (33.89420/-85.46410)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Terrapin Creek watershed for biological and water quality monitoring as part of the 2005 Assessment of the Alabama, Coosa, and Tallapoosa (ACT) River Basins. The objectives of the ACT Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the ACT basin group.
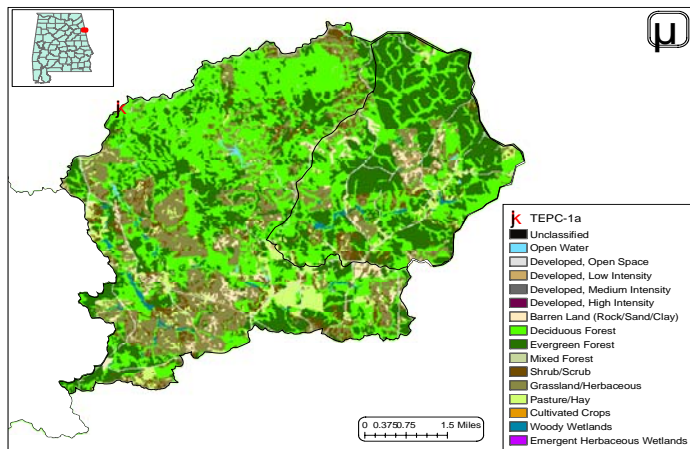

Figure 1. Sampling location and landuse within the Terrapin Creek watershed at TEPC-1a.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Terrapin Creek at TEPC-1a is a *Fish & Wildlife (F&W)* stream that drains approximately 41 mi^2 in Cleburne County and part of the northeast corner of Haralson County, Georgia (Fig. 1). Landuse within the watershed is a mix of forest (61%), grasslands, and pastures. Extensive silviculture was also observed in the watershed during roadside reconnaissance in November 2004. This watershed contains one permitted storm water discharge. It is part of the Talladega Upland (45d) ecoregion which contains the more mountainous parts of the region and has a slightly wetter and cooler climate as compared to other areas of the Alabama-Georgia Piedmont.

REACH CHARACTERISTICS

General observations (Table 2) and habitat assessments (Table 3) were completed during the macroinvertebrate assessment. In comparison with reference reaches in the same ecoregion, they give an indication of the physical condition of the site and the quality and availability of habitat. Terrapin Creek at TEPC-1a is a high-gradient stream characterized by cobble, gravel, and sand substrates. Overall habitat quality was rated as *optimal*. However, sediment deposition was rated *marginal*, with fine particles possibly beginning to fill the interstitial spaces that are vital habitat for macroinvertebrates.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Drainage Area (mi^2)		41
Ecoregion[a]		45d
% Landuse		
Open water		<1
Wetland	Woody	1
Forest	Deciduous	40
	Evergreen	21
	Mixed	<1
Shrub/scrub		5
Grassland/herbaceous		22
Pasture/hay		6
Development	Open space	2
	Low intensity	<1
Barren		2
Population/km^2 [b]		4
# NPDES Permits[c]	**TOTAL**	1
Construction Stormwater		1

a. Talladega Upland

b. 2000 US Census data

c. #NPDES permits downloaded from ADEM's NPDES Management System database, 9 Jun 2008

Table 2. Physical characteristics at TEPC-1, May 4, 2005.

Physical Characteristics		
Width (ft)		35
Canopy cover		Mostly Shaded
Depth (ft)		
	Riffle	0.5
	Run	1.2
	Pool	2.5
% of Reach		
	Riffle	15
	Run	75
	Pool	10
% Substrate		
	Boulder	5
	Cobble	35
	Gravel	25
	Sand	15
	Silt	7
	Organic Matter	13

BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). The WMB-I uses measures of taxonomic richness, community composition, and community tolerance to assess the overall health of the macroinvertebrate community. Each metric is scored on a 100 point scale. The final score is an average of the score for each metric. Taxa richness and composition measures were negatively affected by a low percentage of stoneflies (Plecoptera), one of the more pollution sensitive aquatic insect orders, leading to a *fair* bioassessment rating overall at TEPC-1a (Table 4).

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Table 3. Results of the habitat assessment conducted at TEPC-1a on May 4, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	82	Optimal (> 70)
Sediment deposition	58	Marginal (41-58)
Sinuosity	80	Sub-optimal (65-84)
Bank and vegetative stability	83	Optimal (≥75)
Riparian buffer	74	Sub-optimal (70-90)
Habitat assessment score	184	
% Maximum score	**77**	**Optimal (> 70)**

Table 4. Results of the macroinvertebrate bioassessment conducted at TEPC-1a on May 4, 2005.

Macroinvertebrate Assessment Results			
	Results	Scores	Rating
Taxa richness measures		**(0-100)**	
# Ephemeroptera (mayfly) genera	13	100	Excellent (>85)
# Plecoptera (stonefly) genera	3	50	Good (50-75)
# Trichoptera (caddisfly) genera	10	83	Good (67-83)
Taxonomic composition measures			
% Non-insect taxa	6	77	Good (74.1-87.1)
% Non-insect organisms	1	98	Excellent (>97)
% Plecoptera	2	10	Poor (6.56-13.1)
Tolerance measures			
Beck's community tolerance index	23	82	Excellent (>80.4)
WMB-I Assessment Score	**---**	**72**	**Fair (48-72)**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected monthly, semi-monthly (metals), or quarterly (pesticides, herbicides (atrazine), and semi-volatile organics) during March through October of 2005 to help identify any stressors to the biological communities. *In situ* measurements indicated Terrapin Creek at TEPC-1a to be meeting established water quality criteria for its *F&W* use classification. Intensive water quality sampling showed median values of all parameters to be similar to the 90th percentile of verified ecoregional reference reach samples collected in the Talladega Upland ecoregion. Fecal coliform counts were >200 col/100mL during flood conditions in March (730 col/100mL) and July (400 col/100mL).

CONCLUSIONS

Bioassessment results indicated the macroinvertebrate community to be in *fair* condition, mostly due to low percentage of stonefly (Plecoptera) organisms. The primary concern within Terrapin Creek at TEPC-1a was habitat degradation and siltation.

Table 5. Summary of water quality data collected March-October, 2005. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL) when results were less than this value. Median, average (Avg), and standard deviations (SD) values were calculated by multiplying the MDL by 0.5 when results were less than this value. Metals results were compared to ADEM's chronic aquatic life use criteria adjusted for hardness.

Parameter	N	Min		Max		Median	Avg	SD
Physical								
Temperature (°C)	7		11.0		27.0	18.0	19.7	5.3
Turbidity (NTU)	7		2.5		60.1	6.3	19.9	23.8
Total dissolved solids (mg/L)	6		16.0		81.0	34.0	41.7	26.5
Total suspended solids (mg/L)	6		5.0		66.0	8.0	24.8	28.6
Specific conductance (µmhos)	7		31.2		43.9	38.6	37.5	5.7
Hardness (mg/L)	4		8.2		12.3	10.6	10.4	2.1
Alkalinity (mg/L)	6		7.9		15.3	9.7	10.9	3.2
Stream Flow (cfs)	4		9.1		79.8	62.6	53.5	---
Chemical								
Dissolved oxygen (mg/L)	7		6.8		10.2	8.7	8.5	1.2
pH (su)	7		7.0		8.1	7.2	7.4	0.4
Ammonia Nitrogen (mg/L)	6	<	0.015	<	0.015	0.011	0.011	0.004
Nitrate+Nitrite Nitrogen (mg/L)	6		0.009		0.073	0.041	0.042	0.021
Total Kjeldahl Nitrogen (mg/L)	6	<	0.150		0.811	0.157	0.274	0.284
Total nitrogen (mg/L)	6		0.115		0.863	0.179	0.316	0.294
Dissolved reactive phosphorus (mg/L)	6	<	0.004		0.008	0.004	0.005	0.002
Total phosphorus (mg/L)	6		0.018		0.077	0.052	0.049	0.023
[J] CBOD-5 (mg/L)	6	<	1.0		3.6	1.1	1.3	1.2
[J] Chlorides (mg/L)	6		3.4		3.9	3.7	3.7	0.2
Atrazine (µg/L)	1			<	0.05			
Total Metals								
Aluminum (mg/L)	3	<	0.015		0.09	0.075	0.058	0.044
Iron (mg/L)	3		0.539		1.35	0.764	0.884	0.419
Manganese (mg/L)	3		0.022		0.08	0.078	0.060	0.033
Dissolved Metals								
Aluminum (mg/L)	3	<	0.015	<	0.015	0.0075	0.008	0.0
Antimony (µg/L)	3	<	2	<	2	1	1	0.0
Arsenic (µg/L)	3	<	10	<	10	5	5	0.0
Cadmium (mg/L)	3	<	0.005	<	0.005	0.0025	0.0025	0.0
Chromium (mg/L)	3	<	0.004	<	0.004	0.002	0.002	0.0
Copper (mg/L)	3	<	0.005	<	0.005	0.0025	0.003	0.0
Iron (mg/L)	3		0.247		0.578	0.45	0.425	0.167
Lead (µg/L)	3	<	2	<	2	1	1	0
Manganese (mg/L)	3	<	0.005		0.022	0.0025	0.009	0.011
[J] Mercury (µg/L)	3	<	0.3	<	0.3	0.15	0.2	0.1
Nickel (mg/L)	3	<	0.006	<	0.006	0.003	0.003	0.0
Selenium (µg/L)	3	<	10	<	10	5	5	0
Silver (mg/L)	3	<	0.003	<	0.003	0.0015	0.0015	0.0
Thallium (µg/L)	3	<	1	<	1	0.5	0.500	0
Zinc (mg/L)	3	<	0.006	<	0.006	0.003	0.003	0.0
Biological								
[J] Chlorophyll *a* (µg/L)	6		0.27		3.74	1.34	1.65	1.2
[J] Fecal Coliform (col/100 mL)	6		11		730	20	200	301

J=estimate; N=# samples; M=value> 90th % tile of samples collected at (45d) eco-regional reference reaches.