

2005 Monitoring Summary



Brushy Creek at Monroe County Rd 20 (31.48535/-87.28425)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Brushy 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.

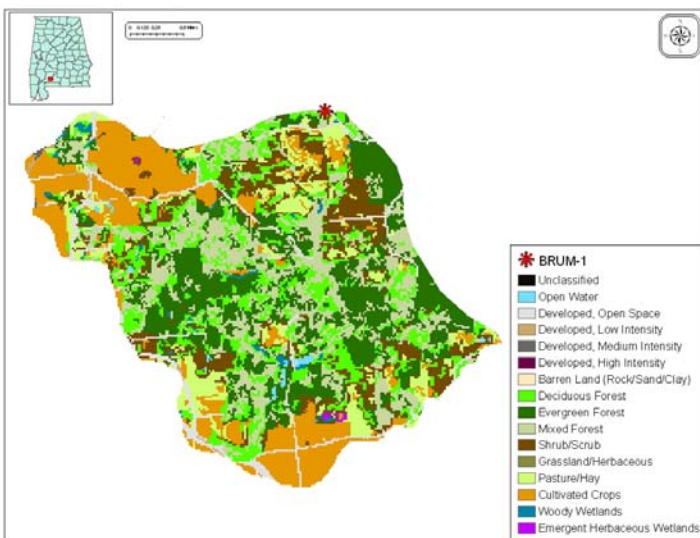


Figure 1. Sampling location and landuse within the Brushy Creek watershed at BRUM-1.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Brushy Creek is a small Fish & Wildlife (F&W) stream located in the Alabama River basin, south-east of the city of Monroeville. Broad, gently sloping ridgetops, with steeper side slopes near drainage areas, and low to moderate gradient sand and clay bottomed streams, are characteristic of the Southern Pine Plains and hills ecoregion (65f) where Brushy Creek is located. Landuse within the watershed is primarily forest (56%) and agricultural (25%) (Fig. 1).

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. Brushy Creek at BRUM-1 is typical of ecoregion 65f, characterized by a moderate-gradient and sand and gravel substrates. Overall habitat quality was categorized as *marginal* mostly due to a lack of riparian buffer. Sediment deposition and bank erosion were also observed. Active pasture grazing up to the stream bank was noted throughout the entire reach.

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. Metric results for macroinvertebrate richness indicated good populations of mayflies and stoneflies. The overall WMB-I scored BRUM-1 with a *fair* community condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics	
Drainage Area (mi ²)	9
Ecoregion ^a	65f
% Landuse	
Open water	<1
Wetland	Woody 1
Forest	Deciduous 15
	Evergreen 22
	Mixed 19
Shrub/scrub	13
Grassland/herbaceous	<1
Pasture/hay	8
Cultivated crops	17
Development	Open space 4
Population/km ^{2b}	26
# NPDES Permits ^c	TOTAL 4
Construction Stormwater	2
Mining	2

a. Southern Pine Plains and Hills

b. 2000 US Census data

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

Table 2. Physical characteristics at BRUM-1

Physical Characteristics	
Width (ft)	20
Canopy cover	Open
Depth (ft)	
	Riffle 0.4
	Run 1.0
	Pool 1.8
% of Reach	
	Riffle 35
	Run 60
	Pool 5
% Substrate	
	Cobble 2
	Gravel 35
	Sand 45
	Silt 10
	Clay 1
	Organic Matter 7

Table 3. Results of the habitat assessment conducted May 25, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	68	Optimal (>65)
Sediment deposition	41	Marginal (40-52)
Sinuosity	83	Sub-optimal (65-84)
Bank and vegetative stability	41	Marginal (35-59)
Riparian buffer	18	Poor (<50)
Habitat assessment score	120	
% Maximum score	50	Marginal (40-52)

Table 4. Results of the macroinvertebrate bioassessment conducted May 25, 2005.

Macroinvertebrate Assessment Results			
	Results	Scores	Rating
Taxa richness measures		(0-100)	
# Ephemeroptera (mayfly) genera	11	92	Excellent (>85)
# Plecoptera (stonefly) genera	6	100	Excellent (>75)
# Trichoptera (caddisfly) genera	5	42	Poor (22-44)
Taxonomic composition measures			
% Non-insect taxa	8	69	Fair (49.4-74.1)
% Non-insect organisms	12	70	Fair (62.7-93.9)
% Plecoptera	6	29	Good (19.7-59.8)
Tolerance measures			
Beck's community tolerance index	15	54	Fair (40.7-60.7)
WMB-I Assessment Score	---	65	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. The median concentration of nitrate+nitrite-nitrogen and total suspended solids were above the concentrations expected in this ecoregion.

CONCLUSIONS

Bioassessment results indicated the macroinvertebrate community to be in *fair* condition. Habitat assessment results and intensive water quality sampling suggested habitat degradation and nutrient enrichment as potential sources of the degraded biological condition. Condition of the streambanks and riparian buffer also suggested the potential for increased stress in the future, if not addressed.

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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	16.0	24.0	21.9	20.7	2.6
Turbidity (NTU)	8	4.6	33.0	7.8	11.7	9.5
Total Dissolved Solids (mg/L)	7	26.0	114.0	50.0	64.9	33.3
Total Suspended Solids (mg/L)	7	3.0	37.0	17.0 ^M	17.9	12.7
Specific Conductance (µmhos)	7	26.4	68.4	50.1	50.6	12.9
Hardness (mg/L)	4	11.5	26.7	23.6	21.4	6.8
Alkalinity (mg/L)	7	8.0	22.3	15.2	16.4	5.3
Stream Flow (cfs)	7	13.4	31	17.2	20.3	---
Chemical						
Dissolved Oxygen (mg/L)	7	7.6	9.74	8.9	8.5	0.8
pH (su)	7	6.6	7.8	7.5	7.4	0.4
Ammonia Nitrogen (mg/L)	7	< 0.015	0.021	0.008	0.011	0.007
Nitrate+Nitrite Nitrogen (mg/L)	7	0.188	0.456	0.389 ^M	0.348	0.111
Total Kjeldahl Nitrogen (mg/L)	7	< 0.150	0.420	0.258	0.263	0.118
Total Nitrogen (mg/L)	7	0.439	0.768	0.616	0.622	0.100
Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.062	0.027	0.024	0.020
Total Phosphorus (mg/L)	7	< 0.004	0.038	0.035	0.029	0.012
CBOD-5 (mg/L)	6	< 1.0	2.5	0.9	1.3	1.0
^J Chlorides (mg/L)	7	4.9	10.0	5.4	6.1	1.8
Atrazine (µg/L)	2	< 0.05	< 0.05	0.03	0.03	---
Total Metals						
Aluminum (mg/L)	4	< 0.015	0.173	0.024	0.057	0.1
Iron (mg/L)	4	0.693	1.26	0.790	0.883	0.3
Manganese (mg/L)	4	< 0.005	0.058	0.024	0.027	0.0
Dissolved Metals						
Aluminum (mg/L)	4	< 0.015	0.055	0.008	0.019	0.024
Antimony (µg/L)	4	< 2	2	1	1	0.0
Arsenic (µg/L)	4	< 10	10	5	5	0.0
Cadmium (mg/L)	4	< 0.005	0.005	0.003	0.003	0.000
Chromium (mg/L)	4	< 0.004	0.004	0.002	0.002	0.000
Copper (mg/L)	4	< 0.005	0.005	0.003	0.003	0.000
Iron (mg/L)	4	0.052	0.162	0.086	0.097	0.048
Lead (µg/L)	4	< 2	2	1	1	0.0
Manganese (mg/L)	4	< 0.005	0.02	0.010	0.011	0.009
Mercury (µg/L)	4	< 0.3	0.3	0.15	0.15	0.00
Nickel (mg/L)	4	< 0.006	0.006	0.003	0.003	0.000
Selenium (µg/L)	3	< 10	10	5	5	0.0
Silver (mg/L)	4	< 0.003	0.003	0.002	0.002	0.000
Thallium (µg/L)	4	< 1	1	0.5	0.500	0.0
Zinc (mg/L)	4	< 0.006	0.006	0.003	0.003	0.000
Biological						
^J Chlorophyll a (µg/L)	7	0.53	17.09	2.14	4.88	6.22
^J Fecal Coliform (col/100 mL)	6	60	600	325	327	235

J = Estimate; N = Number of Samples; M = Value > 90th percentile of verified ecoregional reference reach samples within eco-region 65f