Alabama Department of Environmental Management

Basin Assessment Site

Rivers and Streams Monitoring Program

2005 Monitoring Summary

Fair

Big Wills Creek at unnamed Co. Rd. upstream of exit 218 off I-59 (34.44464/ -85.75066)

BACKGROUND

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

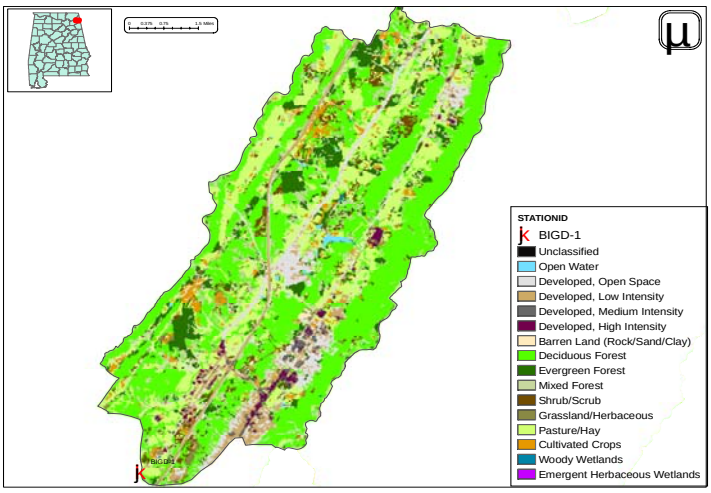

Figure 1. Sampling location and landuse within the Big Wills Creek watershed at BIGD-1.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Big Wills Creek is a *Fish & Wildlife (F&W)* stream in the city of Ft. Payne. It is located in the Southern Limestone/Dolmite Valleys and Low Rolling Hills ecoregion (67f),. Landuse within the watershed is primarily forest (56%), with some agricultural (23%) and urban areas (15%). Interstate 59 runs through the length of the watershed (Fig. 1). There are 54 permitted discharges located along the watershed.

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. Big Will Creek at BIGD-1 is a low-gradient stream with gravel, cobble, and sand substrates. Overall habitat quality was categorized as *sub-optimal* due to sedimentation, bank erosion, and a lack of stable in-stream habitat. The reach was largely pool and run habitat with little riffle area. There is also little riparian habitat along the reach with hay pastures and cattle pens along the banks.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Drainage Area (mi^2)		49
Ecoregion[a]		67f
% Landuse		
Open water		<1
Wetland	Woody	<1
Forest	Deciduous	41
	Evergreen	7
	Mixed	8
Shrub/scrub		4
Grassland/herbaceous		1
Pasture/hay		20
Cultivated crops		3
Development	Open space	8
	Low intensity	5
	Moderate intensity	1
	High intensity	1
Barren		<1
Population/km^2[b]		42
# NPDES Permits[c]	**TOTAL**	54
Construction Stormwater		33
Mining		3
Mining General Permit (old)		10
Industrial General		4
Industrial Individual		1
Municipal Individual		3

a. Southern Limestone/Dolmite Valley and Low Rolling Hills
b. 2000 U.S. Census Data
c. # NPDES permits download from ADEM's NPDES Management System database, 9 Jun 2008

Table 2. Physical characteristics of Big Wills Creek at BIGD-1, May 19, 2005.

Physical Characteristics		
Width (ft)		50
Canopy cover		Est. 50/50
Depth (ft)		
	Riffle	0.3
	Run	1.0
	Pool	2.8
% of Reach		
	Riffle	2
	Run	48
	Pool	50
% Substrate		
	Boulder	5
	Cobble	25
	Gravel	35
	Sand	22
	Silt	5
	Organic Matter	3

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 indicated the macroinvertebrate community to be characterized by pollution-tolerant taxa groups, indicating *fair* community condition.

Table 3. Results of the habitat assessment conducted on Big Wills Creek at BIGD-1 on May 19, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	68	Sub-optimal (59-70)
Sediment deposition	70	Sub-optimal (59-70)
Sinuosity	48	Marginal (45-64)
Bank and vegetative stability	75	Sub-optimal (60-74)
Riparian buffer	54	Marginal (50-69)
Habitat assessment score	159	
% Maximum score	**66**	**Sub-optimal (59-70)**

Table 4. Results of the macroinvertebrate bioassessment conducted on Big Wills Creek at BIGD-1 on May 19, 2005.

Macroinvertebrate Assessment Results			
	Results	**Scores (0-100)**	**Rating**
Taxa richness measures			
# Ephemeroptera (mayfly) genera	15	100	Excellent (>85)
# Plecoptera (stonefly) genera	1	17	Poor (16-31)
# Trichoptera (caddisfly) genera	9	75	Good (67-83)
Taxonomic composition measures			
% Non-insect taxa	10	59	Fair (49.4-74.1)
% Non-insect organisms	2	96	Good (93.9-97.0)
% Plecoptera	1	3	Very Poor (<6.56)
Tolerance measures			
Beck's community tolerance index	11	39	Poor (20.2-40.7)
WMB-I Assessment Score	**---**	**56**	**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. Median values of turbidity, total dissolved solids, nitrate+nitrite-nitrogen, chlorides, hardness, and alkalinity were above values expected in this ecoregion.

CONCLUSIONS

Bioassessment results indicated the macroinvertebrate community to be in *fair* condition. Intensive water quality and habitat assessment results suggest sedimentation, bank erosion, habitat degradation, nutrient enrichment, and urban runoff as potential causes of the degraded biological assessment results.

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.

Parameter	N	Min	Max	Median	Avg	SD
Physical						
Temperature (°C)	9	11.7	25.2	21.5	19.9	5.4
Turbidity (NTU)	9	2.7	12.5	11.2[M]	9.3	3.5
Total dissolved solids (mg/L)	7	105.0	286.0	169.0[M]	171.4	57.7
Total suspended solids (mg/L)	7	5.0	17.0	11.0	10.3	4.3
Specific conductance (µmhos)	9	266.9	337.3	320.1[M]	309.1	24.0
Hardness (mg/L)	5	133.0	165.0	157.0[M]	154.0	12.2
Alkalinity (mg/L)	7	137.6	158.4	143.0[M]	145.3	7.9
Stream Flow (cfs)	9	3.5	61.5	19.7	23.5	---
Chemical						
Dissolved oxygen (mg/L)	9	7.9	11.02	8.6	9.0	1.3
pH (su)	9	7.4	8.01	7.7	7.7	0.2
Ammonia Nitrogen (mg/L)	7	< 0.015	0.071	0.008	0.019	0.024
Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.003	0.413	0.323[M]	0.289	0.134
Total Kjeldahl Nitrogen (mg/L)	7	< 0.150	0.367	0.075	0.159	0.121
Total nitrogen (mg/L)	7	0.076	0.715	0.421	0.448	0.215
Dissolved reactive phosphorus (mg/L)	7	< 0.004	0.015	0.010	0.009	0.005
Total phosphorus (mg/L)	7	0.004	0.070	0.034	0.035	0.022
CBOD-5 (mg/L)	7	1.0	3.6	1.8	2.1	1.0
[J]Chlorides (mg/L)	7	4.6	8.5	5.2[M]	6.0	1.5
Atrazine (µg/L)	1	---	---	---	< 0.03	---
Total Metals						
Aluminum (mg/L)	4	< 0.015	0.209	0.028	0.068	0.1
Iron (mg/L)	4	0.042	0.201	0.093	0.107	---
Manganese (mg/L)	4	< 0.005	0.036	0.014	0.017	0.0014
Dissolved Metals						
Aluminum (mg/L)	4	< 0.015	0.138	0.008	0.040	0.1
Antimony (µg/L)	4	< 2	< 2	1	1	---
Arsenic (µg/L)	4	< 10	< 10	5	5	---
Cadmium (mg/L)	4	< 0.005	< 0.005	0.003	0.003	---
Chromium (mg/L)	4	< 0.004	< 0.004	0.002	0.002	---
Copper (mg/L)	4	< 0.005	< 0.005	0.003	0.003	---
Iron (mg/L)	4	< 0.005	0.014	0.0025	0.005	---
Lead (µg/L)	4	< 2	< 2	1	1	---
Manganese (mg/L)	4	< 0.005	< 0.005	0.0025	0.003	---
Mercury (µg/L)	4	< 0.3	< 0.3	0.15	0.15	---
Nickel (mg/L)	4	< 0.006	< 0.006	0.003	0.003	---
Selenium (µg/L)	4	< 10	< 10	5	5	---
Silver (mg/L)	4	< 0.003	< 0.003	0.002	0.002	---
Thallium (µg/L)	4	< 1	< 1	0.5	0.500	---
Zinc (mg/L)	4	< 0.006	< 0.006	0.003	0.003	---
Biological						
[J] Chlorophyll a (µg/L)	7	< 0.10	2.67	0.80	1.11	1.0
[J] Fecal Coliform (col/100 mL)	7	29	270	83	103	84

J=estimate; N=# samples; M=value > 90% of all verified ecoregional reference reach data collected in ecoregion 67f.

FOR MORE INFORMATION, CONTACT:
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