

2005 Monitoring Summary



Wolf Creek at unnamed county road in Shelby County (33.56883/-86.33817)

BACKGROUND

Wolf Creek was selected 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 site and to estimate overall water quality within the ACT basin group.

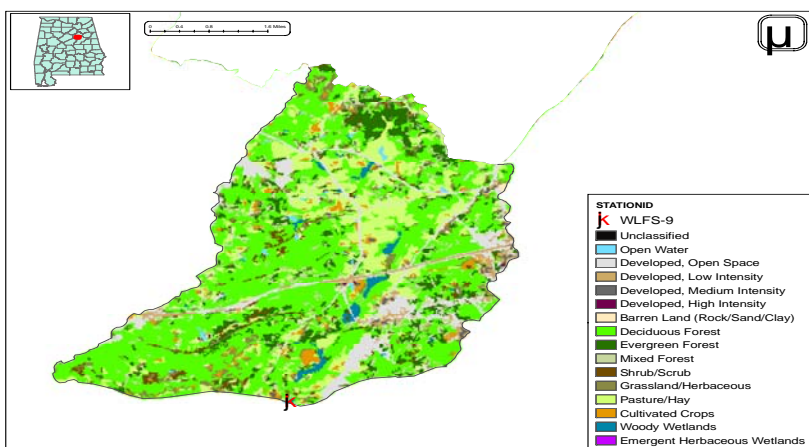


Figure 1. Sampling location and landuse within the Wolf Creek watershed at WLFS-9

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Wolf Creek at WLFS-9 is a *Fish & Wildlife (F&W)* stream located in Shelby County (Fig. 1). It is located in the Coosa River Basin within the Southern Shale Valleys (67g) ecoregion. Landuse in the watershed is forest (59%), with some pasture lands and urban areas (12%). There were twenty eight permitted discharges 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. Wolf Creek at WLFS-9 is a medium gradient, riffle/run stream with bottom substrates consisting mostly of gravel and cobble. Overall habitat quality and availability was rated as *sub-optimal* for supporting diverse aquatic macroinvertebrate communities.

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 all individual metric scores. The final score indicated the biological community at WLFS-9 to be in *poor* condition (Table 4).

Table 1. Summary of Watershed Characteristics.

Watershed Characteristics		
Drainage Area (mi ²)		22
Ecoregion ^a		67g
% Landuse		
Open water		<1
Wetland	Woody	1
	Emergent herbaceous	<1
Forest	Deciduous	47
	Evergreen	8
	Mixed	4
Shrub/scrub		3
Grassland/herbaceous		4
Pasture/hay		16
Cultivated crops		2
Development	Open space	10
	Low intensity	2
	Moderate intensity	<1
	High intensity	<1
Population/km ^{2b}		3
# NPDES Permits ^c	TOTAL	28
	401 Water Quality Certification	1
	Construction Stormwater	23
	Mining General Permit (old)	4

a.Southern Shale Valleys

b.2000 U.S. Census Data

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

Table 2. Physical characteristics of Wolf Creek at WLFS-9, June 28, 2005.

Physical Characteristics		
Width (ft)		35
Canopy cover		Shaded
Depth (ft)	Riffle	0.5
	Run	1.3
	Pool	2.5
% of Reach	Riffle	15
	Run	50
	Pool	35
% Substrate	Boulder	15
	Cobble	20
	Gravel	40
	Sand	18
	Silt	5
	Organic Matter	2

Table 3. Results of the habitat assessment conducted on Wolf Creek at WLFS-9, June 28, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	68	Sub-optimal (59-70)
Sediment deposition	68	Sub-optimal (59-70)
Sinuosity	63	Marginal (45-64)
Bank and vegetative stability	50	Marginal (35-59)
Riparian buffer	86	Sub-optimal (70-90)
Habitat assessment score	165	
% Maximum score	69	Sub-optimal (59-70)

Table 4. Results of the macroinvertebrate bioassessment of Wolf Creek at WLFS-9 conducted on June 28, 2005.

Macroinvertebrate Assessment Results			
	Results Scores		Rating
	(0-100)		
Taxa richness measures			
# Ephemeroptera (mayfly) genera	4	33	Poor (23-46)
# Plecoptera (stonefly) genera	1	17	Poor (16-31)
# Trichoptera (caddisfly) genera	9	75	Good (67-83)
Taxonomic composition measures			
% Non-insect taxa	9	63	Fair (49.4-74.1)
% Non-insect organisms	30	21	Very Poor (<31.3)
% Plecoptera	0	1	Very Poor (<6.56)
Tolerance measures			
Beck's community tolerance index	5	18	Very Poor (<20.2)
WMB-I Assessment Score	---	32	Poor (24-48)

WATER CHEMISTRY

Results of water chemistry 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. Fecal coliform concentration was >2000 colonies/100ml during the site visit in July. Chlorides, total phosphorus, dissolved reactive phosphorus, and total and dissolved iron concentrations were slightly higher than expected for this ecoregion. Results of other physical and chemical analyses were similar to the 90th percentile of all verified reference data within ecoregion 67g.

CONCLUSIONS

Bioassessment results indicated the macroinvertebrate community to be in *poor* condition. Intensive water quality sampling indicated nutrient enrichment, metals, and chloride to be potential sources of the degraded conditions. Fecal coliform concentrations were elevated during the July site visit. This was likely due to a heavy rain days before sampling. Additionally habitat assessment results were scored as *sub-optimal* due to marginal scores for sinuosity and bank stability.

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)	8	12.0	25.0	22.5	20.4	4.8
Turbidity (NTU)	8	8.2	239.0	12.6	48.2	80.4
Total Dissolved Solids (mg/L)	7	25.0	88.0	68.0	63.6	22.1
Total Suspended Solids (mg/L)	7	5.0	134.0	11.0	35.9	48.0
Specific Conductance (µmhos)	8	65.2	124.9	86.0	87.9	21.5
Hardness (mg/L)	6	25.1	52.2	31.3	36.2	12.1
Alkalinity (mg/L)	7	16.3	49.3	29.6	32.9	13.6
Stream Flow (cfs)	4	1.6	16.3	6.2	7.6	---
Chemical						
Dissolved Oxygen (mg/L)	8	4.6c	9.5	6.6	7.2	1.8
pH (su)	8	6.6	7.4	7.1	7.1	0.2
Ammonia Nitrogen (mg/L)	7	< 0.015	0.048	0.008	0.015	0.015
Nitrate+Nitrite Nitrogen (mg/L)	7	0.106	0.248	0.211	0.185	0.056
Total Kjeldahl Nitrogen (mg/L)	7	< 0.150	0.578	0.254	0.295	0.154
Total Nitrogen (mg/L)	7	0.293	0.686	0.446	0.490	0.111
Dissolved Reactive Phosphorus (mg/L)	7	0.005	0.055	0.015 ^M	0.020	0.017
Total Phosphorus (mg/L)	7	0.034	0.115	0.060 ^M	0.062	0.028
CBOD-5 (mg/L)	7	< 1.0	4.9	2.0	2.4	1.6
COD (mg/L)	6	< 2.0	< 2.0	1.0	1.0	0.0
^J Chlorides (mg/L)	6	4.1	5.4	4.4 ^M	4.5	0.5
Atrazine (µg/L)	2	< 0.05	< 0.05	0.03	0.03	---
Total Metals						
Aluminum (mg/L)	4	< 0.015	0.66	0.102	0.218	0.308
Iron (mg/L)	4	0.663	1.31	1.08 ^M	1.033	0.272
Manganese (mg/L)	4	0.074	0.271	0.130	0.151	0.084
Dissolved Metals						
Aluminum (mg/L)	4	< 0.015	< 0.015	0.008	0.008	0.000
Antimony (µg/L)	4	< 2	< 2	1	1	0
Arsenic (µg/L)	4	< 10	< 10	5	5	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	0.072	0.451	0.279 ^M	0.270	0.197
Lead (µg/L)	4	< 2	< 2	1	1	0
Manganese (mg/L)	4	< 0.005	0.149	0.042	0.059	0.065
Mercury (µg/L)	4	< 0.30	< 0.30	0.15	0.15	0.00
Nickel (mg/L)	4	< 0.006	< 0.006	0.003	0.003	0.000
Selenium (µg/L)	4	< 10	< 10	5	5	0
Silver (mg/L)	4	< 0.003	< 0.003	0.002	0.002	0.000
Thallium (µg/L)	4	< 1	< 1	0.5	0.5	0.0
Zinc (mg/L)	4	< 0.006	< 0.006	0.003	0.003	0.000
Biological						
^J Chlorophyll a (µg/L)	7	0.27	2.67	1.07	1.20	0.84
^J Fecal Coliform (col/100 mL)	7	53	> 4900	150	1068	1802

J=estimate; N=#of samples; Min=Minimum; Max=Maximum; M=value > 90% of all verified ecoregional reference data within ecoregion 67.

FOR MORE INFORMATION, CONTACT:
 Scott Hicks, ADEM Aquatic Assessment Unit
 1350 Coliseum Boulevard Montgomery, AL 36110
 (334) 260-2786 Shicks@adem.state.al.us