

# 2005 monitoring Summary



\$303(d)/TMDL Monitoring Site

Little Wills Creek at AL Hwy 68 approximately 100 yards from the confluence with Big Wills Creek (34.28278/85.89546)

## BACKGROUND

In 1996, the Alabama Department of Environmental Management (ADEM) added the five and a half mile segment of Little Wills Creek from its source to the confluence of Big Wills Creek to Alabama's Clean Water Act (CWA) §303(d) list for organic enrichment/dissolved oxygen (OE/DO) and nutrient enrichment. A Total Maximum Daily Load (TMDL) approved in 1997, identified and addressed municipal discharge and urban runoff as probable causes of impairment. A macroinvertebrate bioassessment conducted in 2003 using ADEM's WMB-EPT method, indicated the macroinvertebrate community to be in good condition; consequentially, the segment was removed from §303(d) list for nutrient impairment in 2004. However, ADEM continued to monitor the site in 2005 to ensure the biological integrity was maintained.

The reach was also incorporated into the 2005 Alabama, Coosa, and Tallapoosa (ACT) River Basins Assessment. The objectives of monitoring the ACT Basin were to assess the biological integrity of each monitoring site and estimate overall water quality within the ACT basin group.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Drainage Area (mi <sup>2</sup> )		12
Ecoregion <sup>a</sup>		67f
% Landuse		
Open water		<1
Wetland	Woody	<1
Forest	Deciduous	45
	Evergreen	5
	Mixed	11
Shrub/scrub		4
Grassland/herbaceous		3
Pasture/hay		20
Cultivated crops		3
Development	Open space	6
	Low intensity	3
	Moderate intensity	1
	High intensity	<1
Barren		<1
Population/km <sup>2b</sup>		20
# NPDES Permits <sup>c</sup>	<b>TOTAL</b>	5
	Construction Stormwater	1
	Mining	2
	Industrial General	1
	Municipal Individual	1

- a. Southern Limestone/Dolomite Valleys and Low Rolling Hills
- b. 2000 US CensusData
- c. #NPDES permits downloaded from ADEM's NPDES Management System database, 9 Jun 2008

Table 2. Physical characteristics of Little Wills Creek at LWCD-1 May 19, 2005.

Physical Characteristics		
Width (ft)		30
Canopy cover		Mostly Shaded
Depth (ft)	Riffle	0.3
	Run	1.0
	Pool	2.0
% of Reach	Riffle	5
	Run	70
	Pool	25
% Substrate	Bedrock	5
	Boulder	5
	Cobble	10
	Gravel	45
	Sand	25
	Silt	7
	Organic Matter	3

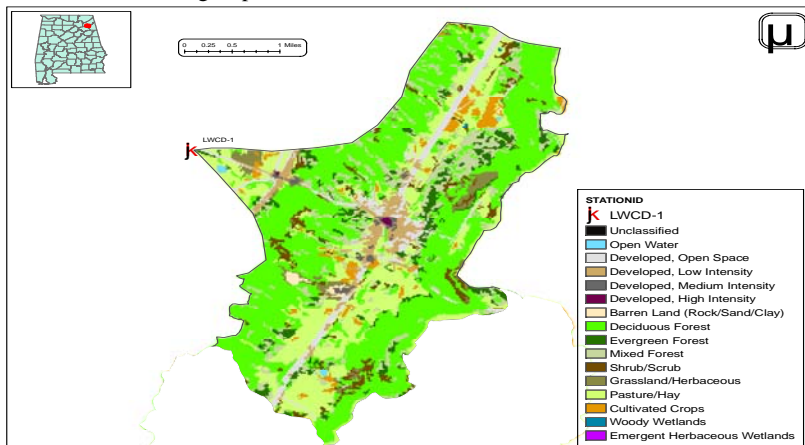


Figure 1. Sampling location and landuse within the Little Wills watershed at LWCD-1.

## WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Little Wills Creek at LWCD-1 is a small *Fish and Wildlife (F&W)* stream in southern DeKalb County (Fig. 1). Landuse in the watershed is primarily forest (61%) with areas of pasture/hay. Development comprises 10% of the watershed, which drains the city of Collinsville and the portion Interstate 59 running the length of the watershed. It lies in Southern Limestone/Dolomite Valleys and Low Rolling Hills ecoregion (67f). There are five total NPDES permits, including one for municipal discharge just upstream of the sampling reach.

## 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. Little Wills Creek at LWCD-1 is a low-gradient gravel and sand stream with some bedrock, cobble and boulder substrates. Pasture/hay fields border both sides of the riparian zone along the length of the reach. Overall habitat quality was categorized as *optimal*.

## 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 to be in *poor* condition (Table 4).

**Table 3.** Results of the habitat assessment conducted on Little Wills Creek at LWCD-1 on May 19, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	75	Optimal (>65)
Sediment deposition	76	Optimal (>65)
Sinuosity	50	Marginal (45-64)
Bank and vegetative stability	66	Sub-optimal (60-74)
Riparian buffer	58	Marginal (50-69)
Habitat assessment score	162	
<b>% Maximum score</b>	<b>67</b>	<b>Optimal (&gt;65)</b>

**Table 4.** Results of the macroinvertebrate bioassessment of Little Wills Creek at LWCD-1 conducted on May 19, 2005.

Macroinvertebrate Assessment Results			
	Results	Scores	Rating
<b>Taxa richness measures</b>		<b>(0-100)</b>	
# Ephemeroptera (mayfly) genera	8	67	Fair (47-70)
# Plecoptera (stonefly) genera	1	17	Poor (16-31)
# Trichoptera (caddisfly) genera	7	58	Fair (45-66)
<b>Taxonomic composition measures</b>			
% Non-insect taxa	12	53	Fair (49.4-74.1)
% Non-insect organisms	2	94	Good (93.9-97.0)
% Plecoptera	0	1	Very Poor (<6.56)
<b>Tolerance measures</b>			
Beck's community tolerance index	12	43	Fair (40.7-60.7)
<b>WMB-I Assessment Score</b>	<b>---</b>	<b>47</b>	<b>Poor (24-48)</b>

## 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. Median concentrations of nutrients (nitrate-nitrite nitrogen, total kjeldahl nitrogen, total nitrogen, total phosphorus and dissolved reactive phosphorous), chlorophyll *a*, hardness, chlorides and specific conductance are above concentrations found in 90% of verified ecoregional reference reach samples. Median concentrations of the metals that were detected (total aluminum, iron, and manganese and dissolved aluminum, iron, and manganese) were generally detected in low concentrations.

## CONCLUSIONS

Bioassessment results indicated the macroinvertebrate community to be in *poor* condition. Overall habitat quality was categorized as *optimal*. Median nutrient values, (nitrate-nitrite nitrogen, total nitrogen, and dissolved reactive phosphorous), chlorophyll *a*, total and dissolved solids, chlorides and specific conductance values were above values expected in this ecoregion and may be contributing to a *poor* macroinvertebrate assessment result.

**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
<b>Physical</b>						
Temperature (°C)	10	11.2	21.6	18.4	17.2	3.8
Turbidity (NTU)	10	2.5	38.3	4.5	7.7	10.8
Total dissolved solids (mg/L)	8	107.0	206.0	150.0	148.4	33.4
Total suspended solids (mg/L)	8	3.0	47.0	9.0	14.4	15.0
Specific conductance (µmhos)	10	173.7	308.4	264.8 <sup>M</sup>	264.7	40.2
Hardness (mg/L)	4	73.4	143.0	132.0 <sup>M</sup>	121.3	28.9
Alkalinity (mg/L)	8	78.1	127.6	119.9	114.8	16.6
Stream Flow (cfs)	9	2.3	25	6.9	9.2	---
<b>Chemical</b>						
Dissolved oxygen (mg/L)	10	5.7	10.5	9.4	8.8	1.5
pH (su)	10	7.1	8.3	7.6	7.6	0.3
Ammonia Nitrogen (mg/L)	8	< 0.015	0.567	0.099	0.219	0.239
Nitrate+Nitrite Nitrogen (mg/L)	8	0.067	1.528	1.110 <sup>M</sup>	0.936	0.492
Total Kjeldahl Nitrogen (mg/L)	8	0.216	1.299	0.419 <sup>M</sup>	0.530	0.370
Total nitrogen (mg/L)	8	0.913	1.915	1.441	1.467	0.342
Dissolved reactive phosphorus (mg/L)	8	0.008	0.193	0.064 <sup>M</sup>	0.071	0.059
Total phosphorus (mg/L)	8	0.033	0.220	0.077 <sup>M</sup>	0.093	0.065
<sup>J</sup> CBOD-5 (mg/L)	8	< 1.0	6.8	1.9	2.3	2.1
Chlorides (mg/L)	8	4.2	13.3	5.6 <sup>M</sup>	6.7	3.1
Atrazine (µg/L)	1				< 0.05	
<b>Total Metals</b>						
Aluminum (mg/L)	4	< 0.015	0.05	0.008	0.022	0.025
Iron (mg/L)	4	< 0.005	0.063	0.046	0.033	0.027
Manganese (mg/L)	4	< 0.005	0.041	0.003	0.009	0.010
<b>Dissolved Metals</b>						
Aluminum (mg/L)	4	< 0.015	0.141	0.008	0.052	0.077
Antimony (µg/L)	4	< 2	< 2	1	1	0
Arsenic (µg/L)	3	< 10	< 10	5	5	0
Cadmium (mg/L)	4	< 0.005	< 0.005	0.002	0.002	0.000
Chromium (mg/L)	4	< 0.004	< 0.004	0.002	0.002	0.000
Copper (mg/L)	4	< 0.005	< 0.005	0.002	0.002	0.000
Iron (mg/L)	4	< 0.005	0.01	0.003	0.005	0.004
Lead (µg/L)	4	< 2	< 2	1	1	0
Manganese (mg/L)	4	< 0.005	0.017	0.003	0.007	0.008
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)	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
<b>Biological</b>						
<sup>J</sup> Chlorophyll <i>a</i> (µg/L)	8	1.07	18.69	3.20 <sup>M</sup>	5.30	6.15
<sup>J</sup> Fecal Coliform (col/100 mL)	8	43	970	140	259	322

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

FOR MORE INFORMATION, CONTACT:  
Keith Gilliland, ADEM Aquatic Assessment Unit  
1350 Coliseum Boulevard Montgomery, AL 36110  
(334) 260-2735, wkg@adem.state.al.us