

# 2005 Monitoring Summary



## Tributary to Dry Branch at Shelby County Rd 103 (33.22680/-86.48350)

### BACKGROUND

The tributary to Dry Branch from Dry Branch to its source has been on Alabama's Clean Water Act (CWA) §303(d) list of impaired waters for not meeting its *Fish and Wildlife (F&W)* water use classification. It is listed for nutrients from municipal wastewaters and urban runoff/storm sewers (ADEM 2007—[link to 303d list](#)).



Figure 1. Tributary to Dry Branch at UTDS-1.

The Alabama Department of Environmental Management (ADEM) monitored the tributary to Dry Branch at UTDS-1 to verify and document impairment from nutrients at this site. Macroinvertebrate and habitat assessments were conducted to verify impairment to aquatic communities. Monthly water chemistry samples were collected to identify the causes of impairment. Results from these data may also be used in determination of Total Maximum Daily Load needs and priorities.

### WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. The tributary to Dry Branch is an extremely small watershed (1 mi<sup>2</sup>) located within the Southern Limestone/Dolomite Valleys and Low Rolling Hills ecoregion. The stream has a *F&W* water use classification and drains the town of Wilsonville. Landuse within the watershed is primarily urban (33%) and forested (27%) areas with some agriculture.

### 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. The tributary to Dry Branch at UTDS-1 is a small, mostly-open canopy stream reach characterized by gravel and sand substrates. The lack of stable substrate and riparian protection combined with extensive channelization within the reach categorized the overall habitat quality as *marginal* for supporting macroinvertebrate communities. Beaverdam construction in the reach blocked some flow.

Table 1. Summary of watershed characteristics.

Physical Characteristics		
Drainage Area (mi <sup>2</sup> )		1
Ecoregion <sup>a</sup>		67f
% Landuse		
Open water		
Wetland	Woody	<1
Forest	Deciduous	14
	Evergreen	6
	Mixed	7
Shrub/scrub		3
Grassland/herbaceous		10
Pasture/hay		17
Cultivated crops		1
Development	Open space	18
	Low intensity	11
	Moderate intensity	3
	High intensity	1
Barren		8
Population/km <sup>2</sup> <sup>b</sup>		27
# NPDES Permits <sup>c</sup>	<b>TOTAL</b>	8
	Construction Stormwater	5
	Mining General Permit (old)	1
	Municipal Individual	2

a. Southern Limestone/Dolomite Valleys and Low Rolling Hills

b. 2000 U.S. Census data

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

Table 2. Summary of Reach Characteristics

Physical Characterization		
Width (ft)		5
Canopy cover		Mostly Open
Depth (ft)		
	Run	0.5
	Pool	1.0
% of Reach		
	Run	95
	Pool	5
% Substrate		
	Boulder	1
	Cobble	3
	Gravel	58
	Sand	30
	Silt	6
	Organic Matter	2

**Table 3.** Results of a habitat assessment conducted at UTDS-1, June 28, 2005.

Habitat Assessment (% Maximum Score)	Rating
Instream habitat quality 66	Sub-optimal (59-70)
Sediment deposition 54	Marginal (41-58)
Sinuosity 35	Poor (<45)
Bank and vegetative stability 84	Optimal (≥75)
Riparian buffer 40	Poor (<50)
Habitat assessment score 124	
<b>% Maximum score 56</b>	<b>Marginal (41-58)</b>

**Table 4.** Results of the macroinvertebrate bioassessment conducted at UTDS-1, June 28, 2005.

Macroinvertebrate Assessment			
	Results	Scores	Rating
<b>Taxa richness measures</b>			
# EPT genera	6	24	Poor (19-37)
<b>Taxonomic composition measures</b>			
% Non-insect taxa	21	20	Very Poor (<30.9)
% Plecoptera	0	0	Very Poor (<1.86)
% Dominant taxa	25	62	Fair (47.0-70.5)
<b>Functional composition measures</b>			
% Predators	13	0	Very Poor (<15.1)
<b>Tolerance measures</b>			
Beck's community tolerance index	1	5	Very Poor (<10.6)
% Nutrient tolerant organisms	41	49	Poor (25.4-50.8)
<b>WMB-I Assessment Score</b>	<b>---</b>	<b>23</b>	<b>Poor (19-37)</b>

## 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. *Metrics generated by this methodology are insufficient to evaluate a watershed this small (1 mi<sup>2</sup>). However, when compared to a similarly sized reference condition (GILL-1), metric results indicated the macroinvertebrate community to be in poor condition (Table 4) [re-evaluate when all data is in ALAWADR].* Very few pollution-intolerant taxa were collected at the site and the community as a whole was dominated by pollution-tolerant organisms.

## 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* parameters were measured during each site visit. Four of eight (50%) dissolved oxygen measurements were below the F&W water use criteria. Median total dissolved solids, alkalinity, hardness, and specific conductance were above values expected in this ecoregion. Median nutrient (nitrate+nitrite-nitrogen, ammonia, total nitrogen, total Kjeldahl nitrogen, and total and dissolved reactive phosphorus), chloride and metals (total and dissolved manganese) concentrations were also elevated. The fecal coliform count was above the 2000 colonies/100 mL criteria for the F&W use classification during one of six (17%) sampling events, with greater than 2,700 colonies/100 mL measured during March 23, 2005. However, stream flows at the time of collection were documented to be above normal and may account for the elevated fecal coliform results.

**Table 5.** Summary of water quality data collected March-October, 2005. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL). 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
<b>Physical</b>						
Temperature (°C)	8	13.0	27.0	23.0	21.2	4.7
Turbidity (NTU)	8	0.8	22.6	4.9	7.3	6.8
Total dissolved solids (mg/L)	6	124.0	422.0	286.5 <sup>M</sup>	270.3	130.9
Total suspended solids (mg/L)	6	2.0	40.0	11.5	15.8	14.9
Specific conductance (µmhos)	8	191.0	670	470.8 <sup>M</sup>	435.8	163.0
Hardness (mg/L)	4	82.8	310.0	227.5 <sup>M</sup>	212.0	95.9
Alkalinity (mg/L)	6	67.1	161.6	151.6 <sup>M</sup>	131.6	37.5
Stream Flow (cfs)	7	0.1	3.5	0.2	0.8	---
<b>Chemical</b>						
Dissolved oxygen (mg/L)	8	3.7 <sup>C</sup>	7.9	5.1	5.7	1.6
pH (su)	8	6.8	8.05	7.6	7.5	0.4
Ammonia Nitrogen (mg/L)	6	< 0.015	0.339	0.037 <sup>M</sup>	0.107	0.136
Nitrate+Nitrite Nitrogen (mg/L)	6	0.248	4.409	0.647 <sup>M</sup>	1.248	1.576
Total Kjeldahl Nitrogen (mg/L)	6	< 0.150	0.805	0.360 <sup>M</sup>	0.425	0.271
Total nitrogen (mg/L)	6	0.323	4.704	1.374 <sup>M</sup>	1.685	1.541
Dissolved reactive phosphorus (mg/L)	6	< 0.004	1.069	0.085 <sup>M</sup>	0.234	0.412
Total phosphorus (mg/L)	6	0.074	1.041	0.134 <sup>M</sup>	0.270	0.379
CBOD-5 (mg/L)	6	< 1.0	4.3	1.7	2.0	1.2
Chlorides (mg/L)	6	5.2	32.9	14.2 <sup>M</sup>	16.0	10.6
Atrazine (µg/L)	2	< 0.05	0.06	0.04	0.04	0.02
<b>Total Metals</b>						
Aluminum (mg/L)	4	< 0.015	0.234	0.069	0.095	0.1
Iron (mg/L)	4	0.048	0.323	0.128	0.157	0.1
Manganese (mg/L)	4	0.019	1.37	0.376 <sup>M</sup>	0.535	0.6
<b>Dissolved Metals</b>						
Aluminum (mg/L)	4	< 0.015	0.058	0.020	0.027	0.02
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	0.0
Chromium (mg/L)	4	< 0.004	< 0.004	0.002	0.002	0.0
Copper (mg/L)	4	< 0.005	< 0.005	0.003	0.003	0.0
Iron (mg/L)	4	< 0.005	0.086	0.010	0.027	0.04
Lead (µg/L)	4	< 2	< 2	1	1	0
Manganese (mg/L)	4	< 0.005	1.32	0.413 <sup>M</sup>	0.537	0.6
Mercury (µg/L)	4	< 0.3	< 0.3	0.15	0.188	0.1
Nickel (mg/L)	4	< 0.006	< 0.006	0.003	0.003	0.0
Selenium (µg/L)	4	< 10	< 10	5	5	0
Silver (mg/L)	4	< 0.003	< 0.003	0.002	0.002	0.0
Thallium (µg/L)	4	< 1	< 1	0.5	0.5	0
Zinc (mg/L)	4	< 0.006	< 0.006	0.003	0.003	0.0
<b>Biological</b>						
<sup>J</sup> Chlorophyll a (µg/L)	6	0.53	4.81	1.07	2.14	1.9
<sup>J</sup> Fecal Coliform (col/100 mL)	6	5	> 2700 <sup>C</sup>	212	726	1056

<sup>J</sup>=estimate; N=# samples; C=value exceeds established criteria for Fish & Wildlife use classification; M=value > 90% of ADEM's verified reference reaches collected in ecoregions 67f

## CONCLUSIONS

Bioassessment results indicated the macroinvertebrate community to be in *poor* condition, below aquatic life use criteria for its *Fish & Wildlife* use classification. Results of other data collected at the site suggest siltation, habitat alteration, and nutrient enrichment to be potential causes of the degraded biological conditions at this location. Additionally, elevated metals concentrations (total and dissolved manganese) may be adversely impacting water quality in this watershed.

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