ADEM
Alabama Department of Environmental Management

Ambient Monitoring Site

Rivers and Streams Monitoring Program

2005 Monitoring Summary

™

Fair

Mulberry Creek at Dallas County road 52 (32.58278/-86.90361)

BACKGROUND

Mulberry Creek at MULD-1 is one of a network of 94 sites monitored annually to identify long-term trends in water quality and to provide data for the development of TMDLS and water quality criteria. The site is also a USGS stream flow gauging station..

Habitat and macroinvertebrate assessments were conducted on June 28, 2005 to assess the biological integrity at this site.
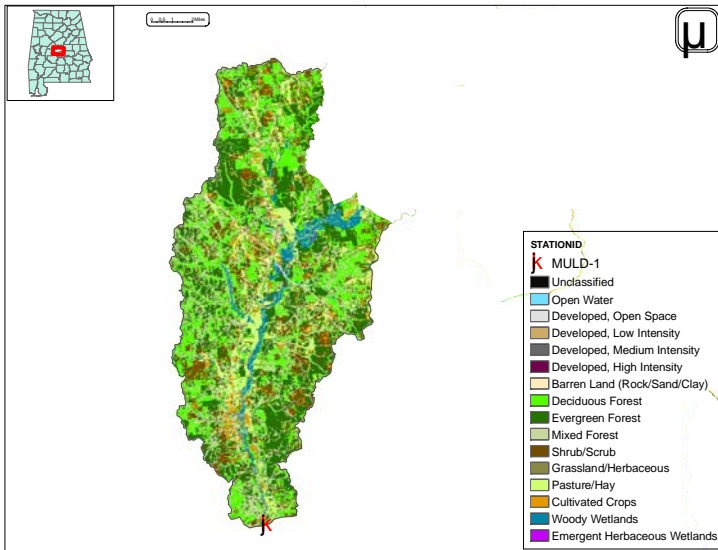

Figure 1. Sampling location and landuse within the Mulberry Creek watershed upstream of MULD-1.

WATERSHED CHARACTERISTICS

The Mulberry Creek watershed lies within the Fall Line Hills (65i) eco-region. It is largely comprised of forest (63%). Fourteen percent of the watershed is pasture lands and cultivated crops. Six small towns are located within the watershed (Vine Hill, Riderville, Stanton, Maplesville, Randolph, Jones) and account for the relatively high number of permitted discharges (Table 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. Mulberry Creek at MULD-1 is a *Swimming/Fish & Wildlife (S/F&W)* stream. It is a wide, low-gradient stream characterized by sand and gravel substrates . Overall habitat quality was categorized as *sub-optimal* due to a lack of instream habitat. The reach was also characterized by a relatively straight stream channel, which puts it at risk to impacts from sedimentation and scouring.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Drainage Area (mi^2)		204
Ecoregion[a]		65i
% Landuse		
Open water		<1
Wetland	Woody	3
	Emergent herbaceous	<1
Forest	Deciduous	26
	Evergreen	22
	Mixed	15
Shrub/scrub		15
Grassland/herbaceous		<1
Pasture/hay		11
Cultivated crops		3
Development	Open space	3
	Low intensity	1
	Moderate intensity	<1
	High intensity	<1
Barren		<1
Population/km^2 [b]		13
# NPDES Permits[c]	**TOTAL**	36
Construction Stormwater		15
Mining		3
Mining General Permit (old)		10
Industrial General		2
Industrial Individual		1
Municipal Individual		5

a. Fall Line Hills
b. 2000 U. S. Census data
c. #NPDES permits from ADEM's NPDES Management System database, 9 Jun 2008

Table 2. Physical characteristics at MULD-1, June 28, 2005.

Physical Characterization		
Width (ft)		60
Canopy cover		Open
Depth (ft)		
	Run	1.0
	Pool	2.5
% of Reach		
	Run	90
	Pool	10
% Substrate		
	Cobble	2
	Gravel	34
	Sand	54
	Silt	3
	Clay	5
	Organic Matter	2

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. The relatively low taxa richness of stoneflies, a pollution-intolerant group, and high percent dominance of pollution-tolerant organisms indicated the macroinvertebrate community to be in *fair* condition (Table 4).

Table 3. Results of the habitat assessment conducted at MULD-1, June 28, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	41	Marginal (40-52)
Sediment deposition	64	Sub-optimal (53-65)
Sinuosity	35	Poor (<45)
Bank and vegetative stability	64	Sub-optimal (60-74)
Riparian buffer	90	Sub-optimal (70-90)
Habitat assessment score	132	
% Maximum score	**60**	**Sub-optimal (53-65)**

Table 4. Results of macroinvertebrate bioassessment.

Macroinvertebrate Assessment			
	Results	**Scores**	**Rating**
Taxa richness measures			
# EPT genera	15	60	Good (56-78)
Taxonomic composition measures			
% Non-insect taxa	6	95	Good (92.7-96.3)
% Plecoptera	2	9	Good (5.6-52.8)
% Dominant taxa	8	100	Excellent (>85.2)
Functional composition measures			
% Predators	9	6	Very Poor (<15.1)
Tolerance measures			
Beck's community tolerance index	4	18	Poor (10.6-21.2)
% Nutrient tolerant organisms	24	77	Good (76.2-88.1)
WMB-I Assessment Score	**---**	**52**	**Fair (37-56)**

WATER CHEMISTRY RESULTS

Median values of in situ measurements and water chemistry of samples collected in June, August and October of 2005 to help identify any stressors to the biological communities are presented in Table 5. *In* situ parameters were measured during each site visit. One of four (25%) turbidity measurements (August 11, 2005) were above *S/F&W* water use criteria. Median total suspended solids, and total aluminum and iron concentrations were above values expected for Fall Line Hills streams. The median concentration of carbonaceous 5-day biochemical oxygen demand ($CBOD_5$), which is a measure of the amount of oxygen required by microorganisms to decompose organic matter in the water, was also elevated. The fecal coliform count was >200 colonies/100mL during two of three sampling events. However, stream flows during the collection of these samples were above normal and may account for the elevated turbidity, carbonaceous 5-day biochemical oxygen demand, total suspended solids, and fecal coliform results.

CONCLUSIONS

Bioassessment results indicated the macroinvertebrate community to be in *fair* condition. Mulberry Creek is characterized by stream flows that rise and fall very quickly. Combined with the low sinuosity, this could increase scouring impacts to biological communities. High stream flows also likely account for the elevated turbidity, $CBOD_5$, total suspended solids, and fecal coliform counts during 2005.

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
Physical						
Temperature (°C)	4	18.0	28.0	24.0	23.5	4.4
Turbidity (NTU)	4	6.2	274.0[C]	72.9	106.5	127.3
Total dissolved solids (mg/L)	3	20.0	120.0	69.0	69.7	50.0
Total suspended solids (mg/L)	3	10.0	276.0	125.0[M]	137.0	133.4
Specific conductance (µmhos)	4	30.6	43.5	36.7	36.9	6.0
Hardness (mg/L)	2	8.9	12.9	10.9	10.9	2.8
Alkalinity (mg/L)	3	2.9	9.0	4.5	5.5	3.2
Stream Flow (cfs)	4	105.0	1040	447.5	510.0	---
Chemical						
Dissolved oxygen (mg/L)	4	7.5	9.4	7.9	8.2	0.9
pH (su)	4	6.2	7.4	7.0	6.9	0.6
Ammonia Nitrogen (mg/L)	3	< 0.015	0.015	0.015	0.013	0.004
Nitrate+Nitrite Nitrogen (mg/L)	3	0.108	0.170	0.110	0.129	0.035
Total Kjeldahl Nitrogen (mg/L)	3	0.150	0.309	0.272	0.219	0.126
Total nitrogen (mg/L)	3	0.185	0.479	0.380	0.348	0.150
Dissolved reactive phosphorus (mg/L)	3	0.012	0.016	0.012	0.013	0.002
Total phosphorus (mg/L)	3	0.006	0.078	0.053	0.046	0.037
CBOD-5 (mg/L)	3	1.2	2.4	2.0[M]	1.9	0.6
Chlorides (mg/L)	3	4.0	5.4	4.7	4.7	0.7
Total Metals						
Aluminum (mg/L)	1				2.060[M]	
Iron (mg/L)	1				4.750[M]	
Manganese (mg/L)	1				0.206	
Dissolved Metals						
Aluminum (mg/L)	1				<0.015	
Antimony (µg/L)	1				<2	
Arsenic (µg/L)	1				<10	
Cadmium (mg/L)	1				<0.005	
Chromium (mg/L)	1				<0.004	
Copper (mg/L)	1				<0.005	
Iron (mg/L)	1				0.157	
Lead (µg/L)	1				<2	
Manganese (mg/L)	1				<0.02	
Mercury (µg/L)	1				<0.3	
Nickel (mg/L)	1				<0.006	
Selenium (µg/L)	1				<10	
Silver (mg/L)	1				<0.003	
Thallium (µg/L)	1				<1	
Zinc (mg/L)	1				<0.006	
Biological						
[J] Chlorophyll a (µg/L)	3	1.07	10.68	2.67	4.81	5.1
[J] Fecal Coliform (col/100 mL)	3	30	6800[C]	770	2533	3714

J=estimate; N=# samples; C=value exceeds established criteria for Swimming/ Fish & Wildlife use classification; M=value > 90% of ADEM's verified reference reaches collected in ecoregion 65i.