Alabama Department of Environmental Management

Ecological Reference Reach

Rivers and Streams Monitoring Program

2006 Monitoring Summary

Excellent

Halls Creek at AL Hwy 59 in Baldwin County (31.05264/-87.83701)

BACKGROUND

Halls Creek is one of the streams the Alabama Department of Environmental Management (ADEM) monitors as a "best attainable condition" reference watershed for comparison with streams throughout the Southern Pine Plains and Hills ecoregion (65f).

Additionally, Halls Creek was selected for biological and water quality monitoring as part of the 2006 Assessment of the Escatawpa, Mobile, and Tombigbee (EMT) River Basins. The objectives of the EMT Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the EMT basin group.

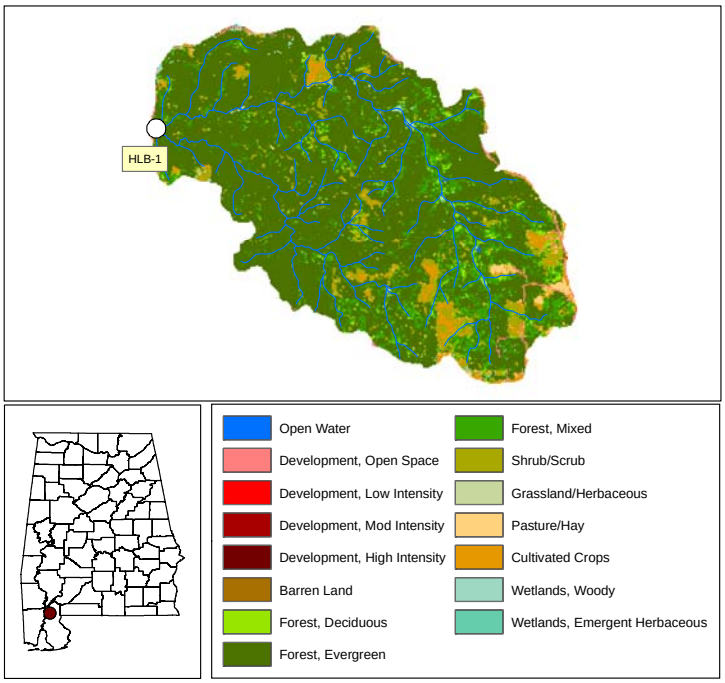

Figure 1. Sampling location and landuse within the Halls Creek watershed at HLB-1.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Halls Creek at HLB-1 is a small, second order *Fish & Wildlife (F&W)* stream. Land cover within the watershed is mainly forest (88%) interspersed with shrubs/scrubs (7%) and cultivated crops (3%) (Figure 1). There is only one construction permit located within the watershed area.

REACH CHARACTERISTICS

General observations (Table 2) and a habitat assessment (Table 3) were completed during the macroinvertebrate assessment. Halls Creek at HLB-1 (Fig. 2) is a medium-gradient, glide-pool stream characterized by sand, gravel and clay substrates. Overall habitat quality was categorized as *sub-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 *excellent* condition (Table 4) and characteristic of forested reference reaches in the Southern Pine Plains and Hills ecoregion.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Mobile Bay Area
Drainage Area (mi^2)		20
Ecoregion[a]		65f
% Landuse		
Open water		<1
Wetland	Woody	1
	Emergent herbaceous	<1
Forest	Deciduous	2
	Evergreen	74
	Mixed	12
Shrub/scrub		7
Grassland/herbaceous		<1
Pasture/hay		1
Cultivated crops		3
Development	Open space	1
	Low intensity	<1
Population/km^2[b]		5
# NPDES Permits[c]	**TOTAL**	1
Construction Stormwater		1

a.Southern Pine Plains & Hills
b.2000 US Census
c.#NPDES permits downloaded from ADEM's NPDES Management System database, 18 Sep 2009

Table 2. Physical characteristics of Halls Creek at HLB-1, May 16, 2006.

Physical Characteristics		
Width (ft)		35
Canopy cover		Mostly Open
Depth (ft)	Run	1.0
	Pool	1.0
% of Reach	Run	90
	Pool	10
% Substrate	Gravel	10
	Sand	73
	Silt	3
	Clay	5
	Organic Matter	11

Table 3. Results of the habitat assessment conducted on Halls Creek at HLB-1, May 16, 2006.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	43	Marginal (40-52)
Sediment deposition	64	Sub-optimal (53-65)
Sinuosity	38	Poor (<45)
Bank and vegetative stability	55	Marginal (35-59)
Riparian buffer	85	Sub-optimal (70-90)
Habitat assessment score	126	
% Maximum score	**57**	**Sub-optimal (53-65)**

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Table 4. Results of the macroinvertebrate bioassessment conducted in Halls Creek at HLB-1, May 16, 2006.

Macroinvertebrate Assessment			
	Results	**Scores**	**Rating**
Taxa richness measures			
# EPT genera	19	76	Good (57-78)
Taxonomic composition measures			
% Non-insect taxa	2	100	Excellent (>96.34)
% Plecoptera	18	91	Excellent (>52.8)
% Dominant taxa	21	72	Good (70.6-85.2)
Functional composition measures			
% Predators	32	100	Excellent (>72.1)
Tolerance measures			
Beck's community tolerance index	14	64	Good (31.9-65.9)
% Nutrient tolerant organisms	27	72	Fair (50.9-76.2)
WMB-I Assessment Score	---	**82**	**Excellent (>78)**

Figure 2. Halls Creek at HLB-1, January 20, 2010.

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 2006 to help identify any stressors to the biological communities. Median concentrations of nutrients, total and dissolved sediments, and chlorides were within the expected range for Southern Pine Plains and Hills streams. Median concentrations of the metals that were detected (total aluminum, iron, manganese and dissolved iron and manganese) were below concentrations on 90th percentile of verified ecoregional reference reach samples. Pesticides, and semi-volatile organics were not detected in the sample collected on September 12, 2006.

SUMMARY

As part of the assessment process, ADEM will review the monitoring information presented in this report, along with all other available data.

Halls Creek at HLB-1 was typical of other streams in the Southern Pine Plains and Hills, which are generally low to moderate gradient streams with sand and clay substrates (Griffith et al. 2001). Landuse, road density, and population density categorized Halls Creek among the least-disturbed watersheds in the EMT basin group. Bioassessment results and water quality data indicated the reach to be in *excellent* condition.

FOR MORE INFORMATION, CONTACT:
Sreeletha Prem Kumar, ADEM Environmental Indicators Section
1350 Coliseum Boulevard Montgomery, AL 36110
(334) 260-2782 skumar@adem.state.al.us

Table 5. Summary of water quality data collected March-October, 2006. 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	16.0	24.6	20.0	20.5	2.9
Turbidity (NTU)	9	2.2	3.8	3.3	3.2	0.5
[J] Total Dissolved Solids (mg/L)	8	4.0	53.0	30.0	30.1	16.2
[J] Total Suspended Solids (mg/L)	8	< 4.0	7.0	5.0	4.8	1.6
Specific Conductance (µmhos)	9	19.1	60.8	20.4	25.8	13.4
Hardness (mg/L)	3	23.0	36.0	36.0	31.7	7.5
Alkalinity (mg/L)	8	< 1.0	20.0	2.8	4.8	6.5
Stream Flow (cfs)	9	9.1	26.6	11.8	13.9	5.4
Chemical						
Dissolved Oxygen (mg/L)	9	6.9	9.0	8.3	8.2	0.6
pH (su)	9	5.6[C]	6.6	6.0	6.0	0.3
Ammonia Nitrogen (mg/L)	8	< 0.010	0.019	0.008	0.008	0.005
Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.003	0.046	0.026	0.024	0.016
Total Kjeldahl Nitrogen (mg/L)	8	< 0.150	0.412	0.239	0.233	0.152
Total Nitrogen (mg/L)	8	0.077	0.451	0.250	0.257	0.158
Dissolved Reactive Phosphorus (mg/L)	8	< 0.004	0.012	0.005	0.006	0.004
Total Phosphorus (mg/L)	8	< 0.004	0.023	0.012	0.013	0.009
CBOD-5 (mg/L)	8	< 1.0	1.4	0.8	0.8	0.4
COD (mg/L)	1	< 2.0	< 2.0	1.0	1.0	-
TOC (mg/L)	4	1.8	4.3	2.5	2.8	1.1
Chlorides (mg/L)	8	< 1.4	6.0	3.0	3.2	1.7
Atrazine (µg/L)	1	< 0.05	< 0.05	0.03	0.03	-
Total Metals						
Aluminum (mg/L)	3	0.18	0.24	0.220	0.213	0.031
Iron (mg/L)	3	0.839	1.38	1.06	1.093	0.272
Manganese (mg/L)	3	0.012	0.021	0.014	0.016	0.005
Dissolved Metals						
Aluminum (mg/L)	3	< 0.05	0.1	0.050	0.050	0.000
Antimony (µg/L)	3	< 7.5	< 7.5	3.8	3.8	0.0
Arsenic (µg/L)	3	< 5	5	2.5	2.5	0.0
Cadmium (mg/L)	3	< 0.0003	0.0003	0.0001	0.0001	0.000
Chromium (mg/L)	3	< 0.005	0.005	0.003	0.003	0.000
Copper (mg/L)	3	< 0.005	0.005	0.003	0.003	0.000
Iron (mg/L)	3	0.140	0.237	0.191	0.189	0.049
Lead (µg/L)	3	< 5	< 5	2.5	2.5	0.0
Manganese (mg/L)	3	0.01	0.016	0.013	0.013	0.003
Mercury (µg/L)	3	< 0.5	< 0.5	0.3	0.3	0.0
Nickel (mg/L)	3	< 0.005	0.012	0.003	0.006	0.005
Selenium (µg/L)	3	< 7.5	< 7.5	3.8	3.8	0.0
Silver (mg/L)	3	< 0.001	< 0.001	0.0004	0.0004	0.000
Thallium (µg/L)	3	< 2.5	9	4.5	3.4	1.9
Zinc (mg/L)	3	< 0.005	< 0.005	0.003	0.003	0.000
Biological						
Chlorophyll a (µg/L)	8	< 0.10	1.78	0.52	0.75	0.65
[J] Fecal Coliform (col/100 mL)	5	10	230	50	107	101

J=estimate; N= # samples; C=value exceeds the established criteria for F&W water use classification.