

2005 Monitoring Summary



Harwells Mill Creek at Redland Rd. (Elmore Co.) (32.45804/-86.18217)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Harwells Mill Creek watershed 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 monitoring site and to estimate overall water quality within the ACT basin group.

Additionally, this watershed was sampled in response to a request made by the Alabama Clean Water Partnership to characterize dissolved oxygen, siltation, nutrient enrichment, pathogens and habitat conditions, and any related impact to the biological community.

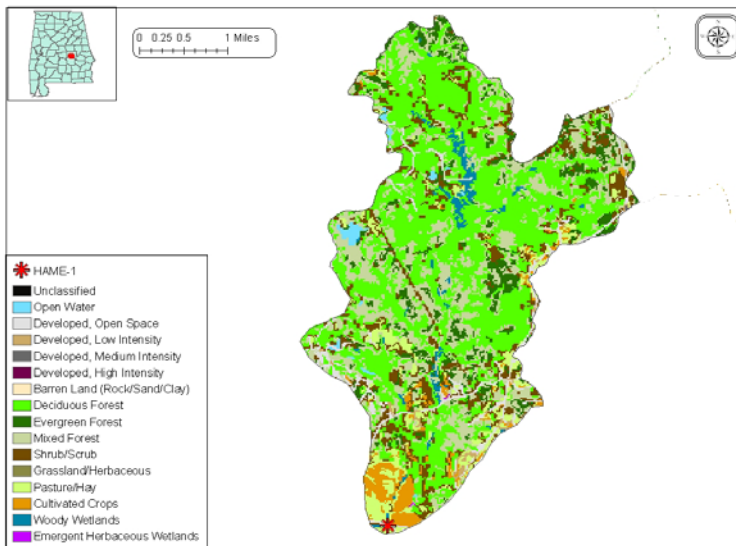


Figure 1. Sampling location and landuse within the Harwells Mill Creek watershed at HAME-1.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Harwells Mill Creek is a small *Fish & Wildlife (F&W)* stream located near the cities of Montgomery and Wetumpka (Fig. 1). Landuse within the watershed is primarily forest (73%), with some agriculture and open development.

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. Harwells Mill Creek at HAME-1 is a low-gradient stream with a sand and gravel substrate. Overall habitat quality was categorized as *poor* due to bank stability, sedimentation, sinuosity, a narrow riparian buffer and lack of quality instream habitat.

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. Metric results indicated the macroinvertebrate community to be characterized by nutrient-tolerant taxa groups and predators, indicating *fair* community condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Drainage Area (mi ²)		12
Ecoregion ^a		65p
% Landuse		
Open water		1
Wetland	Woody	2
	Emergent herbaceous	<1
Forest	Deciduous	43
	Evergreen	8
	Mixed	22
Shrub/scrub		11
Grassland/herbaceous		<1
Pasture/hay		6
Cultivated crops		3
Development	Open space	4
	Low intensity	1
	Moderate intensity	<1
Population/km ² ^b		39
# NPDES Permits ^c	TOTAL	11
	Construction Stormwater	11

- Southeastern Flood Plains and Low Terraces
- 2000 U.S. Census Data
- #NPDES permits downloaded from ADEM's NPDES Management System database, 9 Jun 2008

Table 2. Physical characteristics at HAME-1, June 24, 2005.

Physical Characteristics		
Width (ft)		12.5
Canopy cover		Shaded
Depth (ft)		
	Riffle	0.3
	Run	0.7
	Pool	0.1
% of Reach		
	Riffle	5
	Run	90
	Pool	5
% Substrate		
	Gravel	10
	Sand	83
	Silt	2
	Organic Matter	5

Table 3. Results of the habitat assessment conducted June 24, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	32	Poor (<40)
Sediment deposition	33	Poor (<40)
Sinuosity	30	Poor (<45)
Bank and vegetative stability	21	Poor (<35)
Riparian buffer	48	Poor (<50)
Habitat assessment score	74	
% Maximum score	33	Poor (<40)

Table 4. Results of the macroinvertebrate bioassessment conducted June 24, 2005.

Macroinvertebrate Assessment			
	Results	Scores	Rating
Taxa richness measures			
# EPT genera	21	84	Excellent (>78)
Taxonomic composition measures			
% Non-insect taxa	6	97	Excellent (>96.34)
% Plecoptera	3	22	Good (5.6-52.8)
% Dominant taxa	20	76	Good (70.5-85.2)
Functional composition measures			
% Predators	11	15	Very Poor (<15.1)
Tolerance measures			
Beck's community tolerance index	10	45	Good (31.8-65.9)
% Nutrient tolerant organisms	42	46	Poor (25.4-50.8)
WMB-I Assessment Score	---	55	Fair (37-56)

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. Median concentrations of physical parameters (TDS, TSS, hardness, alkalinity), nutrients (nitrate+nitrite-nitrogen, total Kjeldahl nitrogen, dissolved reactive phosphorous, total phosphorous, CBOD-5), atrazine, metals (total aluminum, total iron, total manganese, dissolved manganese), and chlorophyll *a* exceeded expected values based on the 25th percentile of all data collected in ecoregion 65p.

CONCLUSIONS

Bioassessment results indicated the macroinvertebrate community to be in *fair* condition. Intensive water quality sampling and a habitat assessment suggest habitat degradation, sedimentation, nutrients, and metals to be potential enrichment causes of the degraded biological condition.

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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. 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)	9	15.0	29.0	23.7	23.2	4.0
Turbidity (NTU)	9	10.0	97.5	18.9	35.3	30.5
Total Dissolved Solids (mg/L)	7	24.0	95.0	69.0 ^M	65.4	26.0
Total Suspended Solids (mg/L)	7	7.0	201.0	13.0 ^M	59.6	83.0
Specific Conductance (µmhos)	9	57.8	70.0	63.3	63.8	3.9
Hardness (mg/L)	5	18.6	24.6	22.2 ^M	21.6	2.7
Alkalinity (mg/L)	7	17.3	23.7	18.8 ^M	19.9	2.6
Stream Flow (cfs)	9	4.3	42.0	10.6	13.6	---
Chemical						
Dissolved Oxygen (mg/L)	9	7.4	9.4	8.2	8.2	0.6
pH (su)	9	6.7	7.8	7.2	7.2	0.3
Ammonia Nitrogen (mg/L)	7	< 0.015	0.021	0.008	0.008	0.006
Nitrate+Nitrite Nitrogen (mg/L)	7	0.071	0.292	0.224 ^M	0.198	0.073
Total Kjeldahl Nitrogen (mg/L)	7	< 0.150	0.522	0.153 ^M	0.216	0.173
Total Nitrogen (mg/L)	8	0.268	0.753	0.367	0.414	0.167
Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.051	0.010 ^M	0.021	0.0
Total Phosphorus (mg/L)	7	0.04	0.09	0.06 ^M	0.06	0.0
CBOD-5 (mg/L)	7	< 1.0	3.3	1.2 ^M	1.7	1.1
^J Chlorides (mg/L)	7	4.6	8.1	5.2	5.2	0.5
Atrazine (µg/L)	2	< 0.05	0.14	0.08 ^M	0.08	0.00
Total Metals						
Aluminum (mg/L)	5	< 0.02	1.14	0.67 ^M	0.62	0.537
Iron (mg/L)	5	< 0.01	3.55	1.51 ^M	1.64	1.457
Manganese (mg/L)	5	< 0.005	0.101	0.025 ^M	0.039	0.047
Dissolved Metals						
Aluminum (mg/L)	5	< 0.015	0.110	0.008	0.033	0.057
Antimony (µg/L)	5	< 2	< 2	1	1	0
Arsenic (µg/L)	5	< 10	< 10	5	5	0
Cadmium (mg/L)	5	< 0.01	< 0.01	0.00	0.00	0.00
Chromium (mg/L)	5	< 0.004	< 0.004	0.002	0.002	0.000
Copper (mg/L)	5	< 0.01	< 0.01	0.00	0.00	0.00
Iron (mg/L)	5	< 0.01	< 0.20	0.09	0.10	0.088
Lead (µg/L)	5	< 2	< 2	1	1	0
Manganese (mg/L)	5	< 0.005	0.042	0.003 ^M	0.012	0.020
Mercury (µg/L)	5	< 0.30	< 0.30	0.15	0.15	0.00
Nickel (mg/L)	5	< 0.006	< 0.006	0.003	0.003	0.000
Selenium (µg/L)	5	< 10	< 10	5	5	0
Silver (mg/L)	5	< 0.003	< 0.003	0.002	0.002	0.000
Thallium (µg/L)	5	< 1	< 1	0.5	0.5	0.0
Zinc (mg/L)	5	< 0.01	< 0.01	0.00	0.00	0.00
Biological						
^J Chlorophyll <i>a</i> (µg/L)	8	< 0.1	3.7	1.1 ^M	1.4	1.3
Fecal Coliform (col/100 mL)	7	150	1600	230	450	442

^J=Reported value is an estimate; N=# samples; M=Median values > 25th percentile of all data collected in ecoregion/subregion 65p