

2005 Monitoring Summary



Washington Creek at AL Hwy 183 near Marion (Perry County) (32.56997/-87.39136)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Washington 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. A habitat and macroinvertebrate assessment was conducted on Washington Creek at WASP-1 on May 26, 2005.

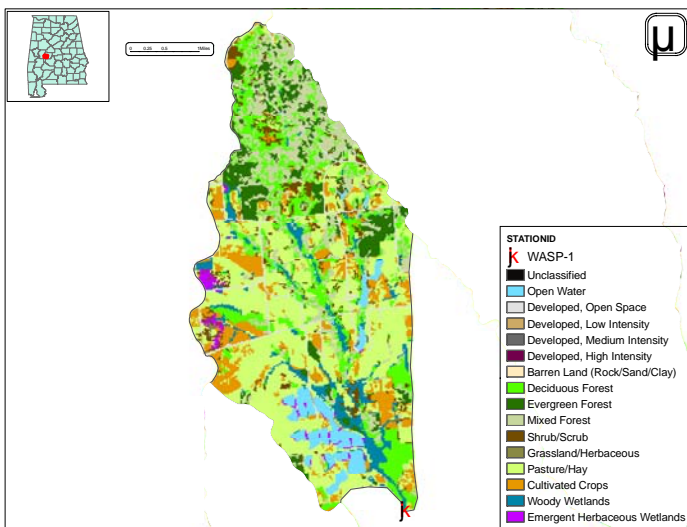


Figure 1. Sampling location and landuse within the Washington Creek watershed at WASP-1.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Washington Creek is a small *Fish and Wildlife* (F&W) stream located in Perry County near Marion. It is a tributary of the Upper Bogue Chitto Creek watershed, which was given a first priority rating for nonpoint source impairment potential by the local Soil and Water Conservation District (SWCD) in 1998. At WASP-1, the stream drains approximately sixteen square miles of countryside. Landuse within the watershed is 38% forest, 32% pasture, and 11% cultivated crops. Population density is low in this area.

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. Washington Creek at WASP-1 is a shallow, low-gradient stream reach located in the Blackland Prairie ecoregion. The lack of stable substrate within the reach categorized overall habitat quality as *sub-optimal* for supporting macroinvertebrate communities. The reach was also characterized by a relatively straight stream channel, which contributes to impacts from sedimentation and scouring and minimizes available habitat for aquatic life to populate.

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 pollution-tolerant taxa groups, indicating *poor* community condition (Table 4).

Table 1. Summary of watershed characteristics.

Physical Characteristics		
Drainage Area (mi ²)		16
Ecoregion ^a		65a
% Landuse		
Open water		5
Wetland	Woody	5
	Emergent herbaceous	1
Forest	Deciduous	15
	Evergreen	8
	Mixed	15
Shrub/scrub		5
Grassland/herbaceous		<1
Pasture/hay		32
Cultivated crops		11
Development	Open space	3
	Low intensity	<1
Population/km ² ^b		7
# NPDES Permits ^c	TOTAL	1
Mining General Permit (old)		1

a. Blackland Prairie

b. 2000 U.S. Census data

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

Table 2. Physical characteristics at WASP-1, May 26, 2005.

Physical Characterization		
Width (ft)		18
Canopy cover		Mostly Shaded
Depth (ft)	Run	0.4
% of Reach	Run	100
% Substrate	Bedrock	10
	Cobble	15
	Gravel	10
	Sand	20
	Silt	6
	Clay	35
	Organic Matter	4

Table 3. Results of habitat assessment conducted May 26, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	34	Poor (<40)
Sediment deposition	59	Sub-optimal (53-65)
Sinuosity	30	Poor (<45)
Bank and vegetative stability	68	Sub-optimal (60-74)
Riparian buffer	89	Sub-optimal (70-90)
Habitat assessment score	121	
% Maximum score	55	Sub-optimal (53-65)

Table 4. Results of macroinvertebrate assessment conducted May 26, 2005.

Macroinvertebrate Assessment			
	Results Scores		Rating
Taxa richness measures			
# EPT genera	9	36	Poor (19-37)
Taxonomic composition measures			
% Non-insect taxa	12	67	Fair (61.8-92.7)
% Plecoptera	0	0	Very Poor (<1.86)
% Dominant taxa	29	52	Fair (47.0-70.5)
Functional composition measures			
% Predators	14	0	Very Poor (<15.1)
Tolerance measures			
Beck's community tolerance index	4	18	Poor (10.6-21.2)
% Nutrient tolerant organisms	47	39	Poor (25.4-50.8)
WMB-I Assessment Score	---	30	Poor (19-37)

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. The median chlorophyll-*a* concentration, which is a measure of in-stream algal biomass, and the median total phosphorus concentration was higher than 90% of ecoregional reference samples. Median values of total and dissolved manganese were also above concentrations expected in Blackland Prairie streams.

CONCLUSIONS

Bioassessment results indicated the macroinvertebrate community to be in *poor* condition, below the levels expected to indicate support of the aquatic life use and verifying the impairment of its *Fish & Wildlife* use classification. Results of other data collected at the site suggest siltation, habitat alteration, or 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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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)	7	15.0	27.0	21.0	21.1	3.9
Turbidity (NTU)	7	10.0	74.8	17.3	25.8	22.1
Total dissolved solids (mg/L)	5	52.0	104.0	74.0	75.6	19.0
Total suspended solids (mg/L)	5	7.0	48.0	25.0	26.0	16.5
Specific conductance (µmhos)	7	38.5	119.5	94.5	90.6	25.3
Hardness (mg/L)	3	11.3	36.1	27.7	25.0	12.6
Alkalinity (mg/L)	5	9.9	35.4	30.4	26.4	9.9
Stream Flow (cfs)	6	1.4	28.5	14.1	13.8	---
Chemical						
Dissolved oxygen (mg/L)	7	6.5	9.6	8.1	8.2	1.1
pH (su)	7	6.5	8.04	7.3	7.2	0.5
Ammonia Nitrogen (mg/L)	5	< 0.015	0.040	0.008	0.018	0.015
Nitrate+Nitrite Nitrogen (mg/L)	5	0.044	1.108	0.096	0.309	0.452
Total Kjeldahl Nitrogen (mg/L)	5	< 0.150	0.690	0.652	0.541	0.262
Total nitrogen (mg/L)	5	0.697	1.183	0.748	0.850	0.205
Dissolved reactive phosphorus (mg/L)	5	0.016	0.046	0.026	0.029	0.014
Total phosphorus (mg/L)	5	0.123	0.225	0.131 ^M	0.149	0.043
CBOD-5 (mg/L)	5	< 1.0	3.3	2.6	2.1	1.2
COD (mg/L)	3	< 2.0	< 2.0	1.0	1.0	0
Chlorides (mg/L)	5	5.3	2.0	6.9	7.0	1.8
Total Metals						
Aluminum (mg/L)	3	0.103	1.37	0.191	0.555	0.7
Iron (mg/L)	3	1.78	2.45	2.38	2.203	0.4
Manganese (mg/L)	3	0.235	0.485	0.281 ^M	0.334	0.1
Dissolved Metals						
Aluminum (mg/L)	3	< 0.015	0.141	0.107	0.085	0.1
Antimony (µg/L)	3	< 2	< 2	1	1	0
Arsenic (µg/L)	2	< 10	< 10	5	5	0
Cadmium (mg/L)	3	< 0.005	< 0.005	0.0025	0.0025	0.0
Chromium (mg/L)	3	< 0.004	< 0.004	0.002	0.002	0.0
Copper (mg/L)	3	< 0.005	< 0.005	0.0025	0.003	0.0
Iron (mg/L)	3	0.161	0.539	0.252	0.3173	0.2
Lead (µg/L)	3	< 2	< 2	1	1	0
Manganese (mg/L)	3	0.123	0.527	0.158 ^M	0.269	0.2
Mercury (µg/L)	3	< 0.3	< 0.3	0.15	0.15	0.0
Nickel (mg/L)	3	< 0.006	< 0.006	0.003	0.003	0.0
Selenium (µg/L)	3	< 10	< 10	5	5	0
Silver (mg/L)	3	< 0.003	< 0.003	0.0015	0.0015	0.0
Thallium (µg/L)	3	< 1	< 1	0.5	0.500	0
Zinc (mg/L)	3	< 0.006	< 0.006	0.003	0.003	0.0
Biological						
^J Chlorophyll a (µg/L)	5	4.27	19.67	9.08 ^M	11.30	7.2
^J Fecal Coliform (col/100 mL)	5	70	1900	250	513	781

^J=estimate; N=# samples; M=value > 90% of ADEM's verified reference reaches collected in ecoregions 65a/b