

2006 Monitoring Summary



Magnolia River at Baldwin County Road 65 (30.42442/-87.71749)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Magnolia River watershed 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. Water quality samples were taken at Baldwin county road 65 (MGRB-3, Figure 1). However, since MGRB-3 was unwadeable, habitat and macroinvertebrate assessments were conducted on the Magnolia River at Baldwin county road 24 (MGRB-2) on May 27, 2006. MGRB-2 is located approximately 1.4 river miles upstream of MGRB-3.



Figure 1. Magnolia River at MGRB-3, January 21, 2010.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. The Magnolia River is a *Swimming/Fish & Wildlife* (S/F&W) stream located in the Southern Pine Plains and Hills ecoregion (Table 1). Landuse within the watershed is primarily croplands with some pasture and forested areas. The Department has issued twenty-two NPDES permits in this watershed.

REACH CHARACTERISTICS

General observations (Table 2) and a habitat assessment (Table 3) were completed at MGRB-2 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. Magnolia River at MGRB-2 is a shallow, low-gradient stream reach with a predominantly sand substrate. In-stream habitat was rated as *marginal*. The reach was also characterized by a relatively straight stream channel, which puts it at risk to impacts from sedimentation and scouring.

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 *fair* community condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Mobile
Drainage Area (mi ²)		7
Ecoregion ^a		65f
% Landuse		
Open water		<1
Wetland	Woody	3
	Emergent herbaceous	1
Forest	Deciduous	2
	Evergreen	10
	Mixed	6
Shrub/scrub		4
Grassland/herbaceous		<1
Pasture/hay		11
Cultivated crops		47
Development	Open space	10
	Low intensity	5
	Moderate intensity	1
	High intensity	<1
Population/km ² ^b		108
# NPDES Permits ^c	TOTAL	22
	Construction Stormwater	22

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 Magnolia River at MGRB-3, May 17, 2006.

Physical Characteristics		
Width (ft)		15
Canopy cover		Shaded
Depth (ft)	Run	1.0
	Pool	2.0
% of Reach	Run	50
	Pool	50
% Substrate	Sand	65
	Silt	5
	Clay	5
	Organic Matter	25

Table 3. Results of habitat assessment conducted May 17, 2006.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	53	Marginal (40-52)
Sediment deposition	68	Optimal (>65)
Sinuosity	55	Marginal (45-64)
Bank and vegetative stability	70	Sub-optimal (60-74)
Riparian buffer	81	Sub-optimal (70-90)
Habitat assessment score	142	
% Maximum score	64	Sub-optimal (53-65)

Table 4. Results of the macroinvertebrate bioassessment (May 17, 2006)

Macroinvertebrate Assessment			
	Results	Scores	Rating
Taxa richness measures			
# EPT genera	8	32	Poor (19-37)
Taxonomic composition measures			
% Non-insect taxa	13	63	Fair (61.9-92.7)
% Plecoptera	2	12	Good (5.7-52.8)
% Dominant taxa	25	63	Fair (47.1-70.5)
Functional composition measures			
% Predators	11	37	Fair (30.2-45.2)
Tolerance measures			
Beck's community tolerance index	6	27	Fair (21.3-31.8)
% Nutrient tolerant organisms	17	89	Excellent (>88.1)
WMB-I Assessment Score	---	46	Fair (38-56)

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. When possible, in situ measurements and water samples are collected monthly, semi-monthly (metals), or quarterly (pesticides, herbicides (atrazine), and semi-volatile organics) during March through October to help identify any stressors to the biological communities. Median nutrient (nitrate+nitrite nitrogen, total nitrogen) concentrations were elevated for a Southern Pine Plains and Hills stream based on the 90th percentile of reference reaches in this ecoregion. Stream pH was slightly acidic and typical of the ecoregion. The fecal coliform count was >3,000 colonies/100 mL in one of 5 (20%) samples collected (September 13th). However, high stream flows at the time of collection may account for the elevated fecal coliform results.

CONCLUSIONS

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

Bioassessment results indicated the macroinvertebrate community in Magnolia River at MGRB-2 to be in *fair* condition. Results of other data collected during 2006 suggest nutrient enrichment to be a potential cause of the deteriorated biological conditions. Overall habitat quality was categorized as *good*.

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Table 5. Summary of water quality data collected March-October, 2006. 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)	10	16.0	24.0	21.3	20.8	2.7
Turbidity (NTU)	10	1.4	22.9	2.5	5.6	6.9
Total Dissolved Solids (mg/L)	8	30.0	89.0	49.5	52.9	18.6
Total Suspended Solids (mg/L)	8	1.0	14.0	2.5	4.2	4.2
Specific Conductance (µmhos)	10	58.0	84.1	65.7	67.5	6.8
Hardness (mg/L)	3	5.0	42.0	30.0	25.7	18.9
Alkalinity (mg/L)	8	<1.0	6.0	3.8	3.8	1.7
Stream Flow (cfs)	8	2.1	27.2	6.3	8.4	7.9
Chemical						
Dissolved Oxygen (mg/L)	10	5.3	7.5	6.8	6.7	0.6
pH (su)	10	5.2 ^c	6.1	5.5	5.6	0.3
Ammonia Nitrogen (mg/L)	8	<0.010	<0.015	0.008	0.007	0.001
Nitrate+Nitrite Nitrogen (mg/L)	7	1.590	2.340	2.164 ^M	2.080	0.274
Total Kjeldahl Nitrogen (mg/L)	8	<0.100	0.420	0.075	0.153	0.129
Total Nitrogen (mg/L)	7	1.810	2.584	2.310 ^M	2.244	0.302
Dissolved Reactive Phosphorus (mg/L)	8	<0.004	0.026	0.003	0.007	0.008
Total Phosphorus (mg/L)	8	<0.004	0.092	0.021	0.028	0.028
CBOD-5 (mg/L)	8	<1.0	2.5	1.6	1.4	0.8
Chlorides (mg/L)	8	1.8	13.7	10.0	8.1	5.1
Atrazine (µg/L)	2	<0.05	<0.05	0.03	0.03	0.00
Total Metals						
Aluminum (mg/L)	3	0.13	1.4	0.320	0.617	0.685
Iron (mg/L)	3	0.156	0.784	0.326	0.422	0.325
Manganese (mg/L)	3	0.044	0.079	0.062	0.062	0.018
Dissolved Metals						
Aluminum (mg/L)	3	0.11	0.53	0.140	0.260	0.234
Antimony (µg/L)	3	<7.5	<7.5	3.8	3.8	0.0
Arsenic (µg/L)	3	<5	<5	3	3	0
Cadmium (mg/L)	3	<0.0003	<0.0003	0.0001	0.0001	0.0000
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	0.074	0.150	0.136	0.120	0.040
Lead (µg/L)	3	<5	<5	3	3	0
Manganese (mg/L)	3	0.041	0.066	0.055	0.054	0.013
Mercury (µg/L)	3	<0.5	<0.5	0.3	0.3	0.0
Nickel (mg/L)	3	<0.005	0.01	0.003	0.005	0.004
Selenium (µg/L)	3	<7.5	<7.5	3.8	3.8	0.0
Silver (mg/L)	3	<0.0008	<0.0008	0.0004	0.0004	0.0000
Thallium (µg/L)	3	<2.5	9	4.5	3.4	1.9
Zinc (mg/L)	3	0.006	0.009	0.007	0.007	0.002
Biological						
Chlorophyll a (µg/L)	8	<0.10	10.68	1.80	3.10	3.55
^J Fecal Coliform (col/100 mL)	5	17	>3000 ^c	44	676	1303

J=estimate; N=# samples; M=value > 90th percentile of all verified ecoregional reference reach data collected within eco-region 65f; C= value exceeds established criteria for F&W use classification.