

2011 Monitoring Summary



Magnolia River at US Hwy 98 Crossing in Baldwin County (30.40662/-87.73671)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Magnolia River watershed for biological and water quality monitoring as part of the 2011 Assessment of the Escatawpa, Mobile, and Tombigbee (EMT) River Basin. 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.

Magnolia River at MGNB-101 was also selected as a site for the 2011 Weeks Bay Nutrient Sources, Fate, Transport, and Effects Study. The final report of Weeks Bay study is available at <http://www.adem.alabama.gov/programs/water/wqsurvey/>.

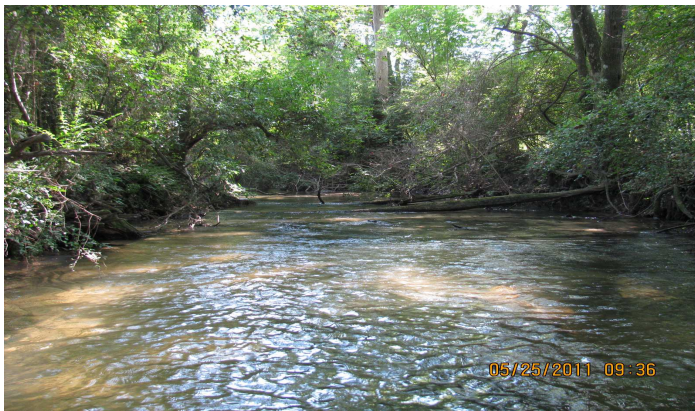


Figure 1. Magnolia River at MGNB-101, May 25, 2011.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Magnolia River is a *Swimming/Fish & Wildlife (S/F&W)* stream located in the Southern Pine Plains & Hills ecoregion. Based on the 2006 National Land Cover Dataset, landuse within the watershed is primarily agricultural (58%) with some forested and wooded wetland areas. The Department has issued 105 NPDES permits in Magnolia River watershed as of September 1, 2012.

REACH CHARACTERISTICS

General observations (Table 2) and a habitat assessment (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. Magnolia River at MGNB-101 is a low gradient stream with a predominately sand substrate (Figure 1). Overall habitat quality was categorized as *optimal*. The reach was 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 the average of all individual metric scores. Metric results indicated the macroinvertebrate community to be in *fair* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Mobile River
Drainage Area (mi ²)		16
Ecoregion ^a		65f
% Landuse		
Open water		<1
Wetland	Woody	10
	Emergent herbaceous	<1
Forest	Deciduous	<1
	Evergreen	9
	Mixed	<1
Shrub/scrub		3
Grassland/herbaceous		4
Pasture/hay		23
Cultivated crops		35
Development	Open space	11
	Low intensity	4
	Moderate intensity	1
	High intensity	<1
Barren		<1
Population/km ^{2b}		83
# NPDES Permits ^c	TOTAL	105
	401 Water Quality Certification	1
	Construction Stormwater	84
	Mining	7
	Municipal Individual	13

a. Southern Pine Plains & Hills

b. 2000 US Census

c. #NPDES permits downloaded from ADEM's NPDES Management System database, September 1, 2012.

Table 2. Physical characteristics of Magnolia River at MGNB-101, May 25, 2011.

Physical Characteristics		
Canopy Cover	Mostly Shaded	
Width (ft)	15	
Depth (ft)		
	Run	2
	Pool	4
% of Reach		
	Run	60
	Pool	40
% Substrate		
	Mud/Muck	1
	Sand	62
	Silt	2
	Organic Matter	35

Table 3. Results of the habitat assessment conducted on Magnolia River at MGNB-101, May 25, 2011.

Habitat Assessment	%Maximum Score	Rating
GP		
Instream Habitat Quality	76	Optimal >65
Sediment Deposition	75	Optimal >65
Sinuosity	45	Marginal (45-64)
Bank and Vegetative Stability	76	Optimal >74
Riparian Buffer	81	Sub-optimal (70-89)
Habitat Assessment Score	165	
% Maximum Score	75	Optimal >65

Table 4. Results of the macroinvertebrate bioassessment conducted in Magnolia River at MGNB-101, May 25, 2011.

Macroinvertebrate Assessment		
	Results	Scores
Taxa richness and diversity measures		(0-100)
% EPC taxa	33	63
% Trichoptera & Chironomidae Taxa	50	11
Taxonomic composition measures		
% EP Individuals	6	11
Functional feeding group		
% Collector-Filterer Individuals	25	60
Community tolerance		
% Nutrient Tolerant individuals	46	32
WMB-I Assessment Score	---	35
WMB-I Assessment Rating		Fair (31-45)

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 February through November of 2011 to help identify any stressors to the biological communities. No bacteria samples were collected. Dissolved oxygen concentrations ranged from 6.9-8.7 mg/L. Stream pH values were below the 6.0 criteria in seventeen of the twenty-four samples collected; however, a slightly acidic pH is not unusual in this stream type. Median specific conductance and hardness were higher than expected for the ecoregion. Median nutrient concentrations (total nitrogen, nitrate-nitrite), as well as chlorides and dissolved manganese were higher than expected based on the 90th percentile of reference reaches in this ecoregion. Pesticides, semi-volatile organics, and atrazine were not detected in the three samples collected (March 15, May 19 and August 11, 2011).

SUMMARY

Bioassessment results indicated the macroinvertebrate community in Magnolia River at MGNB-101 to be in *fair* condition. Overall habitat quality was categorized as *optimal*. Elevated nutrient, conductivity, hardness, chlorides and dissolved manganese levels may be potential causes for deterioration of biological communities. Nutrient concentrations (total nitrogen, nitrate-nitrite) suggest nutrient enrichment. The neutral to slightly acidic pH is typical of streams in this ecoregion.

Table 5. Summary of water quality data collected February-November, 2011. 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.

Parameter	N	Min	Max	Med	Avg	SD	E
Physical							
Temperature (°C)	24	16.5	23.8	22.0	21.3	2.0	
Turbidity (NTU)	23	1.0	7.0	2.0	2.6	1.4	
Total Dissolved Solids (mg/L)	10	47.0	64.0	52.5	54.2	6.4	
Total Suspended Solids (mg/L)	10	< 5.0	9.0	2.5	3.2	2.0	
Specific Conductance (µmhos)	10	68.2	73.0	71.3 ^G	71.2	1.7	
Hardness (mg/L)	3	19.0	21.0	19.2 ^G	19.7	1.1	
^J Alkalinity (mg/L)	10	< 4.0	5.0	4.0	3.8	1.0	
Stream Flow (cfs)	21	11.0	31.0	17.0	17.8	6.4	
Chemical							
Dissolved Oxygen (mg/L)	24	6.9	8.7	7.4	7.5	0.5	
pH (su)	24	5.3 ^C	7.4	5.9	5.9	0.5	17
^J Ammonia Nitrogen (mg/L)	10	< 0.014	0.770	0.007	0.092	0.240	
Nitrate+Nitrite Nitrogen (mg/L)	10	1.830	2.470	2.055 ^M	2.102	0.199	
^J Total Kjeldahl Nitrogen (mg/L)	10	< 0.070	0.260	0.080	0.104	0.088	
^J Total Nitrogen (mg/L)	10	< 1.910	< 2.505	2.198 ^M	2.206	0.185	
^J Dissolved Reactive Phosphorus (mg/L)	10	< 0.006	0.011	0.007	0.007	0.003	
^J Total Phosphorus (mg/L)	10	0.010	0.026	0.014	0.016	0.005	
^J CBOD-5 (mg/L)	10	< 1.0	1.1	0.5	0.6	0.2	
^J TOC (mg/L)	10	0.5	1.6	0.9	1.0	0.4	
Chlorides (mg/L)	10	< 0.2	11.0	11.0 ^M	9.7	3.4	
^J Atrazine (µg/L)	3	< 0.02	< 0.02	0.01	0.01	0.00	
Total Metals							
^J Aluminum (mg/L)	3	0.131	0.332	0.134	0.199	0.115	
^J Iron (mg/L)	3	0.072	0.144	0.091	0.102	0.037	
^J Manganese (mg/L)	3	0.037	0.042	0.037	0.039	0.003	
Dissolved Metals							
^J Aluminum (mg/L)	3	0.086	0.129	0.117	0.111	0.022	
Antimony (µg/L)	3	< 1.9	< 2.3	1.2	1.1	0.1	
Arsenic (µg/L)	3	< 1.4	< 2.8	1.0	1.0	0.4	
Cadmium (mg/L)	3	< 0.00002	< 0.0001	< 0.0001	< 0.0001	0.0000	
Chromium (mg/L)	3	< 0.006	< 0.006	0.003	0.003	0.000	
Copper (mg/L)	3	< 0.005	< 0.005	0.002	0.002	0.000	
^J Iron (mg/L)	3	< 0.036	0.067	0.045	0.043	0.024	
Lead (µg/L)	3	< 0.8	< 0.9	0.4	0.4	0.0	
^J Manganese (mg/L)	3	0.030	0.042	0.034 ^M	0.035	0.006	
^J Mercury (µg/L)	2	< 0.072	< 0.105	0.044	0.044	0.012	
Nickel (mg/L)	3	< 0.007	< 0.007	0.004	0.004	0.000	
Selenium (µg/L)	3	< 0.8	< 1.3	0.4	0.5	0.1	
Silver (mg/L)	3	< 0.0002	< 0.0002	< 0.0002	< 0.0001	0.0000	
Thallium (µg/L)	3	< 1.1	< 1.2	0.6	0.6	0.0	
^J Zinc (mg/L)	3	< 0.032	< 0.032	0.016	0.016	0.000	
Biological							
^J Chlorophyll a (µg/L)	10	< 1.00	1.00	0.50	0.50	0.00	

C=value exceeds established criteria for F&W water use classification; E=# samples exceeding criteria; G=value higher than median concentration of ecoregional reference reach data collected in the ecoregion 65f; J=estimate; M=value >90% of ecoregional reference reach data collected in the ecoregion 65f; N=# samples.

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