Alabama Department of Environmental Management

Ambient Monitoring Site

Rivers and Streams Monitoring Program

2007 Monitoring Summary

Fair™

North River at Tuscaloosa County Road 38 (33.47980 / -87.59680)

BACKGROUND

North River at NRRT-1 is one of a network of 94 ambient sites monitored annually to identify long-term trends in water quality and to provide data for the development of Total Maximum Daily Loads (TMDLs) and water quality criteria. The North River, from Lake Tuscaloosa upstream to Ellis Creek, was also placed on Alabama's 2006 §303(d) list of impaired waterways due to nutrients, siltation, and other habitat alteration from abandoned surface mines. The site is also a USGS stream flow gauging station (02464000). Habitat and macroinvertebrate assessments were conducted on May 8, 2007 to assess the biological integrity of the site.

Figure 1. Sampling location within the North River watershed downstream of NRRT-1.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. North River at NRRT-1 is a *Fish & Wildlife (F&W)* stream located approximately 15 miles north of the city of Tuscaloosa, Alabama. Based on the 2000 National Land Cover Dataset, land use within the area is dominated by forest (75%) and has a low population density. Since February 23, 2011, ADEM has issued 21 NPDES permits within this watershed.

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. North River at NRRT-1 is located within the Fall Line Hills ecoregion. It is a high-gradient stream characterized by bedrock substrate (Figure 1). Overall habitat quality was categorized as *optimal*.

BIOASSESSMENT REULTS

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 scores for each individual metric. Metric results indicated the macroinvertebrate community to be in *fair* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Black Warrior River
Drainage Area (mi^2)		223
Ecoregion[a]		65i
% Landuse		
Open water		<1
Wetland	Woody	3
	Emergent herbaceous	<1
Forest	Deciduous	35
	Evergreen	26
	Mixed	14
Shrub/scrub		8
Grassland/herbaceous		3
Pasture/hay		5
Cultivated crops		2
Development	Open space	3
	Low intensity	<1
	Moderate intensity	<1
	High intensity	<1
Barren		<1
Population/km^2[b]		8
# NPDES Permits[c]	**TOTAL**	21
401 Water Quality Certification		1
Construction Stormwater		11
Mining		5
Industrial General		1
Municipal Individual		2
Underground Injection Control		1

a.Fall Line Hills

b.2000 US Census

c.#NPDES permits downloaded from ADEM's NPDES Management System database, February 23, 2011

Table 2. Physical characteristics of North River at NRRT-1, May 8, 2007.

Physical Characteristics		
Width (ft)		80
Canopy Cover		Mostly Open
Depth (ft)		
	Riffle	1.0
	Run	1.5
	Pool	2.0
% of Reach		
	Riffle	5
	Run	85
	Pool	10
% Substrate		
	Bedrock	51
	Boulder	15
	Cobble	10
	Gravel	5
	Sand	5
	Silt	10
	Organic Matter	4

Table 3. Results of habitat assessment conducted at NRRT-1, May 8,

Habitat Assessment	% Max Score	Rating
Instream habitat quality	63	Sub-optimal (53-65)
Sediment deposition	69	Optimal >65
Sinuosity	65	Sub-optimal (65-84)
Bank and vegetative stability	83.	Optimal >74
Riparian buffer	93	Optimal >89
Habitat assessment score	**179**	
% Maximum score	**74**	**Optimal >65**

Table 4. Results of macroinvertebrate bioassessment conducted in North River at NRRT-1, May 8, 2007.

Macroinvertebrate Assessment			
	Results	**Scores**	**Rating**
Taxa richness measures		**(0-100)**	
# Ephemeroptera (mayfly) genera	11	92	Excellent (>85)
# Plecoptera (stonefly) genera	4	67	Good (50-75)
# Trichoptera (caddisfly) genera	11	92	Excellent (>83)
Taxonomic composition measures			
% Non-insect taxa	10	61	Fair (49.5-74.1)
% Non-insect organisms	5	87	Fair (62.8-93.9)
% Plecoptera	9	46	Good (19.8-59.8)
Tolerance measures			
Beck's community tolerance index	15	54	Fair (41.0-60.9)
WMB-I Assessment Score	**--**	**71**	**Fair (49-72)**

WATER CHEMISTRY RESULTS

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, atrazine, and semi-volatile organics) during March through October to help identify any stressors to the biological communities. Specific conductance, hardness, chlorides, total dissolved solids, and chlorophyll *a* were higher than background concentrations as compared to reference reach data collected in the Fall Line Hills ecoregion. Stream pH exceeded the *F&W* use classification criteria during three sampling events. Dissolved mercury exceeded the aquatic life use and human health criteria during one out of six sampling events.

SUMMARY

Macroinvertebrate results indicated the macroinvertebrate community to be in *fair* condition. Habitat conditions were *optimal*, but results of other data collected during 2007 verify nutrient and siltation impairment from abandoned coal mines. Additionally, stream pH and mercury exceeded criteria applicable to North River *F&W* use classification. ADEM is scheduled to develop TMDLs for the impairments in 2014 using these and all other available data.

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Table 5. Summary of water quality data collected March-October, 2007. 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	Q	E
Physical								
Temperature (°C)	10	17.3	27.7	25.0	23.7	3.5		
Turbidity (NTU)	10	2.5	10.3	4.3	5.5	2.8		
Total Dissolved Solids (mg/L)	8	217.0	1955	496.0 M	809.6	678.0		
Total Suspended Solids (mg/L)	8	1.0	18.0	5.5	7.0	5.6		
Specific Conductance (µmhos)	10	514.6	4595	1123 G	2003.8	1592		
Hardness (mg/L)	7	19.1	58.0	47.8 G	40.2	14.1		
Alkalinity (mg/L)	8	100.3	922.1	645.2 M	529.7	339.6		
Stream Flow (cfs)	10	0.6	58.4	7.0	16.6	19.2		
Chemical								
Dissolved Oxygen (mg/L)	10	5.8	13.4	8.2	8.4	2.1		
pH (su)	10	7.5	8.9C	8.3	8.3	0.4		3
Ammonia Nitrogen (mg/L)	8	< 0.015	0.028	0.008	0.010	0.007		
Nitrate+Nitrite Nitrogen (mg/L)	8	0.051	0.585	0.232	0.236	0.172		
Total Kjeldahl Nitrogen (mg/L)	8	< 0.150	0.751	0.444	0.444	0.230		
Total Nitrogen	8	< 0.157	1.008	0.746	0.680	0.302		
Dissolved Reactive Phosphorus (mg/L)	8	0.004	0.050	0.012	0.015	0.014	J	
Total Phosphorus (mg/L)	8	0.025	0.055	0.034	0.034	0.010		
CBOD-5 (mg/L)	8	< 1.0	6.0	0.5	1.3	1.9		
Chlorides (mg/L)	8	82.0	673.7	480.6 M	400.6	255.2	J	
Atrazine (µg/L)	1	<			0.05			
Total Metals								
Aluminum (mg/L)	6	< 0.015	0.210	0.085	0.089	0.076	J	
Iron (mg/L)	6	0.066	0.560	0.220	0.276	0.206	J	
Manganese (mg/L)	6	0.040	0.097	0.068	0.068	0.022	J	
Dissolved Metals								
Aluminum (mg/L)	6	< 0.015	0.200	0.008	0.057	0.081		
Antimony (µg/L)	6	< 1.6	5.0	1.0	1.2	0.6		
Arsenic (µg/L)	4	< 0.5	5.0	1.1	1.2	0.9		
Cadmium (mg/L)	6	< 0.000	<0.005	0.002	0.002	0.001		
Chromium (mg/L)	6	< 0.003	0.010	0.002	0.003	0.001		
Copper (mg/L)	6	< 0.002	0.010	0.002	0.003	0.001		
Iron (mg/L)	6	< 0.005	0.277	0.045	0.097	0.114	J	
Lead (µg/L)	6	< 1.1	5.0	0.7	0.1	0.7		
Manganese (mg/L)	6	< 0.005	0.050	0.011	0.018	0.020		
Mercury (µg/L)	6	< 0.0	0.5AH	0.2	0.2	0.1	J	2
Nickel (mg/L)	6	< 0.006	0.020	0.003	0.006	0.007		
Selenium (µg/L)	6	< 1.6	5.0	0.8	1.1	0.7		
Silver (mg/L)	6	< 0.0	0.0	0.0	0.0	0.0		
Thallium (µg/L)	6	< 0.6	2.5	0.3	0.5	0.4		
Zinc (mg/L)	6	< 0.002	0.010	0.003	0.003	0.001		
Biological								
Chlorophyll a (ug/L)	8	0.53	24.56	10.50 M	11.19	8.23	J	
Fecal Coliform (col/100 mL)	8	10	750	40	177	260	J	

A= *F&W* aquatic life use criterion exceeded; C= *F&W* criterion violated; E=# samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 65i H= *F&W* human health criterion exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 65i; N=# samples