

2006 Monitoring Summary

Gunnison Creek at Radcliff Road in Mobile County (30.89785-88.04787)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Gunnison Creek 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.

Gunnison Creek is among the least-disturbed watersheds in the Floodplains and Low Terraces ecoregion (75i) based on landuse, road density, and population density. The 2006 data will be used to evaluate the use of Gunnison Creek as a “best attainable” condition reference watershed for comparison with other Floodplains and Low Terraces streams.

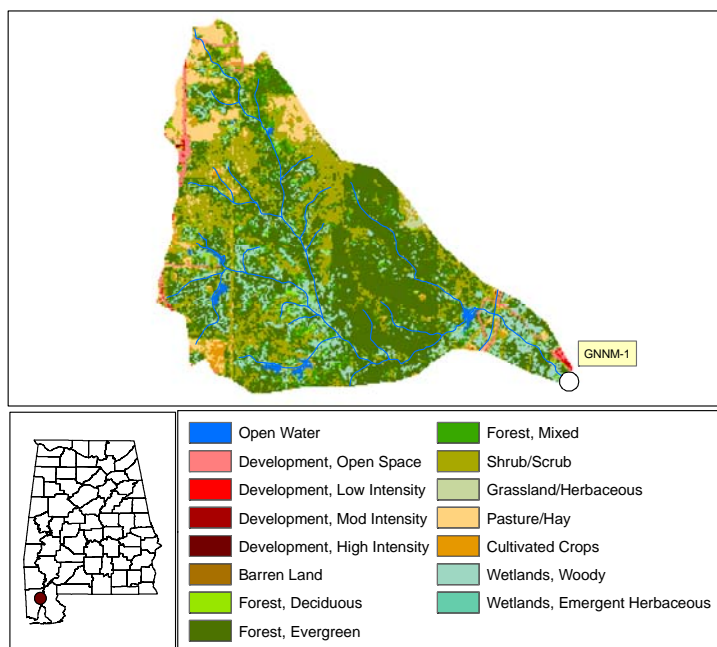


Figure 1. Sampling location and landuse within the Gunnison Creek watershed at GNNM-1.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Gunnison Creek at GNNM-1 is a *Swimming/Fish & Wildlife (S/F&W)* stream located in Mobile County. Land cover within the watershed is mainly forest (65%) interspersed with shrub/scrub and wetland (Fig.1). Four construction permits were issued within the watershed area.

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. Gunnison Creek at GNNM-1 is typical of ecoregion 75i. It is characterized by a low gradient and sand and silt substrates (Fig. 2). The overall habitat score was similar to reference reaches in other areas of the coastal plain. Bank stability was noted as a concern, however.

BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled at GNNM-1 using ADEM’s Intensive Multi-habitat Bioassessment methodology (WMB-I). Table 4 summarizes results of taxa richness, community composition and community tolerance metrics. Data collected at GNNM-1 may be used to develop an index of ADEM’s WMB-I for Ecoregion 75i.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Mobile
Drainage Area (mi ²)		11
Ecoregion ^a		75i
% Landuse		
Open water		1
Wetland	Woody	12
	Emergent herbaceous	<1
Forest	Deciduous	1
	Evergreen	44
	Mixed	8
Shrub/scrub		23
Grassland/herbaceous		<1
Pasture/hay		6
Cultivated crops		1
Development	Open space	2
	Low intensity	<1
	Moderate intensity	<1
	High intensity	<1
Population/km ² ^b		14
# NPDES Permits ^c	TOTAL	4
Construction Stormwater		4

a.Floodplains & Low Terraces

b.2000 US Census

c.#NPDES permits downloaded from ADEM’s NPDES Management System database, 18 Sep. 2009

Table 2. Physical characteristics of Gunnison Creek at GNNM-1, May 23, 2006.

Physical Characteristics		
Width (ft)		20
Canopy cover		Shaded
Depth (ft)	Run	1.5
	Pool	4.0
% of Reach	Run	30
	Pool	70
% Substrate	Sand	80
	Silt	10
	Organic Matter	8
	Mud/Muck	2

Table 3. Results of the habitat assessment conducted on Gunnison Creek at GNNM-1, May 23, 2006.

Habitat Assessment (% Maximum Score)	
Instream habitat quality	58
Sediment deposition	76
Sinuosity	60
Bank and vegetative stability	58
Riparian buffer	88
Habitat assessment score	152
% Maximum score	69

Table 4. Results of the macroinvertebrate bioassessment conducted in Gunnison Creek at GNNM-1, May 23, 2006.

Macroinvertebrate Assessment		Results
Taxa richness measures		
# EPT genera		10
Taxonomic composition measures		
% Non-insect taxa		14
% Plecoptera		0
% Dominant taxa		18
Functional composition measures		
% Predators		26
Tolerance measures		
Beck's community tolerance index		6
% Nutrient tolerant organisms		28



Figure 2. Gunnison Creek at GNNM-1, January 20, 2010.

WATER CHEMISTRY

Results of water chemistry 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 2006 to characterize water quality conditions in Gunnison Creek at GNNM-1. *In situ* parameters indicated that the reach was meeting water quality criteria for its S/F&W use classification. Dissolved oxygen concentrations ranged from 6.3-8.8 mg/L. The pH was slightly acidic, which is natural for coastal plain streams. Individual fecal coliform counts did not exceed 270 colonies/100 ml of sample. Collected metals were generally below detection limits. Pesticides, semi-volatile organics, and atrazine were not detected in the two samples collected (March 29 and September 20, 2006).

SUMMARY

Gunnison Creek at GNNM-1 was typical of other streams in the Floodplains and Low Terrace, which are generally low-gradient streams with sand and silt substrates (Griffith et al. 2001). Land use, road density, and population density categorized Gunnison Creek among the least-disturbed watersheds in the Floodplains and Low Terraces ecoregion (75i). Habitat, bioassessment, and water quality data indicate the reach to be similar to reference reaches in other areas of the coastal plains, despite small residential and pasture areas in the watershed.

Table 5. Summary of water quality data collected March-October, 2006. 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.

Parameter	N	Min	Max	Median	Avg	SD
Physical						
Temperature (°C)	9	18.0	27.3	23.0	23.2	3.0
Turbidity (NTU)	9	1.3	8.2	1.9	2.6	2.1
Total Dissolved Solids (mg/L)	8	1.0	39.0	29.0	26.3	12.5
Total Suspended Solids (mg/L)	8	< 1.0	9.0	2.8	3.4	2.4
Specific Conductance (µmhos)	9	28.0	38.8	30.1	31.2	3.3
Hardness (mg/L)	3	14.0	26.0	21.0	20.3	6.0
Alkalinity (mg/L)	8	< 1.0	7.0	4.4	4.3	2.1
Stream Flow (cfs)	8	7.2	20.2	10.6	11.4	4.6
Chemical						
Dissolved Oxygen (mg/L)	9	6.3	8.8	7.4	7.3	0.8
pH (su)	9	5.5 ^c	6.1	5.9	5.9	0.2
Ammonia Nitrogen (mg/L)	8	< 0.010	0.030	0.008	0.011	0.009
Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.003	0.060	0.025	0.026	0.023
Total Kjeldahl Nitrogen (mg/L)	8	< 0.150	0.570	0.217	0.260	0.199
Total Nitrogen (mg/L)	8	0.077	0.594	0.237	0.286	0.204
Dissolved Reactive Phosphorus (mg/L)	8	< 0.004	0.012	0.006	0.007	0.004
Total Phosphorus (mg/L)	8	< 0.004	0.026	0.010	0.013	0.009
CBOD-5 (mg/L)	8	< 1.0	1.9	0.5	0.9	0.6
Chlorides (mg/L)	8	< 1.4	6.8	3.0	4.0	2.2
Atrazine (µg/L)	2	< 0.05	< 0.05	0.03	0.03	0.00
Total Metals						
Aluminum (mg/L)	3	0.1	0.18	0.140	0.123	0.067
Iron (mg/L)	3	0.481	0.665	0.501	0.549	0.101
Manganese (mg/L)	3	0.007	0.016	0.012	0.012	0.005
Dissolved Metals						
Aluminum (mg/L)	3	< 0.1	0.11	0.050	0.070	0.035
Antimony (µg/L)	3	< 7.5	< 7.5	3.8	3.8	0.0
Arsenic (µg/L)	3	< 5	< 5	2.5	2.5	0.0
Cadmium (mg/L)	3	< 0.0003	< 0.0003	0.0001	0.0001	0.000
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	0.153	0.482	0.199	0.278	0.178
Lead (µg/L)	3	< 5	< 5	2.5	2.5	0.0
Manganese (mg/L)	3	0.007	0.012	0.010	0.010	0.003
Mercury (µg/L)	3	< 0.5	< 0.5	0.3	0.3	0.0
Nickel (mg/L)	3	< 0.005	< 0.008	0.003	0.004	0.003
Selenium (µg/L)	3	< 7.5	< 7.5	3.8	3.8	0.0
Silver (mg/L)	3	< 0.001	< 0.001	0.0004	0.0004	0.000
Thallium (µg/L)	3	< 9	< 9	4.5	4.5	0.0
Zinc (mg/L)	3	< 0.005	< 0.005	0.003	0.003	0.000
Biological						
Chlorophyll a (µg/L)	8	< 0.89	4.27	0.98	1.52	1.35
^J Fecal Coliform (col/100 mL)	6	4	270	53	103	114

J=estimate; N= # samples.

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