

# 2011 Monitoring Summary

Reference Reach Site

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

### BACKGROUND

Gunnison Creek is among the least-disturbed watersheds in the Floodplains and Low Terraces (75i) ecoregion, based on landuse, road density, and population density. The 2011 data will be used to evaluate Gunnison Creek at GNNM-1 as a “best-attainable” condition reference watershed for comparison with other streams in the Floodplains and Low Terraces ecoregion.

The Gunnison Creek watershed was also selected for biological and water quality monitoring as part of the 2011 Escatawpa, Mobile, and Tombigbee (EMT) River Basin Assessment Monitoring Program. The objectives of the EMT River Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the basin.



Figure 1. Gunnison Creek at GNNM-1, taken on May 16, 2011.

### 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. Based on the 2011 National Land Cover Dataset, land use within the watershed is an even mixture of forest (39%), wetlands (25%), and shrub/scrub. Population density is low. As of May 13, 2013, 10 NPDES outfalls were active in the 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. Gunnison Creek at GNNM-1 is a tannic, low gradient (Figure 1). Benthic substrate consists primarily of sand with some organic matter and silt. Overall habitat quality was rated as *sub-optimal* for supporting the macroinvertebrate community due to a marginal riparian buffer.

### BIOASSESSMENT RESULTS

The benthic macroinvertebrate community was sampled 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		Mobile River
Basin		Mobile River
Drainage Area (mi <sup>2</sup> )		11
Ecoregion <sup>a</sup>		75i
% Landuse		
Open water		1
Wetland	Woody	24
	Emergent herbaceous	1
Forest	Deciduous	<1
	Evergreen	31
	Mixed	7
Shrub/scrub		23
Grassland/herbaceous		6
Pasture/hay		5
Development	Open space	2
	Low intensity	<1
	Moderate intensity	<1
	High intensity	<1
Barren		<1
Population/km <sup>2b</sup>		14
# NPDES Permits <sup>c</sup>	<b>TOTAL</b>	10
	Construction Stormwater	9
	Municipal Individual	1

a. Floodplains and Low Terraces

b. 2000 US Census

c. #NPDES permits downloaded from ADEM’s NPDES Management System database, May 13, 2013.

Table 2. Physical characteristics of Gunnison Creek at GNNM-1, May 24, 2011.

Physical Characteristics	
<b>Canopy Cover</b>	<b>Mostly Shaded</b>
<b>Width (ft)</b>	<b>10.0</b>
<b>Depth (Ft)</b>	
	<b>Run</b>
	<b>1.5</b>
	<b>Pool</b>
	<b>3.0</b>
<b>% of Reach</b>	
	<b>Run</b>
	<b>50</b>
	<b>Pool</b>
	<b>50</b>
<b>% Substrate</b>	
	<b>Mud/Muck</b>
	<b>2</b>
	<b>Sand</b>
	<b>63</b>
	<b>Silt</b>
	<b>10</b>
	<b>Organic Matter</b>
	<b>25</b>

**Table 3. Results of the habitat assessment conducted on Gunnison Ck at GNNM-1, May 24, 2011. Macroinvertebrates were also collected.**

Habitat Assessment	Maximum Score	Rating
<b>GP</b>		
Instream Habitat Quality	59	Sub-optimal (55-79)
Sediment Deposition	75	Sub-optimal (55-79)
Sinuosity	83	Optimal >79
Bank and Vegetative Stability	75	Sub-optimal (58-79)
Riparian Buffer	45	Marginal (31-59)
<b>Habitat Assessment Score</b>	<b>115</b>	
<b>% Maximum Score</b>	<b>64</b>	<b>Sub-optimal (57-80)</b>

**Table 4. Results of macroinvertebrate assessment conducted in Gunnison Creek at GNNM-1 on May 16, 2011.**

Macroinvertebrate Assessment		Results
<b>Taxa richness and diversity measures</b>		
# EPT taxa		17
<b>Taxonomic composition measures</b>		
% Non-insect taxa		10
% Plecoptera		2
% Dominant taxon		31
<b>Functional feeding group</b>		
% Predators		10
<b>Community tolerance</b>		
Becks community tolerance index		15
% Nutrient tolerant individuals		36

## WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. When possible, *in situ* measurements and water samples were collected during the months of April, June, August, and October 2011 to help identify any stressors to the biological communities. Organics and pesticides were collected in April and October. Dissolved oxygen concentrations ranged from 6.6-8.3 mg/L. Stream pH was acidic, which is typical of streams in this ecoregion. Individual *E. coli* counts did not exceed 147 colonies/100 mL of sample. Collected metals were generally below detection limits.

## SUMMARY

Gunnison Creek at GNNM-1 is typical of other streams in the Floodplains and Low Terraces ecoregion, which are generally low-gradient, tannic streams, with sand and silt substrates (Griffith et al. 2001). Landuse, road density, and population density categorized Gunnison Creek among the least-disturbed watersheds within the region. However, the number of active construction/stormwater discharges has increased.

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**Table 5. Summary of water quality data collected March-October 2014. 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	Med	Avg	SD	Q	E
<b>Physical</b>								
Temperature (°C)	5	18.5	27.8	24.7	24.0	3.5		
Turbidity (NTU)	5	0.9	2.3	1.4	1.5	0.5		
Total Dissolved Solids (mg/L)	4	22.0	88.0	40.0	42.5	19.0		
Total Suspended Solids (mg/L)	4	< 1.0	< 1.0	0.8	0.8	0.3		
Specific Conductance (µmhos/cm@25C)	5	29.5	31.5	29.9	30.4	0.9		
Hardness (mg/L)	4	6.5	7.8	7.4	7.2	0.8		
Alkalinity (mg/L)	4	2.9	4.9	4.3	4.1	0.9		
Stream Flow during Sample Collection (cfs)	5	7.4	14.1	10.6	10.9	3.0		
<b>Chemical</b>								
Dissolved Oxygen (mg/L)	5	6.6	8.3	7.3	7.4	0.6		
pH (SU)	5	5.89 <sup>J</sup>	8.1	5.9	6.0	0.1		3
Ammonia Nitrogen (mg/L)	4	< 0.006	< 0.006	0.002	0.002	0.000		
↓ Nitrate-Nitrite Nitrogen (mg/L)	4	0.014	0.036	0.020	0.022	0.010		
Total Kjeldahl Nitrogen (mg/L)	4	< 0.076	0.512	0.119	0.197	0.220		
↓ Total Nitrogen (mg/L)	4	< 0.074	0.526	0.139	0.219	0.213		
↓ Dissolved Reactive Phosphorus (mg/L)	4	0.006	0.009	0.007	0.007	0.001		
↓ Total Phosphorus (mg/L)	4	0.006	0.006	0.006	0.007	0.001		
↓ CBOD-5 (mg/L)	4	< 2.0	< 2.0	1.0	1.0	0.0		
COD (mg/L)	4	< 3.1	18.8	7.1	8.6	7.9		
TOC (mg/L)	4	2.5	2.9	2.7	2.7	0.2		
Chlorides (mg/L)	4	4.1	4.6	4.4	4.4	0.2		
Alazine (µg/L)	2	< 0.02	< 0.02	0.01	0.01	0.00		
<b>Total Metals</b>								
↓ Aluminum (mg/L)	4	< 0.043	0.110	0.045	0.056	0.043		
Iron (mg/L)	4	0.362	1.270	0.596	0.706	0.413		
↓ Manganese (mg/L)	4	0.007	0.018	0.012	0.012	0.005		
<b>Dissolved Metals</b>								
↓ Aluminum (mg/L)	4	< 0.043	0.045	0.022	0.027	0.012		
Antimony (µg/L)	4	< 1.9	< 1.9	0.9	0.9	0.0		
Arsenic (µg/L)	4	< 1.4	< 1.4	0.7	0.7	0.0		
Cadmium (µg/L)	4	< 0.022	< 0.022	0.011	0.011	0.000		
Chromium (mg/L)	4	< 0.009	< 0.009	0.004	0.004	0.000		
Copper (mg/L)	4	< 0.020	< 0.020	0.010	0.010	0.000		
↓ Iron (mg/L)	4	0.129	0.289	0.195	0.202	0.067		
Lead (µg/L)	4	< 0.9	< 0.9	0.5	0.5	0.0		
↓ Manganese (mg/L)	4	0.006	0.011	0.010	0.009	0.003		
Mercury (µg/L)	4	< 0.035	< 0.035	0.018	0.018	0.000		
Nickel (mg/L)	4	< 0.042	< 0.042	0.021	0.021	0.000		
Selenium (µg/L)	4	< 1.3	< 1.3	0.7	0.7	0.0		
Silver (µg/L)	4	< 0.015	< 0.015	0.008	0.008	0.000		
↓ Thallium (µg/L)	4	< 1.1	1.4 <sup>F</sup>	0.5	0.8	0.4	1	
Zinc (mg/L)	4	< 0.012	< 0.012	0.006	0.006	0.000		
<b>Biological</b>								
Chlorophyll a (mg/m <sup>2</sup> )	4	< 0.10	1.78	0.53	0.72	0.74		
<i>E. coli</i> (MPN/DL)	4	34.5	148.7	99.9	95.2	54.5		

A= F&W aquatic life use criterion exceeded; C= F&W criterion violated; E= # of samples that exceeded criteria; J=estimate; N=# samples; Q=# of uncertain exceedances.