

2013 Monitoring Summary



Guess Creek on private property accessed from Jackson County Road 20 (34.74518/-86.22124)

BACKGROUND

An 11-mile reach of Guess Creek from the Paint Rock River upstream to Bee Branch was placed on Alabama's Clean Water Act (CWA) §303(d) list of impaired waters in 1998 for not meeting its *Fish and Wildlife (F&W)* water use classification. It was listed for unknown toxicity, organic enrichment, and pathogens from pasture grazing and other unknown sources.

The Alabama Department of Environmental Management (ADEM) monitored Guess Creek at GUES-3 as part of the 2013 sampling plan. A macroinvertebrate and a habitat assessment were conducted to estimate potential impairment to the aquatic community. Monthly water chemistry samples were collected to identify the cause of impairment. Results from these data may also be used in the development of the Total Maximum Daily Load (TMDL) for Guess Creek.



Figure 1. Guess Creek at GUES-3, May 22, 2013.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Guess Creek at GUES-3 is a *Fish and Wildlife (F&W)* stream located in Jackson County. Based on the 2006 National Land Cover Dataset, landuse within the watershed is primarily forest (71%) with some pasture land. Less than 4% of the area is developed. As of June 6, 2013, a total of three NPDES permits have been issued 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. Guess Creek at GUES-3 is a riffle-run stream located in the Eastern Highland Rim ecoregion (Figure 1). Benthic substrate consists primarily of clay and gravel. Overall habitat quality was rated as *sub-optimal* for supporting macroinvertebrate communities. However, cows were observed in the stream reach during macroinvertebrate sampling.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Tennessee River	
Drainage Area (mi²)	33	
Ecoregion^a	71g	
% Landuse		
Open water		<1
Wetland	Woody	<1
Forest	Deciduous	69
	Evergreen	1
	Mixed	1
Shrub/scrub		7
Grassland/herbaceous		2
Pasture/hay		15
Cultivated crops		2
Development	Open space	2
	Low intensity	<1
	Moderate intensity	<1
Barren		<1
Population/km^{2b}	16	
# NPDES Permits^c	TOTAL	3
Mining		1
Industrial General		2

a. Eastern Highland Rim

b. 2000 US Census

c. #NPDES permits downloaded from ADEM's NPDES Management System database, June 6, 2013.

Table 2. Physical characteristics of Guess Creek at GUES-3, June 26, 2013.

Physical Characteristics		
Width (ft)	50	
Canopy Cover	Mostly Shaded	
Depth (ft)	Riffle	0.3
	Run	1.5
	Pool	3.0
% of Reach	Riffle	10
	Run	65
	Pool	25
% Substrate	Boulder	1
	Clay	35
	Cobble	10
	Gravel	25
	Sand	14
	Silt	10
	Organic Matter	5

Table 3. Results of the habitat assessment survey conducted on Gues Creek at GUES-3, June 26, 2013.

Habitat Survey	% Max Score	Rating
Instream Habitat Quality	74	Sub-optimal (55-74.9)
Sediment Deposition	76	Sub-optimal/Optimal (75-79.9)
Riffle Frequency	70	Sub-optimal (55-74.9)
Bank Vegetative Stability	60	Sub-optimal (55-74.9)
Riparian Zone Measurements	48	Marginal (30-49.9)
Habitat Assessment Score	132	
% Maximum Score	66	Sub-optimal (55-74.9)

Table 4. Results of the macroinvertebrate bioassessment conducted in Gues Creek at GUES-3, June 26, 2013.

Macroinvertebrate Assessment Results	
Taxonomic richness and diversity metrics	
Total # taxa	67
# rare and highly sensitive taxa	0
# sensitive taxa	14
# sensitive EPT taxa	6
Taxonomic composition metrics	
% tolerant individuals	73
% tolerant taxa	16
% sensitive EPT taxa	9
% sensitive taxa	21
% rare and highly sensitive taxa	0
Percent individual metrics	
% sensitive EPT individuals	1
% rare and highly sensitive individuals	0
% sensitive individuals	1
WMB-I Assessment Score	4.0
WMB-I Assessment Rating	Fair (3.8-4)

BIOASSESSMENT RESULTS

The benthic macroinvertebrate community was sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). Measures of taxonomic richness, community composition and pollution tolerance were used to assess the overall health of the macroinvertebrate community in comparison to conditions expected in north Alabama streams and rivers. Each site is placed in one of six levels ranging from 1, or natural, to 6, or highly altered. Metric results indicated the macroinvertebrate community to be in *fair* condition (Table 4).

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. When possible, in situ measurements and water samples were collected monthly during March through October 2013 to help identify any stressors to the biological communities. Summer *E. coli* counts exceeded maximum single sample *F&W* human health criteria on three sampling dates. The summer geometric mean was also exceeded for *E. coli*. Median specific conductance at GUES-3 was higher than the median of reference reach data collected in ecoregion 71.

Table 5. Summary of water quality data collected March-October, 2013. 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	E
Physical							
Temperature (°C)	17	8.3	18.1	17.5	16.4	2.7	
Turbidity (NTU)	17	2.7	56.1	4.8	9.4	13.1	
↓ Total Dissolved Solids (mg/L)	8	78.0	199.0	100.0	120.8	46.0	
↓ Total Suspended Solids (mg/L)	8	< 1.0	9.0	4.0	4.2	2.5	
Specific Conductance (µmhos)	17	122.0	230.0	181.0 ^g	174.8	30.1	
Alkalinity (mg/L)	8	41.6	107.0	59.6	66.0	20.4	
Stream Flow (cfs)	15	5.1	145.4	22.4	34.2	35.3	
Chemical							
Dissolved Oxygen (mg/L)	17	7.2	11.3	8.3	8.6	1.0	
pH (su)	17	7.3	7.9	7.6	7.6	0.2	
↓ Ammonia Nitrogen (mg/L)	8	< 0.015	0.056	0.011	0.018	0.017	
↓ Nitrate+Nitrite Nitrogen (mg/L)	8	0.108	0.225	0.176	0.172	0.038	
↓ Total Kjeldahl Nitrogen (mg/L)	8	< 0.050	0.382	0.180	0.194	0.103	
↓ Total Nitrogen (mg/L)	8	< 0.160	0.547	0.354	0.366	0.112	
↓ Dissolved Reactive Phosphorus (mg/L)	7	< 0.003	< 0.007	0.004	0.004	0.001	
↓ Total Phosphorus (mg/L)	8	< 0.007	0.027	0.009	0.010	0.007	
↓ CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0	
↓ Chlorides (mg/L)	8	< 1.4	2.4	1.9	1.8	0.5	
Biological							
Chlorophyll a (µg/L)	8	< 1.00	< 1.00	0.50	0.50	0.00	
↓ <i>E. coli</i> (col/100ml)	16	32	2420 ^h	298	428	551	4

E=# samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 71; H=*F&W* human health criteria exceeded; J=estimate; N=# samples.

SUMMARY

Bioassessment results indicated the macroinvertebrate community in Gues Creek at GUES-3 to be in *fair* condition. Overall habitat quality was categorized as *sub-optimal* for supporting biological communities. However, cows were observed in the stream reach at the time of macroinvertebrate sampling. Water chemistry analyses concluded that summer *E. coli* counts at GUES-3 exceeded *F&W* human health criteria in 2013. Median specific conductance was slightly higher than expected for streams in ecoregion 71. Monitoring should continue to ensure that water quality and biological conditions meet current standards.

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