

2013 Monitoring Summary



Browns Creek at Nesmith Road in Blount County (34.22322/-86.43794)

BACKGROUND

Since 2012, Browns Creek, from Guntersville Lake to its source (approximately 12 miles), has been on Alabama's Clean Water Act (CWA) §303(d) list of impaired waters for only partially meeting its *Fish and Wildlife (F&W)* water use classification. It was listed for impairments caused by nutrient and total dissolved solids (TDS) from municipal agriculture and mining. The segment was listed as impaired based on data collected in 2009.

The Alabama Department of Environmental Management (ADEM) monitored Browns Creek at BRSB-2 to collect additional data for the development of Total Maximum Daily Loads (TMDLs) to address these impairments. A macroinvertebrate and a habitat assessment were conducted to assess biological conditions. Monthly water chemistry samples were collected to identify the causes of impairment.



Figure 1. Browns Creek at BRSB-2, June 24, 2013.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Browns Creek at BRSB-2 is a *Fish & Wildlife (F&W)* stream located in Blount County, approximately 13 miles south of Guntersville. According to the 2011 National Land Cover Dataset, landuse within the watershed is primarily forested (47%) and pasture/hay. As of September 1, 2012, ADEM has issued eight NPDES discharge permits in 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. Browns Creek at BRSB-2 is a high-gradient, gravel-bottomed stream, typical of other streams within the Sequatchie Valley ecoregion (Figure 1). Overall habitat quality was rated as *marginal*. Though Browns Creek at BRSB-2 has optimal sinuosity and sub-optimal instream habitat quality, it also has a poor riparian buffer.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Tennessee River	
Drainage Area (mi²)	10	
Ecoregion^a	68b	
% Landuse		
Open water		<1
Wetland	Woody	<1
Forest	Deciduous	39
	Evergreen	3
	Mixed	4
Shrub/scrub		6
Grassland/herbaceous		2
Pasture/hay		32
Cultivated crops		9
Development	Open space	3
	Low intensity	<1
	Moderate intensity	<1
	High intensity	<1
Barren		1
Population/km^{2b}	1	
# NPDES Permits^c	TOTAL	8
Construction Stormwater		5
Mining		2
Industrial General		1

a.Sequatchie Valley

b.2000 US Census

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

Table 2. Physical characteristics of Browns Creek at BRSB-2, June 24, 2013.

Physical Characteristics		
Width (ft)	20	
Canopy cover	Mostly Open	
Depth (ft)		
	Riffle	0.5
	Run	1.3
	Pool	3
% of Reach		
	Riffle	45
	Run	10
	Pool	45
% Substrate		
	Boulder	8
	Cobble	25
	Gravel	50
	Hard Pan Clay	5
	Sand	5
	Silt	5
	Organic Matter	2

Table 3. Results of the habitat assessment conducted on Browns Creek at BRSB-2, June 24, 2013.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	63	Sub-optimal (59-70)
Sediment Deposition	52	Marginal (41-58)
Sinuosity	88	Optimal (> 84)
Bank and Vegetative Stability	54	Marginal (35-59)
Riparian Buffer	23	Poor (<50)
Habitat Assessment Score	126	
% Maximum score	52	Marginal (41-58)

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 comparison to conditions expected in north Alabama streams and rivers. Each score is based on a six-point scale, ranging from 1, or *natural*, to 6, or *highly altered*. The macroinvertebrate survey conducted in Browns Creek at BRSB-2 rated the macroinvertebrate community to be in *fair-poor* condition (Table 4).

Table 4. Results of the macroinvertebrate bioassessment conducted in Browns Creek at BRSB-2, June 24, 2013.

Macroinvertebrate Assessment			
	Results	Scores	
			(0-100)
Taxa richness measures			
# EPT taxa	12		35
Taxonomic composition measures			
% Non-insect taxa	17		29
% Dominant taxon	22		72
% EPC taxa	25		47
Functional feeding group measures			
% Predators	4		10
Tolerance measures			
% Taxa as Tolerant	31		53
WMB-I Assessment Score	---		41
WMB-I Assessment Rating			Fair (39-58)

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected monthly from March through October 2013 to help identify potential stressors to the biological communities. Median total dissolved solids (TDS), specific conductivity, alkalinity, nitrate+nitrite nitrogen, and total nitrogen values were higher than expected based data collected at reference reaches within the Southwestern Appalachians ecoregion (68). Sequatchie Valley ecoregion (68d) is a level IV ecoregion within the level III Southwestern Appalachians ecoregion (68).

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 for non-metals parameters. 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
Physical						
Temperature (°C)	9	9.2	24.0	20.6	19.8	4.9
Turbidity (NTU)	12	3.3	53.9	8.0	11.6	13.7
Total Dissolved Solids (mg/L)	8	153.0	313.0	183.5 ^M	196.8	49.4
Total Suspended Solids (mg/L)	8	2.0	16.0	7.0	8.0	4.9
Specific Conductance (µmhos)	9	257.0	331.0	304.0 ^G	300.9	24.8
Alkalinity (mg/L)	8	95.1	133.3	113.0 ^M	114.8	15.2
Stream Flow (cfs)	11	2.6	46.6	7.8	15.0	15.0
Chemical						
Dissolved Oxygen (mg/L)	9	7.1	12.4	8.7	9.2	1.8
pH (su)	9	7.6	7.9	7.8	7.8	0.1
Ammonia Nitrogen (mg/L)	8	< 0.015	0.078	0.014	0.025	0.024
Nitrate+Nitrite Nitrogen (mg/L)	8	0.634	1.650	1.305 ^M	1.215	0.325
Total Kjeldahl Nitrogen (mg/L)	8	0.219	1.300	0.444	0.519	0.333
Total Nitrogen (mg/L)	8	1.281	2.092	1.772 ^M	1.734	0.242
Dissolved Reactive Phosphorus (mg/L)	8	0.016	0.027	0.017	0.019	0.004
Total Phosphorus (mg/L)	8	0.026	0.390	0.038	0.084	0.125
CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0
Chlorides (mg/L)	8	2.5	4.2	3.3	3.3	0.5
Biological						
Chlorophyll a (µg/L)	8	< 1.00	11.70	2.90	3.48	3.78

G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 68; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 68; N=# samples;

Browns Creek is currently listed as impaired by nutrient enrichment and total dissolved solids (TDS). Monthly water quality sampling conducted at BRSB-2 in 2013 indicated median concentrations of TDS and nutrients (nitrate+nitrite nitrogen, total nitrogen and DRP) to be higher than expected, based on verified reference reach data collected in ecoregion 68. Specific conductivity and alkalinity were also above values expected in this ecoregion. Habitat conditions were rated as *marginal*, due to sediment deposition, unstable banks, and limited riparian buffers. Macroinvertebrate sampling indicated the macroinvertebrate community to be in *fair-poor* condition. The TMDLs for these impairments are set to be drafted in 2015.

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