

2011 Monitoring Summary



Inman Creek at unnamed Forest Service Road in Bankhead National Forest, Winston County (34.21590/-87.22400)

BACKGROUND

Inman Creek is one of the streams the Alabama Department of Environmental Management (ADEM) monitors as a “best attainable condition” reference watershed for comparison with streams throughout the Dissected Plateau ecoregion.

Additionally, Brushy Creek was selected for sampling to provide baseline water quality and biological data for comparison with data from similar stream reaches downstream of discharges from surface coal mining facilities. The objective of the study was to collect data to understand specific requirements needed to ensure that discharges from these facilities will not cause or contribute to water quality standards violations.



Figure 1. Inman Creek at INMW-1, May 11, 2011.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Inman Creek at INMW-1 is a small *Fish and Wildlife (F&W)* stream located in the Dissected Plateau (68e) ecoregion, within Bankhead National Forest. According to the 2006 National Land Cover Dataset, land cover within the watershed is approximately 81% forested. As of September 4, 2012, ADEM’s NPDES Management System database showed no permitted discharges located within 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. Inman Creek at INMW-1 is a high-gradient, riffle-run stream. Dominant substrates in the reach consists of cobble, gravel and bedrock (Figure 1). Overall habitat quality was rated as *optimal* for supporting macroinvertebrate communities.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Black Warrior River	
Drainage Area (mi²)	5	
Ecoregion^a	68e	
% Landuse		
Wetland	Woody	<1
Forest	Deciduous	30
	Evergreen	29
	Mixed	22
Shrub/scrub		3
Grassland/herbaceous		2
Pasture/hay		10
Cultivated crops		<1
Development	Open space	3
	Low intensity	<1
	Moderate intensity	<1
Barren		<1
Population/km^{2b}	3	

a. Dissected Plateau

b. 2000 US Census

Table 2. Physical characteristics of Inman Creek at INMW-1, May 11, 2011.

Physical Characteristics	
Width (ft)	35
Canopy Cover	Mostly Shaded
Depth (ft)	
Riffle	0.4
Run	1.0
Pool	1.5
% of Reach	
Riffle	35
Run	40
Pool	25
% Substrate	
Bedrock	20
Boulder	10
Cobble	30
Gravel	20
Sand	10
Organic Matter	10

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. Each metric is scored on a 100 point scale. The final score is the average of all individual metric scores. The final score indicated the biological community at INMW-1 to be in *good* condition (Table 4).

Table 3. Results of the habitat assessment conducted on Inman Creek at INMW-1, May 11, 2011.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	81	Optimal (>70)
Sediment Deposition	85	Optimal (>70)
Sinuosity	90	Optimal (>84)
Bank and Vegetative Stability	68	Sub-optimal (60-74)
Riparian Buffer	88	Sub-optimal (70-89)
Habitat Assessment Score	194	
% Maximum Score	81	Optimal (>70)

Table 4. Results of the macroinvertebrate bioassessment conducted in Inman Creek at INMW-1, May 11, 2011.

Macroinvertebrate Assessment			
	Results	Scores (0-100)	
Taxa richness measures			
# EPT taxa	26	96	
Taxonomic composition measures			
% Non-insect taxa	4	94	
% Dominant taxon	18	83	
% EPC taxa	33	62	
Functional feeding group measures			
% Predators	9	32	
Tolerance measures			
% Taxa as Tolerant	22	79	
WMB-I Assessment Score	---	74	
WMB-I Assessment Rating		Good (59-79)	

WATER CHEMISTRY

Results of water chemistry are presented in Table 5. In situ measurements and water samples were collected twice monthly or monthly (metals) during January through August of 2011 to help identify any stressors to the biological communities. Inconsistencies in number of samples (Table 5, column N) are due to one sampling event cancellation due to tornadic activity in April and variations in sampling plans. Dissolved oxygen exceeded *F&W* use classification criteria on July 27, 2011. However, on that date stream flow was measured at 0.04 cfs, which could have contributed to the lower dissolved oxygen reading. Ammonia-nitrogen and chlorides were higher than expected based on the 90th percentile of all samples collected at reference reaches in ecoregion 68e. On sampling date April 15, 2011, the turbidity value was greater than 50 NTU above ecoregional guidelines. This high turbidity value corresponds to a high flow event.

SUMMARY

ADEM monitored Inman Creek as part of the Basin Assessment and as a "best attainable" condition reference reach watershed for the Black Warrior River in 2011. Bioassessment results show the macroinvertebrate community to be in *good* condition, and the overall habitat quality was rated as *optimal*. Ammonia nitrogen, chlorides, and turbidity were higher than expected for this ecoregion.

Table 5. Summary of water quality data collected January-August, 2011. 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
Physical						
Temperature (°C)	17	6.0	24.3	17.6	17.2	6.1
Turbidity (NTU)	17	3.2	61.7 ^T	5.4	10.3	14.0
^J Total Dissolved Solids (mg/L)	15	18.0	44.0	28.0	29.2	7.2
^J Total Suspended Solids (mg/L)	15	< 0.3	34.0	2.0	6.0	10.1
Specific Conductance (µmhos)	17	25.0	50.0	36.0	36.6	6.6
Hardness (mg/L)	7	7.0	12.2	9.0	9.3	2.2
^J Alkalinity (mg/L)	15	4.0	11.1	5.4	6.4	2.2
Stream Flow (cfs)	16	0.04	34.6	2.2	6.3	9.6
Chemical						
Dissolved Oxygen (mg/L)	17	4.6 ^C	11.8	9.0	9.0	2.0
pH (su)	17	6.8	7.7	7.2	7.2	0.3
^{JB} Ammonia Nitrogen (mg/L)	12	0.050	0.500	0.500 ^M	0.429	0.166
^J Nitrate+Nitrite Nitrogen (mg/L)	15	0.135	0.781	0.287	0.360	0.178
^B Total Kjeldahl Nitrogen (mg/L)	0					
^B Total Nitrogen (mg/L)	0					
^B Total Phosphorus (mg/L)	0					
Chlorides (mg/L)	15	1.2	2.2	1.8 ^M	1.8	0.3
Total Metals						
^J Aluminum (mg/L)	7	0.074	0.603	0.095	0.224	0.203
^J Iron (mg/L)	7	0.051	0.700	0.192	0.344	0.299
^J Manganese (mg/L)	7	< 0.007	0.139	0.016	0.041	0.053
Dissolved Metals						
Cadmium (µg/L)	7	< 0.000	< 0.000	0.000	0.000	0.000
Chromium (mg/L)	7	< 0.009	< 0.009	0.004	0.004	0.000
Copper (mg/L)	7	< 0.020	< 0.020	0.010	0.010	0.000
Lead (µg/L)	7	< 0.9	< 0.9	0.5	0.5	0.0
Nickel (mg/L)	7	< 0.042	< 0.042	0.021	0.021	0.000
^J Silver (µg/L)	7	< 0.015	0.017	0.015	0.015	0.001
Zinc (mg/L)	7	< 0.012	< 0.012	0.006	0.006	0.000

J=estimate; B=samples excluded due to laboratory QC concerns; N=number of samples; M=value > 90% of all verified ecoregional reference reach data collected in the ecoregion 68e; T=value exceeds 50 NTU above 90th percentile of all verified ecoregional reference reach data collected in the ecoregion 68e; E=number of samples that exceeded criteria; C=Ecological Refer-

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