

2013 Monitoring Summary



Chanelower Creek at Sally Burns Road in Colbert county (34.62736/-88.06238)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Chanelower Creek watershed for biological and water quality monitoring as part of the 2013 Assessment of the Tennessee (TN) River Basin. The objectives of the TN Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the TN basin group.

Additionally, Chanelower Creek is considered to be among least-disturbed watersheds in the TN basin group based on landuse, road density, and population density. Therefore, these data will also be used to evaluate the use of Chanelower Creek as a “best attainable” condition reference watershed for comparison with other Transition Hills streams.



Figure 1. Chanelower Creek at CHLC-1, June 4, 2013.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Chanelower Creek at CHLC-1 is a *Fish & Wildlife (F&W)* stream located within the Transition Hills ecoregion of Colbert County. Based on the 2006 National Landcover Dataset, landuse in the watershed is primarily forest (77%). Population density is relatively low in the watershed. ADEM has issued one NPDES permit within 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. Chanelower Creek at CHLC-1 (Figure 1) is a high-gradient, sand and gravel bottomed stream. Habitat quality and availability was rated as *marginal* for supporting diverse aquatic macroinvertebrate communities due to inadequate bank stability and riparian buffer. Sedimentation results in a straightened stream channel.

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 in comparison to least-impaired reference reaches in the same ecoregion. The final score is the average of all individual metric scores. The final score indicated the biological community to be in *fair* condition (Table 4) and lower than the typical ecological reference streams of this type.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Tennessee River	
Drainage Area (mi²)	9	
Ecoregion^a	65j	
% Landuse		
Open water		<1
Wetland	Woody	<1
Forest	Deciduous	73
	Evergreen	3
	Mixed	1
Shrub/scrub		13
Grassland/herbaceous		<1
Pasture/hay		6
Cultivated crops		1
Development	Open space	2
	Low intensity	<1
Population/km^{2b}	2	
# NPDES Permits^c	TOTAL	1
	Construction Stormwater	1

a. Transition Hills

b. 2000 US Census

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

Table 2. Physical characteristics of Chanelower Creek at CHLC-1, June 4, 2013.

Physical Characteristics	
Canopy Cover	Estimate 50/50
Width (ft)	18
Depth (ft)	
	Riffle 0.5
	Run 1.0
	Pool 2.5
% of Reach	
	Riffle 10
	Run 40
	Pool 50
% Substrate	
	Boulder 3
	Clay 5
	Cobble 2
	Mud/Muck 4
	Gravel 15
	Hard Pan Clay 10
	Sand 40
	Silt 10
	Organic Matter 11

Table 3. Results of the habitat assessment conducted on Chandelower Creek at CHLC-1, June 4, 2013.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	54	Sub-optimal (53-65)
Sediment Deposition	53	Sub-optimal (53-65)
Sinuosity	58	Marginal (45-64)
Bank and Vegetative Stability	38	Marginal (35-59)
Riparian Buffer	44	Poor <50
Habitat Assessment Score	118	
% Maximum Score	49	Marginal (40-52)

Table 4. Results of the macroinvertebrate bioassessment conducted in Chandelower Creek at CHLC-1, June 4, 2013.

Macroinvertebrate Assessment		
	Results	Scores (0-100)
Taxa richness and diversity measures		
# EPT taxa	14	43
Shannon Diversity	3.75	49
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	6	12
% Non-insect taxa	16	36
Functional feeding group		
% Predator Individuals	12	47
Community tolerance		
% Tolerant taxa	34	41
WMB-I Assessment Score	---	38
WMB-I Assessment Rating		Fair (29-43)

WATER CHEMISTRY

Results of water chemistry are presented in Table 5. In situ measurements and water samples were collected during April, June, August and October of 2013 to help identify any stressors to the biological communities. Samples were not taken during the August sampling event due to no stream flow.

The F&W human health criterion for arsenic at CHLC-1 was exceeded during the June and October sampling events. Specific conductance values were higher than the median concentration of all verified ecoregional reference reach data collected in ecoregion 65j. Dissolved manganese values were greater than 90% of all verified ecoregional reference reach data collected in the Transition Hills ecoregion.

SUMMARY

To be used for comparison with other streams, "best-attainable" reference reaches must be representative of other streams in the ecoregion.

In-stream habitat quality at Chandelower Creek at CHLC-1 was rated as *marginal*. Inadequate bank stability and riparian buffer, resulting in sedimentation issues and a poor community tolerance, may have contributed to bioassessment results that are listed as *fair*. Some water quality results were elevated as compared to data from ADEM's least-impaired reference reaches in ecoregion 65j. The data presented in this report and all other available data will be reviewed to identify the causes and sources of the degraded biological conditions.

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Table 5. Summary of water quality data collected April, June, August and 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)	4	14.8	24.0	21.1	20.2	4.1	
Turbidity (NTU)	8	5.7	12.8	7.7	8.0	2.3	
Total Dissolved Solids (mg/L)	3	52.0	82.0	70.0	68.0	15.1	
Total Suspended Solids (mg/L)	3	2.0	18.0	10.0	10.0	8.0	
Specific Conductance (µmhos)	4	80.5	96.6	94.6 ^G	91.6	7.4	
Hardness (mg/L)	3	34.2	37.6	36.2	36.0	1.7	
Alkalinity (mg/L)	3	28.6	36.2	35.0	33.3	4.1	
Stream Flow (cfs)	6	0.8	10.2	2.0	3.5	3.5	
Chemical							
Dissolved Oxygen (mg/L)	4	6.1	9.9	7.7	7.8	1.6	
pH (su)	4	6.8	7.0	7.0	6.9	0.1	
Ammonia Nitrogen (mg/L)	3	<0.004	0.021	0.009	0.011	0.010	
Nitrate+Nitrite Nitrogen (mg/L)	3	0.024	0.124	0.027	0.058	0.057	
Total Kjeldahl Nitrogen (mg/L)	3	<0.041	0.770	0.322	0.371	0.377	
Total Nitrogen (mg/L)	3	<0.044	0.797	0.446	0.429	0.376	
^J Dissolved Reactive Phosphorus (mg/L)	3	<0.004	0.006	0.005	0.004	0.002	
Total Phosphorus (mg/L)	3	0.011	0.026	0.020	0.019	0.008	
CBOD-5 (mg/L)	3	<2.0	<2.0	1.0	1.0	0.0	
Chlorides (mg/L)	3	1.6	2.1	1.6	1.8	0.3	
Total Metals							
^J Aluminum (mg/L)	3	0.178	0.620	0.344	0.381	0.223	
Iron (mg/L)	3	0.354	0.770	0.683	0.602	0.219	
^J Manganese (mg/L)	3	0.027	0.105	0.035	0.056	0.043	
Dissolved Metals							
^J Aluminum (mg/L)	3	<0.076	0.093	0.038	0.056	0.032	
Antimony (µg/L)	3	<0.1	2.6	0.0	0.5	0.7	
^J Arsenic (µg/L)	3	0.3	<1.4	0.6 ^H	0.5	0.2	2
Cadmium (µg/L)	3	<0.046	<0.170	0.085	0.064	0.036	
^J Chromium (mg/L)	3	0.0006	<0.032	0.001	0.006	0.009	
^J Copper (mg/L)	3	<0.0004	<0.031	0.000	0.005	0.009	
^J Iron (mg/L)	3	0.056	0.438	0.150	0.215	0.199	
Lead (µg/L)	3	<0.1	<1.1	0.0	0.2	0.3	
^J Manganese (mg/L)	3	0.024	0.081	0.026 ^M	0.044	0.032	
Mercury (µg/L)	1				<0.057		
^J Nickel (mg/L)	3	<0.0004	<0.016	0.000	0.003	0.004	
Selenium (µg/L)	3	<0.2	<1.4	0.1	0.3	0.3	
Silver (µg/L)	3	<0.215	<2.120	1.060	0.742	0.550	
Thallium (µg/L)	3	<0.1	<1.1	0.0	0.2	0.3	
^J Zinc (mg/L)	3	<0.003	<0.017	0.003	0.005	0.003	
Biological							
Chlorophyll a (ug/L)	3	<0.10	0.36	0.05	0.15	0.18	
^J E. coli (col/100mL)	3	326	1414	1,046	928	554	

E=# samples that exceeded criteria; G=value higher than median concentration of all verified ecoregional reference reach data collected in the ecoregion 65j; H= F&W human health criterion exceeded; J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 65j; N=# samples.