Alabama Department of Environmental Management

Basin Assessment Site

Rivers and Streams Monitoring Program

2013 Monitoring Summary

Fair

Cedar Creek at AL Hwy 24 in Franklin County (34.48694/-87.82750)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Cedar 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 to estimate overall water quality within the TN basin.

Figure 1. Cedar Creek at CEDF-1, June 25, 2013.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Cedar Creek is a *Fish & Wildlife (F&W)* stream located near Russellville in the Tennessee River basin. Based on the 2006 National Land Cover Dataset, landuse within the watershed is primarily forested areas (52%) with some pasture and little development. The human population is relatively low for this area. The ADEM has issued twenty-two NPDES discharge permits in this monitoring unit.

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.

Cedar Creek at CEDF-1 (Figure 1) is a high-gradient, boulder, gravel and cobble bottomed stream in the Transition Hills ecoregion. Overall habitat quality was categorized as *optimal*.

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. Metric results indicated the macroinvertebrate community to be in *fair* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Tennessee River
Drainage Area (mi^2)		85
Ecoregion[a]		65j
% Landuse		
Open water		1
Wetland	Woody	1
	Emergent herbaceous	<1
Forest	Deciduous	37
	Evergreen	9
	Mixed	6
Shrub/scrub		10
Grassland/herbaceous		2
Pasture/hay		22
Cultivated crops		2
Development	Open space	5
	Low intensity	3
	Moderate intensity	1
	High intensity	<1
Barren		1
Population/km^2[b]		55
# NPDES Permits[c]	**TOTAL**	22
Construction Stormwater		11
Mining		3
Industrial General		6
Industrial Individual		1
Underground Injection Control		1

a.Transition Hills
b.2000 US Census
c.#NPDES permits downloaded from ADEM's NPDES Management System database, September 1, 2012.

Table 2. Physical characteristics of Cedar Creek at CEDF-1, June 25, 2013.

Physical Characteristics		
Canopy Cover		Estimate 50/50
Width (ft)		35
Depth (ft)		
	Riffle	0.5
	Run	1.5
	Pool	4.0
% of Reach		
	Riffle	5
	Run	45
	Pool	50
% Substrate		
	Boulder	15
	Cobble	34
	Mud/Muck	2
	Gravel	35
	Sand	15
	Silt	5
	Organic Matter	4

TM Graphics provided by Florida Dept. of Environmental Protection (FDEP); used with permission

Table 3. Results of the habitat assessment conducted on Cedar Creek at CEDF-1, June 25, 2013.

Habitat Assessment	% Maximum Score	Rating
RR		
Instream Habitat Quality	78	Optimal >65
Sediment Deposition	64	Sub-optimal (53-65)
Sinuosity	68	Sub-optimal (65-84)
Bank and Vegetative Stability	66	Sub-optimal (60-74)
Riparian Buffer	70	Sub-optimal (70-89)
Habitat Assessment Score	**166**	
% Maximum Score	**69**	Optimal >65

Table 4. Results of the macroinvertebrate bioassessment conducted in Cedar Creek at CEDF-1, June 25, 2013.

Macroinvertebrate Assessment	Results
Taxa richness and diversity measures	
Total # Taxa	77
# EPT taxa	15
Shannon Diversity	3.89
# Highly-sensitive and Specialized Taxa	14.00
Taxonomic composition measures	
% EPT minus Baetidae and Hydropsychidae	16
% Non-insect taxa	14
% Individuals in Dominant 5 Taxa	62
Functional feeding group	
% Predator Individuals	4
Community tolerance	
# Sensitive EPT	5
% Sensitive taxa	18
% Tolerant taxa	32
WMB-I Assessment Score	**4**
WMB-I Assessment Rating	**Fair**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected during March, May, July and September of 2013 to help identify any stressors to the biological communities.

The *F&W* human health criterion for arsenic at CEDF-1 was exceeded during the July and September sampling events. Specific conductance and hardness values were higher than the median concentration of all verified ecoregional reference reach data collected in ecoregion 65j. Total and dissolved solids, alkalinity, nutrients (total and nitrate-nitrite nitrogen, total and dissolved reactive phosphorus), chlorides, total aluminum and iron , and dissolved manganese values were greater than 90% of all verified ecoregional reference reach data collected in the Transition Hills ecoregion.

SUMMARY

Bioassessment results indicated the macroinvertebrate community to be in *fair* condition. Overall habitat quality was categorized as *optimal*. 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.

FOR MORE INFORMATION, CONTACT:
Brien Diggs, ADEM Aquatic Assessment Unit
1350 Coliseum Boulevard Montgomery, AL 36110
(334) 260-2750 lod@adem.state.al.us

Table 5. Summary of water quality data collected March, May, July & September 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)	5	12.1	24.3	21.8	19.7	5.4	
Turbidity (NTU)	5	4.5	32.5	19.0	18.1	13.0	
Total Dissolved Solids (mg/L)	4	152.0	219.0	188.5M	187.0	28.7	
Total Suspended Solids (mg/L)	4	<1.0	34.0	28.0M	22.6	15.4	
Specific Conductance (µmhos)	5	226.5	391.5	322.6G	318.8	65.1	
Hardness (mg/L)	4	103.0	174.0	131.0G	134.8	29.3	
Alkalinity (mg/L)	4	104.0	164.0	132.0M	133.0	24.5	
Stream Flow (cfs)	3	6.8	82.0	22.8	37.2	39.6	
Chemical							
Dissolved Oxygen (mg/L)	5	6.9	10.4	7.1	8.2	1.6	
pH (su)	5	7.2	7.8	7.5	7.5	0.2	
Ammonia Nitrogen (mg/L)	4	<0.008	0.042	0.024	0.023	0.020	
Nitrate+Nitrite Nitrogen (mg/L)	4	0.400	1.070	0.783M	0.759	0.295	
Total Kjeldahl Nitrogen (mg/L)	4	0.245	0.520	0.344	0.363	0.118	
Total Nitrogen (mg/L)	4	0.645	1.590	1.126M	1.122	0.394	
Dissolved Reactive Phosphorus (mg/L)	4	0.028	0.150	0.076M	0.082	0.054	
Total Phosphorus (mg/L)	4	0.056	0.191	0.103M	0.113	0.058	
CBOD-5 (mg/L)	4	<2.0	<2.0	1.0	1.0	0.0	
Chlorides (mg/L)	4	5.4	17.9	11.0M	11.4	5.6	
Atrazine (µg/L)	1				0.22		
Total Metals							
JAluminum (mg/L)	4	<0.076	0.931	0.838M	0.661	0.421	
JIron (mg/L)	4	0.150	1.040	0.938M	0.766	0.414	
Manganese (mg/L)	4	0.055	0.107	0.070	0.075	0.022	
Dissolved Metals							
JAluminum (mg/L)	4	<0.032	0.097	0.063	0.064	0.033	
Antimony (µg/L)	4	<0.1	<2.6	0.7	0.7	0.7	
JArsenic (µg/L)	4	<0.8	<1.4	0.8H	0.7	0.2	2
JCadmium (µg/L)	4	<0.046	0.170	0.070	0.062	0.030	
JChromium (mg/L)	4	<0.001	0.032	0.009	0.009	0.008	
JCopper (mg/L)	4	0.0004	<0.031	0.008	0.008	0.008	
JIron (mg/L)	4	<0.018	0.095	0.052	0.052	0.041	
Lead (µg/L)	4	<0.1	<1.1	0.3	0.3	0.3	
JManganese (mg/L)	4	0.012	0.030	0.026M	0.024	0.008	
Mercury (µg/L)	2	<0.057	<0.057	0.028	0.028	0.000	
JNickel (mg/L)	4	0.0005	<0.016	0.004	0.004	0.004	
JSelenium (µg/L)	4	0.3	<1.4	0.6	0.5	0.2	
Silver (µg/L)	4	<0.215	<2.12	0.584	0.584	0.550	
Thallium (µg/L)	4	<0.1	<1.1	0.3	0.3	0.3	
JZinc (mg/L)	4	0.003	<0.017	0.006	0.006	0.003	
Biological							
Chlorophyll a (ug/L)	4	0.74	2.40	1.69	1.63	0.68	
JE. coli (col/100mL)	4	86	2420	1,120	1186	1019	

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.