Alabama Department of Environmental Management

NPS Intensive Monitoring Program

Rivers and Streams Monitoring Program

2010 Monitoring Summary

Yellow Creek at Phelps Road near Tuscaloosa County Road 89 (33.33806/-87.45333)

BACKGROUND

Yellow Creek at YELT-33A is among the least-disturbed watersheds in the Shale Hills sub-ecoregion of the Southwestern Appalachians ecoregion, based on landuse, road density, and population estimates. In 2010, it was monitored as a candidate reference reach for streams in this subecoregion.

Figure 1. Reach Characteristics of Yellow Creek at YELT-33A, April 14, 2010.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Yellow Creek from Tuscaloosa Water Supply Reservoir Dam to its source is a *Public Water Supply (PWS)* stream. Based on the 2006 National Land Cover Dataset, landuse within the watershed is primarily forest (67%), shrubs/scrubs and grasslands. Population density is relatively low in this area. As of September 1, 2012, fourteen NPDES permits, including three mining permits, have been issued 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. Yellow Creek at YELT-33A is a moderate gradient stream characterized primarily by gravel, sand, and organic matter substrates (Figure 1). 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 in comparison to least-impaired reference reaches in the same ecoregion. The final score is the average of scores of all individual metrics. Metric results indicated the macroinvertebrate community to be in *good* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Black Warrior River
Drainage Area (mi^2)		14
Ecoregion[a]		68f
% Landuse		
Open water		<1
Wetland	Woody	1
Forest	Deciduous	18
	Evergreen	32
	Mixed	17
Shrub/scrub		15
Grassland/herbaceous		10
Pasture/hay		1
Cultivated crops		<1
Development	Open space	2
	Low intensity	<1
Barren		3
Population/km^2 [b]		2
# NPDES Permits[c]	**TOTAL**	14
Construction Stormwater		11
Mining		3

a.Shale Hills
b.2000 US Census
c.#NPDES permits downloaded from ADEM's NPDES Management System database, September1, 2012.

Table 2. Physical Characteristics of Yellow Creek at YELT-33A, May 26, 2010.

Physical Characteristics		
Width (ft)		17
Canopy Cover		Shaded
Depth (ft)		
	Riffle	0.5
	Run	2.0
	Pool	3.5
% of Reach		
	Riffle	10
	Run	60
	Pool	30
% Substrate		
	Cobble	5
	Gravel	40
	Sand	30
	Silt	5
	Organic Matter	20

Table 3. Results of the habitat assessment conducted on Yellow Creek at YELT-33A, May 26, 2010.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	69	Sub-optimal (59-70)
Sediment Deposition	67	Sub-optimal (59-70)
Sinuosity	80	Sub-optimal (65-84)
Bank and Vegetative Stability	70	Sub-optimal (60-74)
Riparian Buffer	89	Sub-optimal (70-89)
Habitat Assessment Score	**174**	
% Maximum Score	**73**	**Optimal >70**

Table 4. Results of the macroinvertebrate bioassessment conducted in Yellow Creek at YELT-33A, May 26, 2010.

Macroinvertebrate Assessment		
	Results	**Scores**
Taxonomic composition measures		**(0-100)**
# EPT taxa	17	57
Taxonomic composition measures		
% Non-insect taxa	3	98
% Dominant taxon	16	87
% EPC taxa	29	52
Functional feeding group measures		
% Predators	13	53
Tolerance measures		
% Taxa as Tolerant	26	65
WMB-I Assessment Score	**---**	**69**
WMB-I Assessment Rating		**Good (59-79)**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. *In situ* measurements and water samples were collected monthly, during April through December of 2010 to help identify any stressors to the biological communities.

In situ parameters suggested that Yellow Creek at YELT-33A was meeting its *PWS* use classification. Dissolved oxygen concentrations ranged from 7.6-11.7 mg/L. However, stream pH was below the established criterion for *PWS* use classification during low flows experienced August through October.

Median concentrations of nutrients, total and dissolved solids, CBOD-5 and chlorides were within the expected range for Southwestern Appalachian streams. Collected metals were generally below detection limits. Pesticides, semi-volatile organics, and atrazine were not detected in the two samples collected (June 9 and October 20, 2010). Dissolved arsenic exceeded the Human Health (HH) criterion for water and fish consumption in May.

SUMMARY

Yellow Creek at YELT-33a is among the least-disturbed watersheds within the Shale Hills subecoregion, based on land-use, road density, and population. The 2010 bioassessment results indicated the macroinvertebrate community to be in *good* condition. Also, habitat was assessed as *optimal* for supporting macroinvertebrate communities. Stream pH was <6.0 s.u., August through October. Additional low-level metals sampling may be necessary to determine if the arsenic criterion exceedance was due to natural conditions or anthropogenic sources.

Table 5. Summary of water quality data collected April-December, 2010. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL). 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	Q	E
Physical								
Temperature (°C)	9	7.0	27.6	17.1	17.2	7.0		
Turbidity (NTU)	9	2.8	9.7	3.9	4.8	2.1		
Total Dissolved Solids (mg/L)	8	< 1.0	42.0	27.0	23.3	12.7	J	
Total Suspended Solids (mg/L)	8	< 1.0	6.0	1.0	1.9	1.9		
Specific Conductance (µmhos)	9	30.3	36.9	33.9	33.9	2.4		
Hardness (mg/L)	8	7.2	10.6	8.3	8.5	1.1		
Alkalinity (mg/L)	8	3.7	10.5	4.8	5.4	2.2		
Stream Flow (cfs)	8	5.2	22.4	11.5	12.9	7.0		
Chemical								
Dissolved Oxygen (mg/L)	9	7.6	11.7	9.1	9.4	1.4		
pH (su)	9	5.7 C	6.4	6.4	6.2	0.3		3
Ammonia Nitrogen (mg/L)	8	< 0.021	< 0.021	0.010	0.010	0.000		
Nitrate+Nitrite Nitrogen (mg/L)	8	0.006	0.092	0.080	0.073	0.028	J	
Total Kjeldahl Nitrogen (mg/L)	8	< 0.080	0.305	0.103	0.131	0.106		
Total Nitrogen (mg/L)	8	< 0.046	0.377	0.188	0.204	0.117	J	
Dissolved Reactive Phosphorus (mg/L)	8	0.004	0.009	0.008	0.008	0.002	J	
Total Phosphorus (mg/L)	8	0.008	0.032	0.010	0.018	0.011	J	
CBOD-5 (mg/L)	8	< 2.0	2.4	1.0	1.2	0.5		
Chlorides (mg/L)	8	2.6	3.3	2.8	2.8	0.2		
Atrazine (µg/L)	2	< 0.02	< 0.02	0.01	0.01	0.00		
Total Metals								
Aluminum (mg/L)	8	< 0.033	0.149	0.075	0.074	0.055	J	
Iron (mg/L)	8	0.445	0.950	0.696	0.713	0.187		
Manganese (mg/L)	8	< 0.001	0.145	0.052	0.057	0.051	J	
Dissolved Metals							J	
Aluminum (mg/L)	8	< 0.033	0.067	0.016	0.023	0.018	J	
Antimony (µg/L)	8	< 0.7	<1.9	0.9	0.9	0.2		
Arsenic (µg/L)	8	< 0.4	<2.1 H	1.0	0.9	0.3	J	1
Cadmium (mg/L)	8	< 0.000	0.014	0.001	0.002	0.003		
Chromium (mg/L)	8	< 0.009	0.013	0.006	0.006	0.001		
Copper (mg/L)	8	< 0.013	0.020	0.006	0.007	0.001		
Iron (mg/L)	8	< 0.026	0.282	0.160	0.149	0.082	J	
Lead (µg/L)	8	< 1.7	< 1.7	0.8	0.8	0.0		
Manganese (mg/L)	8	< 0.001	0.129	0.042	0.045	0.043	J	
Mercury (µg/L)	8	< 0.1	< 0.1	0.0	0.0	0.0	J	
Nickel (mg/L)	8	< 0.019	0.042	0.010	0.011	0.004		
Selenium (µg/L)	8	< 1.7	< 1.7	0.8	0.8	0.0		
Silver (mg/L)	8	< 0.000	0.002	0.000	0.000	0.000		
Thallium (µg/L)	8	< 0.6	< 0.6	0.3	0.3	0.0		
Zinc (mg/L)	8	< 0.012	0.030	0.015	0.014	0.003		
Biological								
Chlorophyll a (ug/L)	8	< 0.10	1.07	0.53	0.47	0.32		
E. coli (col/100mL)	8	65	291	157	162	66	J	

C=(*PWS*) criterion violated; E=# samples that exceeded the criteria; H=(*PWS*) human health criterion exceeded; J=estimate; N=# samples; Q=qualifier.

FOR MORE INFORMATION, CONTACT:
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