Alabama Department of Environmental Management

303(d)/TMDL Monitoring Site

Rivers and Streams Monitoring Program

2006 Monitoring Summary

Walnut Creek at U.S. Hwy 231 near Troy in Pike County (31.7695/-85.9248)

BACKGROUND

The three mile segment of Walnut Creek just downstream of U.S. Hwy 231 to Pike County Road 59 is on Alabama's list of impaired water bodies. The segment was added in 1998 based on macroinvertebrate and water quality data collected in 1997. The cause of impairment was listed as "unknown toxicity" from "municipal sources". Additional monitoring was conducted in 2006 to assess biological integrity and to identify the cause of impairment. Walnut Creek at US Hwy 231 (WCP-1) was used as an upstream control for comparison to data collected within the listed segment. However, habitat and macroinvertebrate assessments could not be conducted due to nonwadeable conditions within the reach.

Fig. 1. Photo of Walnut Creek at WCP-1 taken January, 2010.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Walnut Creek at WCP-1 is a low-gradient *Fish & Wildlife (F&W)* stream in Pike County. Land use within the watershed is primarily forest (56%) with some pastureland and shrubs (Fig. 1). As of September 18, 2009, the ADEM has issued 39 NPDES permits in this watershed.

REACH CHARACTERISTICS

General observations (Table 2) and a habitat assessment (Table 3) were completed during the water quality sampling events. 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. Walnut Creek at WCP-1 is a sandy, low gradient stream within the Southern Hilly Gulf Coastal Plain sub-ecoregion. Overall habitat quality was rated as *optimal* although sinuosity scored low. A lack of bends in a stream increases the possibility of higher stream velocities and scouring during high flow events.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Choctawhatchee River
Drainage Area (mi^2)		21
Ecoregion[a]		65d
% Landuse		
Open water		1
Wetland	Woody	3
	Emergent herbaceous	<1
Forest	Deciduous	19
	Evergreen	22
	Mixed	15
Shrub/scrub		12
Grassland/herbaceous		<1
Pasture/hay		8
Cultivated crops		5
Development	Open space	9
	Low intensity	5
	Moderate intensity	2
	High intensity	1
Population/km^2 [b]		128
# NPDES Permits[c]	**TOTAL**	39
Construction Stormwater		37
Industrial General		1
Municipal Individual		1

a. Southern Hilly Gulf Coastal Plain

b. 2000 US Census

c. #NPDES permits downloaded from ADEM's NPDES Management System database, 18 Sep 2009

Table 2. Physical characteristics of Walnut Creek at WCP-1 on Oct 18, 2006.

Physical Characteristics		
Width (ft)		20
Canopy cover		Mostly Shaded
Depth (ft)		
	Run	2.0
	Pool	4.0
% of Reach		
	Run	55
	Pool	45
% Substrate		
	Sand	50
	Silt	10
	Organic Matter	35
	Mud/Muck	5

Table 3. Results of the habitat assessment of Walnut Creek at WCP-1 on October 18, 2006.

Habitat Assessment	(% Max Score)	Rating
Instream habitat quality	69	Optimal (>65)
Sediment deposition	76	Optimal (>65)
Sinuosity	33	Poor (<45)
Bank and vegetative stability	71	Sub-optimal (60-74)
Riparian buffer	79	Sub-optimal (70-90)
Habitat assessment score	157	
% Maximum score	**71**	**Optimal (>65)**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. When possible, in situ measurements and water samples are collected monthly, semi-monthly (metals), or quarterly (pesticides, herbicides (atrazine), and semi-volatile organics) during March through October to help identify water quality impairments.

The median concentration of total phosphorus was higher than expected based on the 90th percentile of reference reach data collected in the Southern Hilly Gulf Coastal Plain sub-ecoregion. Turbidity and hardness were also higher than expected in the sub-ecoregion. Additionally, dissolved oxygen concentrations did not meet *F&W* use classification criteria during four of six sampling events.

SUMMARY

Results from intensive water quality sampling showed turbidity, hardness, and total phosphorus to be higher than expected in the Southern Hilly Gulf Coastal Plain ecoregion based on the 90th percentile of data collected at least impaired reference reaches. Habitat and macroinvertebrate assessments could not be conducted due to nonwadeable conditions.

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Table 4. Summary of water quality data collected March-October, 2006. 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. Metals results were compared to ADEM's chronic aquatic life use criteria adjusted for hardness.

Parameter	N	Min	Max	Median	Avg	SD
Physical						
Temperature (°C)	6	11.0	24.0	19.3	19.0	4.8
Turbidity (NTU)	6	11.0	27.5	16.9 M	18.0	6.4
Total Dissolved Solids (mg/L)	6	48.0	386.0	91.0	131.3	127.0
Total Suspended Solids (mg/L)	6	2.0	16.0	6.0	7.7	5.6
Specific Conductance (µmhos)	6	78.4	213.9	133.5	137.9	58.3
Hardness (mg/L)	1				72.0	
Alkalinity (mg/L)	6	34.0	93.0	40.5	53.3	24.6
Stream Flow (cfs)	4	12.6	27.3	16.4	18.2	6.7
Chemical						
Dissolved Oxygen (mg/L)	6	1.9C	8.2	5.4C	5.2	2.2
pH (su)	6	6.1	7.3	7.0	6.9	0.4
Ammonia Nitrogen (mg/L)	6	< 0.015	0.031	0.022	0.022	0.008
Nitrate+Nitrite Nitrogen (mg/L)	6	< 0.005	2.350	0.045	0.423	0.945
Total Kjeldahl Nitrogen (mg/L)	6	< 0.150	0.610	0.367	0.357	0.201
Total Nitrogen (mg/L)	6	0.109	2.960	0.404	0.780	1.078
Dissolved Reactive Phosphorus (mg/L)	6	< 0.004	0.140	0.002	0.026	0.056
Total Phosphorus (mg/L)	6	0.026	0.270	0.065 M	0.092	0.089
CBOD-5 (mg/L)	6	< 1.0	2.9	1.9	1.7	1.0
Chlorides (mg/L)	6	1.4	21.0	6.7	8.1	7.0
Atrazine (µg/L)	1				<0.05	
Total Metals						
Aluminum (mg/L)	1				<0.5	
Iron (mg/L)	1				3.0	
Manganese (mg/L)	1				1.08	
Dissolved Metals						
Aluminum (mg/L)	1				<0.5	
Antimony (µg/L)	1				<7.5	
Arsenic (µg/L)	1				<5	
Cadmium (mg/L)	1				<0.0003	
Chromium (mg/L)	1				<0.005	
Copper (mg/L)	1				<0.005	
Iron (mg/L)	1				0.329	
Lead (µg/L)	1				<5	
Manganese (mg/L)	1				1.02	
Mercury (µg/L)	1				<0.5	
Nickel (mg/L)	1				0.005	
Selenium (µg/L)	1				<7.5	
Silver (mg/L)	1				<0.0008	
Thallium (µg/L)	1				<9	
Zinc (mg/L)	1				0.098	
Biological						
Chlorophyll a (mg/L)	6	< 1.00	4.27	1.07	1.86	1.69
J Fecal Coliform (col/100 mL)	4	33	560	56	176	257

J=estimate; N= # of samples; M=value >90% of collected samples in ecoregion 65d; C=value exceeds established criteria for *F&W* water use classification.