

2006 Monitoring Summary

§303(d)/TMDL Monitoring Site

Walnut Creek at Pike County Road 59 (31.7283/-85.925)

BACKGROUND

The three mile segment of Walnut Creek, between U.S Hwy 231 downstream to Pike County Road 59 is on Alabama's §303(d) list of impaired water bodies. It 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 the impairment.

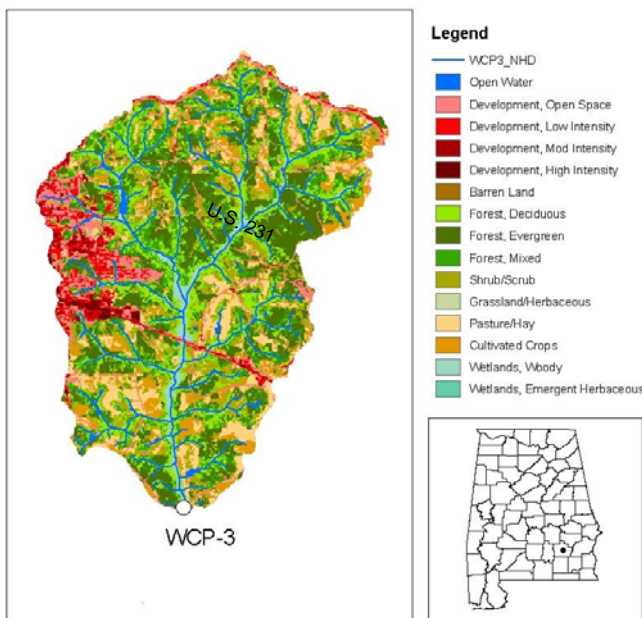


Figure 1. Sampling location and landuse within the Walnut Creek watershed at WCP-3.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Walnut Creek is a small *Fish & Wildlife (F&W)* stream located near the city of Troy. Landuse within the watershed is primarily woodlands (56%), with some farmland (pasture, row crops). As of September 18, 2009, the ADEM has issued 59 NPDES permits in this watershed, mainly for construction stormwater.

REACH CHARACTERISTICS

Habitat and macroinvertebrate assessments could not be completed in 2006 due to non-flowing and unwadeable conditions. Comparison of reach characteristics documented during the 1997 macroinvertebrate assessment and the October 2006 water quality sampling event show the reach to be wider and deeper in 2006 than in 1997 (Table 2).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Choctawhatchee River	
Drainage Area (mi ²)	34	
Ecoregion ^a	65d	
% Landuse		
Open water		1
Wetland	Woody	3
	Emergent herbaceous	<1
Forest	Deciduous	18
	Evergreen	21
	Mixed	14
Shrub/scrub		13
Grassland/herbaceous		<1
Pasture/hay		11
Cultivated crops		6
Development	Open space	8
	Low intensity	4
	Moderate intensity	1
	High intensity	1
Population/km ² ^b		99
# NPDES Permits ^c	TOTAL	59
	Construction Stormwater	55
	Industrial General	1
	Municipal Individual	2
	Underground Injection Control	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. Summary of Reach characteristics at WCP-3 on September 30, 1997 and October 18, 2006.

Physical Characteristics			
		9/30/1997	10/18/2006
Width (ft)		15	30
Canopy cover		Mostly shaded	Open
Depth (ft)			
	Run	2.0	3.0
	Pool	3.5	5.5
% of Reach			
	Run	Not estimated	75
	Pool	Not estimated	25
% Substrate			
	Sand	40	50
	Silt	11	30
	Clay	0	5
	Organic Matter	24	10
	Mud/Muck	25	5

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 4. In situ measurements and water samples were collected monthly, semi-monthly (metals), or quarterly (pesticides, herbicides (atrazine), and semi-volatile organics) during March through October of 2006 to help identify the cause(s) of any water quality impairments.

Median total dissolved solids, specific conductance, alkalinity, chlorides, pH, pesticides (atrazine), metals (total manganese, dissolved aluminum, manganese, thallium, and zinc) and nutrient (nitrate+nitrite-nitrogen, total Kjeldahl nitrogen, total nitrogen, dissolved reactive phosphorus, and total phosphorus), concentrations were above values expected in the Southern Hilly Gulf Coast Plain ecoregion based on the 90th percentile of data collected at least impaired reference reaches.

Water samples collected in 1997 and 2006 are not completely comparable because samples were only collected once in September of 1997. This screening-level assessment suggested that concentrations of most parameters at this site were similar to concentrations measured at an upstream control site (ADEM 1997). However, the concentrations of chlorides, magnesium, and zinc were higher than the upstream control and are higher than concentrations measured during 2006. The concentrations of all other parameters were lower than or similar to concentrations measured in 2006.

SUMMARY

Results from intensive water quality sampling showed conductivity, metals and nutrient concentrations to be higher than expected based on the 90th percentile of data collected at least impaired reference reaches in the Southern Hilly Gulf Coast Plain ecoregion. Comparison of reach characteristics documented in 1997 and 2006 showed the reach to have been wider and deeper in 2006. The impact of water quality conditions on biological communities could not be evaluated because habitat and macroinvertebrate assessments could not be conducted.

LITERATURE CITED

ADEM 1997. Water Quality Assessment of Walnut Creek in Troy, Alabama (Pike County) September – October 1997. Field Operations Division, Alabama Department of Environmental Management, Montgomery, Alabama.

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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). 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)	8	12.0	25.1	21.6	20.8	4.2
Turbidity (NTU)	8	8.1	18.7	11.8	12.4	3.2
Total Dissolved Solids (mg/L)	8	144.0	903.0	335.5 ^M	394.4	257.7
Total Suspended Solids (mg/L)	8	2.0	19.0	10.0	10.1	4.7
Specific Conductance (µmhos)	8	212.2	1405.0	509.7 ^M	593.7	409.5
Hardness (mg/L)	3	101.0	137.0	110.0	116.0	18.7
Alkalinity (mg/L)	8	43.0	165.0	92.8 ^M	100.1	48.7
Stream Flow (cfs)	4	3.9	29.8	20.0	18.4	11.1
Chemical						
Dissolved Oxygen (mg/L)	8	5.7	10.0	6.5	7.1	1.4
pH (su)	8	6.6	7.9	7.6 ^M	7.6	0.4
Ammonia Nitrogen (mg/L)	8	< 0.010	0.050	0.015	0.021	0.017
Nitrate+Nitrite Nitrogen (mg/L)	8	1.009	6.440	2.651 ^M	3.375	2.311
Total Kjeldahl Nitrogen (mg/L)	8	0.200	1.200	0.604 ^M	0.585	0.345
Total Nitrogen (mg/L)	8	1.238	7.640	3.392 ^M	3.960	2.493
Dissolved Reactive Phosphorus (mg/L)	8	0.064	0.980	0.311 ^M	0.407	0.354
Total Phosphorus (mg/L)	8	0.136	1.100	0.393 ^M	0.484	0.368
CBOD-5 (mg/L)	8	< 1.0	4.4	0.9	1.6	1.4
Chlorides (mg/L)	8	1.6	55.0	14.8 ^M	19.3	17.2
Atrazine (µg/L)	2	< 0.05	0.16	0.09 ^M	0.09	0.10
Total Metals						
Aluminum (mg/L)	3	0.35	0.575	0.570	0.498	0.128
Iron (mg/L)	3	0.857	1.82	0.96	1.212	0.529
Manganese (mg/L)	3	0.297	0.661	0.317 ^M	0.425	0.205
Dissolved Metals						
Aluminum (mg/L)	3	< 0.07	< 0.5	0.250 ^M	0.197	0.110
Antimony (µg/L)	3	< 7.5	< 7.5	3.8	3.8	0.0
Arsenic (µg/L)	3	< 5	< 5	2.5	2.5	0.0
Cadmium (mg/L)	3	< 0.00025	< 0.00025	0.00013	0.00013	0.00000
Chromium (mg/L)	3	< 0.005	< 0.005	0.003	0.003	0.000
Copper (mg/L)	3	< 0.005	0.006	0.003	0.004	0.002
Iron (mg/L)	3	0.050	0.467	0.082	0.200	0.232
Lead (µg/L)	3	< 5	< 5	2.5	2.5	0.0
Manganese (mg/L)	3	0.219	0.6	0.269 ^M	0.363	0.207
Mercury (µg/L)	3	< 0.5	< 0.5	0.3	0.3	0.0
Nickel (mg/L)	3	< 0.005	< 0.005	0.003	0.003	0.001
Selenium (µg/L)	3	< 7.5	< 7.5	3.8	3.8	0.0
Silver (mg/L)	3	< 0.001	< 0.001	0.000	0.000	0.000
Thallium (µg/L)	3	< 2.5	11	4.5 ^M	5.6	5.0
Zinc (mg/L)	3	0.023	0.108	0.031 ^M	0.054	0.047
Biological						
Chlorophyll a (µg/L)	8	< 0.10	3.74	2.15	2.12	1.45
^J Fecal Coliform (col/100 mL)	6	73	1060	115	332	401

^J=estimate; N=# samples; M=value > 90th percentile of all data collected within eco-region 65d.