Alabama Department of Environmental Management

NPS Intensive Monitoring Program

Rivers and Streams Monitoring Program

2009 Monitoring Summary

TM

Fair

McDaniel Creek at Lawrence County Road 336 (33.44820/-86.14450)

BACKGROUND

McDaniel Creek, was placed on Alabama's Clean Water Act (CWA) §303(d) list of impaired waters for not meeting its *Fish & Wildlife (F&W)* water use classifications. It was listed for organic enrichment and dissolved oxygen (OE/DO) concerns in the Tennessee River Basin. (*ADEM 2002 303d list*)

The Alabama Department of Environmental Management (ADEM) collected water chemistry samples monthly at McDaniel Creek at MCDL-360 to assess impairment and estimate overall water quality. Habitat assessment and benthic macroinvertebrate community assessments were requested to assess the impact of metals on the biological communities.

The non-point source BMP implementation project is expected to result in organic enrichment pollutant load reductions of 20% and sediment load reductions of 42.7%.

The project is also designed to reduce soil erosion in the West Flint Creek Watershed. An estimated 4 miles of stream bank will be restored through animal exclusion and restoration of riparian buffer zones.

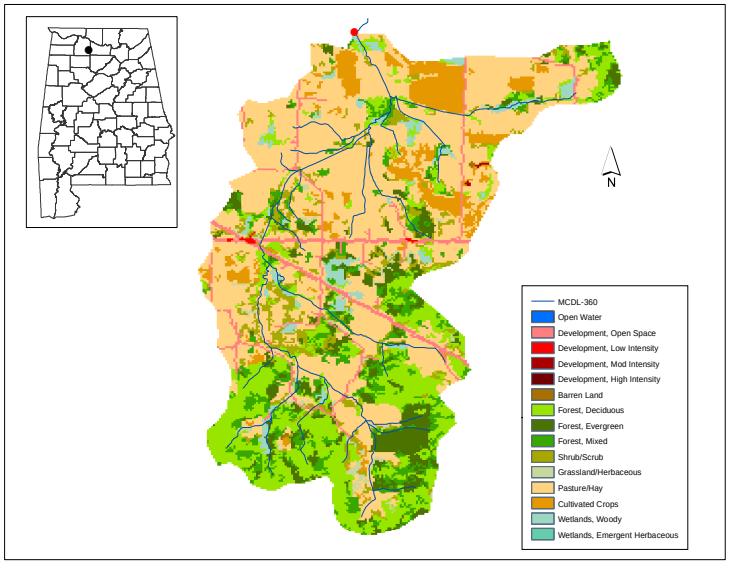

Figure 1. McDaniel Creek at MCDL-360

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. McDaniel Creek is a *Fish & Wildlife (F&W)* stream located south of the city of Five Points in Lawrence County. Landuse within the watershed is primarily pasture/hay and cultivated crops (52%), with some forested areas (33%). The ADEM has issued 4 construction stormwater permits 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. McDaniel Creek at MCDL-360 is a shallow, riffle-run stream reach located in the Western Highland Rim ecosystem (Fig 1). Overall habitat quality was categorized as *marginal* for supporting diverse aquatic macroinvertebrate communities.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Tennessee River
Drainage Area (mi^2)		11
Ecoregion[a]		71g
% Landuse		
Open water		<1
Wetland	Woody	3
Forest	Deciduous	18
	Evergreen	7
	Mixed	8
Shrub/scrub		6
Grassland/herbaceous		1
Pasture/hay		45
Cultivated crops		7
Development	Open space	4
	Low intensity	<1
	Moderate intensity	<1
Barren		<1
Population/km^2[b]		6
# NPDES Permits[c]	**TOTAL**	5
401 Water Quality Certification		1
Construction Stormwater		4

a.Eastern Highland Rim

b.2000 US Census

c.#NPDES permits downloaded from ADEM's NPDES Management System database, September 1, 2012.

Table 2. Physical characteristics of McDaniel Ck at MCDL-360, June 30, 2009.

Physical Characteristics		
Width (ft)		12.0
Canopy Cover		Mostly Shaded
Depth (Ft)		
	Riffle	0.3
	Run	1.0
	Pool	1.5
% of Reach		
	Riffle	5
	Run	75
	Pool	20
% Substrate		
	Bedrock	2
	Boulder	1
	Clay	75
	Cobble	2
	Gravel	5
	Sand	5
	Silt	5
	Organic Matter	5

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Table 3. Results of the habitat assessment conducted on McDaniel Ck at MCDL-360, June 30, 2009.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	50	Marginal (41-58)
Sediment Deposition	58	Marginal (41-58)
Sinuosity	83	Sub-optimal (65-84)
Bank and Vegetative Stability	40	Marginal (35-59)
Riparian Buffer	48	Poor <50
Habitat Assessment Score	**130**	
% Maximum Score	**54**	**Marginal (41-58)**

Table 4. Results of the macroinvertebrate bioassessment conducted at MCDL-360, June 30, 2009.

Macroinvertebrate Assessment		
	Results	**Scores**
Taxa richness and diversity measures		**(0-100)**
# EPT taxa	9	22
Shannon Diversity	4.70	93
Taxonomic composition measures		
% EPT minus Baetidae and Hydropsychidae	9	19
% Non-insect taxa	19	17
Functional feeding group		
% Predator Individuals	14	57
Community tolerance		
% Tolerant taxa	47	3
WMB-I Assessment Score	**---**	**35**
WMB-I Assessment Rating		**Fair (29-43)**

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 tolerance to assess the condition of the macroinvertebrate community. Each metric is scored on a 100 point scale in comparison to least-impaired reference reaches. The final score is an average of the score from each metric. Metric results indicated the macroinvertebrate community to be in *fair* condition (Table 4).

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. When possible, In situ measurements and water samples were collected monthly, semi-monthly (metals), or quarterly (pesticides, herbicides, and semi-volatile organics) from March through October of 2009 to identify any stressors to the biological community.

Median total dissolved solids, specific conductance, hardness, alkalinity, chlorides, TKN, dissolved reactive phosphorus, total phosphorus and metals (total aluminum, total iron and total and dissolved manganese) concentrations were elevated for an Eastern Highland Rim stream. Copper exceeded the chronic freshwater life use criterion for *F&W* use classification for one out of four sampling events. One fecal coliform sample was >2000 colonies/100 ml of sample, but the sample was taken after a rain event.

SUMMARY

Bioassessment results indicated the macroinvertebrate community in McDaniel Creek at MCDL-360 to be in *fair* condition. However, some nutrients and metals were elevated as compared to data collected from ecoregional reference reaches. Monitoring should continue to ensure that biological conditions remain stable.

Table 5. Summary of water quality data collected March-October, 2009. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL) when results were less than this value for non-metals parameters. 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
	Physical							
	Temperature (°C)	8		13.1	23.6	22.0	20.2	4.1
	Turbidity (NTU)	8		5.3	50.1	16.6	19.0	14.1
J	Total Dissolved Solids (mg/L)	7		154.0	210.0	192.0 M	189.4	17.6
J	Total Suspended Solids (mg/L)	7		4.0	11.0	7.0	7.3	2.6
	Specific Conductance (µmhos)	8		237.5	371.5	326.6 M	323.1	45.3
	Hardness (mg/L)	4		142.0	178.0	158.0 M	159.0	16.5
	Alkalinity (mg/L)	7		106.0	175.0	150.0 M	148.3	24.1
	Stream Flow (cfs)	8		0.4	61.3	3.9	15.0	21.3
	Chemical							
	Dissolved Oxygen (mg/L)	8		5.1	9.4	6.6	6.9	1.5
	pH (su)	8		7.3	7.8	7.6	7.6	0.2
	Ammonia Nitrogen (mg/L)	7	<	0.006	0.047	0.007	0.020	0.019
J	Nitrate+Nitrite Nitrogen (mg/L)	7	<	0.003	1.355	0.572	0.643	0.430
	Total Kjeldahl Nitrogen (mg/L)	7		0.398	1.384	0.530 M	0.665	0.341
J	Total Nitrogen (mg/L)	7	<	0.742	1.939	1.191	1.309	0.499
	Dissolved Reactive Phosphorus (mg/L)	7		0.019	0.133	0.067 M	0.065	0.045
J	Total Phosphorus (mg/L)	7		0.026	0.188	0.053 M	0.091	0.065
	CBOD-5 (mg/L)	7	<	1.0	2.1	1.0	1.1	0.5
	Chlorides (mg/L)	7		3.3	6.8	4.5 M	4.6	1.1
	Atrazine (µg/L)	2	<	0.06	1.62	0.82	0.82	1.12
	Total Metals							
	Aluminum (mg/L)	4		0.414	1.390	0.895 M	0.898	0.493
	Iron (mg/L)	4		0.412	0.999	0.679 M	0.692	0.323
J	Manganese (mg/L)	4		0.060	0.158	0.069 M	0.089	0.046
	Dissolved Metals							
J	Aluminum (mg/L)	4	<	0.019	0.041	0.016	0.021	0.014
	Antimony (µg/L)	4	<	0.7	< 0.7	0.4	0.4	0.0
	Arsenic (µg/L)	4	<	0.4	1.6	0.2	0.4	0.3
	Cadmium (mg/L)	4	<	0.003	< 0.003	0.002	0.002	0.000
	Chromium (mg/L)	4	<	0.013	< 0.013	0.006	0.006	0.000
J	Copper (mg/L)	4	<	0.013	0.024 C	0.006	0.011	0.009
J	Iron (mg/L)	4	<	0.016	0.047	0.028	0.029	0.017
	Lead (µg/L)	4	<	0.6	1.0	0.5	0.5	0.1
J	Manganese (mg/L)	4	<	0.001	0.044	0.036 M	0.029	0.020
	Mercury (µg/L)	4	<	0.1	< 0.1	0.0	0.0	0.0
	Nickel (mg/L)	4	<	0.004	0.019	0.006	0.006	0.004
	Selenium (µg/L)	4	<	0.4	1.5	0.2	0.3	0.3
	Silver (mg/L)	4	<	0.002	< 0.002	0.001	0.001	0.000
	Thallium (µg/L)	4	<	0.4	0.5	0.2	0.2	0.0
	Zinc (mg/L)	4	<	0.003	0.030	0.002	0.005	0.007
	Biological							
	Chlorophyll a (ug/L)	7	<	1.00	3.56	1.87	1.84	0.96
J	Fecal Coliform (col/100 mL)	7		50	14,000 C	330	2,274	5,176

J=estimate; N=# samples; M=value > 90th percentile of all data collected within eco-region 71; c=value exceeds water use classification. Specific conductance-M=value > median of all ecoregional reference reach data collected in ecoregion 71

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