

2006 Monitoring Summary



Dowling Branch at Geneva Co Rd 36 (Dundee Road) (31.12683/-85.69371)

BACKGROUND

Dowling Branch from Cox Mill Creek to its source was placed on Alabama's Clean Water Act (CWA) 2006 §303(d) list of impaired waters for not meeting its *Fish and Wildlife* (F&W) water use classification. It was listed for pathogens and organic enrichment from urban runoff/storm sewers and agricultural fields.

The Alabama Department of Environmental Management (ADEM) monitored Dowling Branch at DOWG-1 to document impairment from organic enrichment and pathogens. Macroinvertebrate and habitat assessments were conducted to verify impairment to aquatic communities. Monthly water chemistry samples were collected to identify the cause of impairment. Results from these data may also be used in the determination of Total Maximum Daily Load (TMDL) needs and priorities.



Figure 1. Dowling Branch watershed at DOWG-1, January 5, 2007.

WATERSHED CHARACTERISTICS

Dowling Branch at DOWG-1 drains a small watershed located within the Dougherty Plain ecoregion (*Griffith et al. 2001*) in Geneva County. Landuse within the watershed was composed of agricultural crops and pasture/hay (55%), forest (10%), woody wetlands, and shrub/scrub (Table 1). Development activities accounted for 14% of land cover within the 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. Dowling Branch at DOWG-1 is a small, mostly-shaded stream reach (Fig.1). The low gradient and sandy substrates within the reach are typical of the area. The reach was characterized by a relatively straight stream channel and limited instream habitat. Additionally, flow was obstructed by snags.

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 an average of the score for each metric. Metric results indicated the macroinvertebrate community to be in *poor* condition (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin	Choctawhatchee River	
Drainage Area (mi ²)	3	
Ecoregion ^a	65g	
% Landuse		
Open water		1
Wetland	Woody	9
	Emergent herbaceous	<1
	Deciduous	3
Forest	Evergreen	7
	Mixed	<1
	Shrub/scrub	
Grassland/herbaceous		<1
Pasture/hay		17
Cultivated crops		38
Development	Open space	8
	Low intensity	6
	Moderate intensity	<1
	High intensity	<1
Population/km ² ^b		123
# NPDES Permits ^c	TOTAL	1
Municipal Individual		1

a. Dougherty Plain

b. 2000 US Census

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

Table 2. Physical characteristics of Dowling Branch at DOWG-1, June 21, 2006.

Physical Characteristics		
Width (ft)	7	
Canopy cover	Mostly Shaded	
Depth (ft)	Run	1.0
	Pool	1.5
% of Reach	Run	20
	Pool	80
% Substrate	Gravel	3
	Sand	70
	Silt	20
	Clay	3
	Organic Matter	4

Table 3. Results of the habitat assessment conducted on Dowling Branch at DOWG-1, June 21, 2006.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	41	Marginal (40-52)
Sediment deposition	70	Optimal (>65)
Sinuosity	38	Poor (<45)
Bank and vegetative stability	65	Sub-optimal (60-74)
Riparian buffer	74	Sub-optimal (70-90)
Habitat assessment score	128	
% Maximum score	58	Sub-optimal (53-65)

WATER CHEMISTRY

In situ measurements and water samples were collected monthly, during March through October of 2006 to help identify any stressors to the biological communities. Water chemistry results are summarized in Table 5. Dissolved oxygen values were <5.0 mg/l in five of eight sampling events. However, stream flow was visible but not detectable during these months. Median nutrient concentrations (total nitrogen, nitrate+nitrite-nitrogen, ammonia nitrogen, Kjeldahl nitrogen, total phosphorus, and dissolved reactive phosphorus), chlorophyll *a* and CBOD-5 were higher than the 90th percentile of reference reaches in ecoregion 65g.

SUMMARY

As part of the assessment process, ADEM will review the monitoring information presented in this report, along with all other available data.

Results of the 2006 bioassessment indicated the macroinvertebrate community in Dowling Branch at DOWG-1 to be in *poor* condition. These results support listing the segment on Alabama's CWA 2006 §303(d) list of impaired waters for not meeting its *Fish and Wildlife* (F&W) water use classification. However, low flow may also have contributed to these conditions.

Several Best Management Practices (BMP) have been implemented in the watershed since 2007 to reduce nutrient and siltation inputs into the stream.

Table 4. Results of the macroinvertebrate bioassessment conducted in DOWG-1, June 21, 2006.

Macroinvertebrate Assessment				
	Results Scores		Rating	
Taxa richness measures				
# EPT genera	4	16	Very Poor (<19)	
Taxonomic composition measures				
% Non-insect taxa	26	0	Very Poor (<30.9)	
% Plecoptera	0	0	Very Poor (<1.86)	
% Dominant taxa	21	72	Good (70.6-85.2)	
Functional composition measures				
% Predators	10	34	Fair (30.2-45.2)	
Tolerance measures				
Beck's community tolerance index	0	0	Very Poor (<10.6)	
% Nutrient tolerant organisms	30	67	Fair (50.9-76.2)	
WMB-I Assessment Score	---	27	Poor (19-37)	

Table 5. 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.

Parameter	N	Min	Max	Median	Avg	SD
Physical						
Temperature (°C)	9	16.0	24.0	23.0	21.3	3.2
Turbidity (NTU)	9	4.0	8.7	5.8	6.2	1.9
Total Dissolved Solids (mg/L)	8	4.0	102.0	41.0	46.5	29.2
Total Suspended Solids (mg/L)	8	<3.0	9.0	3.5	4.6	2.4
Specific Conductance (µmhos)	9	47.2	120.3	63.7	66.3	21.1
Alkalinity (mg/L)	8	9.6	50.8	15.6	20.3	13.2
Stream Flow (cfs)	4	1.2	1.8	1.3	1.4	0.3
Chemical						
Dissolved Oxygen (mg/L)	9	1.8	8.4	4.0	4.3	2.1
pH (su)	9	6.0	6.4	6.1	6.2	0.1
Ammonia Nitrogen (mg/L)	8	<0.010	1.031	0.016 ^M	0.161	0.355
Nitrate+Nitrite Nitrogen (mg/L)	8	0.114	1.018	0.336 ^M	0.396	0.318
Total Kjeldahl Nitrogen (mg/L)	8	0.183	1.802	0.498 ^M	0.676	0.512
Total Nitrogen (mg/L)	8	0.488	1.980	0.833 ^M	0.957	0.401
Dissolved Reactive Phosphorus (mg/L)	8	<0.005	0.078	0.017 ^M	0.027	0.028
Total Phosphorus (mg/L)	8	0.058	0.296	0.094 ^M	0.116	0.076
CBOD-5 (mg/L)	8	<1.0	3.5	1.5 ^M	1.7	1.1
Chlorides (mg/L)	8	<1.6	9.4	4.5	5.2	3.0
Biological						
Chlorophyll <i>a</i> (µg/L)	8	1.07	11.21	3.25 ^M	4.43	3.54
^J Fecal Coliform (col/100 mL)	4	20	200	59	84	80

N=# samples; C=value exceeds established criteria for F&W water use classification; J=estimate; M=value > 90% of all verified ecoregional reference reach data collected in the subcoregion/ecoregion 65g.

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