Alabama Department of Environmental Management

Basin Assessment Site

Rivers and Streams Monitoring Program

2005 Monitoring Summary

Fair™

Nances Creek at Unnamed Calhoun County Road (T12S/R10E/S33) (33.95607/-85.59050)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Nances Creek watershed for biological and water quality monitoring as part of the 2005 Assessment of the Alabama, Coosa, and Tallapoosa (ACT) River Basins. The objectives of the ACT Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the ACT basin group.

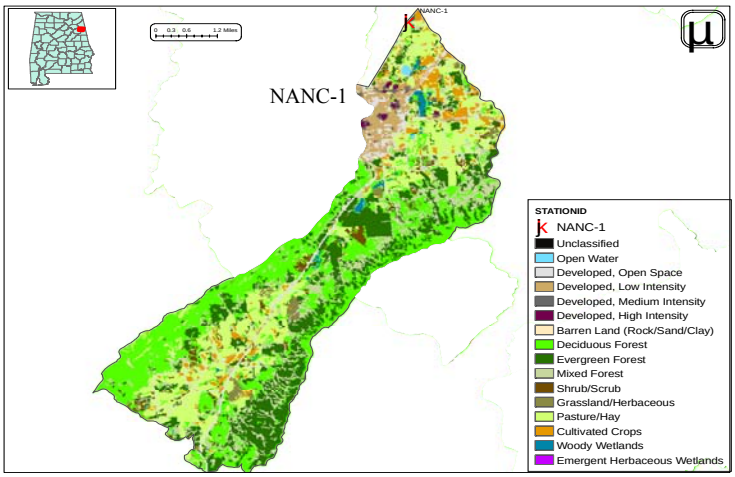

Figure 1. Sampling location and land use within the Nances Creek watershed at NANC-1, May 4, 2005. .

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Nances Creek is a small *Fish & Wildlife (F&W)* stream that drains approximately 28 mi^2 in Calhoun County between Hollingsworth and Piedmont along Talladega National Forest and State Hwy 9 (Fig. 1). It is part of the Coosa River basin. It is located in the Southern Limestone/Dolomite and Low Rolling Hills sub-ecoregion (67f), which is characterized by undulating valleys and rounded ridges and hills. Land use within the watershed is primarily forest, with some pasture/hay. The watershed contains seven permitted discharges (Table 1).

REACH CHARACTERISTICS

General observations (Table 2) and habitat assessments (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. Nances Creek at NANC-1 is a high-gradient, riffle-run stream characterized by cobble, boulder, and gravel substrates. Habitat quality was rated as *optimal* in all assessment categories.

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 macro invertebrate community. Each metric is scored on a 100 point scale. The final score is an average of the score for each metric. The condition of the macroinvertebrate community was assessed as *fair* overall, with taxa richness and composition affected by very low stonefly numbers. The composition was also impacted by low diversity in the % non-insect taxa category (Table 4).

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Drainage Area (mi^2)		28
Ecoregion[a]		67f
% Landuse		
Open water		<1
Wetland	Woody	1
Forest	Deciduous	27
	Evergreen	20
	Mixed	12
Shrub/scrub		2
Grassland/herbaceous		2
Pasture/hay		21
Cultivated crops		4
Development	Open space	5
	Low intensity	3
	Moderate intensity	1
	High intensity	<1
Barren		<1
Population/km^2 [b]		25
# NPDES Permits[c]	**TOTAL**	7
Construction Stormwater		4
Mining General Permit (old)		2
Municipal Individual		1

a.Southern Limestone/Dolomite Valleys and Low Rolling Hills
b.2000 US Census data
c.#NPDES permits downloaded from ADEM's NPDES Management System database, 9 Jun 2008

Table 2. Physical characteristics at NANC-1, May 4, 2005

Physical Characteristics		
Width (ft)		30
Canopy cover		Mostly Shaded
Depth (ft)		
	Riffle	0.5
	Run	1.5
	Pool	2.0
% of Reach		
	Riffle	20
	Run	50
	Pool	30
% Substrate		
	Bedrock	5
	Boulder	25
	Cobble	35
	Gravel	20
	Sand	10
	Silt	2
	Organic Matter	3

TM Graphics provided by Florida Dept. of Environmental Protection (FDEP); used with permission and in terms of this report should only be considered a quick reference to the results of the macro invertebrate assessment and not a rating of the site quality overall.

Table 3. Results of the habitat assessment conducted at NANC-1, May 4, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	87	Optimal (> 70)
Sediment deposition	80	Optimal (> 70)
Sinuosity	85	Optimal (≥85)
Bank and vegetative stability	83	Optimal (≥75)
Riparian buffer	95	Optimal (>90)
Habitat assessment score	204	
% Maximum score	**85**	**Optimal (> 70)**

Table 4. Results of the macro invertebrate bioassessment conducted at NANC-1, May 4, 2005.

Macroinvertebrate Assessment Results			
	Results	**Scores**	**Rating**
Taxa richness measures		**(0-100)**	
# Ephemeroptera (mayfly) genera	11	92	Excellent (>85)
# Plecoptera (stonefly) genera	2	33	Fair (32-49)
# Trichoptera (caddisfly) genera	8	67	Good (67-83)
Taxonomic composition measures			
% Non-insect taxa	14	44	Poor (24.7-49.4)
% Non-insect organisms	6	85	Fair (62.7-93.9)
% Plecoptera	1	3	Very Poor (<6.56)
Tolerance measures			
Beck's community tolerance index	14	50	Fair (40.7-60.7)
WMB-I Assessment Score	**---**	**53**	**Fair (48-72)**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. 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 2005 to help identify any stressors to the biological communities. *In situ* measurements showed Nances Creek to be meeting bacteria, temperature, dissolved oxygen, and pH criteria for its *Fish and Wildlife* Use Classification. However, median nutrient (total nitrogen, nitrate-nitrite-nitrogen, total and dissolved reactive phosphorus) and chloride concentrations were higher than the 90 percentile of verified reference reach samples collected in the Southern Limestone/Dolomite Valleys and Low Rolling Hills ecoregion. Median chlorophyll-*a* concentrations, which are used as index of in-stream algal biomass, were also higher than expected.

CONCLUSIONS

Bioassessment results showed the macroinvertebrate community to be in *fair* condition. Results of intensive water quality sampling suggest nutrient enrichment may be affecting the condition of the macroinvertebrate community.

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Table 5. Summary of water quality data collected at NANC-1, March-October, 2005. 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 (ºC)	7	13.0	25.0	18.0	18.3	4.2
Turbidity (NTU)	7	5.4	34.7	11.3[M]	15.1	10.7
Total dissolved solids (mg/L)	6	41.0	140.0	91.5	90.5	43.4
Total suspended solids (mg/L)	6	4.0	55.0	9.0	20.7	22.1
Specific conductance (µmhos)	7	66.1	194.8	156.3	152.3	44.2
Hardness (mg/L)	4	25.6	103.0	77.4	70.8	33.9
Alkalinity (mg/L)	6	12.8	90.1	61.3	54.1	29.4
Stream Flow (cfs)	5	23.4	66.3	36.1	38.0	---
Chemical						
Dissolved oxygen (mg/L)	6	7.0	10.3	8.5	8.7	1.3
pH (su)	6	7.3	8.51	7.9	7.9	0.4
Ammonia nitrogen (mg/L)	6	< 0.015	< 0.015	0.011	0.011	0.004
Nitrate+nitrite nitrogen (mg/L)	6	0.249	0.720	0.505[M]	0.513	0.163
Total Kjeldahl nitrogen (mg/L)	6	< 0.150	0.812	0.249	0.333	0.262
Total nitrogen (mg/L)	6	0.541	1.448	0.745[M]	0.858	0.314
Dissolved reactive phosphorus (mg/L)	6	0.013	0.074	0.033[M]	0.039	0.023
Total phosphorus (mg/L)	6	0.068	0.103	0.080[M]	0.082	0.013
[J] CBOD-5 (mg/L)	6	< 1.0	4.7	1.3	1.7	1.6
[J] Chlorides (mg/L)	6	4.0	6.4	4.9[M]	5.0	0.9
Atrazine (µg/L)	1			< 0.05		- -
Total Metals						
Aluminum (mg/L)	3	0.015	0.078	0.054	0.047	0.036
Iron (mg/L)	3	0.285	0.37	0.34	0.332	0.043
Manganese (mg/L)	3	0.055	0.101	0.058	0.071	0.026
Dissolved Metals						
Aluminum (mg/L)	3	< 0.015	< 0.015	0.0075	0.008	0.0
Antimony (µg/L)	3	< 2	< 2	1	1	0
Arsenic (µg/L)	3	< 10	< 10	5	5	0
Cadmium (mg/L)	3	< 0.005	< 0.005	0.0025	0.0025	0.0
Chromium (mg/L)	3	< 0.004	< 0.004	0.002	0.002	0.0
Copper (mg/L)	3	< 0.005	< 0.005	0.0025	0.003	0.0
Iron (mg/L)	3	< 0.005	0.113	0.072	0.0625	0.1
Lead (µg/L)	3	< 2	< 2	1	1	0
Manganese (mg/L)	3	< 0.005	0.04	0.022	0.022	0.019
[J] Mercury (µg/L)	3	< 0.3	< 0.3	0.15	0.2	0.1
Nickel (mg/L)	3	< 0.006	< 0.006	0.003	0.003	0.0
Selenium (µg/L)	3	< 10	< 10	5	5	0
Silver (mg/L)	3	< 0.003	< 0.003	0.0015	0.0015	0.0
Thallium (µg/L)	3	< 1	< 1	0.5	0.500	0.0
Zinc (mg/L)	3	< 0.006	< 0.006	0.003	0.003	0.0
Biological						
[J] Chlorophyll *a* (µg/L)	6	2.49	10.41	4.99[M]	5.73	3.1
[J] Fecal Coliform (col/100 mL)	6	100	1960	405[M]	747	806

J=estimate; N=# samples; M=value> 90th % tile of samples collected at (67f) eco-regional reference reaches.