

2005 Monitoring Summary



Moores Mill Creek (Lee County) at Bent Creek Rd (32.60287/-85.42579)

BACKGROUND

Moores Mill Creek from Chewacla Creek to its source is on Alabama's Clean Water Act (CWA) 2008 §303(d) list of impaired waters for not meeting its *Swimming* and *Fish and Wildlife* (S/F&W) water use classifications. It is listed for siltation (habitat alteration) from land development and urban runoff/storm sewers.

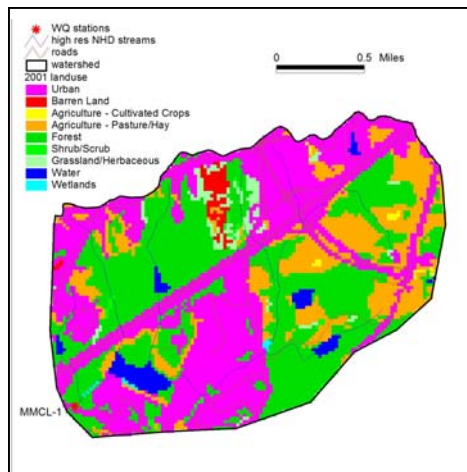


Figure 1. sampling location and watershed of Moores Mill Creek at MMCL-1.

ADEM monitored Moores Mill Creek at MMCL-1 to assess biological integrity at the site and document impairment from siltation. Macroinvertebrate and habitat assessments were conducted to verify impairment to aquatic communities. Monthly water chemistry samples were collected to identify the causes of impairment. Results from these data may also be used in determination of Total Maximum Daily Load needs and priorities.

WATERSHED CHARACTERISTICS

The Moores Mill Creek watershed at MMCL-1 is a small watershed located within the Southern Outer Piedmont Ecoregion. Approximately 40% of the MMCL-1 watershed lies within the cities of Auburn and Opelika corporate limits (Fig. 1). This segment is more forested than the downstream areas, ninety percent of which lies within Auburn and Opelika (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. Moores Mill Creek at MMCL-1 is a small, mostly-shaded stream reach characterized by cobble and gravel substrates. Overall habitat quality was in the "Optimal" category, but bank condition and a lack of riffle habitat were issues of concern. The stream was characterized by a relatively straight stream channel and narrow riparian buffer. Beaverdam construction in the reach blocked some flow.

These results support the findings of a stream walk survey conducted by ADEM and Tetra Tech, Inc. during the fall of 2005 (Tetra Tech, Inc. 2006). Occasional bank erosion and bed sedimentation were observed just downstream of MMCL-1.

Table 1. Summary of watershed characteristics .

| Watershed Characteristics | |
|---|-----|
| Drainage Area (mi ²) | 3 |
| Ecoregion ^a | 45b |
| % Landuse | |
| Open water | 3 |
| Development | |
| Open space | 23 |
| Low intensity | 15 |
| Medium intensity | 2 |
| High intensity | 1 |
| Barren land | 1 |
| Forest | |
| Deciduous | 20 |
| Evergreen | 15 |
| Mixed | 1 |
| Shrub/scrub | 1 |
| Grassland/herbaceous | 2 |
| Pasture/hay | 16 |
| Population/km ² ^b | 166 |
| # NPDES Permits ^c | 55 |
| 401 Wetland Water Quality Certification | 1 |
| Construction/stormwater | 38 |
| Mining General (Old) | 3 |

a. Southern Outer Piedmont

b. 2000 US Census data

c. # NPDES permits from ADEM's NPDES Management System database, June 9, 2008.

Table 2. Summary of physical characteristics at MMCL-1, June 15, 2005.

| Physical Characteristics | |
|--------------------------|---------------|
| Width (ft) | 12 |
| Canopy cover | Mostly Shaded |
| Depth (ft) | |
| Riffle | 0.3 |
| Run | 1.2 |
| Pool | 1.6 |
| % of Reach | |
| Riffle | 5 |
| Run | 35 |
| Pool | 60 |
| % Substrate | |
| Boulder | 3 |
| Cobble | 38 |
| Gravel | 39 |
| Sand | 5 |
| Silt | 10 |
| Organic Matter | 5 |

Table 3. Results of a habitat assessment conducted at MMCL-1, June 15, 2005.

| Habitat Assessment (% Maximum Score) | | Rating |
|--------------------------------------|-----------|--------------------------|
| Instream habitat quality | 78 | Optimal (> 70) |
| Sediment deposition | 73 | Optimal (> 70) |
| Sinuosity | 50 | Marginal (45-64) |
| Bank and vegetative stability | 63 | Sub-optimal (60-74) |
| Riparian buffer | 90 | Sub-optimal (70-90) |
| Habitat assessment score | 180 | |
| % Maximum score | 75 | Optimal (> 70) |

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 *very poor* condition (Table 4). Very few pollution-intolerant taxa were collected at the site and the community as a whole was dominated by pollution-tolerant organisms.

WATER CHEMISTRY

In situ measurements and water samples were collected monthly, during March through October of 2005 to help identify any stressors to the biological communities. Median values of water chemistry results are presented in Table 5. The fecal coliform count was >200 colonies/100 mL of sample on April 7th (1,600 colonies/100mL sample; stream flow=26.0 cfs) and July 7th (570 colonies/100mL sample; stream flow=6.2 cfs).

Median concentrations of alkalinity, chlorides, and specific conductance were above values expected in the Piedmont ecoregion. Median nutrient concentrations (total nitrogen, nitrate+nitrite-nitrogen, ammonia, total phosphorus and total Kjeldahl nitrogen) were also higher than expected.

SUMMARY

Results of the 2005 macroinvertebrate assessment indicated the macroinvertebrate community to be in *very poor* condition, verifying the impairment caused by siltation (habitat alteration) from land development and urban runoff/storm sewers. Development accounted for 40% of land cover within the watershed. Based on the 2001 MRLC definitions, impervious surfaces compose five to fifteen percent of the watershed, which can severely alter stream hydrology. The reach was also characterized by a relatively straight stream channel and narrow riparian zone, which limit protection of the stream and aquatic communities from runoff, contributes to scouring from sedimentation, and minimizes the habitat for aquatic communities. Intensive water quality data also identified nutrients (nitrogen) and total dissolved solids as parameters of concern at the site.

Table 4. Results of the macroinvertebrate bioassessment conducted at MMCL-1, June 15, 2005.

| Macroinvertebrate Assessment | | | |
|---------------------------------------|------------|-----------|---------------------------|
| | Results | Scores | Rating |
| Taxa richness measures (0-100) | | | |
| # Ephemeroptera (mayfly) genera | 3 | 25 | Poor (23-46) |
| # Plecoptera (stonefly) genera | 0 | 0 | Very poor (<16) |
| # Trichoptera (caddisfly) genera | 4 | 33 | Poor (22-44) |
| Taxonomic composition measures | | | |
| % Non-insect taxa | 24 | 3 | Very poor (<25) |
| % Non-insect organisms | 3 | 92 | Fair (63-94) |
| % Plecoptera | 0 | 0 | Very Poor (<7) |
| Tolerance measures | | | |
| Beck's community tolerance index | 2 | 7 | Very Poor (<20) |
| WMB-I Assessment Score | --- | 23 | Very poor (<24) |

Table 5. Summary of water quality data collected 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.

| Parameter | N | Min | Max | Median | Avg | SD |
|--|---|---------|-------|--------------------|-------------------|-------|
| Physical | | | | | | |
| Temperature (°C) | 7 | 17.2 | 31.0 | 24.0 | 23.7 | 4.9 |
| Turbidity (NTU) | 7 | 6.6 | 65.0 | 17.1 | 23.5 | 19.4 |
| Total dissolved solids (mg/L) | 7 | 31.0 | 130.0 | 72.0 | 78.7 | 40.8 |
| Total suspended solids (mg/L) | 7 | 8.0 | 38.0 | 11.0 | 15.4 | 10.5 |
| Specific conductance (µmhos) | 7 | 64.7 | 99.1 | 86.4 ^M | 83.1 | 12.6 |
| Hardness (mg/L) | 1 | | | | 33.5 ^M | |
| Alkalinity (mg/L) | 7 | 26.1 | 38.6 | 29.4 ^M | 30.7 | 4.3 |
| Stream Flow (cfs) | 7 | 2.0 | 26 | 3.8 | 7.0 | --- |
| Chemical | | | | | | |
| Dissolved oxygen (mg/L) | 7 | 5.5 | 9.8 | 6.9 | 7.4 | 1.5 |
| pH (su) | 7 | 6.8 | 7.63 | 7.2 | 7.1 | 0.3 |
| Ammonia Nitrogen (mg/L) | 7 | < 0.015 | 0.079 | 0.033 ^M | 0.041 | 0.029 |
| Nitrate+Nitrite Nitrogen (mg/L) | 7 | 0.106 | 0.398 | 0.272 ^M | 0.251 | 0.100 |
| Total Kjeldahl Nitrogen (mg/L) | 7 | 0.239 | 1.461 | 0.472 ^M | 0.644 | 0.440 |
| Total nitrogen (mg/L) | 7 | 0.376 | 1.754 | 0.775 ^M | 0.895 | 0.437 |
| Dissolved reactive phosphorus (mg/L) | 6 | < 0.004 | 0.019 | 0.008 | 0.010 | 0.007 |
| Total phosphorus (mg/L) | 7 | 0.037 | 0.078 | 0.070 ^M | 0.063 | 0.016 |
| CBOD-5 (mg/L) | 7 | < 1.0 | 4.6 | 2.7 | 2.6 | 1.3 |
| Chlorides (mg/L) | 7 | 4.1 | 6.4 | 5.4 ^M | 5.3 | 0.9 |
| Biological | | | | | | |
| Chlorophyll <i>a</i> (µg/L) | 1 | | | | 7.48 ^M | |
| ^J Fecal Coliform (col/100 mL) | 7 | 6 | 1600 | 67 | 343 | 589 |

N=# samples; J=estimate; M=value > 90% of ADEM's reference reaches

REFERENCES

Tetra Tech, Inc. 2006. Stream channel stability and geomorphic assessments of the Lower Tallapoosa tributaries, Alabama: Including Line Creek, Cubahatchee Creek, Calabee Creek, and Moore's Mill Creek. Prepared for the Alabama Department of Environmental Management, Water Division. Montgomery, Alabama. 50pp.

FOR MORE INFORMATION, CONTACT:

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