

2006 Monitoring Summary



Clear Creek at Choctaw County Road 32 (32.23648/-88.19938)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Clear Creek watershed for biological and water quality monitoring as part of the 2006 Assessment of the Escatawpa, Mobile, and Tombigbee (EMT) River Basins. The objectives of the EMT Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the EMT basin group. Based on landuse information and population density, Clear Creek is also an ecoreference candidate station. The 2006 data will be used to evaluate Clear Creek as a “best attainable” condition reference watershed for comparison with other Coastal Plain streams.

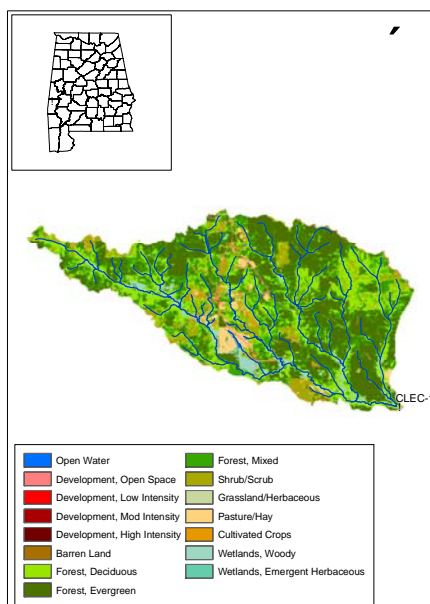


Figure 1. Sampling location and land use within the Clear Creek watershed at CLEC-1.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Clear Creek is a small *Fish & Wildlife (F&W)* stream that drains approximately 31 mi² in Choctaw County between Cromwell and Jachin, Alabama (Figure 1). It is located in the Southern Hilly Gulf Coastal Plain sub-ecoregion (65d), which is characterized by irregular plains and undulating terraces (Griffith et al, 2001). Land use within the watershed is primarily forest (80%), with some shrub/scrub. As of September 2009, the watershed contains two permitted discharges (Table 1).

Table 1. Summary of watershed characteristics.

| Watershed Characteristics | | Lower Tombigbee River |
|---|---------------------|-----------------------|
| Basin | | 31 |
| Drainage Area (mi ²) | | 65d |
| Ecoregion ^a | | |
| % Landuse | | |
| Open water | | <1 |
| Wetland | Woody | 5 |
| | Emergent herbaceous | <1 |
| Forest | Deciduous | 25 |
| | Evergreen | 34 |
| | Mixed | 21 |
| Shrub/scrub | | 9 |
| Grassland/herbaceous | | <1 |
| Pasture/hay | | 4 |
| Cultivated crops | | 1 |
| Development | Open space | 2 |
| | Low intensity | <1 |
| Population/km ² ^b | | 3 |
| # NPDES Permits ^c | TOTAL | 2 |
| Construction Stormwater | | 2 |

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. Physical characteristics of Clear Creek at CLEC-1, May 30, 2006.

| Physical Characteristics | |
|--------------------------|---------------|
| Width (Ft.) | 20 |
| Canopy Cover | Mostly Shaded |
| Depth (Ft) | |
| Run | 1.0 |
| Pool | 3.0 |
| % of Reach | |
| Run | 60 |
| Pool | 40 |
| % Substrate | |
| Clay | 2 |
| Sand | 83 |
| Silt | 8 |
| Organic Matter | 7 |

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. Clear Creek at CLEC-1 is a low-gradient stream characterized by sand substrate. Habitat quality was rated as *sub-optimal*.

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 overall condition of the macroinvertebrate community was assessed as *fair* (Table 4).

Table 3. Results of the habitat assessment conducted on Clear Creek at CLEC-1, May 30, 2006.

| Habitat Assessment | %Maximum Score | Rating |
|---------------------------------|----------------|----------------------------|
| Instream Habitat Quality | 48 | Marginal (40-52) |
| Sediment Deposition | 60 | Sub-optimal (53-65) |
| Sinuosity | 58 | Marginal (45-64) |
| Bank and Vegetative Stability | 50 | Marginal (35-59) |
| Riparian Buffer | 69 | Marginal (50-69) |
| Habitat Assessment Score | 121 | |
| % Maximum Score | 55 | Sub-optimal (53-65) |

Table 4. Results of the macroinvertebrate bioassessment conducted in Clear Creek at CLEC-1, May 30, 2006.

| Macroinvertebrate Assessment | | | |
|--|---------|-----------|---------------------|
| | Results | Scores | Rating |
| Taxa richness measures | | | |
| # EPT genera | 15 | 60 | Good (57-78) |
| Taxonomic composition measures | | | |
| % Non-insect taxa | 6 | 97 | Excellent (>96.3) |
| % Plecoptera | 1 | 6 | Good (5.7-52.8) |
| % Dominant taxa | 22 | 71 | Good (70.6-85.2) |
| Functional composition measures | | | |
| % Predators | 15 | 52 | Good (45.3-72.1) |
| Tolerance measures | | | |
| Beck's community tolerance index | 7 | 32 | Good (31.9-65.9) |
| % Nutrient tolerant organisms | 36 | 57 | Fair (50.9-76.2) |
| WMB-I Assessment Score | -- | 54 | Fair (38-56) |

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 2006 to help identify any stressors to the biological communities. *Water chemistry results were generally similar to the 90th percentile of reference reach data collected in the Southern Hilly Gulf Coastal Plain sub-ecoregion (65d).* However, median concentrations of total manganese and some dissolved metals were higher than expected for this ecoregion.

SUMMARY

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

Bioassessment results showed the macroinvertebrate community to be in *fair* condition. Higher than expected metals concentrations and habitat degradation were issues of concern within the reach.

FOR MORE INFORMATION, CONTACT:

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Table 5. Summary of water quality data collected at CLEC-1, 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. Metals results were compared to ADEM's chronic aquatic life use criteria adjusted for hardness.

| Parameter | N | Min | Max | Med | Avg | SD | Q |
|--------------------------------------|---|---------|-------|--------------------|--------|-------|---|
| Physical | | | | | | | |
| Temperature (°C) | 7 | 15.0 | 26.6 | 22.6 | 22.4 | 3.9 | |
| Turbidity (NTU) | 8 | 7.8 | 47.9 | 14.6 | 23.0 | 15.6 | |
| Total Dissolved Solids (mg/L) | 6 | 68.0 | 101.0 | 78.5 | 80.3 | 12.1 | |
| Total Suspended Solids (mg/L) | 6 | 1.0 | 28.0 | 9.5 | 13.2 | 11.6 | |
| Specific Conductance (µmhos) | 7 | 50.8 | 97.4 | 87.3 | 80.5 | 18.7 | |
| Hardness (mg/L) | 2 | 33.7 | 51.0 | 42.4 | 42.4 | 12.2 | |
| Alkalinity (mg/L) | 6 | 20.0 | 49.2 | 34.4 | 32.7 | 11.0 | |
| Stream Flow (cfs) | 8 | 2.7 | 44.1 | 6.6 | 11.7 | 13.8 | |
| Chemical | | | | | | | |
| Dissolved Oxygen (mg/L) | 7 | 6.7 | 10.3 | 7.6 | 7.8 | 1.2 | |
| pH (su) | 7 | 6.7 | 7.3 | 7.1 | 7.1 | 0.2 | |
| Ammonia Nitrogen (mg/L) | 6 | < 0.015 | 0.079 | 0.038 | 0.038 | 0.025 | |
| Nitrate+Nitrite Nitrogen (mg/L) | 6 | 0.035 | 0.081 | 0.074 | 0.064 | 0.021 | |
| Total Kjeldahl Nitrogen (mg/L) | 6 | 0.346 | 0.611 | 0.554 | 0.522 | 0.103 | |
| Total Nitrogen (mg/L) | 6 | 0.381 | 0.692 | 0.608 | 0.586 | 0.118 | |
| Dissolved Reactive Phosphorus (mg/L) | 6 | < 0.004 | 0.015 | 0.004 | 0.005 | 0.005 | |
| Total Phosphorus (mg/L) | 6 | < 0.029 | 0.100 | 0.050 | 0.046 | 0.008 | |
| CBOD-5 (mg/L) | 6 | < 0.8 | 2.7 | 1.2 | 1.4 | 0.8 | |
| COD (mg/L) | 1 | | | | < 2.0 | | |
| TOC (mg/L) | 1 | | | | 5.3 | | |
| Chlorides (mg/L) | 4 | 2.0 | 2.8 | 2.7 | 2.6 | 0.4 | |
| Atrazine (µg/L) | 1 | | | | < 0.05 | | |
| Total Metals | | | | | | | |
| Aluminum (mg/L) | 2 | 0.260 | 0.281 | 0.270 | 0.270 | 0.015 | |
| Iron (mg/L) | 2 | 2.120 | 2.410 | 2.265 | 2.265 | 0.205 | |
| Manganese (mg/L) | 2 | 0.180 | 0.216 | 0.198 ^M | 0.198 | 0.026 | |
| Dissolved Metals | | | | | | | |
| Aluminum (mg/L) | 2 | < 0.050 | 0.070 | 0.048 | 0.048 | 0.032 | |
| Antimony (µg/L) | 2 | < 7.5 | 10.0 | 4.4 ^M | 4.4 | 0.9 | |
| Arsenic (µg/L) | 2 | < 5.0 | 10.0 | 3.8 | 3.8 | 1.8 | |
| Cadmium (mg/L) | 2 | < 0.000 | 0.015 | 0.004 | 0.004 | 0.005 | |
| Chromium (mg/L) | 2 | < 0.005 | 0.050 | 0.014 ^M | 0.014 | 0.016 | |
| Copper (mg/L) | 2 | < 0.005 | 0.050 | 0.014 ^M | 0.014 | 0.016 | |
| Iron (mg/L) | 2 | 0.350 | 0.522 | 0.436 | 0.436 | 0.122 | |
| Lead (µg/L) | 2 | < 5.0 | 10.0 | 3.8 ^M | 3.8 | 1.8 | |
| Manganese (mg/L) | 2 | 0.157 | 0.166 | 0.162 ^M | 0.162 | 0.006 | |
| Mercury (µg/L) | 2 | < 0.0 | 0.5 | 0.1 | 0.1 | 0.2 | |
| Nickel (mg/L) | 2 | < 0.005 | 0.050 | 0.014 ^M | 0.014 | 0.016 | |
| Selenium (µg/L) | 2 | < 7.5 | 50.0 | 14.4 ^M | 14.4 | 15.0 | |
| Silver (mg/L) | 2 | < 0.001 | 0.050 | 0.013 ^M | 0.013 | 0.017 | |
| Thallium (µg/L) | 1 | | | | < 10.0 | | |
| Zinc (mg/L) | 2 | < 0.005 | 0.050 | 0.014 ^M | 0.014 | 0.016 | |
| Biological | | | | | | | |
| Chlorophyll a (ug/L) | 6 | < 0.10 | 2.67 | 1.48 | 1.38 | 1.00 | |
| Fecal Coliform (col/100 mL) | 4 | 93 | 980 | 355 | 446 | 416 | J |

J=estimate; N=# samples; M=value > 90th % tile of samples collected at (65d) eco-regional reference reaches.