ECRR Stream Testing Training
Mullens Opportunity Center, Mullens, West Virginia
June 7-10, 2009

Group 3 Report: Milam Fork Water Quality Summary

INTRODUCTION

Water quality monitoring

Long-term water quality monitoring projects can provide important data about changes in the water quality and ecological health of specific streams and the watershed in general. These changes can show improvement and recovery from a previously degraded condition, or indicate unhealthy conditions that need to be addressed. Volunteer water monitoring can also provide educational opportunities for community members to become more engaged in maintaining a healthy ecological watershed system.

Why use benthic macroinvertebrates?

Benthic macroinvertebrates include the insects, crayfish, worms, clams and other small organisms that live among the rocks, plants, and sediments in the bottom of streams. These creatures feed on fallen leaves and woody debris, aquatic plants and algae, suspended nutrients, and other invertebrates, and in turn are an important food source for larger organisms including fish, amphibians, birds and mammals.

While chemical testing offers a snapshot view of water quality, studying the invertebrate communities can provide insight into the long-term effects of different pollutants and habitat conditions on the ecological health of the stream. Some of these insects can live for months or years in the same stretch of a creek, and different types of invertebrates can tolerate different levels of various pollutants. When used as part of a long-term water quality monitoring program, in combination with chemical testing and habitat assessment, these benthic macroinvertebrate surveys can provide very valuable screening data for identifying potential problems and making management decisions.

METHODS

Location

We studied three sites on Milam Fork, in Wyoming County, West Virginia:

- Most upstream site: Slab Run (wetlands)
- Farther downstream: Milam Park (low gradient, next to McGraw School)
- Most downstream site: Milam Creek Riffle (higher gradient, rocky)

In order to interpret the data we collected and make management or restoration recommendations, more research is needed on historical and current land use in the watershed and potential sources of detrimental impacts (such as sediment, fertilizer and pesticide runoff, mine drainage, etc.).

Protocol

For each site, we set up a 300 ft (~100 m) reach, which is the standard length of a stream sample area. We followed the West Virginia Save Our Streams Level-One protocol, which is available online at: http://www.wvdep.org/item.cfm?ssid=11&ss1id=202 . The three main characteristics studied are:

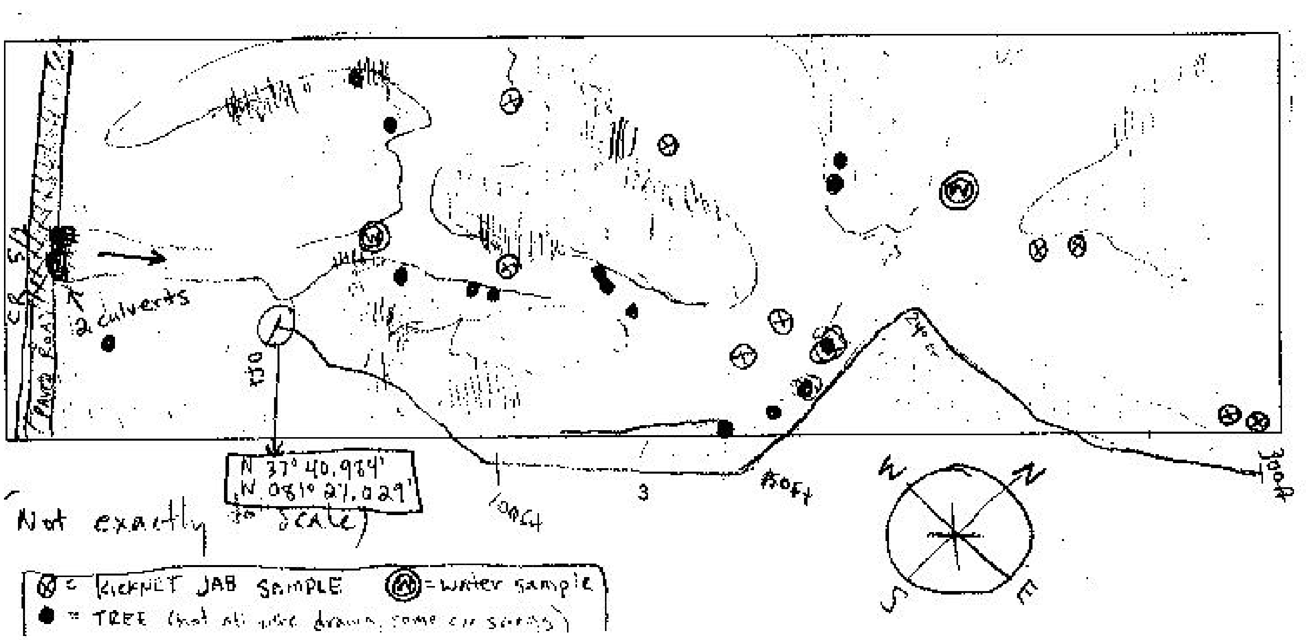
- Physical/Habitat
- Chemical
- Biological

Physical characteristics of the stream and surrounding habitat include:
- Land use of the area that drains into the stream (forest, fields, roads, parking lots, etc.)
- The extent of the riparian buffer around the streams (trees, shrubs, and other vegetation that help absorb runoff and keep streams clear and cool)
- How wide the stream is, how fast it is flowing, and how much water is moving downstream
- What bottom of the stream looks like (mud, sand, gravel, larger rocks, boulders, bedrock, etc.)

Chemical characteristics measured include:
- **Water temperature**
- **Dissolved oxygen (D.O.)**: Very important for determining what kinds of invertebrates and fish can live in a stream. High D.O. levels and cool temperatures are ideal for trout and the insects they eat.
- **pH**: Values outside a certain range can indicate problems such as mine drainage, and can affect the ability of the stream to support sensitive organisms. More acidic water has a lower pH, while more alkaline water has a higher pH; a neutral value is 7.0.
- **Alkalinity**: The ability of the stream to neutralize acidic inputs (the buffer capacity); influenced mainly by the type of rocks and soils in the watershed and streambed.
- **Conductivity and metals:** High conductivity levels and iron concentrations can indicate a need for more extensive heavy metal testing.
- **Nitrates/nitrites and phosphates:** Two types of nutrients that plants need to survive and grow. Excess nutrients from fertilizer or sewage runoff can cause algae to grow out of control, then use up the oxygen in the stream as it decays. This can harm aquatic insects and fish.
- **Fecal coliform/*E. coli***: These bacteria pose a risk to human health (in terms of drinking water and swimming), and can indicate the presence of livestock waste or untreated sewage inputs.
- **Turbidity**: Measures the murkiness of the water, due to suspended algae, mud, etc.

Biological characteristics measured included the abundance and diversity of the aquatic insects and other invertebrates inhabiting the stream, as well as some information about the algae cover and streamside vegetation.

SLAB RUN WETLANDS (most upstream site)



RESULTS
Physical/Habitat

- Low flow; water was not moving very fast.
- Silty/sandy/muddy bottom, which is not ideal for many of the organisms that are adapted to live in cool, fast-flowing, rocky streams.
- However, there were good habitat areas for some aquatic species, including wetland plants and vegetated undercut banks.
- Our results showed a marginal overall stream score (out of optimal, suboptimal, marginal and poor)
- Our methods were not ideal for evaluating the habitat value of this type of wetland, because it was designed more for rocky streams.
- No tree cover surrounding the wetland; mowed down to water's edge in some areas

Chemical

- Fairly good levels of dissolved oxygen; coolest water temperature of all three sites studied
- All other parameters were also within reasonable levels to support aquatic life
- (Bacterial test results not yet available)

Biological

- Invertebrate community fairly typical for wetland habitat
- Less sensitive species were more prevalent
- Lower diversity of aquatic insects

CONCLUSION

- Management suggestions: increase riparian buffer

MILAM PARK (farther downstream, next to McGraw School)

RESULTS

Physical/Habitat

- Low gradient
- Still silty, but more rocks
- Silt decreased as riparian buffer increased
- Land use next to stream:
    - River right (looking downstream): Small parking lot, mowed grassy area, fallow fields grading into high weeds and shrubs. Fields (formerly wetlands) drained by several ditches into stream.
    - River left: Hardwoods and understory vegetation
    - Recent flooding; large amounts of woody debris (including lumber and fence sections) and trash in stream

Chemical

- Low dissolved oxygen (5 ppm): minimum for sustaining most aquatic life in warm-water stream
- Sample taken around noon, which should be a fairly high point in daily D.O. fluctuations
- Warmer water temperature than the upstream wetland despite higher flow (could have been influenced by time of day)

Biological

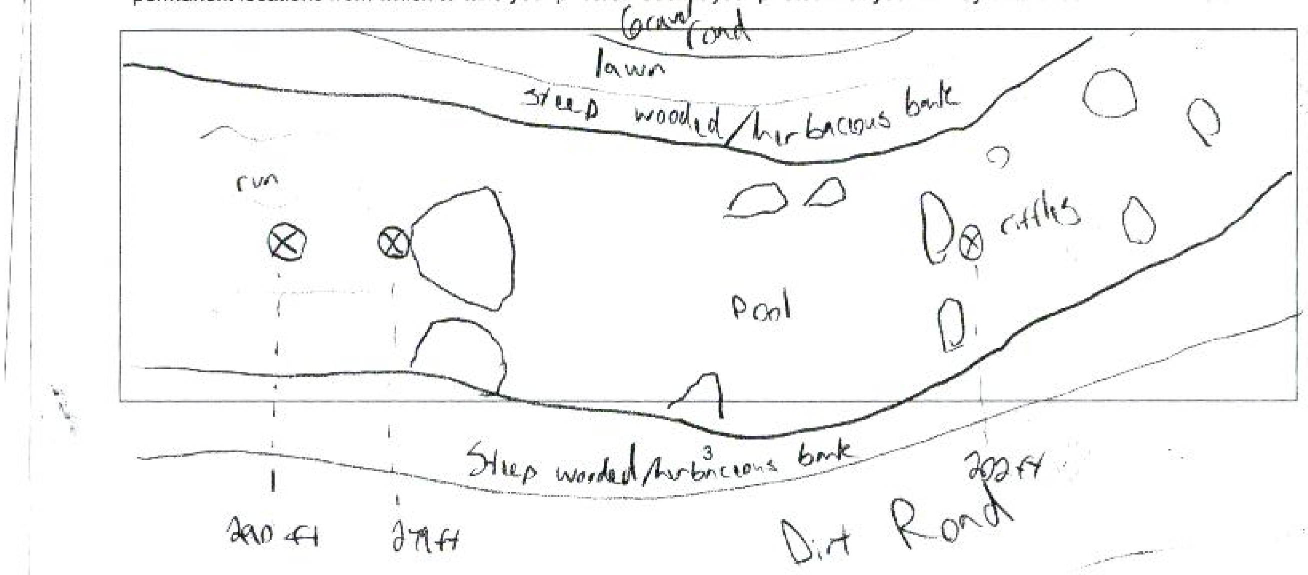
- A few more sensitive species, including a stonefly
- Many organisms that can tolerate low oxygen levels
    - Red midge larvae (bloodworms)
    - Many aquatic worms (oligochaetes)
- Greater abundance and variety of insect and other invertebrate species

CONCLUSION

- Increasing buffer vegetation (planting trees, not mowing down to edge of stream) could help shade the stream, decrease temperature, increase dissolved oxygen, lower sediment runoff inputs.
- Trash pickup could improve water quality (a car battery was removed from the stream channel)

MILAM CREEK RIFFLE SITE (farthest downstream, higher gradient, rocky)

Photograph and **sketch your study reach**: Use the space below or a separate piece of paper to draw your study reach. Indicate the direction of flow, north, sample locations and important features of the reach. Photographs are an excellent method for tracking changes, especially changes related to the condition of the habitat. Choose a minimum of two permanent locations from which to take your photos. Submit your photos with your survey data sheet.



RESULTS

Physical/Habitat

- Riffle and run habitats, rocky bottom
- Fast-moving water, shaded by trees along both sides of stream
- Dirt road along left side of stream (looking downstream), right side includes mowed area with less than 10 ft tree buffer next to stream
- Algae and other organisms covering rocks (food for other organisms)

Chemical

- Dissolved oxygen good for aquatic life
- Warmest water temperature sampled; time of day was late afternoon, however

Biological

- Most abundant and diverse community of aquatic organisms
- More orders and families of sensitive insects
- More balanced community, no overabundance of worms or midge larvae
- Found two hellgrammites

CONCLUSION

- Many factors influenced the suboptimal rating for overall water quality and ecological health of the stream; however, this was the most productive site sampled in Milam Fork.

OVERALL CONCLUSION

More information is needed about the historical and current land usage and potential impacts of the Milam Fork watershed. Community input about the history of the area and water use priorities, such as fishing, water quality, recreation, swimming and drinking water, is also needed. Volunteer stream surveys could increase community involvement and familiarity with watershed issues; riparian buffer restoration and trash pickup are also potential project opportunities.