Antietam National Battlefield

National Park Service
U.S. Department of the Interior

Macroinvertebrates *Resource Brief*

Importance

A macroinvertebrate is any animal without a backbone that is large enough to be seen by the naked eye. Aquatic (water-dwelling) or benthic (occupying the lowest level of a body of water) macroinvertebrates include aquatic insects, crayfish, and mussels. Crayfish and aquatic insects (including stoneflies, mayflies, and caddisflies) consume organic matter that falls into rivers and streams, while mussels filter nutrients and sediment from the water. All macroinvertebrates provide food for other creatures: fish and other stream-dependent creatures like lizards and salamanders consume aquatic insects; crayfish are eaten by fish, birds, raccoons, and others; while mussels provide food and habitat to other animals.



Photo: NPS/Nortrup

A fine-meshed D-shaped net is used to scoop up macroinvertebrates from promising stream habitat.

Monitoring

Macroinvertebrate monitoring is part of a broader effort by the National Capital Region Network (NCRN) Inventory & Monitoring (I&M) program to assess the condition of streams and watersheds.

Long-term macroinvertebrate monitoring at thirty-seven park sites throughout the NCRN began in 2008 and followed a six-year rotation. Each spring 5-8 sites were visited. At Antietam National Battlefield (ANTI) monitoring is done in Sharpsburg Creek. Macroinvertebrate monitoring is co-located with fish monitoring and stream physical habitat analysis.

The objectives of this combined monitoring are to:

- Determine current conditions and track long-term trends in stream condition,
- Determine trends in species composition and functional groups of fish and benthic invertebrates

At each site, monitoring teams mark out a 75 meter stream segment. Organisms are dislodged from approximately 20 square feet of stream habitats and captured in a fine-meshed, D-shaped net (see photo). Riffles and other productive spots are sampled preferentially when available. The collected macroinvertebrates are preserved and subsampled to 100 individuals. Most are identified to genus if possible, using stereoscopes (low-magnification microscopes). Chironomidae (chironomids or non-biting midges) are slide-mounted and identified using compound microscopes. A list of taxa and their abundance at each site is generated.

BIBI Scores

The number and species of macroinvertebrates present in a stream segment is used to calculate a Benthic Index of Biotic Integrity (BIBI) score. Scoring takes into account factors such as:

- number and diversity of taxonomic groups
- the proportion of individuals belonging to specific taxonomic groups
- ability of individuals present to survive short- and long-term exposure to stressors from chemical pollution, changes in water quantity, or habitat degradation
- mode of feeding including scrapers, predators, collectors, filterers, and shredders
- habit tendencies including burrowers, climbers, clingers, and sprawlers

Scores also take into account Antietam's location in the highlands BIBI region. Key macroinvertebrate community attributes of a sampled site are compared to a non-degraded reference condition. BIBI scores range from 1 to 5 and are ranked as follows: 1.0-1.9 (very poor), 2.0-2.9 (poor), 3.0-3.9 (fair), and 4.0-5.0 (good).

More Information

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Results

Sharpsburg Creek was monitored in 2013. It was also sampled in 2004 and 2006 while monitoring protocols were under development. Newcomer and Mumma Creeks were also sampled during protocol development in 2004. BIBI scores for all streams indicate poor or very poor stream conditions.

Mumma Creek (ANTM-101-N-2004)

2004 BIBI = 1.5 (very poor)
Number of taxa found: 2
Most common taxa: *Gammarus* (152) and *Dugesia* (1).

Newcomer Creek (ANTM-112-N-2004)

2004 BIBI = 1.5 (very poor)
Number of taxa found: 6
Most common taxa: *Gammarus* (99), *Paraphaenocladius* (5), *Baetis* (1), *Caecidotea* (1), and *Eukiefferiella* (1).

Sharpsburg Creek (ANTI-101-N-2013)

2013 BIBI = 2 (poor)
Number of taxa found: 11
Most common taxa: *Gammarus* (92), *Optioservus* (8), *Eukiefferiella* (3), *Caecidotea* (2), and *Tvetenia* (1).

Sharpsburg Creek (ANTI-101-N-2006)

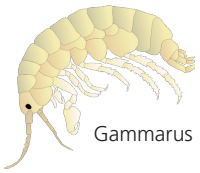
2006 BIBI = 2.25 (poor)
Number of taxa found: 11
Most common taxa: *Gammarus* (92), *Optioservus* (27), *Micropsectra* (4), *Parametriocnemus* (2), and *Baetis* (2).

Sharpsburg Creek (ANTI-101-N-2004)

2004 BIBI = 2.25 (poor)
Number of taxa found: 5
Most common taxa: *Gammarus* (82), *Baetis* (25), *Optioservus* (6), *Caecidotea* (3), and *Hydropsyche* (1).

Taxa Explained

Baetis- genus of mayflies in the family Baetidae.
Dugesia- genus of dugesiid triclad (flatworms).
Gammarus- genus of amphipod crustaceans.
Microspectra- genus of non-biting midges.
Optioservus- genus of the family Elmidae or "riffle beetles".
Parametriocnemus- genus of non-biting midges.
Paraphaenocladius- genus of non-biting midges.


Gammarus

Discussion

Antietam occupies a region known for karst, a geology marked by groundwater that dissolves buried limestone layers. This process not only creates springs, sinkholes, and caves, but stream waters with lower levels of acidity and more dissolved material. These stream water characteristics negatively influence in particular, the presence of clingers and Ephemeroptera (mayflies).

Newcomer and Mumma Creeks were monitored only in 2004 and both earned very poor scores, with only 2 taxa found in Mumma Creek, and 6 in Newcomer Creek. Both streams earned poor ratings in all categories that roll up into the BIBI score.

Sharpsburg Creek earned poor BIBI scores in 2004, 2006, and 2013. Factors causing these poor scores are low ratings for all categories except for moderate ratings for the sensitive midge group Tanytarsini, and for scrapers during all years. Slightly better poor scores during earlier monitoring are due to good ratings for scrapers, swimmers, and diversity of diptera. A total of 11 taxa were found in 2013 and 2006, while in 2004 only 5 taxa were found.

References:

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