Macroinvertebrates *Resource Brief*

Importance

A macroinvertebrate is any animal without a backbone that is large enough to be seen by the naked eye. Macroinvertebrates that are aquatic (water-dwelling) or benthic (occupying the lowest level of a body of water) 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 are a food source for other animals. Fish and other stream-dependent creatures like water turtles and salamanders consume aquatic insects; crayfish are eaten by fish, birds, raccoons, and others; and mussels provide food and habitat to other animals.

Macroinvertebrates are good indicators of watershed health and water quality because they live in the water for all or most of their life, have limited mobility, and differ in their tolerance to amounts and types of pollution.

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. In the George Washington Memorial Parkway (GWMP), monitoring is done in Mine Run, Minnehaha Creek, Pimmit Run, and Turkey Run. 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 work within a 75 meter stream segment. Organisms are dislodged from available riffles and other productive stream habitats and captured in a fine-meshed, D-shaped net (see photo). A subsample of 100 individuals are preserved and identified to genus if possible, using stereoscopes (low-magnification microscopes). Chironomidae (chironomids or non-biting midges) are slide-mounted and identified using compound microscopes.



Photo: NPS/Nortrup

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

BIBI Scores

The species and number of macroinvertebrates present in a stream segment are 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 pollution, changes in stream flow, 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 GWMP's location in the Eastern Piedmont physiographic province. 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

Mine Run, Pimmit Run, and Turkey Run were sampled in 2012 and Minnehaha Creek was sampled in 2014. Some streams were also sampled during development of monitoring protocols: Pimmit Run in 2006 and 2004 and similar locations on Mine Run and Turkey Run in 2004.

With the exception of Mine Run, all streams earned BIBI scores that were either poor or very poor. These low scores stem from the relative absence of pollution- and disturbance-sensitive taxa and high numbers of pollution-tolerant Chironomid taxa. Mine Run however, did have some ephemeroptera as well as the highest total number of taxa.

Mine Run (POTO-211-N-2012)

2012 BIBI = 3.33 (fair)
Number of taxa found: 25
Most common taxa: *Simulium* (15), *Parametriocnemus* (15), *Eukiefferiella* (13), *Tvetenia* (9), and *Amphinemura* (9).

Mine Run (POTO-211-N-2004/ NCRW-211-N-2004)

2004 BIBI = 1.33 (very poor)
Number of taxa found: 17
Most common taxa: *Diamesa* (61), *Orthocladius* (23), *Hydrobaenus* (18), *Chironomidae* (7), and *Diplocladius* (4).

Minnehaha Creek (COCA-117-N-2014)

2014 BIBI = 2 (poor)
Number of taxa found: 28
Most common taxa: *Naididae* (23), *Orthocladius* (15), *Gammarus* (11), *Enchytraeidae* (8), and *Simulium* (7).

Pimmit Run (POTO-309-N-2012)

2012 BIBI = 2.33 (poor)
Number of taxa found: 25
Most common taxa: *Nais* (40), *Cricotopus* (21), *Caecidotea* (12), *Polypedilum* (6), and *Chaetogaster* (5).

Pimmit Run (POTO-309-N-2006)

2006 BIBI = 1.33 (very poor)
Number of taxa found: 22
Most common taxa: *Baetis* (23), *Tvetenia* (15), *Rheocricotopus* (14), *Dicrotendipes* (10), and *Cardiocladius* (8).

Turkey Run (POTO-112-N-2012)

2012 BIBI = 1.67 (very poor)
Number of taxa found: 20
Most common taxa: *Nais* (31), *Simulium* (19), *Tvetenia* (14), *Corynoneura* (11), and *Orthocladius* (6).

Taxa Explained

Baetis- genus of mayflies in the family Baetidae.
Cricotopus- genus of non-biting midges in the subfamily Orthocladiinae of the bloodworm family Chironomidae
Diamesa- a genus of non-biting midges in the subfamily Diamesinae of the bloodworm family Chironomidae.
Gammarus- genus of amphipod crustaceans
Naididae- a family of clitellate oligochaete worms
Nais- subgroup of pollution-tolerant Oligochaetes (worms)
Orthocladius-genus of non-biting midges in the subfamily Orthocladiinae of the bloodworm family Chironomidae
Parametriocnemus- genus of non-biting midges
Simulium - a genus of blackflies
Tvetenia- a genus of non-biting midges of the bloodworm family Chironomidae.

References

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Please cite as: Nortrup. 2015. NCRN Resource Brief: GW Memorial Parkway, Macroinvertebrates