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. Within the parks that make up National Capital Parks - East (NACE) monitoring is done in Accokeek Creek (Piscataway Park), Henson Creek (Suitland Parkway), Oxon Run (Oxon Cove Farm Park), and Still Creek (Greenbelt Park). Macroinvertebrate monitoring is co-located with fish monitoring and stream physical habitat analysis.

The objectives of this combined monitoring are to:

1) Determine current conditions and track long-term trends in stream condition,
2) 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

More Information

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• habit tendencies including burrowers, climbers, clingers, and sprawlers

Additionally, scoring takes into account the location all four NACE streams in the Coastal Plain 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).

Results

Accokeek Creek, Henson Creek, Oxon Run, and Still Creek were all monitored in 2013. Oxon Run was also sampled in 2006 as well as Accokeek Creek and Still Creek in 2004, while monitoring protocols were under development.

BIBI scores rose for all creeks initially sampled in 2004 or 2006. BIBI scores from 2013 indicate fair conditions for all streams.

Accokeek Creek (ACCO-214-N-2013)

2013 BIBI = 3.86 (fair)

Number of taxa found: 36

Most common taxa: *Crangonyx* (21), *Gammarus* (10), *Orthocladius* (8), *Cricotopus* (8), and *Corynoneura* (6).

Accokeek Creek (ACCO-214-N-2004)

2004 BIBI = 3.57 (fair)

Number of taxa found: 23

Most common taxa: *Crangonyctidae* (50), *Chiromus* (26), *Cricotopus* (21), *Orthocladius* (10), and *Ceratopogonidae* (9).

Henson Creek (PRUT-201-N-2013)

2013 BIBI = 3.29 (fair)

Number of taxa found: 21

Most common taxa: *Polypedilum* (49), *Pentaneura* (13), *Argia* (6), *Limnophyes* (5), and *Baetis* (4).

Oxon Run (OXON-301-N-2013)

2013 BIBI = 3.29 (fair)

Number of taxa found: 24

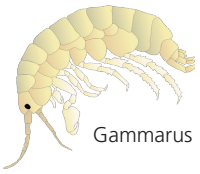
Most common taxa: *Cricotopus* (44), *Tubificidae* (14), *Chironomus* (13), *Girardia* (7), and *Zavrelimyia* (5).

Taxa Explained

Chiromus- a genus of non-biting midges in the subfamily Chironominae of the bloodworm family.

Cragonyx- a genus of crustacean.

Cricotopus- non-biting midges in the subfamily Orthocladiinae of the bloodworm family Chironomidae.



Gammarus

Gammarus- genus of amphipod crustaceans.

Nadidae- a family of clitellate oligochaete worms.

Orthocladius- non-biting midges in the subfamily Orthocladiinae of the bloodworm family Chironomidae.

Pentaneura- non-biting midges in the bloodworm family Chironomidae.

Polypedilum- non-biting midges in the subfamily Chironominae of the bloodworm family Chironomidae.

Tubificidae- a family of clitellate oligochaete worms.

Oxon Run (OXON-301-N-2006)

2006 BIBI = 2.14 (poor)

Number of taxa found: 13

Most common taxa: *Naididae* (71), *Orthocladius* (14), *Cricotopus* (12), *Limnodrilus* (9), and *Thienemannimyia* (2).

Still Creek (ANAC-113-N-2013)

2013 BIBI = 3.86 (fair)

Number of taxa found: 32

Most common taxa: *Cricotopus* (21), *Polypedilum* (13), *Naididae* (12), *Orthocladius* (11), and *Tubificidae* (7).

Still Creek (ANAC-113-N-2004)

2004 BIBI = 3 (fair)

Number of taxa found: 21

Most common taxa: *Polypedilum* (27), *Orthocladius* (25), *Cricotopus* (11), *Tubificidae* (5), and *Tvetenia* (4).

Discussion

Accokeek Creek saw a slight improvement in its fair BIBI scores between 2004 and 2013. Overall 36 taxa were collected in 2013, and 23 in 2004. Numbers of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies), also known as EPT, improved from 2004 to 2013. Both years showed low numbers of sensitive species, a moderate numbers of climbers, and good numbers of scrapers.

Henson Creek earned a fair BIBI score in 2013. The score is due to a moderate number of taxa overall (21), as well as moderate numbers of EPT and scrapers. Henson Creek also had low numbers of sensitive species and good numbers of climbers.

Oxon Run showed BIBI score improvement, going from a poor score in 2006 to a fair score in 2013. While both years showed good Ephemeroptera levels and poor numbers of sensitive species, overall taxa numbers went up from 13 in 2006 to 24 in 2013, and numbers of scrapers and climbers improved.

Still Creek also improved its fair BIBI scores from 2004 to 2013. Both years had low numbers of EPT, disturbance-intolerant species, Chironomids (non-biting midges), and clingers. Also Ephemeroptera improved from low to moderate and the total number of taxa found went from 21 to 32.

References:

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