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. At Rock Creek monitoring is done in Broad Branch, Dumbarton Oaks, Fenwick Branch, Hazen Creek, Klingle Creek, Luzon Branch, Normanstone Branch, Palisades (Battery Kemble/Maddox Branch) Creek, Pinehurst Branch, Piney Branch, and Soapstone Valley Stream. 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



Photo: NPS/Nortrup. Illustration: University of Maryland, Integration & Application Network

Above: A fine-meshed D-shaped net is used to scoop up macroinvertebrates from promising stream habitat. Left: Presence of pollution-sensitive species like this mayfly (Ephemeroptera), along with stoneflies and caddisflies can indicate healthy stream condition.

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.

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 macroinvertebrates 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 Rock Creek'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). See reverse.

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Rock Creek Park

National Park Service
U.S. Department of the Interior

Results

Broad Branch, Fenwick Branch, Hazen Creek, Luzon Branch, Pinehurst Branch, and Soapstone Valley Stream were sampled in 2008. Palisades Creek, Piney Branch, Dumbarton Oaks, Normanstone Branch, and Klingle Creek were sampled in 2014.

BIBI scores indicate poor and very poor stream conditions in all streams. These scores stem from the relative absence of pollution- and disturbance-sensitive taxa and high numbers of pollution-tolerant Chironomid taxa. However, no exotic crayfish were observed.

Broad Branch (ROCK-205-N-2008)

2008 BIBI = 1.33 (very poor)

Number of taxa found: 19

Most common taxa: *Dicrotendipes* (37), *Cricotopus* (34), *Orthocladius* (10), *Enchytraeidae* (9), *Polypedilum* (6)

Dumbarton Oaks (ROCK-109-N-2014)

2014 BIBI = 1.67 (very poor)

Number of taxa found: 22

Most common taxa: *Crangonyx* (39), *Parametriocnemus* (15), *Tvetenia* (13), *Lumbriculidae* (9), *Dolophilodes* (7)

Fenwick Branch (ROCK-202-N-2008)

2008 BIBI = 2.0 (poor)

Number of taxa found: 26

Most common taxa: *Enchytraeidae* (25), *Orthocladius* (21), *Cricotopus* (21), *Polypedium* (5), *Naididae* (5)

Hazen Creek (ROCK-107-N-2008)

2008 BIBI = 1.67 (very poor)

Number of taxa found: 25

Most common taxa: *Parametriocnemus* (39), *Tvetenia* (29), *Cricotopus* (24), *Crangonyx* (8), *Caecidotea* (7)

Klingle Creek (ROCK-105-N-2014)

2014 BIBI = 1.67 (very poor)

Number of taxa found: 22

Most common taxa: *Enchytraeidae* (62), *Orthocladius* (24), *Chaetocladius* (6), *Lumbriculidae* (5), *Smittia* (4)

Taxa Explained

Baetis- genus of mayflies in the family Baetidae

Caecidotea - a genus of crustacean in the family Asellidae

Chaetocladius - genus of non-biting midges in the subfamily Orthocladiinae of the bloodworm family Chironomidae

Cragonyx - a genus of crustacean

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

Dicrotendipes - genus of non-biting midges in the subfamily Orthocladiinae of the bloodworm family Chironomidae

Enchytraeidae - a microdrile oligochaete family

Girardia - a genus of triclad belonging to the Dugesiidae family.

Naididae - a family of clitellate oligochaete worms

Nais - subgroup of pollution-tolerant Oligochaetes (worms)

Orthocladius- same description as Cricotopus

Parametriocnemus - same as Cricotopus

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

Smittia - same description as Cricotopus

Tvetenia- a genus of non-biting midges of the bloodworm family Chironomidae

Luzon Branch (ROCK-104-N-2008)

2008 BIBI = 1.67 (very poor)

Number of taxa found: 19

Most common taxa: *Nais* (50), *Orthocladius* (15), *Enchytraeidae* (15), *Cricotopus* (13), *Polypedilum* (11)

Normanstone Branch (ROCK-111-N-2014)

2014 BIBI = 2.33 (poor)

Number of taxa found: 28

Most common taxa: *Tvetenia* (22), *Dolophilodes* (15), *Orthocladius* (15), *Cura* (13), *Simulium* (10)

Palisades Creek (POTO-118-N-2014)

2014 BIBI = 1.33 (very poor)

Number of taxa found: 19

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Most common taxa: *Eukiefferiella* (11), *Tvetenia* (11), *Orthocladius* (9), *Phagocata* (6), *Polypedilum* (4)

Pinehurst Branch (ROCK-103-N-2008)

2008 BIBI = 1.33 (very poor)

Number of taxa found: 16

Most common taxa: *Orthocladius* (54), *Nais* (14), *Enchytraeidae* (8), *Smittia* (6), *Chaetocladius* (3)

Piney Branch (ROCK-108-N-2014)

2014 BIBI = 1.33 (very poor)

Number of taxa found: 22

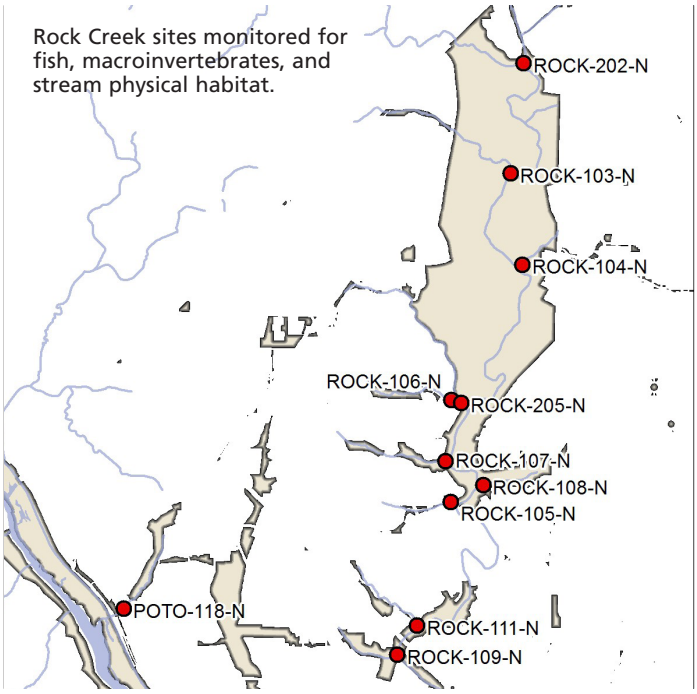
Most common taxa: *Dicrotendipes* (66), *Girardia* (11), *Lumbriculidae* (8), *Enchytraeidae* (7), *Cricotopus* (5)

Soapstone Valley Stream (ROCK-106-N-2008)

2008 BIBI = 2 (poor)

Number of taxa found: 26

Most common taxa: *Cricotopus* (47), *Tvetenia* (23), *Enchytraeidae* (17), *Chaetocladius* (11), *Baetis* (8)



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