



Stream Physical Habitat

Resource Brief

Importance

The physical habitat and water quality of a stream are the template upon which aquatic communities of fish and macroinvertebrates must live.

An aquatic macroinvertebrate is any water-dwelling animal without a backbone that is large enough to be seen by the naked eye. They need spots to cling and burrow, and organic material to consume. Fish require places to hide, feed, and lay eggs.

Together, water quality, aquatic communities, and stream physical habitat indicate a great deal about the condition of a stream and its watershed.



NPS/Watts

Bush Creek

Monitoring

Stream physical habitat 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 stream physical habitat monitoring at thirty-seven park sites throughout the NCRN began in 2008 and follows a set, six-year rotation. Each spring 5-8 sites are visited. At Monocacy National Battlefield (MONO), monitoring is done on Bush Creek and Gambrill Creek. 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

Observations of stream physical habitat are gathered at the same location and time as fish monitoring in late summer and macroinvertebrate monitoring in spring. Monitoring is conducted on non-tidal wadeable streams and rivers.

PHI Scoring

To calculate a stream's Physical Habitat Index (PHI) score, streams are sorted by physiographic province and compared against high quality reference streams in the same province. Monocacy's streams are all in the Eastern Piedmont stream class. As a result, the following 8 characteristics are evaluated:

- 1) riffle quality
- 2) stream bank stability (the extent, height, and severity of bank erosion)
- 3) quantity of woody debris and root wads in the stream
- 4) instream habitat available for fish
- 5) suitability of stream bed surface materials for macroinvertebrates (epifaunal substrate)
- 6) shading
- 7) distance from nearest road (remoteness)
- 8) embeddedness of substrates

PHI scores range from 0-100 with four possible ratings:
(81-100) minimally degraded,
(66-80) partially degraded,
(51-65) degraded, and
(0-50) severely degraded.

Glossary

Benthic- Referring to the bottom of a body of water.

Embeddedness- The amount of space around large stream bottom particles (gravel, cobble, etc). When smaller particles (sand, silt, mud) surround larger particles, embeddedness rises and habitat for small fish, macroinvertebrates, and other creatures is reduced.

Epifaunal Substrate- hard, stable materials that stream biota can live on (such as large woody debris, rootwads, cobble, gravel, etc).

Riffle- Section of stream with faster flow and more turbulence. Provides shelter, is a food source, and adds oxygen to water.

Root wads- A mass of plant roots (a type of woody debris).

Shading- Amount and duration of shade cast over a stream. Helps lower water temperatures.

Woody Debris- large branches, logs, and tree material. Provides shelter.



Results & Discussion

Bush Creek and Gambrill Creek were monitored in 2010 and both earned partially degraded PHI scores. Both streams had moderate levels of stream bank erosion, but differed in levels of habitat provided for stream fauna and physical characteristics like shading and distance from nearby roads.

Bush Creek (MONO-316-N)

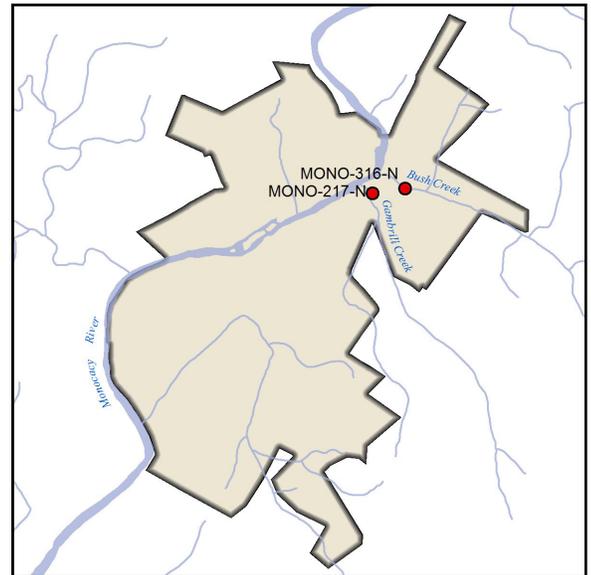
2010 PHI = 73 (partially degraded)

Bush Creek earned a partially degraded PHI score in 2010. Characteristics influencing this score include good ratings for remoteness (distance from roads), instream habitat available for fish, epifaunal substrate available for macroinvertebrates, and low embeddedness levels. However, moderate ratings for bank erosion and low shading levels lowered the score.

Gambrill Creek (MONO-217-N)

2010 PHI = 68 (partially degraded)

In 2010, Gambrill Creek earned a partially degraded PHI score. The creek was rated well for stream shading, moderate for remoteness and stream bank erosion, and poorly for levels of instream wood and quality of available riffle run habitat.



Sites in Monocacy National Battlefield monitored for fish, macroinvertebrates, and stream physical habitat condition.

References:

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- NCRN Monitoring Information for Water Quality, Physical Habitat, and Aquatic Macroinvertebrates. http://science.nature.nps.gov/im/units/ncrn/monitor/stream_survey/index.cfm
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- Paul et al. 2003. A Physical Habitat Index for Freshwater Wadeable Streams in Maryland: Final Report. CBWP-MANTA-EA-03-4.
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