George Washington Memorial Parkway

National Park Service
U.S. Department of the Interior

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.

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 George Washington Memorial Parkway (GWMP), monitoring is done on Minnehaha Creek, Pimmit Run, Turkey Run, and Mine Run. 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.



Minnehaha Creek NPS/Watts

PHI Scoring

To calculate a stream's Physical Habitat Index (PHI) score, streams are sorted by physiographic province and then compared against high quality reference streams in the same physiographic class. All of the streams monitored in GWMP fall into 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) embededdness 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.

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Results & Discussion

Minehaha Creek was monitored in 2009 and Pimmit Run, Turkey Run, and Mine Run were monitored in 2012. All streams earned partially degraded or degraded PHI scores with Minnehaha Creek receiving the park's highest score.

Minnehaha Creek (COCA-117-N)

2009 PHI = 73 (partially degraded)

During 2009 Minnehaha Creek earned a partially degraded PHI score. Positive stream characteristics included low levels of stream bank erosion, high quality instream habitat, moderately good epifaunal substrate, high riffle quality, low levels of embededness, and moderately good shading. However there was little instream woody debris or root wads and the stream is moderately close to a roadway.

Pimmit Run (POTO-309-N)

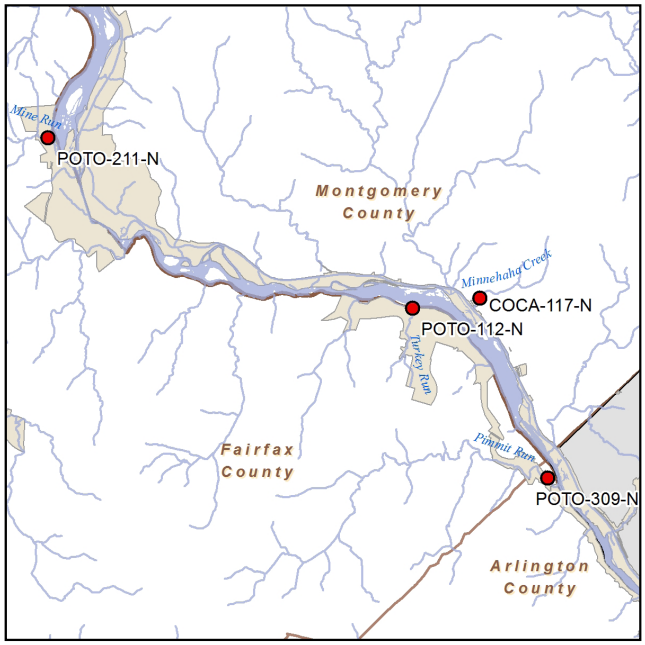
2012 PHI = 62 (degraded)

During 2012 Pimmit Run earned a degraded PHI score. Stream characteristics that influenced this score include moderately high streambank erosion severity and extent, low levels of instream wood and root wads, and close proximity to a road. Other, more positive characteristics included healthy instream habitat for fish, moderate epifaunal substrate for macroinvertebrates, good riffle quality, and good levels of shading.

Turkey Run (POTO-112-N)

2012 PHI = 65 (degraded)

In 2012 Turkey Run earned a degraded PHI score. Negative stream characteristics include extensive and severe streambank erosion and high levels of embededness (poor habitat). The score was positively influenced by the stream's location far from roadways, a moderate amount of instream wood, a good amount of rootwads, and very good stream shading.



Sites in George Washington Memorial Parkway monitored for fish, macroinvertebrates, and stream physical habitat condition.

Mine Run (POTO-211-N)

2012 PHI = 68 (partially degraded)

During 2012 Mine Run earned a partially degraded PHI score. The score was influenced by the stream's close proximity to a roadway, good instream habitat for fish, good epifaunal substrate for macroinvertebrates, good riffle quality, and high levels of shading.

References:

National Capital Region Network Biological Stream Survey Stream Habitat Data (2008-2010). Versar, Inc. National Capital Region Inventory and Monitoring Program, Washington, DC. Generic Dataset-2175673. https://irma.nps.gov/App/Reference/ Profile/2175673

NCRN Monitoring Information for Water Quality, Physical Habitat, and Aquatic Macroinvertebrates. http://science.nature.nps.gov/im/units/ncrn/monitor/stream_survey/index.cfm

NCRN Biological Stream Survey. 2009. Data Analysis Standard Operation Procedure #20, Version 1.1

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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