Rock Creek Park

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 Rock Creek Park (ROCR), monitoring is done on Broad Branch, Dumbarton Oaks, Fenwick Branch, Hazen Creek, Klingle Creek, Luzon Branch, Normanstone Branch, Palisades Creek, Pinehurst Branch, Soapstone Valley Stream, and Piney Branch. 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. Rock Creek'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) 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.

Fenwick Branch NPS/Watts

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

Six streams in the upper section of Rock Creek were monitored in 2008 and five in the lower section were monitored in 2009. Most of the streams in the upper end of the park earned degraded scores, while most in the lower end of the park earned partially degraded scores. Dumbarton Oaks earned the park's highest score (75) and Broad Branch the lowest (50).

In 2008 monitoring showed physical habitat indicators suggesting partially degraded habitat at Soapstone Valley Stream and degraded habitat at all other locations. These low scores are typical of streams in watersheds that are heavily urbanized and impacted by impervious surface and stormwater runoff.

In 2009, streams in the lower section of the park earned partially degraded scores in part because of good to fair ratings for parameters including instream habitat and epifaunal substrate quality. Embeddedness was also not greater than 50% at any of the sites visited indicating good physical structure and habitat available for stream biota. The stream riparian zones were in good condition and well-forested, except when adjacent to park infrastructure (e.g. roads and parking lots).

Broad Branch (ROCK-205-N)

2008 PHI = 50 (severely degraded)

Broad Branch earned a severely degraded PHI score in 2008. Factors influencing this score included a road directly adjacent to the stream, and moderate to severe bank erosion.

Dumbarton Oaks (ROCK-109-N)

2009 PHI = 75 (partially degraded)

In 2009 Dumbarton Oaks earned the highest PHI score for Rock Creek Park: partially degraded. This score represents good instream wood levels and moderately high epifaunal substrate, instream habitat, and levels of shading. At the time of monitoring, pH was elevated (more acidic) at this site.

Fenwick Branch (ROCK-202-N)

2008 PHI = 63 (degraded)

Fenwick Branch earned a degraded PHI score in 2008. Moderately high epifaunal substrate, good riffle habitat and shading levels as well as moderate to severe bank erosion, contributed to the score.

Hazen Creek (ROCK-107-N)

2008 PHI = 65 (degraded)

While Hazen Creek earned a degraded PHI score in 2008, the score was only one point shy of the better, "partially degraded" category. Hazen Creek rated well for levels of instream wood; moderately high for epifaunal substrate, instream habitat, and shading; and moderately to poorly for stream bank erosion.

Klingle Creek (ROCK-105-N)

2009 PHI = 67 (partially degraded)

Klingle Creek earned a partially degraded PHI score in 2009. Characteristics influencing the score included good instream wood levels and moderately high epifaunal substrate, but also close proximity to a roadway.

Luzon Branch (ROCK-104-N)

2008 PHI = 65 (degraded)

In 2008 Luzon Branch earned a degraded PHI score. The stream had high levels of instream wood, moderately high epifaunal substrate and instream habitat for fish, moderately high stream bank erosion levels, and very close proximity to a roadway.

Normanstone Branch (ROCK-111-N)

2009 PHI = 57 (degraded)

Normanstone Branch earned a degraded PHI score in 2009. While Normanstone had good levels of instream wood and shading, it also had moderate bank erosion.

Palisades Creek (POTO-118-N)

2009 PHI = 68 (partially degraded)

In 2009, Palisades Creek on the far west side of the park, earned a partially degraded PHI score. Characteristics influencing the score included high levels of instream wood; moderately high epifaunal substrate, instream habitat, and shading; and moderate amounts of stream bank erosion.

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Pinehurst Branch (ROCK-103-N)

2008 PHI = 65 (degraded)

Pinehurst Branch earned a degraded PHI score in 2008. Pinehurst had high levels of instream wood; moderately high epifaunal substrate, instream habitat, and shading; but is also in close proximity to a roadway.

Piney Branch (ROCK-108-N)

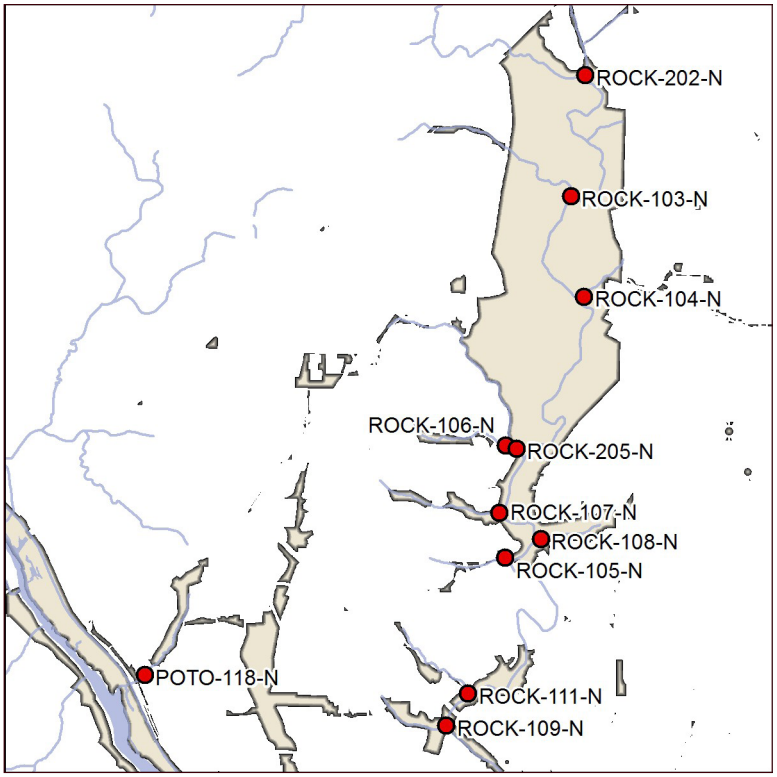
2009 PHI = 66 (partially degraded)

In 2009, Piney Branch earned a partially degraded PHI score. Characteristics influencing the score include low levels of embededness, moderate stream bank erosion, moderate instream habitat, and close proximity to a roadway.

Soapstone Valley Stream (ROCK-106-N)

2008 PHI = 69 (partially degraded)

Soapstone Valley Stream earned a partially degraded PHI score in 2008. High levels of instream wood, moderately high levels of epifaunal substrate and instream habitat were tempered by close proximity to a roadway and high levels of stream bank erosion.



Sites in Rock Creek Park monitored for fish, macroinvertebrates, and stream physical habitat condition.

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.