Appendix A

Compendium of Benthic Macroinvertebrate Metrics Used in District Bioassessment

Compendium of Benthic Macroinvertebrate Metrics Used in District Bioassessment

This document summarizes the individual benthic macroinvertebrate metrics used by the District of Columbia Department of Energy and Environment (DOEE) for bioassessment purposes, as outlined in the 2026 Integrated Report (IR) methodology. The metrics were taken directly from protocols established by the Maryland Biological Stream Survey (MBSS) and EPA's Rapid Bioassessment Protocols. Distinct metric sets are used for Coastal Plain and Piedmont physiographic provinces.

Coastal Plain Site Macroinvertebrate Metrics

The following metrics are used to assess waterbodies in the Coastal Plain:

- Number of Taxa (Genus)
- Number of Ephemeroptera, Plecoptera, and Trichoptera (EPT) Taxa (Genus)
- Number of Ephemeroptera Taxa (Genus)
- % Intolerant Urban
- % Ephemeroptera
- # of Scraper Taxa (Genus)
- % Climbers

Piedmont Site Macroinvertebrate Metrics

- Number of Taxa (Genus)
- Number of EPT Taxa (Genus)
- Number of Ephemeroptera Taxa (Genus)
- % Intolerant Urban
- % Chironomidae
- % Clingers (Genus)

Scoring System

Each metric is scored on a scale of 1 (very poor), 3 (fair), or 5 (good). The scores are summed up to produce an overall Index of Biotic Integrity (BIBI) score. The overall score determines the water quality rating and support determination as follows:

Overall Score	Water Quality Rating	Support Determination
4.0 - 5.0	Good	Fully supporting

3.0 - 3.9	Fair	Fully supporting
2.0 - 2.9	Poor	Not supporting
< 1.9	Very Poor	Not supporting

References

1. *Maryland Department of Natural Resources (2007). Maryland Biological Stream Survey (MBSS) Protocols.*
2. *U.S. Environmental Protection Agency (1989). Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers.*
3. *Southerland, M.T., et al. (2007). Development of a Benthic Index of Biotic Integrity for Maryland Streams.*
4. *MBSS Guide to Benthic Macroinvertebrate and Fish Indices of Biotic Integrity (2024). MD DNR*.
5. *District Department of Energy and Environment (DOEE)*. (2026). *Compendium of MBSS_DCSS Benthic Macroinvertebrate and PHI Metrics Used in District Bioassessment*.

Compendium of Physical Habitat Metrics Used in District Bioassessment

This section summarizes the physical habitat metrics used by the District of Columbia Department of Energy and Environment (DOEE) to assess attainment of Class C aquatic life use. These metrics are based on protocols from EPA's Rapid Bioassessment Protocols (1989) and the Maryland Biological Stream Survey (2007). Distinct metric sets are used for Coastal Plain and Piedmont physiographic provinces.

Coastal Plain Site Physical Habitat Metrics

The following physical habitat metrics are used to assess waterbodies in the Coastal Plain:

- Remoteness
- Shading
- Epifaunal Substrate (EPI)
- Instream Habitat
- Numbers of Woody Debris and Root Wads ("Wood")
- Bank Stability

Piedmont Site Physical Habitat Metrics

The following physical habitat metrics are used to assess waterbodies in the Piedmont:

- Remoteness
- Shading
- Epifaunal Substrate (EPI)
- Instream Habitat
- Numbers of Woody Debris and Root Wads ("Wood")
- Bank Stability
- Riffle Quality
- Embeddedness

Physical Habitat Scoring System

Each metric is scored from 0 to 100 based on field observations. The scores are averaged to produce an overall Physical Habitat Index (PHI) score. The overall score determines the water quality rating and support determination as follows:

Overall PHI Score	Water Quality Rating	Support Determination
76 - 100	Good	Fully supporting
51 - 75	Fair	Fully supporting
26 - 50	Poor	Not supporting
0 - 25	Very Poor	Not supporting

Additional References for Physical Habitat Metrics

6. *Paul, M.J., et al. (2002). Physical Habitat Index (PHI) Development for Urban Streams.*
7. *Maryland Department of Natural Resources (2007). Maryland Biological Stream Survey (MBSS) Protocols.*
8. *U.S. Environmental Protection Agency (1989). Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers*.
9. *District Department of Energy and Environment (DOEE)*. (2026). *Compendium of MBSS_DCSS Benthic Macroinvertebrate and PHI Metrics Used in District Bioassessment*.