

# Water Quality Monitoring – Biological River Monitoring

## Monitoring Purpose

Biological monitoring assesses the integrated effects of water pollution on aquatic organisms, which are greatly affected by the quality of their environment.

Since 1978, the Metropolitan Council Environmental Services (MCES) biological monitoring (biomonitoring) program has been providing information on the presence and abundance of four groups of aquatic organisms:

- Periphyton (attached algae),
- Macroinvertebrates (immature insects, worms, and clams),
- Phytoplankton (floating algae),
- Zooplankton (floating microcrustaceans)



Periphyton and macroinvertebrates are studied because they are major portions of the aquatic food-web in rivers, and lend themselves to quantitative measurement and detection of pollution sources. Since they float and drift with the river current, phytoplankton and zooplankton are less suitable for river studies because pollution sources cannot be discerned from their concentrations at particular locations. However, the types and relative abundances of plankton over time are helpful for detecting changing water quality conditions in a particular river.

Biological monitoring is conducted annually during the summer months at 14 sites located on the Mississippi, Minnesota, St. Croix, and Vermillion Rivers.

## Monitoring Sites

- Mississippi River: 9 monitoring sites from Anoka, MN to Red Wing, MN
- Minnesota River: 2 monitoring sites at Jordan, MN and Fort Snelling, MN
- St. Croix River: 2 monitoring sites at Stillwater, MN and Prescott, WI
- Vermillion River: 1 monitoring site at Empire, MN

(River mile measured from the intersection of the Ohio and Mississippi Rivers near Cairo, IL)

- Near Anoka (river mile 871.6)
- Near Fridley (river mile 862.8)
- Above Lock and Dam No. 1 (river mile 848.0)
- Near St. Paul (river mile 839.4)
- Near Newport (river mile 831.0)
- Near Grey Cloud Island (river mile 826.7)
- Near Government Light (river mile 820.4)
- Above Lock and Dam No. 2 (river mile 816.0)
- Near Diamond Bluff (river mile 800.4)

### **Minnesota River**

(River mile measured from the downstream end or mouth of the river)

- Near Jordan (river mile 39.4)
- Near Fort Snelling (river mile 3.5)

### **St. Croix River**

(River mile measured from the downstream end or mouth of the river)

- Near Stillwater (river mile 24.0)
- Near Prescott (river mile 1.7)

### **Vermillion River**

(River mile measured from the railroad bridge downstream of Hastings)

- Empire (river mile 15.6)

### **Biological Groups Analyzed**

Four biological groups are analyzed: periphyton, macroinvertebrates, phytoplankton, and zooplankton.

Periphyton sampling is conducted using artificial substrates called periphytometers, which are placed near the water surface at monitoring sites and allowed to colonize for 14 days.

Macroinvertebrate sampling is also conducted using artificial substrates called Hester-Dendy multiple plate samplers, which are placed in the water column (1-meter depth) at the monitoring sites and allowed to colonize for 30 days. Macroinvertebrate samples are also collected from the river sediment via Ponar grab sampling.

Phytoplankton sampling is conducted by collecting a composite sample using a Van Dorn water sampler.

Zooplankton sampling is conducted using a Wisconsin plankton net, and at some sites using a Clarke-Bumpus plankton sampler. All plankton samplers filter phytoplankton and zooplankton from known volumes of water, allowing their abundance to be calculated (organisms/liter).

For the four biological groups (periphyton, macroinvertebrates, phytoplankton and zooplankton), taxonomic identification and organism counts are performed on each sample collected. This information is used to calculate various biological metrics that are indicative of the health of these biological communities.

### Monitoring Equipment

	Equipment Used	Variables
Periphyton	<ul style="list-style-type: none"> <li>• Periphytometers</li> <li>• Slide boxes</li> </ul>	<ul style="list-style-type: none"> <li>• Diatom identification</li> <li>• Chlorophyll-a</li> <li>• Total dry weight</li> <li>• Ash-free weight</li> </ul>
Phytoplankton	<ul style="list-style-type: none"> <li>• Van Dorn water sampler</li> <li>• Graduated cylinder</li> <li>• Plastic tub for compositing</li> <li>• Half-gallon plastic container</li> </ul>	<ul style="list-style-type: none"> <li>• Identification</li> <li>• Chlorophyll-a</li> <li>• Total suspended solids</li> <li>• Volatile suspended solids</li> </ul>
Macroinvertebrates	<ul style="list-style-type: none"> <li>• Hester-Dendy artificial substrates</li> <li>• Half-gallon plastic containers</li> <li>• Ponar riverbed sediment sampler</li> </ul>	<ul style="list-style-type: none"> <li>• Identification</li> </ul>
Zooplankton	<ul style="list-style-type: none"> <li>• Wisconsin plankton net</li> <li>• Clark-Bumpus sampler</li> <li>• 1-quart glass jar</li> </ul>	<ul style="list-style-type: none"> <li>• Identification</li> </ul>
Habitat Description	<ul style="list-style-type: none"> <li>• NA</li> </ul>	<ul style="list-style-type: none"> <li>• Current velocity</li> <li>• Incubation dates</li> <li>• Light attenuation</li> <li>• Water depth</li> </ul>

General Equipment	<ul style="list-style-type: none"><li>• Boat and transport vehicle</li><li>• Coolers with ice</li><li>• Anchor and flotation materials</li></ul>	<ul style="list-style-type: none"><li>• NA</li></ul>
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For further information on biological river monitoring, please contact Scott Schellhaass via [email](#) or at 651.602.8341.