

Water Quality Monitoring – Riverbed Sediment Monitoring

Monitoring Purpose

Riverbed sediment can act as a long-term reservoir for contaminants such as pesticides, herbicides, PCBs, PAHs, and metals and cause direct harm to bottom dwelling (benthic) organisms. Samples are collected for toxicity testing, assessing indigenous benthic macro invertebrate (bottom dwelling insect larvae, worms, snails and clams) populations, and characterizing the physical and chemical make-up of the riverbed sediment. These toxicity tests are conducted to determine if riverbed sediments have the potential to adversely affect aquatic organisms.

Monitoring Sites

Riverbed sediments are monitored at selected sites on the Mississippi, Minnesota and St. Croix Rivers at left, mid and right cross-sectional locations.

Mississippi River

(Measured from the intersection of the Ohio and Mississippi Rivers near Cairo, IL)

- Above Lock and Dam No.1 (river mile 848.5)
- Near St. Paul (river mile 839.1)
- At the Outfall of the Metropolitan WWTP (river mile 835.1)
- Pigs Eye Lake near St. Paul
- Near Newport (river mile 831.0)
- Near Government Light (river mile 820.5)
- Above Lock and Dam No. 2 (river mile 816.0)
- Near Diamond Bluff (river mile 800.4)
- Upper Lake Pepin (river mile 784.2)
- Mid Lake Pepin (river mile 772.0)
- Lower Lake Pepin (river mile 766.0)



Minnesota River

(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

(Measured from the downstream end or mouth of the river)

- Above Stillwater (reference site at river mile 25.8)
- Near Stillwater (river mile 23.9)
- Near Prescott (river mile 1.7)

Riverbed Sediment Variables

- Metals:
 - Antimony
 - Arsenic
 - Beryllium
 - Cadmium
 - Chromium
 - Copper
 - Lead
 - Manganese
 - Nickel
 - Selenium
 - Silver
 - Thallium
 - Zinc
- AVS/SEM (Acid-volatile sulfide/Simultaneously extracted metals)
- Cyanide
- Organics:
 - Acid-Extractable
 - Base-Neutral
 - Pesticides
- Total Organic Carbon
- Particle Size
- Macroinvertebrate Identification

Interstitial Pore Water Variables

- Alkalinity
- Hardness
- Ammonia Nitrogen
- Metals:
 - Antimony
 - Arsenic
 - Beryllium
 - Cadmium
 - Chromium
 - Copper
 - Lead
 - Manganese
 - Nickel
 - Selenium
 - Silver
 - Thallium
 - Zinc

Riverbed Sediment Toxicity Testing Variables

- Dissolved Oxygen
- Temperature
- pH
- Specific Conductance
- Alkalinity
- Hardness
- Ammonia Nitrogen
- Ash-Free Dry Weight
- Survival and Growth (*Hyalella azteca* and *Chironomus tentans*)

Riverbed Sediment Monitoring Protocols

Riverbed sediment toxicity testing exposes benthic test organisms to riverbed sediment under controlled laboratory conditions. These toxicity tests are conducted to determine if riverbed sediments have the potential to adversely affect aquatic organisms. The ten-day tests are conducted according to [US Environmental Protection Agency sediment test methods](#) using bloodworms (*Chironomus tentans*) and scuds (*Hyalella azteca*).

Benthic macroinvertebrates are also sampled at each site and preserved for later identification and determination of abundance. The presence of certain indicator species can provide information about riverbed sediment quality.

Riverbed sediment samples are collected at each site for characterization of physical and chemical composition. Particle size analysis is conducted to determine the sediment grain size composition, and the samples are also analyzed for a variety of chemical constituents.

Riverbed Sediment Monitoring Field Equipment

- Equipped boat and transport vehicle
- Electric winch and boom arm
- Ponar sediment samplers, large and petite sizes
- Coolers with ice for sample transport
- Stainless steel pans and spoons
- Garmin GPS
- Wildco sieve bucket for collection of macroinvertebrates
- 70% ethanol for field preservation of macroinvertebrates

For further information on automatic river water monitoring, please contact Tim Pattock via [email](#) or at 651.602.8084.