Summary

Identifying conditions stressing fish and macroinvertebrates

Root River Watershed

Why is it important?

Of all the rivers that drain to the Mississippi, the Root River in southeast Minnesota holds a unique distinction. It is one of the largest watersheds in the state, 1,670 square miles, and touches six Minnesota counties. The river system is famous for trout fishing.

The Root River starts as a drainage ditch in Mower County, then winds 81 miles from intensely farmed areas through more wooded, rolling terrain, and finally through towering bluffs before emptying into the Mississippi River south of La Crescent. Near Forestville State Park, the river literally disappears underground and resurfaces at the Mystery Cave near Preston.

The river flows through some of the most unique geology in the world – karst. Here the erosive effects of water have sculpted thick layers of limestone over thousands of years. The landscape is characterized by abundant sinkholes, springs, caverns, and underground waterways. Karst is like the Swiss cheese of rock. As water flows through karst, it mixes above and below ground. This mixing means pollutants on land can easily reach groundwater used for drinking.

The river's unique topography, geology and location make it an outstanding example of a river in need of extra consideration.

Protecting this river system requires an understanding of its water quality problems. Biological monitoring looks at fish and macroinvertebrate communities to assess the health of water. Macroinvertebrates are creatures without backbones, such as insects, crayfish, snails and small clams, and are commonly called bugs. By examining a stream's biological health, scientists and local partners can determine the impact of human changes on aquatic resources.

Key issues

In simple terms, stressor identification is a scientific process of identifying the major factors causing harm to fish and other life in streams. Stressor identification is a key component of the major watershed restoration and protection projects being carried out under Minnesota's Clean Water Legacy Act.

While some stressors are common across the Root River watershed (drainage area), most are driven by local factors such as land use.

A team of experts familiar with the watershed identified the following as probable causes of stress to aquatic life in the Root River watershed:

- Low dissolved oxygen levels;
- Water temperature higher than optimal;
- Nitrate levels;
- Total Suspended Solids (TSS) clouding the water;
- Lack of physical habitat; and
- Connectivity issues, such as dams or culverts blocking migration of fish.

Stressor identification also detects streams in healthy condition with the goal of protecting them. The Root watershed has several streams of exceptional quality and maintaining their condition should be a priority. Several streams are vulnerable to becoming impaired and also need protection to keep them healthy for aquatic life.

Highlights of report

- Multiple sections of streams and rivers in the watershed are impaired for macroinvertebrates, meaning the sections support fewer bugs than in similar waters or less diverse populations. For example, monitoring crews found fewer dragonflies and damselflies in this watershed compared to the rest of the state. The significance of this is unknown.
- Six sections are impaired for both bugs and fish, again meaning the streams and rivers are failing to demonstrate healthy aquatic communities.
- Only one section of stream is impaired for fish only (bugs here are healthy).
- All the fish-related impairments are for coldwater streams. There were no fish impairments for warmwater streams.
- Scientists have many ideas on why there are more macroinvertebrate impairments than fish impairments. For example, habitat degradation in the watershed is common and may be affecting bugs more than fish at this time. Also, macroinvertebrates may be more sensitive to chemical pollutants like nitrate, also common in the watershed.
- Because of record-breaking rain events in the watershed in 2007 and 2008, some sampling was repeated in 2010 and 2011 to ensure results were representative of overall conditions. These data, along with future sampling, will help determine the long-term impact of extreme rainfall, flooding and other climate changes on aquatic life. At this time it does not appear that flooding had a major impact on the biological health assessments of 2008.

To improve water quality in the Root River watershed, the MPCA recommends:

- Making the following high priorities: Reducing sediment and nitrate levels, and restoring habitat. Focus on reducing sediment eroding from cattle pastures and streambanks. Restore habitat by increasing woody debris and shade along streams. Shading will also help reduce temperatures that are stressing fish and bugs.
- Collect additional data on dissolved oxygen levels, water temperature and connectivity on some streams.

About this study

Watershed Approach

Phase 1: Monitor and assess health of waters

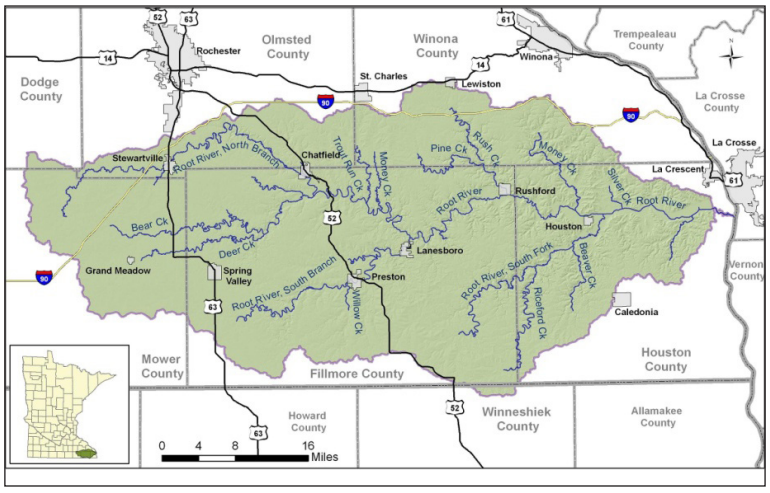
Phase 2: Identify conditions stressing biological life

Phase 3: Determine maximum pollutant loads

Phase 4: Determine Watershed Restoration and Protection Strategies

Start process over every 10 years

This stressor identification follows an intensive water monitoring effort in the Root River dating back to 2007. With local partners, the MPCA examined several parameters in several streams. In addition to water chemistry sampling, nearly 150 stream stations were sampled for biology.



Full report

To view the full report, go to www.pca.state.mn.us/index.php/view-document.html?gid=22460 or search for "Root River watershed" on the MPCA website at www.pca.state.mn.us.

Contact person

Tiffany Schauls
Minnesota Pollution Control Agency
tiffany.schauls@state.mn.us
507-206-2619