Summary

Identifying conditions stressing fish and macroinvertebrates

Shell Rock River Watershed

Why is it important?

The Shell Rock River, recently designated a state water trail, begins at the outlet of Albert Lea Lake in southern Minnesota. It flows to the Cedar River in Iowa, which joins the Iowa River and then the Mississippi.

In Minnesota, this drainage area covers 254 square miles, all in Freeborn County. The largest city is Albert Lea with a population of 18,000 and developed around a chain of lakes. Fountain Lake is popular for boating, fishing and other recreation. Myre-Big Island State Park owns 40 percent of the shoreland of Albert Lea Lake.

Most of the watershed is farmed for corn and soybeans, with an extensive artificial drainage system.

Restoring the 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, often called bugs, are creatures without backbones such as mayflies and crayfish. Quite simply, a healthy water system will sustain a variety of life. Biological monitoring often detects problems that other methods may miss or underestimate. By examining a stream's biological health, scientists and local partners can determine the impact of human changes on aquatic resources.

Key issues

Fish and other aquatic life are suffering from multiple stressors in the Shell Rock River watershed. The main stressors are the following interrelated conditions:

- Excess phosphorus and nitrogen that cause algae. Excess nutrients from agricultural runoff, the Albert Lea wastewater treatment plant, and other sources are upsetting the watershed's natural dynamics by increasing algae. As algae die, the decomposition process uses up oxygen in the water and leaves less for aquatic life.
  - * Average phosphorus levels are highest in the Shell Rock River, followed by Goose and Shoff creeks, both tributaries to Fountain Lake.
  - * Nitrate levels on the main part of the Shell Rock River ranged from 0.05 to 12.0 milligrams per liter, with samples from tile lines as high as 15.0 milligrams per liter.
  - * Average nitrate levels are highest in Bancroft Creek, a tributary to Fountain Lake in Albert Lea, and Peter Lund Creek, a tributary to Albert Lea Lake.
- Low or fluctuating levels of dissolved oxygen needed to sustain fish and other aquatic life. Daily fluctuations in the Shell Rock are more than four times the proposed standard, with readings varying from less than 1.0 up to 24.0 milligrams per liter. Fish need at least 5.0 milligrams per liter to survive, but high levels are also stressful. The extreme differences in one day are also stressful to aquatic life.
- Low flows and high water temperatures during dry conditions contribute to fluctuations in dissolved oxygen levels.
- pH levels contribute to stressors with levels high enough to harm fish and other aquatic life by damaging gills and other effects.
- Lack of habitat due to sediment, which is soil and other particles that cloud the water and build up on lake and stream bottoms, making it hard for aquatic life to breathe, feed and reproduce.

Key issues continued

- Imbalances of dissolved salts and minerals can be toxic to aquatic life. The Shell Rock River has an extreme range of salts and minerals, with the lowest values downstream of the Albert Lea Lake dam and the highest downstream of Albert Lea's wastewater treatment plant.
- Changes in stream flow to accommodate drainage.

To improve water quality in the Shell Rock watershed, the Minnesota Pollution Control Agency (MPCA) recommends:

- Major reductions in nutrient levels in the watershed's streams and lakes
  - * Management of phosphorus and nitrogen, in fertilizer and manure applications to fields, is needed throughout the watershed to reduce algal blooms and harmful impacts to aquatic life and recreation.
  - * The Albert Lea wastewater treatment plant will also need to remove more phosphorus from its discharge to the Shell Rock River.
- Preventing erosion from streambanks, driven by increased flow from drainage, to reduce the sediment levels in water bodies.

The MPCA and local partners will include more detailed recommendations in the Watershed Restoration and Protection Strategies, the document that culminates this first cycle of intensely studying the watershed.

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

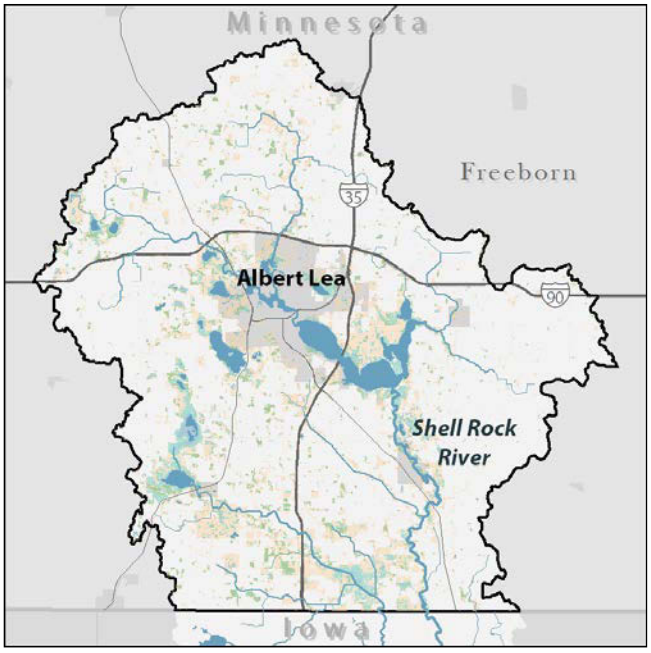
Start process over every 10 years

This stressor identification follows an intensive water monitoring effort in the Shell Rock River dating back to 2009.

With local partners, the MPCA examined several parameters in several streams. In addition to water chemistry sampling, almost 30 stream stations were sampled for biology.

The MPCA and several partners familiar with the watershed examined the data to identify stressors to healthy water conditions.

The next step in the process will be to develop strategies to restore water quality in impaired streams and lakes.



Full report

To view the full report, go to www.pca.state.mn.us/index.php/water/water-types-and-programs/watersheds/shell-rock-river.html or search for "Shell Rock River" on the MPCA website at www.pca.state.mn.us.

Contact person

Chandra Carter
Minnesota Pollution Control Agency
chandra.carter@state.mn.us
651-757-2264