Summary

Stressor Identification

Nemadji River Watershed

Why is it important?

The Nemadji River watershed spans the Minnesota and Wisconsin border; its headwaters are southeast of Duluth, Minnesota, and it discharges into Lake Superior.

The Minnesota portion of the watershed includes numerous streams and a few headwaters lakes. Land use is mostly rural: homes, small scale forestry and agriculture operations and pastures for hay cutting and small herd grazing. Lakeshores are not as intensively developed as is typical in other locations.

Water quality and biological monitoring has been ongoing since 2001 with less frequent sampling dating back to 1967. Due to the MPCA's Intensive Watershed Monitoring efforts, data collection increased in rigor and intensity during 2011-2012. All data were used to identify stream segments that were not supporting healthy aquatic life populations with a focus primarily on fish and macroinvertebrates.

Key issues

In the Nemadji River watershed, six streams do not support healthy fish and macroinvertebrate populations and are listed as impaired. All of these impaired stream segments are Minnesota Department of Natural Resources-designated trout streams and are considered valuable resources in the region.

Impaired streams show an overall lack of sensitive species common to coldwater, along with an increase in warmwater tolerant species. The streams include more pollutant-tolerant species and losing species complexity. Potential causes to investigate included bank erosion, dams, undersized culverts or other stream obstructions, land cover/forest change, habitat fragmentation and loss, stream temperature and flow changes and low dissolved oxygen.

A stressor investigation was completed in 2013-14 to determine the sources of pollution or conditions contributing to the poor biological scores. After examining many causes for the biological impairments, the following five stressors were identified as probable causes of stress to aquatic life:

1. stream flow changes
2. loss of quality habitat
3. periodic low stream oxygen levels
4. high water temperatures
5. high levels of sediment in the stream

Highlights of report

- Historic and recent stream flow changes: Flow changes can degrade habitat, increase sediment, create more erosion via runoff patterns and fragment available habitat. Past and present land use, impoundments or blockages on the stream channels and on a larger scale, climate change, can be reasons for flow changes. All streams showed evidence of flow changes.
- Quality and continuity of the physical habitat: Degraded physical habitat can impact the ability of fish and macroinvertebrates to spawn, forage or find refuge. Dams and culverts can create fish passage barriers or affect flow. All of the impaired streams

Highlights
continued

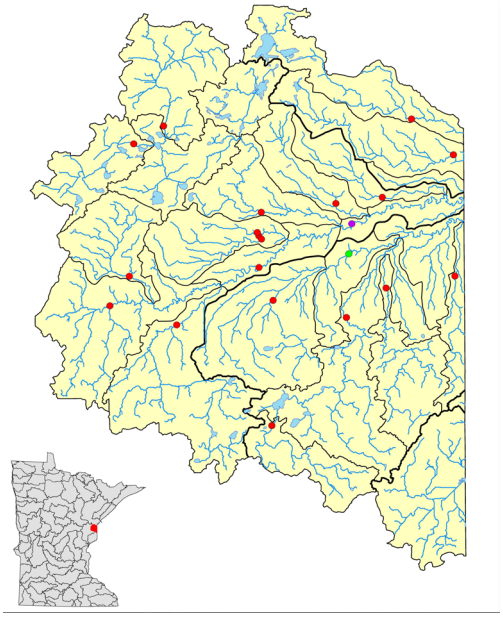
have issues with flow changes and habitat loss resulting from flow and erosion reworking the stream structure. Culverts and barriers are passage problems on Skunk/ Elim, Mud, Deer and Rock Creeks.

- Water temperature: The best growth for many fish species occurs in a narrow range of water temperature. Trout growth is best at low temperatures; high water temperatures result in stressful or even lethal conditions. Rock Creek exhibited the greatest temperature stresses recorded during the study.
- Suspended solids/turbidity: Excess suspended solids can harm aquatic life through direct, physical effects such as abrasion of gills, loss of visibility or avoidance of a stream area which can affect feeding habits and other behavior changes.
- Common probable stressors: In Rock, Clear, Deer and Mud Creeks, suspended solids/turbidity and physical habitat quality were driven by the watershed's historic flow changes and land management decisions. These streams are located within the clay lakeplain. In contrast, the common probable stressor for impaired stream reaches located outside the red clay zone (Elim Creek and Blackhoof River) was habitat changes.

Based on the evidence generated in this study, it is recommended that TMDL efforts focus on developing target sediment loads that will reduce total suspended solids/ turbidity and improve habitat in strategic areas of the watershed.

About this study

In 2011, the Minnesota Pollution Control Agency began an intensive watershed monitoring effort of this watershed's surface waterbodies. Twenty stream stations were sampled for biology at the outlets of variable sized subwatersheds. These locations included mouth of the the Nemadji River and the South Fork Nemadji River, as well as the upstream outlets of major tributaries. As part of this effort, MPCA staff joined with the Carlton County Soil and Water Conservation District to conduct stream water chemistry sampling at the outlets of two rivers.



In 2013, a holistic approach was taken to assess all surface waterbodies within this watershed for the support of aquatic life, recreation and consumption (where sufficient data was available). Additional data from other agencies, groups, and/or individuals were used in the assessment of designated beneficial uses. Twenty-two stream segments and eight lakes were assessed in this effort.

Full report

To view the full report, go to http://www.pca.state.mn.us/lupgdf1 or search for "Nemadji River watershed" on the MPCA web site.

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