Stressor identification report summary

Middle Minnesota River-Mankato Watershed

Why is it important?

The Minnesota Pollution Control Agency (MPCA) uses biological monitoring and assessment to help determine the condition of the state's rivers and streams. Examining fish and aquatic macroinvertebrates (bugs) and related habitat provides data to measure overall health.

This report summarizes stressor identification work in the Minnesota River-Mankato (or Middle Minnesota River) Watershed. Stressor identification is a key component of the major watershed restoration and protection projects being carried out under Minnesota's Clean Water Legacy Act. If biological impairments are found, stressors to the aquatic community must be identified.

The watershed covers 861,886 acres across Cottonwood, Brown, Redwood, Renville, Sibley, Nicollet, Blue Earth, and Le Sueur counties in south-central Minnesota. It includes several small first and second order streams that drain directly into the Minnesota River.

Key issues

Overall, the Minnesota River is unhealthy. Sediment and organic particles clouds the water, phosphorus causes algae, and nitrogen poses risks to both humans and aquatic life including bugs. Too much water flowing into the river plays a big part in all these problems. There is more rain, more artificial drainage, and not enough places to store this water. Geology makes the landscape naturally vulnerable to erosion. Land use is dominated by row crop agriculture, with corn and soybean production accounting for about 90% of cropped lands.

Of 86 assessed stream reaches, 54 were found to be impaired for biology, and only 14 found to be supporting. County Soil and Water Conservation Districts have identified the primary resource concerns to be sediment and erosion control, stormwater management, drinking water and source water protection, drainage management, waste management, nutrient management, surface water quality and wetland management.

Highlights of report

Experts identified the following as probable causes of stress to aquatic life in the watershed: Nitrate levels; Lack of physical habitat and connectivity issues, such as dams or culverts blocking migration of fish; hydrology; and low dissolved oxygen levels (often a result of too much algae). Stressor identification also detects streams in healthy condition with the goal of protecting them.

The following were identified as probable causes of stress to fish and other aquatic life:

- Temperature: Near shore land cover alteration and increasing channel width are both occurring in the watershed, contributing to higher water temperatures.
- Dissolved Oxygen (DO): Sections with low DO often correlated with eutrophic conditions within the headwater regions of the watershed. Several water springs mitigate against upstream oxygen depletion.
- Eutrophication: Eutrophic conditions were identified in the headwater areas, where phosphorus loading is high due to agriculture.
- Nitrate: The Minnesota River Basin has some of the highest stream nitrogen loading in the state. It contributes 69% of the nitrate load converging with the Mississippi River.

Highlights (cont.)

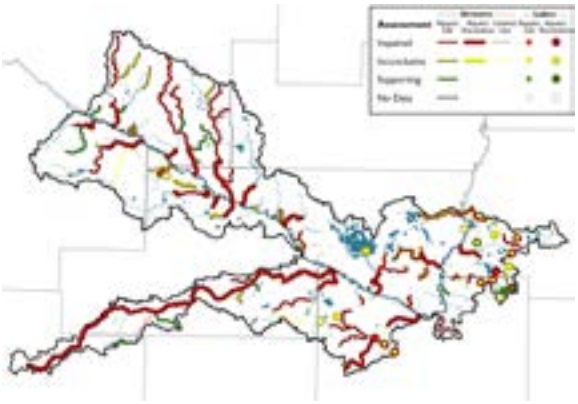
- Total Suspended Solids (TSS): The watershed contributes an estimated 3,252 tons of sediment erosion and transportation a year from ravines, bluffs, and streambanks.
- Altered Hydrology: Currently, 64.5% of the watershed's tributaries are altered as a result of ditching for agricultural practices.

Recommendations

Focus is needed on the headwaters of these impaired systems for downstream improvements to occur. One of the more cost-effective and practical restoration practices can be seen in the elimination and reduction of ditch clean-outs. One of the largest barriers in implementing this is the lack of education in stream morphology, storage, and energy dissipation. Allowing a ditch that is shallow, wide, and homogenous to develop a two-stage sinuous channel that is deeper, narrower, and diverse will carry the same or similar volume of water, and a meander similar to natural conditions. Other Best Management Practices (BMP) found the Department of Agriculture's BMP Handbook are encouraged to improve overall stream health.

About this study

Water quality and biological monitoring in the Minnesota River-Mankato Watershed have been ongoing. As part of the MPCA's Intensive Watershed Monitoring (IWM) approach, monitoring activities increased in rigor and intensity during the years of 2013-2014, and focused more on biological monitoring (fish and macroinvertebrates) as a means of assessing stream health. The data collected during this period, as well as historic data obtained prior to 2013, were used to identify stream reaches where environmental stresses affect fish and aquatic life. Stressor Identification draws upon a broad variety of disciplines and applications, such as aquatic ecology, geology, geomorphology, chemistry, land-use analysis, and toxicology.



Full report

To view the full report, go to www.pca.state.mn.us/sites/default/files/wq-ws5-07020007a.pdf, or search "Minnesota River-Mankato Watershed on the MPCA website.

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