

# Summary

Biotic stressor identification

## Rock River



### About the study

The Rock River is the largest of the four watersheds in southwest Minnesota that are part of the Missouri River Basin, extending south into Iowa. Of its total 1,075,032 acres, about 582,106 acres are located in Rock, Nobles, Pipestone and Murray counties. It includes the cities or villages of Luverne, Edgerton, Adrian, Hills, and Kanaranzi. Land use consists mainly of cropland (80.53%), rangeland (10.99%), and developed land (6.25%).

This report explains the results of biological monitoring and assessment in the watershed. The basic approach is to look at fish and aquatic macroinvertebrates (mostly insects), and related habitat conditions, at sites throughout the watershed. The information is used to produce an Index of biological integrity (IBI) score.

The report explains why one stream has a low index of biological integrity (IBI) score, while another has a high score. It looks at causal factors – negative ones harming fish and insects, and positive ones leading to healthy biology. Stressors may be physical, chemical, or biological. The primary stressors on aquatic life are high levels of phosphorus, nitrates, and total suspended solids, and poor habitat.

During 2011 and 2012 intensive watershed monitoring was performed in the Rock River Watershed at 89 biological monitoring sites. Biological monitoring and water chemistry data from these sites as well as data from other water monitoring stations taken within 10 years of the biological monitoring were used to assess the conditions of the watershed. The watershed assessment for this area occurred in 2013.

### Key issues

According to monitoring data from the watershed, 27 stream segments are currently impaired for a lack of biological health. Contributing factors include nutrients – nitrates and phosphorus, turbidity or total suspended solids, and poor habitat. Low levels of dissolved oxygen can impair biological health; however, its measurement varied widely, and may be overshadowed by the other factors.

**Phosphorus:** Dissolved oxygen, pH, water clarity, and changes in food resources and habitat are all stressors that can result when there is excess phosphorus. From 2000-2014, of 850 phosphorus samples collected, 353 (41.53%) were at or above the 0.15 mg/L standard. The high rate and degree of exceedance shows that phosphorus is a watershed-wide issue and will need to be addressed.

**Nitrate-nitrite:** From 2000-2014, 991 nitrate samples showed values ranging from less than 0.05 mg/l up to 42.9 mg/l. There are many high values throughout the watershed and a nitrate reduction plan is needed to control and reduce the impact it is having on water quality. The elevated nitrate levels during the spring months coincide with fertilizer applications and periods of snowmelt/runoff. The abundance of row crop agriculture and intensive grazing in the watershed makes this a large scale issue.

**Altered hydrology:** Increased flows may directly impair the biological community or may contribute to additional stressors. Increased channel shear stresses, associated with increased flows, often causes increased scouring and bank destabilization. With these stresses added to the stream, the fish and macroinvertebrate community may be influenced by the negative changes in habitat and sediment.

**Turbidity-total suspended solids:** Increases in suspended sediment and turbidity within aquatic systems are now considered one of the greatest causes of water quality and biological impairment. The most recent assessments for the watershed showed

14 turbidity impairments. Excess suspended sediments cause harm to aquatic life through two major ways: Direct, physical effects (i.e. abrasion of gills, suppression of photosynthesis, avoidance behaviors); and indirect effects (i.e. loss of visibility, increase in sediment oxygen demand). Elevated turbidity levels and Total Suspended Solids (TSS) concentrations can reduce the penetration of sunlight and thus impede photosynthetic activity and limit primary production.

## Summaries and recommendations

The Rock River Watershed is impaired for aquatic life due to its biological conditions at 27 different locations. These fish and macroinvertebrate impairments are being impacted by numerous stressors. While additional monitoring is needed, data are sufficient to support recommendations addressing the impairments.

Nutrients – Phosphorus, nitrate-nitrite: A large scale plan is greatly needed, including efforts to improve the timing and rate of fertilizer application; it should increase riparian buffers and reduce cattle access to streams.

Turbidity and total suspended solids: Ways to reduce these would include: Limiting cattle access to streams, practicing rotational and flash grazing, maintaining an ample riparian corridor, applying natural stream channel design practices, and planting deep-rooted vegetation along the stream banks.

Overall, significant problems and stressors to the biological communities exist in Rock River Watershed. Substantial changes are needed watershed-wide to help mitigate the damages caused by the prolonged poor land use and lack of riparian buffer. Until these improvements and long term changes are made, expect the fish and macroinvertebrates in the Rock River Watershed to remain stressed and impaired.

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