

Summary



Hawk Creek Watershed

Biological Stressor Identification

To view the full report, visit: <http://www.pca.state.mn.us/yhizdd8>

Description

The Hawk Creek watershed encompasses about 659,200 acres in the Minnesota River Basin in west-central Minnesota. It includes many streams that flow into Hawk Creek, and many direct tributaries to the Minnesota River. Much of the watershed is channelized and in poor biological condition. The watershed was assessed in 2012 for aquatic recreation, aquatic consumption and aquatic life beneficial uses as part of the Minnesota River-Granite Falls watershed. This report describes the connection between the biological community and the stressor(s) causing the impairments. Stressors are those factors that negatively impact the biological community. Stressors can interact with each other and can be additive to the stress on the biota.

Key issues

Four streams in this watershed were found to be impaired for aquatic life due to their biological communities. Three of the impaired reaches are located on direct tributaries to the Minnesota River: Unnamed Creek, Smith Creek, and County Ditch 119. The other impairment was located on County Ditch 36, a tributary to Hawk Creek. After examining many possible causes for the biological impairments, the following stressors were identified for the impaired streams: High nitrates, lack of habitat, low dissolved oxygen, high phosphorus, altered hydrology, and high turbidity/total suspended solids. The watershed had many instances where the fish and invertebrate IBI scores were below their respective threshold. However, many of these sampling stations are located on stream reaches that are more than 50 percent channelized. The MPCA does not currently assess channelized streams and these impairments are deferred until the implementation of Tiered Aquatic Life Use (TALU).

Highlights

Dissolved oxygen (DO) refers to the concentration of oxygen gas within the water column. Low or highly fluctuating concentrations of DO can have detrimental effects on many fish and invertebrate species. DO concentrations change seasonally and daily in response to shifts in ambient air and water temperature, along with various chemical, physical, and biological processes within the water column. Smith Creek remained above the minimum standard of 5 mg/L. County Ditch 119 consistently fell below the minimum standard. County Ditch 36 also had one reading below the minimum standard during an invertebrate sampling visit. At that time, the DO was 3.99 mg/L. One other measurement at this location was above the standard at 6.32 mg/L. Unnamed Creek had one previous DO measurement of 3.31 mg/L.

Phosphorus is an essential nutrient for all aquatic life, but elevated phosphorus concentrations can result in an imbalance, which can impact stream organisms. It is delivered to streams by wastewater treatment facilities, urban stormwater, agriculture, and direct discharges of sewage. Excess phosphorus does not result in direct harm to fish and invertebrates. Rather, its detrimental effect occurs as it alters other factors in the water environment. Dissolved oxygen, pH, water clarity, and changes in food resources and habitat are all stressors that can result when there is excess phosphorus. From 2000-2012, 2,938 phosphorus samples

were collected. Of those, over 71 percent were at or above the current draft standard of 0.15 mg/L. Many of the readings were above 7 mg/L with the highest reading at 8.05 mg/L.

Exposure to elevated **nitrite or nitrate** concentrations can lead to the development of methemoglobinemia, which ultimately limits the amount of oxygen that can be absorbed by fish and invertebrates. From 2000-2012, 2,687 nitrate samples were collected. Values ranged from 0.001 mg/L up to 37.8 mg/L. At this time, none of the stream units in the watershed that are impaired for biota are classified as Class 1 streams. Minnesota currently does not have a nitrate standard for other classes of waters of the state.



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 cause increased scouring and bank destabilization. With these stresses added to the stream, the fish and invertebrate community may be influenced by the negative changes in habitat and sediment.

Recommendations

Given the high phosphorus readings watershed-wide and highlighted in the biologically impaired reaches of County Ditch 36, County Ditch 119, and Unnamed Creek, a large scale plan to reduce phosphorus amounts may be needed. Management plans focusing on the timing and intensity of the fertilizers and manure application would help reduce the amount of phosphorus in the system. These reductions would also aid in the DO problems present in the watershed. Reducing the amounts of nitrates in the system can be achieved by lowering fertilizer application rates, better application times, using cover crops, wetland restorations and increasing the stream buffer width.

Altered hydrology is a major stressor to the fish and invertebrate communities at the impaired reaches watershed. Changes to the landscape that reduce the volume, rates and timing of runoff as well as increase the base flows will be needed to prevent continued and further impairments to biological assemblages not only in the studied stream reaches, but throughout the watershed. While this report focuses on the biological impairments, turbidity and TSS are watershed-wide problems, and improvements are needed on a large scale basis to prevent further impairments to the biological communities. In general, increases in riparian buffer width, and stabilizing stream banks would greatly help the in-stream habitat that is currently lacking.

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