

# SID Update

## Wedge Creek Watershed 2022

---



The purpose of Cycle 2 stressor identification (SID) work is to perform SID in a way that supports Cycle 2 watershed restoration and protection efforts, with an emphasis on meeting local partner needs, protection of biotic integrity, and identifying changes in biotic condition. Cycle 2 SID work will provide sharper focus in adding value to local partner implementation planning efforts. SID staff will seek to strengthen local partnerships and provide scientific analyses and recommendations in a format and timeframe that is most useful to local partners.

Wedge Creek Watershed was identified for Cycle 2 SID work via conversations with local partners and professional judgement from Minnesota Pollution Control Agency (MPCA) staff. Factors that lead to selection included:

- Potential future implementation projects.
- Limited chemistry data in the upper part of the watershed.
- Wedge Creek Watershed is upstream of Fountain Lake and Albert Lea; both are priorities as Fountain Lake has high recreational value and is impaired for nutrients and Albert Lea has a long history of flooding issues.

Goals for Cycle 2 SID work in Wedge Creek Watershed included:

- Summarize current chemical, biological, and physical conditions and identify changes between Cycle 1 (2009) and Cycle 2 (2019).
- Identify stressors and pollutant sources that are currently impacting biological communities and/or threaten future biological condition.
- Identify any “hot spots” or areas contributing a disproportionate amount of a pollutant.
- Identify and prioritize restoration areas.
- Provide value to local planning efforts.

This SID update document summarizes biological condition and provides monitoring highlights and stressor conclusions for Wedge Creek Watershed.

---

## Biological Communities

Fish and macroinvertebrate communities in the Wedge Creek Watershed are impaired and do not meet standards. Stations 09CD072, 09CD073, and 09CD084 were deferred (not assessed) in Cycle 1 due to channelization; all stations were subsequently assessed in 2018 following adoption of the tiered aquatic life uses (TALU) framework, which provides a mechanism to assess modified water resources. Station 09CD072 is impaired for fish, and stations 09CD073 and 09CD084 are impaired for fish and

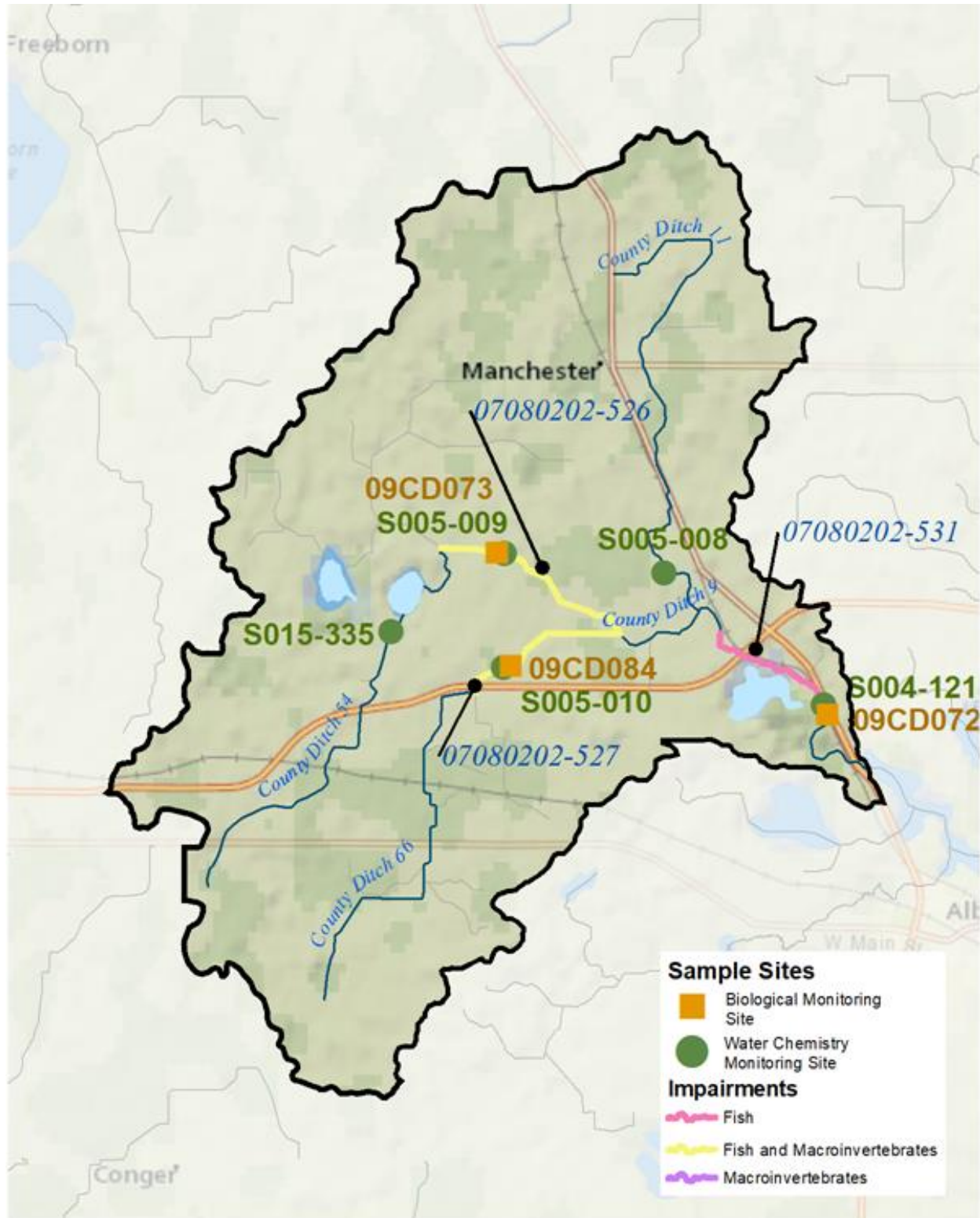
macroinvertebrates; station 09CD072 was the only station sampled in Cycle 2 (Table 1, Figure 1). Cycle 2 fish index of biotic integrity (FIBI) scores were below the threshold while the macroinvertebrate index of biotic integrity (MIBI) score was above the threshold. White sucker and yellow perch were the most abundant fish species in Cycle 1 while fathead minnow, blacknose dace, and green sunfish were the most abundant in Cycle 2. Other differences include common carp being present in good numbers Cycle 1 and absent Cycle 2, and brassy minnows plentiful Cycle 2 and nearly absent Cycle 1. Some natural variability can be expected from one sample to the next, which doesn't necessarily indicate that the fish community has changed markedly since

Cycle 1. Also, carp management activities likely contributed to the carp absence in Cycle 2; a fish barrier was installed at the mouth of Wedge Creek in the winter of 2009/2010. Midges (*Chironomidae*) and caddisflies (*Hydropsychidae*) were the most abundant macroinvertebrates both cycles. Overall, fish and macroinvertebrate communities were similar between Cycle 1 and Cycle 2 resulting in similar IBI scores.

**Table 1: Fish and macroinvertebrate IBI scores in Wedge Creek Watershed.**

<b>Waterbody</b>	<b>AUID</b>	<b>Biological Stations</b>	<b>Biological Impairment</b>	<b>Class</b>	<b>FIBI</b>	<b>Year</b>	<b>MIBI</b>	<b>Year</b>
County Ditch 9	526	09CD073	Fish, Macroinvertebrates	2Bm	22.2	2009	23.7	2009
					13.9	2009		
County Ditch 66	527	09CD084	Fish, Macroinvertebrates	2Bg	41.5	2009	22.5	2009
					35.3	2009		
Unnamed Creek (Wedge Creek)	531	09CD072	Fish	2Bg	31.8	2009	43.4	2009
					23.5	2019	42.7	2019
					27.7	2019		

Figure 1: Wedge Creek Watershed monitoring stations and biological impairments.



## Monitoring Highlights

### Stream Temperature

Instantaneous (point) measurements were collected throughout the watershed over the last decade (2011 through 2020), and stream temperatures ranged from -0.1°C to 24.4°C (141 samples). There were zero values greater than 30°C (daily average warmwater standard); temperature is adequate to support warmwater biota.

### TSS

Total suspended solids (TSS) samples were collected across the watershed as part of SID in 2019, with a goal to sample various flow conditions and establish a range of TSS concentrations. Concentrations ranged from 1.2 – 32 mg/L (average of 12.5 mg/L), and zero of the thirty-five samples exceeded the warmwater TSS standard (65 mg/L). In general, TSS concentrations were low across the watershed.

### Nitrate

Nitrate samples were collected across the watershed as part of SID in 2019, with a goal to sample various flow conditions and establish a range of nitrate concentrations. Concentrations ranged from 1.7 – 14 mg/L (average of 7.5 mg/L), and eight (23%) of the thirty-five samples were above 10 mg/L. Stations S004-121 and S015-335 each had one sample above 10 mg/L while station S005-010 had six samples above 10 mg/L. All samples for stations S005-008 and S005-009 were below 10 mg/L. The watershed area upstream of station S005-010 stands out as a priority area for nitrate reduction as concentrations are consistently elevated and higher than neighboring watersheds. The watershed area for station S005-010 has the highest percentage of cultivated crops (93%) compared to other stations sampled (80-88%), and also contains some of the larger feedlots in the entire Shell Rock River watershed (Figure 2); both are potential explanations as to why this drainage area has higher nitrate concentrations than others in the Wedge Creek watershed. In general, nitrate concentrations as well as nitrate tolerant macroinvertebrates are elevated across the Wedge Creek watershed.

### TP

Total phosphorus (TP) samples were collected across the watershed as part of SID in 2019, with a goal to sample various flow conditions and establish a range of TP concentrations. Concentrations ranged from 0.042 – 0.254 mg/L (average of 0.139 mg/L), and fourteen (40%) of the thirty-five samples exceeded the river eutrophication standard for the South Region (0.15 mg/L). All stations had multiple exceedances, which occurred during low flow and elevated flow conditions. Station S015-335 is consistently higher than the other stations, and should be considered a priority area for phosphorus reduction; reductions to S015-335 will also benefit Sugar Lake. In general, TP concentrations were elevated across the Wedge Creek watershed and reductions are needed to improve water quality in the watershed as well as downstream waters (i.e. Fountain Lake which is impaired for nutrients). In addition to elevated TP concentrations, eutrophication (Figure 3), low DO, elevated chlorophyll-a, and elevated TP tolerant macroinvertebrates have been documented across the watershed.

### DO

DO ranged from 3.9 mg/L to 8.7 mg/L across the watershed during early morning DO surveys in 2019. Early morning DO surveys were conducted on 7/23/19, 8/2/19, and 8/30/19 to characterize conditions and identify low DO. Three exceedances (20%) of the warmwater DO standard (5 mg/L) were identified, with two occurring just downstream of Sugar Lake (station S005-009) and one just upstream of Sugar Lake (station S015-335). DO surveys were also conducted in 2020 near the mouth of Wedge Creek (station S004-121); all three samples were above the standard. Low DO (1.4 mg/L and 3.5 mg/L) was documented in 2021 on County Ditch 66 at the 220<sup>th</sup> Street crossing and station S005-010. There were also several instantaneous (point) measurements collected throughout the watershed over the last decade (2011 through 2020), and three (3%) were below 5 mg/L. In general, macroinvertebrate low DO tolerant individuals and fish low DO index scores and probability of meeting the DO standard were worse than the statewide median. Fathead minnows were the most abundant fish species in Cycle 2; fathead minnows are very tolerant of low DO conditions.

### Habitat

In general, MPCA Stream Habitat Assessment (MSHA) scores at station 09CD072 increased between Cycle 1 and Cycle 2; Cycle 2 scores were 60, 67, and 72. Most sub-category scores (Land Use, Riparian, Substrate, Cover, and Channel Morphology) were similar or improved in Cycle 2. A habitat example from biological monitoring in 2019 can be seen in Figure 4. Overall, adequate habitat is present at station 09CD072, but poor habitat conditions have been documented at other stations in the watershed. County Ditch 9, 11, and 66 all had at least one very low MSHA score from Cycle 1; these stream reaches were deferred in Cycle 1 and not assessed until Cycle 2. Fine substrate is common across the watershed, which can significantly degrade habitat quality and availability (e.g. embeddedness, lack of coarse substrate, etc.). The biology display signs of habitat stress with elevated burrowers and legless individuals, reduced clingers, limited riffle dwelling individuals, and an abundance of tolerant individuals. Often times this type of metric response is associated with lack of coarse substrate and/or woody debris, fine substrate, embeddedness, channelization, etc.

### Fish Passage

A barrier limiting fish migration is located just upstream of station 09CD072 (Figure 5). Stations upstream of the barrier weren't sampled in Cycle 2, but Cycle 1 samples had minimal migratory individuals upstream of the barrier (0-7% upstream of barrier, 37% downstream of barrier). A fish barrier is also located near station 09CD084.

### Flow Alteration

The Wedge Creek watershed is dominated by ditch systems. Channelization is often associated with poor habitat, an abundance of fine substrate, excess nutrients and productivity, and altered DO regimes (low DO and high DO flux). Tile drainage is also common in these landscapes and typically a large source of the nitrogen load.

Figure 2: Land cover, feedlots (AU), and 2019 nutrient (nitrate = green box plots, TP = purple box plots) concentrations (mg/L) in Wedge Creek watershed. The red lines represent the nitrate drinking water standard (10 mg/L) and river eutrophication standard for the South Region (0.15 mg/L). In general, nitrate concentrations at station S005-010 and TP concentrations at station S015-335 were consistently higher than the other stations sampled. The feedlots and associated manure application located in and around these drainage areas is a potential explanation for the higher concentrations. All stations were sampled once/month from April – October, with most samples collected during “normal” (non-event) flow conditions. The DNR WHAF tool was used to help create this map.

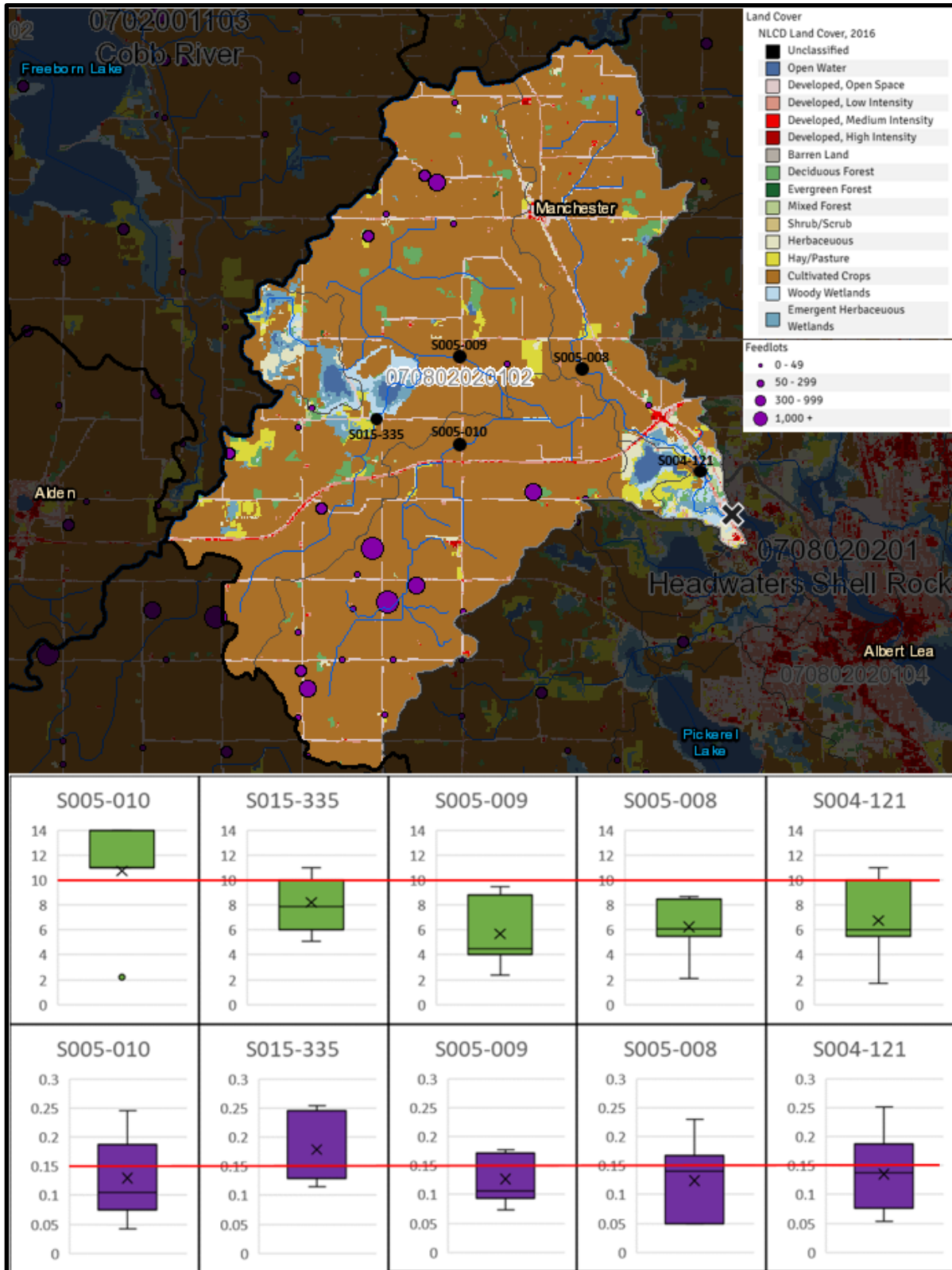


Figure 3: Eutrophication examples from station 09CD073 (upper left), County Ditch 66 at the 220<sup>th</sup> Street crossing (right), and Sugar Lake (bottom left). Sugar Lake photo courtesy of Google Earth.

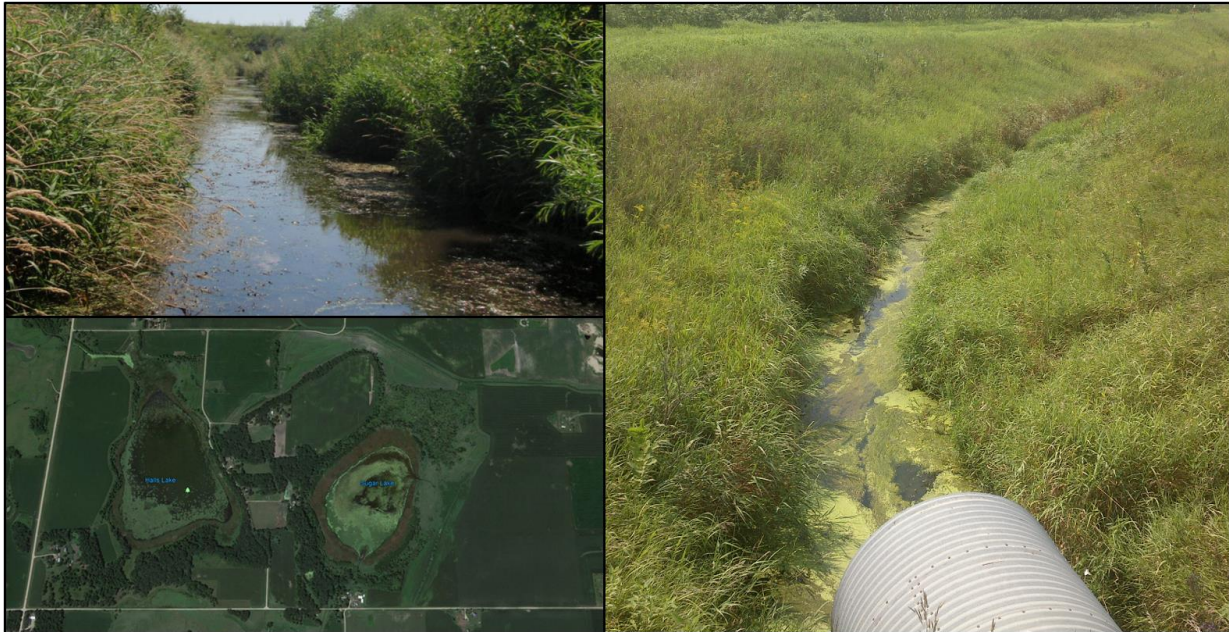


Figure 4: Habitat example from biological monitoring station 09CD072 in Wedge Creek Watershed in 2019.



Figure 5: Fish migration barriers at stations 09CD072 (left) and 09CD084 (right).



## Stressors Summary

- Elevated nitrate, eutrophication, low dissolved Oxygen (DO), poor habitat, fish passage, and flow alteration are stressing the biology in the Wedge Creek Watershed (Table 2), while stream temperature and total suspended solids (TSS) are not currently stressors.
- Flow alteration is a major source of stress and is contributing directly or indirectly to all stressors in the Wedge Creek Watershed. Nitrate and habitat stressors in particular are impacted by flow alteration through tile drainage and channelization.
- The Wedge Creek Watershed is dominated by ditch systems. Channelization is often associated with poor habitat, an abundance of fine substrate, excess nutrients and productivity, and altered DO regimes (low DO and high DO flux). Tile drainage is also common in these landscapes and typically a large source of the nitrogen load. All of these characteristics associated with channelization exist in the Wedge Creek Watershed.
- It's unclear if eutrophication is driving low DO conditions, or if it's the result/combination of other variables such as flow; often times drainage ditches like those in the Wedge Creek Watershed experience low flow conditions, which can foster low DO environments. Also, the impact of Sugar Lake on DO conditions in County Ditch 9 is unclear, but Sugar Lake is a potential source of low DO water based on Google Earth imagery (Figure 3).
- Wedge Creek and County Ditch 66 have barriers impacting fish migration (Figure 5).
- Nitrate concentrations at station S005-010 and TP concentrations at station S015-335 are consistently higher than other stations in the watershed; both drainage areas are good options for prioritizing reduction.
- Although TSS is not currently a stressor, sediment is impacting biology via habitat loss and degradation from an abundance of fine substrate and embeddedness.
- Overall, reducing nitrate and phosphorus loading, improving in-stream habitat, ensuring proper connectivity for fish migration, and addressing flow alteration related issues (e.g. poor habitat,

fine substrate, nitrogen rich tile water, etc.) are critical for the health of fish and macroinvertebrate communities in the Wedge Creek Watershed.

**Table 2: Summary of stressors in Wedge Creek Watershed (● = stressor, ○ = inconclusive stressor, blank = not a stressor).**

Waterbody	AUID	Biological Stations	Biological Impairment	Class	Stressors								
					Temperature	Nitrate	Eutrophication	DO	TSS	Habitat	Fish Passage	Flow Alteration	
County Ditch 9	526	09CD073	Fish, Macroinvertebrates	2Bm		●	●	●			●	○	●
County Ditch 66	527	09CD084	Fish, Macroinvertebrates	2Bg		●	○	○			●	●	●
Unnamed Creek (Wedge Creek)	531	09CD072	Fish	2Bg		○	○	○			○	●	●

## For more information

For more information, go to <https://www.pca.state.mn.us/water/watersheds/shell-rock-river>.

## Contact person

Joe Magee  
 Minnesota Pollution Control Agency  
[joe.magee@state.mn.us](mailto:joe.magee@state.mn.us)  
 507-206-2601

