## **Yellow Medicine River Watershed**

Stressor Identification Update April 2025

## Purpose

The Minnesota Pollution Control Agency (MPCA) conducts biological monitoring of fish and bug communities on select streams in each of the 80 major watersheds on a 10-year cycle. Biological monitoring is an excellent indicator of overall stream health and is important to determining whether water quality standards are met. These standards are designed to ensure that streams are fishable and swimmable. When streams do not meet Index of Biological Integrity (IBI) standards as measured by the biological communities present in the water, this indicates the physical and/or chemical conditions of the water body are not conducive to healthy aquatic biological communities.

The stressor identification (SID) process investigates specifically why fish and bug communities are impaired. SID work was completed in 2013 for the Yellow Medicine River Watershed

Figure 1: Yellow Medicine River Watershed.



(Figure 1) following the initial monitoring and assessment in Cycle 1 (C1). The purpose of Cycle 2 (C2) SID work is to support follow-up watershed restoration and protections strategy (WRAPS) efforts and local water planning and implementation efforts, protect biotic integrity, and identify changes in biotic condition. Identifying impairments and stressors helps guide where to implement restoration best management practices (BMPs) and how to protect and preserve healthy streams. This SID update focuses on streams, while the Minnesota Department of Natural Resources (DNR) will produce a SID document focused on lake SID work for this watershed.

# What have we learned about stream health and stressors in the Yellow Medicine River Watershed?

The Yellow Medicine River and both the North and South Branch Yellow Medicine Rivers were all supporting for fish. Overall in the Yellow Medicine River Watershed (Figure 2), the macroinvertebrate IBI scores "increased by 4.4 points (on average) between 2010 and 2022, ... a statistically significant change" (MPCA 2024). Fish IBI scores showed no statistically significant change.

The most common stressors identified in the watershed were lack of habitat, flow alteration, and dissolved oxygen (DO). They were all identified as stressors in the watershed during C1. Flows in the Yellow Medicine River are increasing (MPCA 2024). Unstable flow regime as a result of channelization and



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tile drains can cause a lack of habitat, unstable stream banks, and filling of pools and riffle habitat. Habitat was a stressor in the majority of stream reaches.

DO is a stressor to Stony Run Creek, the South Branch Yellow Medicine River and the mainstem Yellow Medicine River. There is a natural component to the low DO, due to surrounding wetlands and low gradient river systems. The extent of natural low DO in comparison to low DO caused by human disturbance is unknown.

Nutrient levels in the watershed were high, but nutrient stress was predominantly inconclusive due to a lack of data. Eutrophication was identified as a stressor to Stony Run Creek and Hazel Creek. Targeting nutrient reductions in area with high values would be beneficial. Nitrate values were highest (16 mg/L) on two ditches (-663 and -703) in the JD 17 Subwatershed and Boiling Spring Creek on reach -555 (14.60 mg/L). Phosphorus values were highest (1.66 mg/L) on Spring Creek (-777) and the Yellow Medicine River (0.67 mg/L) on reach -802.

Investigation of stressors for C2 have shown improvements in the stressors affecting the North Branch Yellow Medicine River. The river has experienced multiple no flow to low flow years during both C1 and C2. Continuous flow monitoring on the river would be beneficial.

For additional information on the updated conditions of the watershed, see the <u>Minnesota River-Yellow</u> <u>Medicine River Watershed Assessment and Trends Update</u> (MPCA 2024).

## Part 1: Yellow Medicine River Watershed SID Summary Results

C1 <u>monitoring</u> and <u>SID reporting</u> in the Yellow Medicine River Watershed focused on the biologically impaired reaches on the North Branch Yellow Medicine River (-542), Mud Creek (-543), Judicial Ditch 10 (Wood Lake Creek) (-780 and -781), County Ditch 39 (-713), County Ditch 2 (-717), and four unnamed creeks (-564, -595, -694 and -718). C1 monitoring was completed in 2010, while C1 SID work was completed in 2013.

#### Cycle 2 Biological Impairment Summary

- New fish and/or macroinvertebrate impairments were identified on 27 new stream reaches during C2 assessment.
- Impairments on the North Branch Yellow Medicine River, Creek, Mud Creek, and Judicial Ditch 10 (Wood Lake Creek) from C1 were reaffirmed. Due to restoration work in the North Branch Yellow Medicine River, the river was revisited in C2 for SID work. The other reaches did not have work done in C2 SID and are not covered in this report.

## Part 2: Cycle 2 Stressor Identification Stream Reaches

#### Cycle 2 Stressor Identification: Areas of focus

The Minnesota River – Yellow Medicine River Watershed (HUC 07020004) is bisected by the Minnesota River, with the southwest half drained by the Yellow Medicine River (754,100 acres), and the northeast half drained by Hawk Creek (626,000 acres). This report addresses biological impairments and stressors in the Yellow Medicine River Watershed. A separate report will address impairments and stressors for the Hawk Creek Watershed. The SID process focused on several areas to gain additional information needed. The following list of streams were studied during the SID process (data collection, analysis, and

report writing) in 2020 through 2024 and are further detailed in this report. These streams were selected based on impairment status, previous SID work, and local stakeholder input. Some streams had older impairments that needed additional information to understand stressor connections, while some were new impairments. The amount of information collected in each subwatershed was variable depending on the information needed.

- Stony Run Creek-Minnesota River Subwatershed
  - o Unnamed creek (07020004-710)
  - o County Ditch 6A (07020004-714)
  - County Ditch 90 (07020004-792)
- Stony Run Creek Subwatershed
  - Stony Creek (07020004-580)
  - Stony Creek (07020004-772)
  - Unnamed ditch (07020004-709)
- County Ditch 9 Subwatershed
  - Hazel Creek (07020004-774)
- Upper Yellow Medicine River Subwatershed
  - Yellow Medicine River (07020004-802)
  - Yellow Medicine River (07020004-803)
  - Unnamed creek (07020004-545)
  - Unnamed ditch (07020004-796)
- North Branch Yellow Medicine River Subwatershed
  - North Branch Yellow Medicine River (07020004-542)
- South Branch Yellow Medicine River Subwatershed
  - South Branch Yellow Medicine River (County Ditch 35) (07020004-762)
  - Unnamed Creek (07020004-788)
  - Judicial ditch 550 (07020004-550)
  - o Unnamed creek (07020004-599)
- Lower Yellow Medicine River Subwatershed
  - Judicial Ditch 7 (07020004-636)
- Spring Creek Subwatershed
  - Spring Creek (07020004-776)
  - Spring Creek (07020004-777)
  - Unnamed ditch (07020004-539)
  - County Ditch 48 (07020004-697)

- Judicial Ditch 17 Subwatershed
  - Judicial Ditch 17 (07020004-622)
  - Unnamed ditch (07020004-669)
  - Unnamed creek (07020004-703)
- Judicial Ditch 10 (Wood Lake Creek) Subwatershed
  - o Judicial Ditch 10 (07020004-518)
  - o Judicial Ditch 10 (Wood Lake Creek) (07020004-546)
  - o County Ditch 31 (07020004-737)
- Wood Lake Creek-Minnesota River Subwatershed
  - Boiling Spring Creek (07020004-555)

## Stony Run Creek-Minnesota River

## **Biological Community Summary**

The Stony Run Creek-Minnesota River Subwatershed (Figure 3) had three reaches impaired for aquatic life due to the degraded biological communities. These reaches include: Unnamed Creek (-710), County Ditch 6A (-714), and County Ditch 90 (-792). Stressors are identified in Figure 4.

- Unnamed Creek (-710) is a 1.66-mile-long stream reach impaired for aquatic life use due to the poor fish and macroinvertebrate communities at biological site 10MN058. Sampling occurred in 2010.
- County Ditch 6A (-714) is 1.66-mile-long stream reach impaired for aquatic life use due to the poor macroinvertebrate community at biological site 10MN050. Sampling occurred in 2010 and 2022.
- County Ditch 90 (-792) is a 2-mile-long reach that is impaired for aquatic life use due to the degraded macroinvertebrate assemblage. The biological monitoring station, 10MN120, was sampled in 2010.

Figure 3: Map of Stony Run Creek-Minnesota River Subwatershed with impairments.



Figure 4: Biological stressor determinations in the Stony Run Creek-Minnesota Subwatershed (-710, -714, -792). Red boxes indicate poor conditions and therefore, a stressor to aquatic life. Green boxes indicate good conditions and not a stressor to aquatic life. Grey boxes indicate that the parameter is inconclusive as a stressor.

ſ	Dissolved Oxygen
	• Inconclusive Eight DO values on County Ditch 6A (-714) from 2010-2022 were collected, all measured above the standard of 5 mg/L. Two DO values on reach -710 from 2010 were also above the standard. 15 DO values on County Ditch 90 (-792) from 2010-2021 were collected, of which one value was below the standard of 5 mg/L. Fish and macroinvertebrate DO related metrics indicate DO is not a stressor on reach -710. DO related macroinvertebrate metrics indicate possible DO stress on reach -714. Early morning (pre 9AM) DO readings would help to confirm. DO tolerant macroinvertebrates were high (78.6%) on CD 90 (-792), but fish metrics scored below average. DO is also inconclusive as a stressor to reach -792.
	<ul> <li>Eutrophication</li> <li>Inconclusive         Three total phosphorus (TP) values on County Ditch 6A (-714) from 2010-2022 were collected, all measured below the standard of 0.15 mg/L. One TP value on reach -710 from 2010 was above the standard. Nine TP values on County Ditch 90 (-792) from 2010-2021 were collected, with one value above the standard of 0.15 mg/L. Chlorophyll-a, BOD, and DO fluctuations values are a proximate measurement of eutrophication and have more direct impacts on biology than phosphorus. No chlorophyll-a or DO flux data is available. Eutrophication is inconclusive as a stressor on all three reaches.     </li> </ul>
	Nitrates  Inconclusive Three nitrate values on County Ditch 6A (-714) from 2010-2022 were collected, and all measured above 8 mg/L (the proposed Nitrate criteria for protection of aquatic life). One nitrate value on reach -710 from 2010 was below the standard. One value on County Ditch 90 (-792) from 2010 was collected, which was above the standard. The macroinvertebrate community had indications of nitrate stress during C1 on all three reaches. The community looked better during C2 on reach -714. Nitrate is currently inconclusive as a stressor to aquatic life on all three reaches.
	<ul> <li>Suspended Solids</li> <li>Good         Three TSS values on County Ditch 6A (-714) from 2010-2022 were collected, all measured below the standard of 65 mg/L. One TSS measurement on reach -710 from 2010 was below the standard. Nine TSS measurements on County Ditch 90 (-792) from 2010-2021 were collected, all of which were below the standard. All transparency measurements met the standard on each reach. TSS intolerant taxa were low, but so were TSS tolerant percentages. Suspended solids are not a stressor on the three reaches.     </li> </ul>
	<ul> <li>Suspended Solids         <ul> <li>Good</li> <li>Three TSS values on County Ditch 6A (-714) from 2010-2022 were collected, all measured below the standard of 65 mg/L. One TSS measurement on reach -710 from 2010 was below the standard. Nine TSS measurements on County Ditch 90 (-792) from 2010-2021 were collected, all of which were below the standard. All transparency measurements met the standard on each reach. TSS intolerant taxa were low, but so were TSS tolerant percentages. Suspended solids are not a stressor on the three reaches.</li> </ul> </li> <li>Habitat         <ul> <li>Poor</li> <li>The habitat score at site 10MN120 was 55.2 (Fair), 63.2 (Fair) at 10MN058 and ranged from 38-43 (Poor) at site 10MN050. The majority of the habitat related indicate that habitat is a stressor to each of the three reaches. Simple lithophilic spawners, which require coarse substrate for spawning, typically decrease with limited habitat. Percentages were lower than average at 10MN058. Darters are sensitive to siltation and riffle species tend to decrease due to lack of habitat. Darters were absent at 10MN058 and riffle species were less than 1% of the fish community. Clingers need coarse substrates and decrease with an increase in percent fines. The percentages of clingers were below average at both 10MN050 and 10MN120.</li> </ul></li></ul>

#### Summary of stream health in Stony Run Creek-Minnesota River Subwatershed

Altered hydrology is a stressor to all three reaches. Site 10MN050 on County Ditch 6A had regained sinuosity in 2010 but was cleaned out and straightened sometime before 2022 (Figures 5 and 6). The dredging increased bank erosion slightly.

Figure 5. Site 10MN050 in 2010.



Figure 6. Site 10MN050 in 2022.



Habitat conditions were considered fair to poor on all three reaches. Lack of channel development, lack of sinuosity, lack of depth variability, and moderate embeddedness limited the score at site 10MN050. Lack of channel stability and embededdness limited the score at 10MN058. Lack of channel development and a lack of coarse substrates limited the score at 10MN120. The channelization of the ditches is a significant reason for the poor habitat in this reach.

Nitrate values on the two ditches (County Ditch 6A and County Ditch 90) were limited but were 10 mg/L or higher. Further samples would help determine if nitrate is a stressor. Thick algae at site 10MN120 indicates excess eutrophication (Figure 7). chlorophyll-a (chl-*a*), biochemical oxygen demand (BOD), or DO flux data would be helpful to confirm eutrophication as a stressor.



Figure 7. Algae at site 10MN120 in 2010.

# **Stony Run Creek Subwatershed**

## **Biological Community Summary**

The Stony Run Creek Subwatershed (Figure 8) had three stream reaches impaired for aquatic life use. These include two reaches on Stony Run Creek (-580, -772) and Unnamed ditch (-709). Stressors to Stony Run Creek are identified in Figure 9 and the Unnamed ditch in Figure 10.

- Stony Run Creek (-580) is a 9.91-mile-long stream reach that is impaired for aquatic life use due to the degraded fish and macroinvertebrate communities. Sampling occurred at biological monitoring station 10MN114 in 2010. The fish IBI score was 0.
- Unnamed ditch (-709) is a 2.82-mile-long stream reach that is a tributary to Stony Run Creek. The reach is impaired for aquatic life use due to the degraded fish and macroinvertebrate communities. Sampling occurred at biological monitoring station 10MN052 in 2010.
- Stony Run Creek (-772) is a 9.35-mile-long stream reach that is impaired for aquatic life use due to the low scoring fish and macroinvertebrate assemblages at its biological monitoring station 10MN123. Sampling occurred in 2010 and the Fish IBI score was 0.

Figure 8. Impairments in the Stony Run Creek Subwatershed



Figure 9: Biological stressor determinations for Stony Run Creek (-580 and -772). Red boxes indicate poor conditions and therefore, a stressor to aquatic life. Grey boxes indicate that the parameter is inconclusive as a stressor.





## Figure 10: Biological stressor determinations for the unnamed tributary to Stony Run Creek (-709). Red boxes indicate poor conditions and therefore, a stressor to aquatic life. Grey boxes indicate that the parameter is inconclusive as a stressor.

Dissolved Oxygen  • Poor Two of the three DO measurements taken from 2010-2024 were below the 5 mg/L standard. Values ranged
from 1.49-8.28 mg/L. The majority of both the fish and macroinvertebrate metrics related to DO scored below average. DO is a stressor to aquatic life in this reach.
Eutrophication  Inconclusive  Three phosphorus measurements were collected between 2010-2024. The values ranged from 0.05-0.08 mg/L, all below the 0.15 mg/L standard. Chlorophyll-a, BOD, and DO fluctuations values are a proximate measurement of eutrophication and have more direct impacts on biology than phosphorus. Eutrophication related fish and macroinvertebrate metrics indicate stress, but further samples would be helpful to confirm. Eutrophication is inconclusive as a stressor.
Nitratoc
<ul> <li>Inconclusive</li> <li>Two nitrate measurements were collected between 2010-2024. These values ranged from 4.6-5.6 mg/L, with both values below 8 mg/L (the proposed Nitrate criteria for protection of aquatic life). The macroinvertebrate community of nitrate tolerant taxa was close to average (over 53%) and were lacking any nitrate intolerant taxa. While the macroinvertebrate community seems to be affected by nitrate, further water chemistry samples would help to confirm. Nitrate is inconclusive as a stressor to aquatic life.</li> </ul>
Suspended Solids
• Inconclusive In a small data set, both TSS samples were below the standard, as were the two transparency measurements. The macroinvertebrate sample did not have any TSS intolerant taxa collected, however, the amount of TSS tolerant taxa was also low. TSS is inconclusive as a stressor to aquatic life.
Habitat
• Poor The unnamed ditch had a habitat score of 31 (Poor). Lack of channel development, lack of depth variability, lack of sinuosity, and a lack of coarse substrates decreased the score. The macroinvertebrate assemblages had high percentages of species that are found with increased fine sediments. Given the poor MSHA score as well as the majority of habitat metrics being below average, habitat is a stressor in this reach.
Altered Hydrology
• Poor The reach is 100% altered. Metrics correlated with flow changes indicate altered hydrology is a stressor.

#### Summary of stream health in Stony Run Creek

DO is a stressor to both Stony Run Creek and the tributary. Over 74% DO tolerant individuals were present in the macroinvertebrate community and 100% DO tolerant fish were collected at the two sites on Stony Run Creek. Low DO was collected on both reaches of Stony Run Creek and the tributary. Half of the fish community at site 10MN123 was comprised of individuals that utilize wetland habitat (an indication of low DO). Arrowhead, a wetland plant was also growing in Stony Run Creek (Figure 11). A comment during biological sampling on the unnamed ditch tributary called the site a linear wetland filled with cattails (Figure 12). The extent of natural low DO from the upstream wetland versus low DO from human disturbance on both Stony Run Creek and the tributary is unknown.

Elevated phosphorus and DO values were collected on Stony Run Creek in 2010, 2022, and 2024. Daily DO flux data from August 2024 showed 10 of the 11 days above the standard. The maximum daily fluctuation was 8.43 mg/L. Elevated phosphorus values were found at sites along both reaches during a longitudinal survey.

Habitat conditions were considered fair to poor on Stony Run Creek and the tributary. Lack of channel development lowered the score at each of the biological sites on both

Stony Run Creek and the tributary. There was a lack of riffles on all the reaches, and also a lack of pools both on the tributary and the lower reach of Stony Run Creek Figure 13. Altered channel on Stony Run Creek.

Channelization of Stony Run Creek (Figure 13) and the tributary has impacted the habitat available to the biological communities and has altered the hydrology. Long-lived macroinvertebrate percentages were lowered at all the biological monitoring stations, indicating flow alteration is affecting the community. Figure 11. Wetland plants at site 10MN123.



Figure 12. Channel at site 10MN052.





# **County Ditch 9 Subwatershed**

## **Biological Community Summary**

The County Ditch 9 Subwatershed (Figure 14) had one stream reach impaired for aquatic life use; Hazel Creek (-774). Stressors are identified in Figure 15.

Hazel Creek (-774) in the County Ditch 9 Subwatershed is a 22.6-mile stream reach that is impaired for aquatic life use due to the low scoring fish and macroinvertebrate assemblages at its biological monitoring sites 03MN050 and 10MN047. Station 03MN050 was sampled in 2022 and station 10MN047 was sampled in 2010 and 2022.



Figure 14: Map of County Ditch 9 Subwatershed with impairments.

Figure 15: Biological stressor determinations for Hazel Creek (-774). Red boxes indicate poor conditions and therefore, a stressor to aquatic life. Green boxes indicate good conditions and not a stressor to aquatic life. Grey boxes indicate that the parameter is inconclusive as a stressor.



#### Summary of stream health in Hazel Creek

While the phosphorus data set was small, more than half the values exceeded the standard. Phosphorus values collected during a longitudinal survey in 2023 were all elevated. The maximum value (0.463 mg/L) was collected at site 10MN047, in the middle of the stream reach. Daily DO flux data from August 2024 showed 8 of the 10 days above the standard, with a maximum value of 11.02 mg/L. Eutrophication is likely driving low DO values, algal growth (Figure 16) and elevated daily DO flux

Habitat conditions were considered poor at both sites on Hazel Creek. An increase in bank erosion was observed from C1 to C2. Severe embeddedness of coarse substrates with fine sediments was noted (Figure 17) was recorded. The channelization of the ditch is a significant reason for the poor habitat in this reach. The DNR surveyed two sites downstream of 03MN050 and found that Hazel Creek "has limited or no floodplain connectivity" (DNR 2023).

Two of the nitrate values were elevated, with a high value of 15 mg/L. The Minnesota Department of Agriculture (MDA) also collected elevated values with a high value of 11 mg/L (MDA 2023).

The MDA also sampled for a range of pesticides in Hazel Creek from 2021 through 2023. "Clothianidin was detected over the numeric U.S. Environmental Protection Agency (EPA) chronic invertebrate benchmark (50 ng/L) on May 12, 2022, in Hazel Creek at MN 274 at a concentration of 166 ng/L... Imidacloprid was also detected on May 12, 2022, above the numeric EPA chronic invertebrate benchmark (10 ng/L), in Hazel Creek at MN 274 at a concentration of 13.4 ng/L" (MDA 2022). None of the 37 pesticides collected in 2021 or 2023 were above benchmarks. Macroinvertebrate diversity can decrease with pesticide exposure, but diversity increased at both bio Figure 16. Algae at site 03MN050.



Figure 17. Silt at site 03MN050.



Figure 18. Channelization on Hazel Creek.



sites over time. "...other stressors, low DO or high temperatures, may exacerbate the effects of insecticides" (CADDIS 2025).

# **Upper Yellow Medicine River Subwatershed**

#### **Biological Community Summary**

The Upper Yellow Medicine River Subwatershed (Figure 19) had four reaches impaired for aquatic life due to degraded biological communities. Stressors to the Yellow Medicine River are identified in Figure 20 and stressors to the tributaries are identified in Figure 21.

- The Yellow Medicine River (-802) is a 3.98-mile stream reach that is impaired for aquatic life use due to the poor scoring macroinvertebrate assemblage at two biological monitoring sites, 20MN006 and 20MN012. Both stations were sampled in 2022.
- The Yellow Medicine River (-803) is a 1.24-mile stream reach that is impaired for aquatic life use due to the low scoring macroinvertebrate assemblage at its one biological monitoring site, 10MN060. Station 10MN060 was sampled in 2010.
- Unnamed creek (-545) is a 3.05-mile-long stream reach that is a tributary to the Yellow Medicine River. The reach is impaired for aquatic life use due to the degraded macroinvertebrate community. Sampling occurred at biological monitoring station 10MN017 in 2010 and 2022.
- Unnamed creek (-796) is a 1.2-mile-long stream reach that is a tributary to the Yellow Medicine River. The reach is impaired for aquatic life use due to the degraded macroinvertebrate community. Sampling occurred at biological monitoring station 20EM018 in 2020.

#### Figure 19: Map of Upper Yellow Medicine River Subwatershed with impairments.



Figure 20: Biological stressor determinations for the Yellow Medicine River (-802 and -803). Red boxes indicate poor conditions and therefore, a stressor to aquatic life. Grey boxes indicate that the parameter is inconclusive as a stressor.

Dissolved Oxygen
• Poor The Yellow Medicine River had 14 DO measurements from 2010-2024. These values ranged from 1.68-15.75 mg/L with six values below the 5 mg/L standard. Low DO values were collected throughout both reaches. The majority of DO related metrics scored below average with over 69% DO tolerant macroinvertebrate taxa present. DO is a stressor to the macroinvertebrate on both reaches of the Yellow Medicine River.
Eutrophication
• Inconclusive The Yellow Medicine River had eight measurements from 2010-2024. These values ranged from 0.10-0.67 mg/L, with four values above the 0.15 mg/L standard. Elevated phosphorus values were collected throughout both

reaches. Chl-a, BOD, and DO fluctuations values are a proximate measurement of eutrophication and have more direct impacts on biology than phosphorus. All 11 values of DO flux were below the water quality standard of 5 mg/L. Most of the phosphorus related metrics scored below average. Given the lack of DO flux, other stressors are likely causing stress to the biological communities. Therefore, eutrophication is not a stressor on reach -803. Eutrophication is inconclusive as a stressor on reach -802. DO flux or chl-a data on reach -802 would help determine whether eutrophication is a stressor.

#### Inconclusive

The Yellow Medicine River had seven nitrate values collected from 2010-2024. These values ranged from 0-3.40 mg/L, with all values below 8 mg/L (the proposed Nitrate criteria for protection of aquatic life). The macroinvertebrate community had nitrate tolerant taxa ranging from 31.4%-48.6%. Nitrate related metric responses were mixed. Nitrate is inconclusive as a stressor to the macroinvertebrate community on both reaches of the Yellow Medicine River.

#### Inconclusive

In a small data set, all eight TSS samples were below the standard, as were the two transparency measurements. The macroinvertebrate sample was mixed, particularly at 10MN060. The invert samples did not have any TSS intolerant taxa collected, but the tolerant percentage was not increased. Metrics were mixed, with values lower in the upper reach (-802). Therefore, suspended solids are inconclusive as a stressor.

• Poor

The Yellow Medicine River had habitat scores ranging from 42 (Poor) - 51 (Fair) with an average score of 47.1 (Fair) across the five visits. The scores were lowered by lack of channel development and embeddedness of coarse substrates with fine substrates. The majority of the macroinvertebrate habitat related metrics scored below average. Given the fair MSHA scores and the metrics related to habitat, habitat is a stressor to the upper reaches of the Yellow Medicine River.

#### • Poor

The upper reach has a dam at site 20MN012. The upper reach (-802) is 100% altered while the lower reach (-803) is completely natural but is just downstream of the altered reach. Long lived macroinvertebrate percentages were lowered, indicating flow alteration is affecting the community. Altered hydrology is a stressor to the upper reaches of the Yellow Medicine River.

## Figure 21: Biological stressor determinations for tributaries to the Yellow Medicine River (-545 and -796). Red boxes indicate poor conditions and therefore, a stressor to aquatic life. Grey boxes indicate that the parameter is inconclusive as a stressor.

 Dissolved Oxygen
<ul> <li>Inconclusive         The two tributaries to the Yellow Medicine River had 33 DO measurements on reach -545 and one         measurement on -796 from 2010-2024. Values ranged from 2.68-11.10 mg/L with one value below the 5 mg/L         standard on reach -545. Four DO intolerant macroinvertebrates were collected on reach -796, higher than         average. DO related metrics were mixed. DO is inconclusive as a stressor to aquatic life on the two reaches.     </li> </ul>
Eutrophication
• Inconclusive The two tributaries to the Yellow Medicine River had 18 TP measurements on reach -545 and one measurement on -796 from 2010-2024. Values ranged from 0.02-0.26 mg/L with three values above the standard of 0.15 mg/L on reach -545. Chl- <i>a</i> , BOD, and DO fluctuations values are a proximate measurement of eutrophication and have more direct impacts on biology than phosphorus. No chl- <i>a</i> or DO flux data is available. There are indications of stress to the macroinvertebrate community on reach -796, but more TP samples would be helpful to confirm. Metrics are mixed on reach -545. Therefore, eutrophication is inconclusive as a stressor to both tributaries.
<ul> <li>Nitrates</li> <li>Inconclusive         The two tributaries to the Yellow Medicine River had 12 nitrate measurements on reach -545 and one measurement on -796 from 2010-2024. Values ranged from 0.8-8.98 mg/L with two values above 8 mg/L (the proposed Nitrate criteria for protection of aquatic life) on reach -545. The elevated values were both collected in June. The macroinvertebrate community had indications of nitrate stress, but further samples would be helpful to confirm. Nitrate is inconclusive as a stressor to both tributaries.     </li> </ul>
<ul> <li>Suspended Solids</li> <li>Inconclusive         The two tributaries to the Yellow Medicine River had 18 TSS measurements on reach -545 and one measurement on -796 from 2010-2024. All values were below the standard of 65 mg/L. Three of the 33 transparency measurements were below the standard on reach -545. The invert samples did not have any TSS intolerant taxa collected, and tolerant percentages were increased. Metrics were mixed. Suspended solids are inconclusive as a stressor to both tributaries.     </li> </ul>
Habitat •Poor Reach -545 had an average habitat score of 52.5 (Fair). The score was lowered by severe embeddedness and a lack of channel development. Reach -796 had a score of 38.7 (Poor). The score was lowered by lack of channel stability and severe embeddedness of coarse substrates with fine substrates. The majority of the macroinvertebrate habitat related metrics scored below average. Given the fair MSHA scores and the metrics related to habitat, habitat is a stressor on both reaches.
Altered Hydrology/Connectivity     • Poor     Reach -545 was altered while reach -796 is a natural channel. Both reaches have channelized upstream     watersheds. Long lived macroinvertebrate percentages were lowered on reach -545 indicating flow alteration is

#### Summary of stream health in the Upper Yellow Medicine River

Low DO values were collected on both reaches of the Yellow Medicine River. Continuous DO data were below 5 mg/L during each of the 12 days of deployment during 2024, with a low value of 2.08 mg/L. Over 69% DO tolerant individuals were present in the macroinvertebrate community in the upper reach (-802). The extent of natural low DO from the low gradient headwaters of the river versus low DO from human disturbance is unknown. DO values were lowest after 0.5 inch of rain.

Habitat conditions were considered fair to poor at all sites on the Yellow Medicine River (Figure 22) and the two tributaries. Riffles were absent from the sites on the upper reaches of the Yellow Medicine River. Channelization of the upper reach is likely contributing to the lack of habitat features, but riffles were also absent from the lower natural reach. Severe embeddedness of coarse substrates with fine sediments, or a lack of coarse substrates lowered the habitat scores. Severe erosion limited the score at site 20EM018 (Figure 23).

Elevated phosphorus values (0.67 mg/L) and thick algae (Figure 24) indicate possible eutrophication stress on the unnamed creek on reach -545. DO flux or chl-a data would help to confirm.

There is a dam along site 20MN012 in the upper reach of the Yellow Medicine River (Figure 25). The dam serves as a fish barrier. Fish were not collected at the site so migratory fish numbers are not available. Figure 22. Eroding bank on the Yellow Medicine River.



Figure 23. Eroding bank and trampling at site 20EM018.



Figure 24. Algae at site 10MN017 on reach -545.



Figure 25. Dam on the Yellow Medicine River.



## **Lower Yellow Medicine River Subwatershed**

#### **Biological Community Summary**

The Lower Yellow Medicine River Subwatershed (Figure 26) had one reach impaired for aquatic life due to degraded biological communities, Judicial Ditch 7 (-636). Stressors are identified in Figure 27.

Judicial Ditch 7 (-636) is a 3.3-mile-long stream reach that is impaired due to both the fish and macroinvertebrate assemblages at its biological monitoring station 10MN064. Station 10MN064 was sampled in 2010 and 2022.



Figure 26: Map of Lower Yellow Medicine River Subwatershed with impairment.

Figure 27: Biological stressor determinations for Judicial Ditch 7 (-636). Red boxes indicate poor conditions and therefore, a stressor to aquatic life. Grey boxes indicate that the parameter is inconclusive as a stressor.

<ul> <li>Dissolved Oxygen</li> <li>Inconclusive         Five DO measurements from 2010-2024 were available. Values ranged from 7.8-8.82 mg/L with zero values below the 5 mg/L standard. DO intolerant fish were absent, and DO tolerant macroinvertebrates increased from C1 to C2. DO related metrics were mixed. DO is inconclusive as a stressor to aquatic life.     </li> </ul>
<ul> <li>Eutrophication</li> <li>Inconclusive         Three TP measurements from 2010-2024 were available. Values ranged from 0.04-0.06 mg/L with all values below the standard of 0.15 mg/L. Chlorophyll-a, BOD, and DO fluctuations values are a proximate measurement of eutrophication and have more direct impacts on biology than phosphorus. No chlorophyll-a or DO flux data is available. There are indications of stress to the biological communities, but more TP samples would be helpful to confirm. Eutrophication is inconclusive as a stressor.     </li> </ul>
Nitrates  • Inconclusive  Three nitrate measurements from 2010-2024 were available. Values ranged from 1.9-9.5 mg/L with two values above 8 mg/L (the proposed Nitrate criteria for protection of aquatic life). The elevated values were both collected in both June and August. The macroinvertebrate community had indications of nitrate stress. Nitrate is inconclusive as a stressor to aquatic life.
<ul> <li>Suspended Solids</li> <li>Inconclusive         Three TSS measurements from 2010-2024 were collected. All values were below 12 mg/L, well below the standard of 65 mg/L. Five transparency measurements also all met the standard. The biological communities show indications of TSS stress, but further samples would be helpful to confirm. Suspended solids are inconclusive as a stressor.     </li> </ul>
Habitat • Poor Habitat scores at site 10MN064 averaged 48.8 (Fair) in 2010 and decreased to an average of 36.5 (Poor) in 2022. The reach is primarily a sandy run. All of the habitat related fish metrics scored below average, with both the riffle species and simple lithophilic spawners decreasing from C1 to C2. While there was some improvement in the habitat related macroinvertebrate metrics, the majority also indicate that habitat is a stressor to both communities.
Altered Hydrology

The reaches are 100% altered with a heavily channelized upstream watershed. Metrics related to flow alteration were all close to or below average. Altered hydrology is a stressor.

#### Summary of stream health in the Lower Yellow Medicine River

Lack of habitat is a stressor to Judicial Ditch 7. The habitat scores decreased from C1 to C2. Riffles and pools were present at site 10MN064 in 2010, but the riffles were absent in 2022. The riffle species and simple lithophilic spawners also decreased from C1 to C2. There is a small TSS dataset, but the biological communities have indication of stress from suspended sedimentation. Fine sediments were observed (Figure 28) and are likely contributing to the loss of riffle habitat and of fish species that depend upon coarse substrates and faster water.

The ditch has regained some sinuosity (Figure 29), but altered hydrology is still a stressor. Long-lived macroinvertebrate percentages were lowered, indicating flow alteration is affecting the community.

Two of the three nitrate values were elevated. Nitrate tolerant macroinvertebrates increased from 69.1% in 2020 to 81.9% in 2022. Further nitrate samples would be helpful to confirm nitrate as a stressor.

Figure 28. Fine sediment at site 10MN064.



Figure 29: Judicial Ditch 7.



# North Branch Yellow Medicine River Subwatershed

#### **Biological Community Summary**

One biological impairment exists in the North Branch Yellow Medicine River Subwatershed (Figure 30), on the North Branch Yellow Medicine River (-542). SID work occurred in C1. Stressors from C2 are identified in Figure 31.

North Branch Yellow Medicine River (-542) is a 38.13-mile stream reach that is impaired for aquatic life use due to the low scoring macroinvertebrate assemblages. Station 10EM016 was sampled in 2010, 2015, and 2022. The MIBI score significantly increased from 28 in 2010 and 27 in 2015 to 45 in 2022. The most recent score was above the biological threshold.

Figure 30: Map of the North Branch Yellow Medicine River Subwatershed with impairments.



Figure 31: Biological stressor determinations for North Branch Yellow Medicine River (-542). Red boxes indicate poor conditions and therefore, a stressor to aquatic life. Green boxes indicate good conditions and not a stressor to aquatic life.



## Dissolved Oxygen

The North Branch Yellow Medicine River had 39 DO measurements from 2013-2024. These values ranged from 5.99-8.97 mg/L with zero values below the 5 mg/L standard. Additionally, DO tolerant macroinvertebrates remained low and DO intolerant macroinvertebrates increased since C1. DO remains not a stressor to aquatic life on the North Branch Yellow Medicine River.

Good The North Branch Yellow Medicine River had 22 TP measurements from 2013-2024. These values ranged from 0.2-0.18 mg/L, with two values above the 0.15 mg/L standard. The two elevated values were collected near CSAH 19. Chlorophyll-a, BOD, and DO fluctuations values are a proximate measurement of eutrophication and have more direct impacts on biology than phosphorus. Chlorophyll-a and DO flux were not available. While the EPT percentage decreased from C1, the score was still above average. Total taxa improved and is now above average. Eutrophication is no longer a stressor.



#### Good

The North Branch Yellow Medicine River had six nitrate measurements from 2013-2024. These values ranged from 0-3.6 mg/L, with all values below 8 mg/L (the proposed Nitrate criteria for protection of aquatic life). Nitrate intolerant taxa were absent, but the percentage of nitrate tolerant macroinvertebrates remained below average and slightly decreased from C1. Nitrate remains not a stressor to aquatic life on the North Branch Yellow Medicine River.



#### Good

The North Branch Yellow Medicine River had 23 TSS samples from 2013-2024. These values ranged from 4-70 mg/L, with one value above the standard. Nine transparency measurements (out of 57) exceeded the standard. The macroinvertebrate TSS intolerant taxa were reduced, but the TSS tolerant percentage were also below average. Based on the low TSS values and the majority of the TSS related metrics, TSS is no longer a stressor to the North Branch Yellow Medicine River.



#### • Poor

Parts of the reach were channelized, but the majority of the reach is a natural channel. Parts of the reach were intermittent or dry in 2009, 2012, and 2022 and the river was dry from Porter to the mouth in 2023. Flow regime instability is a stressor to the river.

#### Summary of stream health in the North Branch Yellow Medicine River

Stressors identified in C1 were phosphorus, TSS, and altered hydrology. Phosphorus and TSS values were lower in C2 than in C1. Numerous sediment control basins and alternate intakes BMPs were implemented along the North Branch Yellow Medicine River, which seems to have reduced both sediment input and input from phosphorus attached to soil particles. In C1, 35.6% of phosphorus values were at or above the 0.15 mg/L, which decreased to 9% in C2. The TSS macroinvertebrate tolerant percentage decreased from C1 (41.9%) to C2 (33.6%).

The North Branch Yellow Medicine River was completely dry in 2023 downstream of the city of Porter (Figure 33). It was flowing upstream of Porter. The river was also observed to be dry in September 2009, July of 2012, and August 2022. Groundwater data near Porter has only been available since 2020 so a long term look at groundwater trends in the area was not possible. Flow data was not available on the North Branch Yellow Medicine River and would be helpful to see long term trends. While the area has experienced dry years in terms of precipitation, a stream flowing and then going dry near the mouth of the river was unusual, especially in southwest Minnesota. These dry periods are negatively impacting the macroinvertebrate community. Lack of consistent flow is a stressor to the North Branch Yellow Medicine River. Long lived macroinvertebrates decrease with low flows. The percentage in 2010 was below average but the site was not able to be sampled for macroinvertebrates in 2022 so a comparison over time is not available. Macroinvertebrates were not sampled in 2022 at site 10MN071 because the site was dry with some puddles according to the biological monitoring crew (Figure 32).

The dry conditions in 2023 revealed a dam on the river south of Porter (Figure 34). The dam is a fish barrier during low flows. There is also a wooden barrier at site along (Figure 35).

Figure 32. Site 10MN071 in 2022.



Figure 33. Dry streambed at 10MN071 in 2023.



Figure 35. Dam on the North Branch Yellow Medicine River.



Figure 34.Wooden barrier at 10EM016.



# South Branch Yellow Medicine River Subwatershed

#### **Biological Community Summary**

The South Branch Yellow Medicine River Subwatershed (Figure 36) has four reaches impaired for aquatic life due to the degraded biological communities. These reaches include South Branch Yellow Medicine River (County Ditch 35) (-762), Judicial Ditch 29 (-550), and an unnamed creek (-788). Stressors to the South Branch Yellow Medicine River are identified in Figure 37 and stressors for the tributaries are identified in Figure 38.

South Branch Yellow Medicine River (County Ditch 35) (-762) is an 8.5-mile stream reach that is impaired for aquatic life use due to the low scoring macroinvertebrate assemblage at the biological monitoring site, 10MN024. Station 10MN024 was sampled in 2010 and 2022.

Unnamed Creek (-788) is a 2.97-mile stream reach that is impaired for aquatic life use due to the degraded fish and macroinvertebrate assemblages at the biological monitoring site, 10MN023. The Fish IBI score was 0 at two visits in 2010. Only two fish species were collected during one visit, and three species during the second visit.

Judicial Ditch 29 (-550) is a 1.72-mile stream reach that is impaired for aquatic life use due to the degraded fish and macroinvertebrate assemblages at the biological monitoring site, 10MN028. The MIBI score decreased from 29 in 2010 to 8.8 in 2022.

Unnamed Creek (-599) is a 5.56-mile stream reach that is impaired for aquatic life use due to the degraded fish and macroinvertebrate assemblages at the biological monitoring site, 20MN005. Station 20MN005 was sampled in 2022.



Figure 36: Map of the South Branch Yellow Medicine River Subwatershed with impairments.

Figure 37: Biological stressor determinations for the South Branch Yellow Medicine River (-762). Red boxes indicate poor conditions and therefore, a stressor to aquatic life. Grey boxes indicate that the parameter is inconclusive as a stressor.

Dissolved Oxygen • Poor The South Branch Yellow Medicine River had six DO measurements from 2010-2024. These values ranged from 3.6-13.8 mg/L with two values below the 5 mg/L standard. DO related metrics were elevated. DO is a stressor to aquatic life on the South Branch Yellow Medicine River.
<ul> <li>Eutrophication</li> <li>Inconclusive         The South Branch Yellow Medicine River had four TP measurements from 2010-2024. These values ranged from         0.05-0.33 mg/L, with three values above the 0.15 mg/L standard. Chlorophyll-a, BOD, and DO fluctuations values         are a proximate measurement of eutrophication and have more direct impacts on biology than phosphorus. DO         flux and chlorophyll-a data were not available. The phosphorus related macroinvertebrate metrics were mixed.         Eutrophication is inconclusive as a stressor.     </li> </ul>
Nitrates • Inconclusive The South Branch Yellow Medicine River had four nitrate measurements from 2010-2024. These values ranged from 0.22-7.9 mg/L, with all values below 8 mg/L (the proposed Nitrate criteria for protection of aquatic life). While there is some evidence of nitrate stress, more nitrate samples would be helpful to confirm. Nitrate is inconclusive as a stressor.
Suspended Solids • Good The South Branch Yellow Medicine River had four TSS samples from 2010-2024. Values ranged from 3.6-22 mg/L, all measured below the standard. The four transparency measurements were also below the standard. The percentage of TSS tolerant taxa decreased from 41.7 in C1 to 14.63 in C2. Based on the low TSS and transparency values and the majority of sediment related metrics, suspended solids are not a stressor in this reach.
Habitat • Poor Habitat scores were poor both in 2010 and 2022 ranging from 40.5 to 44.6. Lack of channel development and embeddedness of coarse substrates both lowered the scores. Habitat related metrics were mixed. Given the poor MSHA scores as well as the presence of many tolerant macroinvertebrates related to habitat, habitat is a stressor in this reach.
Altered Hydrology  • Poor  The headwaters of the South Branch Yellow Medicine River (County Ditch 35) is completely channelized. Channelization and tile drainage alters the natural flow regime by moving water through the system at a higher.

The headwaters of the South Branch Yellow Medicine River (County Ditch 35) is completely channelized. Channelization and tile drainage alters the natural flow regime by moving water through the system at a higher frequency, increasing the impact of high flow events and increasing the intensity of low flow periods. Long-lived macroinvertebrates were low at both sampling visits. They decrease with flow changes as they are not able to stay in one place as conditions change. Altered hydrology is a stressor. Figure 38: Biological stressor determinations for tributaries to the South Branch Yellow Medicine River (-550, -599 and -788). Red boxes indicate poor conditions and therefore, a stressor to aquatic life. Green boxes indicate good conditions and not a stressor to aquatic life. Grey boxes indicate that the parameter is inconclusive as a stressor.

# Dissolved Oxygen Inconclusive 24 DO measurements on Judicial Ditch 29 (-550) from 2010-2022 were collected, with one value (2.7 mg/L) below the standard of 5 mg/L. Three DO measurements on reach -788 were collected in 2010 with one value (2.25 mg/L) below the standard. 20 DO measurements on reach -599 from 2010-2024 were collected, with no values below the standard of 5 mg/L. DO related metrics indicate possible DO stress on reaches -599 and -788. Early morning (pre 9AM) DO readings would help to confirm. The DO tolerant macroinvertebrates increased at site 10MN028 from C1 to C2. Early morning DO would also help on reach -550. DO is inconclusive as a stressor on all three reaches.

#### Eutrophication

Inconclusive

Three TP measurements on Judicial Ditch 29 (-550) from 2010-2022 were collected, all values below the standard of 0.15 mg/L. Three TP measurements on reach -788 were collected between 2010-2019 with one value (0.46 mg/L) above the standard. Two TP measurements on reach -599 were collected between 2022-2024 with both values at or above the standard. Chlorophyll-a, BOD, and DO fluctuations values are a proximate measurement of eutrophication and have more direct impacts on biology than phosphorus. No chlorophyll-a or DO flux data were available. There are indications of stress to the biological communities, but more TP samples and DO flux would be helpful to confirm. Eutrophication is inconclusive as a stressor on all three reaches.

#### litrates

#### Inconclusive

Three nitrate measurements on Judicial Ditch 29 (-550) from 2010-2022 were collected, all values below 8 mg/L (the proposed Nitrate criteria for protection of aquatic life). Three nitrate measurements on reach -788 were collected in 2010-2019 with all values below the proposed standard. Two nitrate measurements on reach -599 were collected 2022-2024 with both values below the standard. The macroinvertebrate community had indications of nitrate stress on all three reaches. Further nitrate samples would be helpful. Nitrate is currently inconclusive as a stressor to aquatic life on all three reaches.

#### Suspended Solids

#### Inconclusive

Three TSS measurements were collected on Judicial Ditch 29 (-550) between 2010-2022, all values below the standard of 65 mg/L standard. Two of the 24 transparency measurements exceeded the standard. Three TSS measurements on reach -788 collected between 2010-2019 with all values below the standard. The three transparency values also met the standard. Two TSS measurements on reach -599 were collected between 2022-2024, with both values meeting the standard. TSS related metrics were mixed on all three reaches. Suspended solids are inconclusive as a stressor.

Habita

#### Poor

Habitat scores at site 20MN005 averaged 33.5 (Poor), the score at 10MN023 was 39.5 (Poor), and the score at 10MN028 was 42.9 (Poor). Lack of channel development and severe embeddedness decreased the score at site 20MN005. Lack of channel development, lack of depth variability, and lack of coarse substrates decreased the score at site 10MN023. Lack of channel development and embeddedness decreased the score at site 10MN023. Lack of channel development and embeddedness decreased the score at site 10MN028. Burrowers were increased at all sites, which are an indication of excess fine sediments. The lack of coarse substrates is reflected in the lack of riffle species and lithophilic spawners. The majority of habitat related metrics indicate habitat is a stressor on each reach.

#### Altered Hydrolo

Poor

Reaches -550 and -788 are altered with predominantly channelized upstream watersheds. Reach -599 is natural with a predominantly natural upstream watershed. Long-lived macroinvertebrates were low. Long-lived macroinvertebrates decrease with flow changes, as they are not able to stay in one place as conditions change. Altered hydrology is a stressor to reaches -550 and -788. Altered hydrology is not a stressor to the unnamed creek (-599).

#### Summary of stream health in the South Branch Yellow Medicine River

DO is a stressor to the South Branch Yellow Medicine River. While there was a small DO dataset, both values collected in the morning (when DO values are typically lowest) were below 5 mg/L. DO tolerant macroinvertebrates increased from 32.2% in C1 to 68.8% in C2.

Elevated DO was also collected and algal mats (Figure 39) indicate that eutrophication could also be a stressor. DO flux or chl-*a* samples would help to conform.

Paired nitrate samples from a tile drain and the nearby South Branch Yellow Medicine River were 8.4 mg/L and 6.2 mg/L respectively. There was a sediment plume coming from the outlet (Figure 40), indicating that nitrate and sediment are both flowing from the field into the river.

The habitat conditions in the South Branch Yellow Medicine River were consistent with poor scores in C1 and C2. This was primarily due to the low cover amounts and a lack of riffles. Habitat scores were also poor on the three tributaries. The score at site 10MN023 on reach -788 was lowered due to the lack of any riffles or pools. Site 10MN028 on reach -550 had excess sedimentation. Site 20MN005 on reach -599 was observed to have heavy to severe erosion (Figure 41).

Channelization of the South Branch Yellow Medicine River (County Ditch 35) headwaters and two of the tributaries (-550 and -788) is contributing to the poor habitat conditions. Fish that are generalists are correlated with channelization. Generalists increased from C1 to C2 at site 10MN028.

Early morning DO and further nitrate samples would be helpful on all three of the tributaries.

Figure 39. Algae at site 10MN024.



Figure 40. Tile drain into the South Branch Yellow Medicine River.



Figure 41. Erosion and excess sediment at site 20MN005.



# **Spring Creek Subwatershed**

## **Biological Community Summary**

The Spring Creek Subwatershed (Figure 42) had four reaches impaired for aquatic life due to degraded biological communities. These reaches are Unnamed ditch (-539), County Ditch 48 (-697), Spring Creek (-776) and Spring Creek (-777). Stressors to Spring Creek are identified in Figure 43 and stressors to the tributaries are identified in Figure 44.

Unnamed ditch (-539) is a 3.88-mile-long stream reach that is impaired for aquatic life use due to the poor scoring fish and macroinvertebrate communities at its biological monitoring station 10MN046. No fish were collected when sampled in 2010.

County Ditch 48 (-697) is a 1.89-mile-long stream reach that is impaired for aquatic life use due to poor scoring fish and macroinvertebrate communities at its biological monitoring site 10MN068. Station 10MN068 was sampled in 2010 and 2022.

Spring Creek (-776) is a 19.45-mile-long stream reach that is impaired for aquatic life use due to the fish and macroinvertebrate communities at its biological monitoring station 10EM190. Station 10EM190 was sampled in 2010 and 2022.

Spring Creek (-777) is a 20.48-mile-long stream reach that is impaired for aquatic life use due to the fish and macroinvertebrate communities at three biological monitoring stations: Station 10MN037 was sampled in 2010, station 91MN014 was sampled in 2010 and 2022, and 15MN207 was sampled in 2015.



Figure 42: Map of Spring Creek Subwatershed with impairments.

Figure 43: Biological stressor determinations for Spring Creek (-776 and -777). Red boxes indicate poor conditions and therefore, a stressor to aquatic life. Grey boxes indicate that the parameter is inconclusive as a stressor.

<ul> <li>Dissolved Oxygen</li> <li>Poor</li> <li>Spring Creek had 245 DO measurements from 2010-2024. Values ranged from 0.2-15.86 mg/L with 21 values below the 5 mg/L standard. Almost all of the chemistry data was collected at the mouth of the creek. The majority of both the fish and macroinvertebrate metrics related to DO scored below average in earlier visits, but scores improved with the 2022 fish sample. DO is a stressor to both reaches of Spring Creek.</li> </ul>
<ul> <li>Eutrophication</li> <li>Inconclusive</li> <li>Spring Creek had 254 phosphorus samples from 2010-2024. Values ranged from 0.2-1.66 mg/L, with 185 values on reach -777 and the one Phosphorus value on -776 above the 0.15 mg/L standard. The majority of samples were collected near the mouth. Chlorophyll-a, BOD, and DO fluctuations values are a proximate measurement of eutrophication and have more direct impacts on biology than phosphorus. Chlorophyll-a and DO flux data are not available, but elevated DO (15.86) and pH (9.64) values on reach -777 indicate possible eutrophication. The majority of metrics related to eutrophication scored below average in earlier visits, but scores improved with the 2022 fish sample. Collecting DO flux or chlorophyll-a would help to confirm eutrophication as a stressor. Eutrophication is currently inconclusive as a stressor to both reaches.</li> </ul>
Nitrates  Inconclusive Spring Creek had 254 samples between 2010-2024. Values ranged from 0-11.10 mg/L, with 13 values above 8 mg/L (the proposed Nitrate criteria for protection of aquatic life). Almost all of the chemistry data was collected at the mouth of the creek. The macroinvertebrate community of both sites were lacking any nitrate intolerant taxa; however the nitrate tolerant percentages were also low. Nitrate is inconclusive as a stressor to aquatic life to both reaches of Spring Creek.
Suspended Solids  • Inconclusive Spring Creek had 253 TSS samples from 2010-2024. Values ranged from 0-175 mg/L, with 18 values above the 65 mg/L standard. Over 5% of the transparency tube values also exceeded the standard. While there are some indications of TSS stress in the biological communities, TSS is inconclusive as a stressor to both reaches.
<ul> <li>Habitat</li> <li>Poor</li> <li>Spring Creek had habitat scores ranging from 30.5 (Poor) - 50 (Fair). Lack of channel development and lack of shade decreased the scores. The majority of the habitat related metrics were below average. Given the MSHA scores as well, habitat is a stressor to both reaches of Spring Creek.</li> </ul>
Altered Hydrology • Poor The upstream reach on Spring Creek is predominantly altered and a section of the lower reach is also altered. Metrics correlated with flow changes indicate altered hydrology is a stressor to both reaches of Spring Creek. Channelization and tile drainage alters the natural flow regime by moving water through the system at a higher frequency, increasing the impact of high flow events and increasing the intensity of low flow periods.

Figure 44: Biological stressor determinations for the tributaries to Spring Creek (-539, -697). Red boxes indicate poor conditions and therefore, a stressor to aquatic life. Green boxes indicate good conditions and not a stressor to aquatic life. Grey boxes indicate that the parameter is inconclusive as a stressor.

#### • Poor Both DO values on reach -539 (1.67-2.98 mg/L) and one (4.98 mg/L) of six values on reach -697 were below the 5 mg/L DO standard. Two other DO values on reach -697 were just above 5 mg/L. No fish were collected on reach -539, preventing a complete understanding of the fish community. The DO tolerant macroinvertebrates were elevated. Fish and macroinvertebrate DO related metrics indicate DO is a stressor on reach -697, particularly on the most recent 2023 sample. DO is a stressor on both ditches.

Inconclusive

Five TP measurements between 2010-2024 were collected on the two reaches. Values ranged from 0.19-0.39 mg/L with all values above the standard of 0.15 mg/L. Chlorophyll-a, BOD, and DO fluctuations values are a proximate measurement of eutrophication and have more direct impacts on biology than phosphorus. No chlorophyll-a or DO flux data are available. No fish were collected on reach -539, preventing a complete understanding of the fish community. There are indications of stress to the biological communities, but more TP samples and DO flux would be helpful to confirm. Eutrophication is inconclusive as a stressor on both ditches.

#### Inconclusive

Five nitrate measurements between 2010-2024 were collected on the two reaches. Values ranged from 0.46-10 mg/L with two values above 8 mg/L (the proposed Nitrate criteria for protection of aquatic life) on reach -697. The elevated values were collected in July and August. The macroinvertebrate community had indications of nitrate stress during C1 on both reaches, but the community looked better during C2 on reach -697. Further nitrate samples would be helpful. Nitrate is currently inconclusive as a stressor on both ditches.



• Poor Habitat scores at site 10MN068 averaged 32.7 (Poor) and the score at 10MN046 was 54.5 (Fair). Lack of channel development decreased the score at 10MN046, and lack of stability, lack of depth variability, and lack of coarse substrates decreased the score at site 10MN068. No fish were collected on reach -539, preventing a complete understanding of the fish community. The habitat related fish metrics habitat indicate lack of habitat is a stressor on reach -697. The habitat related macroinvertebrate metrics also indicated that habitat is a stressor to reach -539.



Both reaches are 100% altered with channelized upstream watersheds. Long-lived macroinvertebrates were low. Long-lived macroinvertebrates decrease with flow changes as they are not able to stay in one place as conditions change. Fish that are generalists are correlated with channelization. Generalists increased from C1 to C2. Altered hydrology is a stressor to both ditches.

#### Summary of stream health in Spring Creek

The lower reach of Spring Creek is impaired by DO. Spring Creek is low gradient and was noted to be wetland dominated with a lot of cattails and very low DO (0.2 mg/l) at site 10MN037 in 2010 (Figure 45). Macroinvertebrates were not sampled due to wetland characteristics at site 91MN014. Water was completely stagnant. DO is a stressor, but the natural component from wetland influence is unknown. DO tolerant macroinvertebrates increased from 22.6% in C1 to 44.3% in C2. DO is also a stressor to both ditches. Cattails were observed growing in the channel at site 10MN068.

Spring Creek had elevated phosphorus, elevated DO, and thick algal growth (Figure 46). Orthophosphorus, which is the form of phosphorus available to plants, comprised on average 56% of total phosphorus values, ranging from 11% to 100% on the downstream reach of Spring Creek (-777). Seventy-three percent of phosphorus values exceeded the standard of 0.150 mg/L and were elevated as high as 1.66 mg/L. All phosphorus values collected on the two ditches were elevated (Figure 47). Chl-*a* or DO flux data on Spring Creek and the two ditches would help to confirm eutrophication as a stressor.

The habitat conditions on both Spring Creek and the two ditches ranged from poor to fair. Site 91MN014 on Spring Creek was observed to have severe embeddedness. The score at 10EM190 decreased 13 points from C1 to C2, based on increased bank erosion. The score at site 10MN068 on CD 48 was lowered by a lack of coarse substrates which was reflected in the lack of riffle species and lithophilic spawners.

Figure 45. Spring Creek at site 10MN037.



Figure 46. Algae at site 91MN014.



Figure 47. Excess plant growth on CD 48.



The channelization of the upper reach of Spring Creek and the ditches is also contributing to the poor habitat.

Specific conductance values were very high (over 2,000 uS/cm) on both Spring Creek and the unnamed ditch. A study of Minnesota biological data and stressor linkages found that sites with conductivities higher than 1,000  $\mu$ S/cm rarely meet the biological thresholds for General Use streams (MBI 2012). As salinity increases, macroinvertebrate taxa richness and Ephemeroptera richness decrease (Piscart et al. 2005). Ephemeroptera comprised less than 1% of the macroinvertebrate community on the unnamed ditch. The percentages were also lower than average in Spring Creek, but it is difficult to separate this effect from other stressors.

# **Judicial Ditch 17 Subwatershed**

## **Biological Community Summary**

The Judicial Ditch 17 Subwatershed (Figure 48) has four reaches impaired for aquatic life due to degraded fish and macroinvertebrate communities. These reaches are Judicial Ditch 17 (-622), County Ditch 4 (-663), Unnamed ditch (-669), and Unnamed Creek (-703). Stressors are identified in Figure 49.

- Judicial Ditch 17 (-622) is a 1.1-mile-long reach that flows from County Ditch 3 to the Yellow Medicine River. This reach is impaired for aquatic life use due to the low scoring macroinvertebrate assemblages at its biological monitoring station 10MN012. Station 10MN012 was sampled in 2010 and 2022.
- County Ditch 4 (-663) is a 4.79-mile-long stream reach that is impaired for aquatic life use due to the low scoring macroinvertebrate assemblage at biological monitoring site 10MN070. Station 10MN070 was sampled in 2010.
- Unnamed Ditch (-669) is a 2-mile-long stream reach that is impaired due to the degraded fish and macroinvertebrate communities at its biological monitoring station 10MN043. Station 10MN043 was sampled in 2010 and 2022.
- Unnamed Creek (-703) is a 2.48-mile-long stream reach that is impaired due to the degraded fish and macroinvertebrate communities at its biological monitoring station 10MN130. Station 10MN130 was sampled in 2010.

Figure 48: Map of Judicial Ditch 17 Subwatershed with impairments.



Figure 49: Biological stressor determinations for Judicial Ditch 17 (-622) and tributaries (-663, -669, -703). Red boxes indicate poor conditions and therefore, a stressor to aquatic life. Grey boxes indicate that the parameter is inconclusive as a stressor.

Dissolved Oxygen
• Poor Two DO measurements from 2010 were collected on County Ditch 4 (-663), ranging from 5.58-9.62 mg/L. Of the three DO values collected (2.4-25 mg/L) between 2010-2022 on reach -669, two were below the standard of 5 mg/L. 42 measurements were collected between 2010-2022 on Judicial Ditch 17 (-622), ranging from 0.49-18.53 mg/L. Two measurements were below the standard. Two DO values collected in 2010 on reach -703 (9.3-14.04 mg/L) were above the standard. Reaches -663 and -703 had limited DO data and DO related metrics were mixed. Reach -622 had a few low DO values in a large dataset, but metrics were also mixed. Based on low DO values and an increase of DO tolerant macroinvertebrates, DO is a stressor to reach -669. DO is inconclusive to the other three reaches.
Eutrophication
<ul> <li>Inconclusive         One phosphorus measurement (0.10 mg/L) from 2010 was collected on County Ditch 4 (-663), below the standard of 0.15 mg/L. Two TP measurements were collected between 2010-2022 on reach -669 ranging from 0.12-0.32 mg/L. One value was above the standard. 22 TP measurements were collected between 2010-2022 on Judicial Ditch 17 (-622) ranging from 0.06-0.26 mg/L. Ten of the measurements exceeded the standard. One TP value collected in 2010 on reach -703 (0.2 mg/L) was above the standard. Chlorophyll-a, BOD, and DO fluctuations values are a proximate measurement of eutrophication and have more direct impacts on biology than phosphorus. No chlorophyll-a or DO flux data were available. There are indications of stress to the biological communities, but more TP samples and DO flux would be helpful to confirm on reaches -622, -669 and -703. Metrics were mixed on reach -663. Eutrophication is inconclusive as a stressor on all of the reaches.     </li> </ul>
Nitrates
• Inconclusive One measurement (16 mg/L) from 2010 was collected on County Ditch 4 (-663), above 8 mg/L (the proposed Nitrate criteria for protection of aquatic life). Two nitrate measurements were collected between 2010-2022 on reach (-669) ranging from 0.22-2.70 mg/L, both well below the proposed standard. Twelve nitrate measurements were collected between 2010-2022 on Judicial Ditch 17 (-622) ranging from 0.38-13.5 mg/L. Five of the measurements exceeded the proposed standard. One nitrate value collected in 2010 on reach -703 (16 mg/L) was above the standard. While nitrate was elevated on JD 17, metrics were mixed. The macroinvertebrate community had indications of nitrate stress, but further nitrate samples would be helpful on CD 4 (-663) and (- 703). Nitrate is currently inconclusive as a stressor to aquatic life on all the reaches.
Suspended Solids
• Inconclusive One measurement (2.8 mg/L) from 2010 was collected on County Ditch 4 (-663), which was below the standard of 65 mg/L. Two TSS measurements were collected between 2010-2022 on reach -669 ranging from 4.8-6 mg/L, with both values well below the standard. Twenty-two TSS measurements were collected between 2010-2022 on Judicial Ditch 17 (-622) ranging from 7-70 mg/L. Three of the measurements exceeded the standard. One TSS value collected in 2010 on reach -703 (100 mg/L) was above the standard. TSS intolerant and TSS tolerant macroinvertebrates were both low on JD 17 and reaches -669 and -703. Other metrics were mixed. There are indications of TSS on reach -663 but further TSS samples would help to confirm. Suspended solids are inconclusive as a stressor on all the reaches.
Habitat
• Poor Habitat scores decreased on both JD 17 (10MN012) and the unnamed ditch (10MN043) from C1 to C2. A lack of sinuosity, embeddedness, and a lack of channel stability lowered the scores on JD 17 and a lack of channel development and lack of sinuosity lowered the score at 10MN043. The score at 10MN070 was 35 (Poor), with a lack of channel development, lack of depth variability, and a lack of coarse substrates limiting the score. The score at 10MN130 was 25.5 (Poor) with severe embeddedness and a lack of channel development limiting the score. Sites 10MN070 and 10MN130 had elevated legless individuals which thrive in fine sediments environments. Riffle and darter and sucker species were low at all sites. The habitat related metrics also indicated that habitat is a stressor to each of the reaches.
Altered Hydrology
• Poor All of the reaches are 100% altered. Altered hydrology is a stressor for all of the reaches. Channelization and tile drainage alters the natural flow regime by moving water through the system at a higher frequency, increasing the impact of high flow events and increasing the intensity of low flow periods.

#### Summary of stream health in Judicial Ditch 17 Subwatershed

DO is a stressor to the unnamed ditch on reach -669. There was a limited DO dataset, but two of the three values were below 5 mg/L. There was a large increase of DO tolerant macroinvertebrates from C1 (18%) to C2 (87%). JD 17 also had a very low DO value of 0.49 mg/L. Wetland plants were growing along the ditch (Figure 50).

Thick algae at site 10MN130 indicates excess eutrophication on the unnamed creek (Figure 51). Phosphorus values exceeded the standard at a high rate on JD 17 (45%). Chl-*a*, BOD, or DO flux data would be helpful on both reaches to determine if eutrophication is a stressor.

Three of the reaches (CD 4, JD 17, and the unnamed creek) had high nitrate measurements. Further nitrate samples would be helpful on CD 4 (-663) and the unnamed creek (-703). Nitrate values were low on the unnamed ditch (-669), but nitrate tolerant macroinvertebrates increased from C1 (16.8%) to C2 (56%).

The habitat conditions in JD 17 decreased 20 points from 2010 to 2022 at site 10MN012. The Fair rating lowered to Poor in C2 (Figure 52). Embeddedness increased at the site and a riffle disappeared from the reach. The score at 10MN043 was 50 (Fair) in C1 and decreased to an average of 42 (Poor) in C2. The channelization of each of the reaches is contributing to the poor habitat.

Altered hydrology is a stressor to JD 17 and the three tributaries. Long-lived macroinvertebrates were low at all sites. They decrease with flow changes as they are not able to stay in one place as conditions change. Nest guarders increased at sites 10MN070 and 10MN130. Numbers of nest guarder species are also positively correlated with increased low flows.

Figure 50. Vegetation at 10MN043.



Figure 51. Algal growth at site 10MN130.



Figure 52. Eroding banks on JD 17.



# Judicial Ditch 10 (Wood Lake Creek) Subwatershed

## **Biological Community Summary**

The Judicial Ditch 10 (Wood Lake Creek) Subwatershed (Figure 53) has three reaches impaired for aquatic life due to degraded fish and macroinvertebrate communities. These reaches are Judicial Ditch 10 (-518), Judicial Ditch 10 (Wood Lake Creek) (-546), and County Ditch 31 (-737). Stressors to Judicial Ditch 10 (Wood Lake Creek) are identified in Figure 54 and stressor to the tributaries are identified in Figure 55.

- Judicial Ditch 10 (-518) is a 3.5-mile-long stream reach that is impaired for aquatic life use due to the low scoring fish and macroinvertebrate assemblages at its biological monitoring station 10MN129. Station 10MN129 was sampled in 2010.
- Judicial Ditch 10 (Wood Lake Creek) (-546) is 15.45-mile-long stream reach that is impaired for aquatic life use due to the low scoring fish and macroinvertebrate assemblages at its biological monitoring stations 10MN056 and 10MN126. Both stations were sampled in 2010 and 2022.
- County Ditch 31 (-737) is a 5.27-mile-long stream reach that is impaired due to the degraded macroinvertebrate communities at its biological monitoring station 10MN128. Station 10MN128 was sampled in 2010.



#### Figure 53: Map of Wood Lake Creek-MN River Subwatershed with impairments.

Figure 54: Biological stressor determinations for Judicial Ditch 10 (Wood Lake Creek) (-546). Red boxes indicate poor conditions and therefore, a stressor to aquatic life. Grey boxes indicate that the parameter is inconclusive as a stressor.

Dissolved Oxygen
• Inconclusive Eight DO measurements on Judicial Ditch 10 (Wood Lake Creek) from 2010-2022 were collected. Values ranged from 4.56-24.10 mg/L with one value below the standard of 5 mg/L. There are indications of DO stress on JD 10, particularly at site 10MN126. Early morning DO readings would help to confirm. DO is inconclusive as a stressor.

Eutrophication
• Inconclusive Four TP measurements on Judicial Ditch 10 (Wood Lake Creek) from 2010-2022 were collected. Three values were above the standard of 0.15 mg/L. Chlorophyll-a, BOD, and DO fluctuations values are a proximate measurement of eutrophication and have more direct impacts on biology than phosphorus. No chlorophyll-a or DO flux data were available. There are indications of eutrophic stress, but it would be helpful to collect DO flux or chlorophyll-a to confirm. Eutrophication is inconclusive as a stressor.

#### Inconclusive

Five nitrate measurements on Judicial Ditch 10 (Wood Lake Creek) from 2010-2022 were collected. All nitrate measurements were at or above 8 mg/L (the proposed Nitrate criteria for protection of aquatic life). The macroinvertebrate community of both sites were lacking any nitrate intolerant taxa, but nitrate tolerant percentages were only elevated at site 10MN126. Nitrate is inconclusive as a stressor to aquatic life.



Four TSS measurements on Judicial Ditch 10 (Wood Lake Creek) from 2010-2022 were collected. One value (140 mg/L) was above the standard of 65 mg/L. The highest value was collected in the lower part of the reach. The eight transparency measurements met the standard. TSS intolerant taxa were low, but so were TSS tolerant percentages. Suspended solids are inconclusive as a stressor.

📉 Habita
• Poor The h score lack o there habita

abitat score at site 10MN056 was 30.5 in 2010 and decreased to 20 in 2022, both poor scores. The habitat at site 10MN126 was 30.3 (Poor). Scores were lowered at both sites by a lack of channel development, a f depth variability, and no coarse substrates. Site 10MN126 also had a lack of channel stability. While was some improvement in the habitat related fish macroinvertebrate metrics, the majority indicate that at is a stressor to JD 10.

• Poor

Judicial Ditch 10 is 100% altered. Channelization and tile drainage alters the natural flow regime by moving water through the system at a higher frequency, increasing the impact of high flow events and increasing the intensity of low flow periods. Altered hydrology is a stressor.

## Figure 55: Biological stressor determinations for County Ditch 10 (-518) and County Ditch 31 (-737). Red boxes indicate poor conditions and therefore, a stressor to aquatic life. Grey boxes indicate that the parameter is inconclusive as a stressor.

<ul> <li>Dissolved Oxygen</li> <li>Inconclusive Seven DO measurements on the two ditches were collected from 2010-2019. Values ranged from 0.91-12.96 mg/L with one below the standard of 5 mg/L. Fish and macroinvertebrate DO related metrics indicate DO is a stressor on reach -518. Early morning DO readings would help to confirm. DO is also inconclusive as a stressor to reach -737.</li> </ul>
Eutrophication  Inconclusive Two TP measurements on the two ditches were collected in 2010. The value on Judicial Ditch 10 (0.21 mg/L) was above the standard of 0.15 mg/L. Chlorophyll-a, BOD, and DO fluctuations values are a proximate measurement of eutrophication and have more direct impacts on biology than phosphorus. No chlorophyll-a or DO flux data were available. Metrics were mixed. Eutrophication is inconclusive as a stressor on both ditches.
Nitrates  Inconclusive Two nitrate measurements on the two ditches from 2010 were collected. The value on County Ditch 31 (14 mg/L) was above 8 mg/L (the proposed Nitrate criteria for protection of aquatic life). The macroinvertebrate community had indications of nitrate stress, but further nitrate values would be helpful to confirm. Nitrate is currently inconclusive as a stressor to the two ditches.
Suspended Solids  • Inconclusive Two TSS measurements on the two ditches from 2010 were collected, both well below the standard of 65 mg/L. All four transparency measurements were 100 cm. TSS intolerant taxa were low, but the TSS tolerant percentages were also below average. Metrics were mixed. TSS is inconclusive as a stressor on both ditches.
Habitat •Poor The habitat score at site 10MN128 was 47.8 (Fair). The habitat score at site 10MN129 was 30.5 (Poor). Lack of depth variability, lack of channel development, lack of sinuosity, and a lack of coarse substrates decreased the score at both sites. The habitat related fish metrics scored below average at site 10MN029. Habitat is a stressor to both ditches.
<ul> <li>Altered Hydrology</li> <li>Poor         The ditches are both 100% altered. Channelization and tile drainage alters the natural flow regime by moving water through the system at a higher frequency, increasing the impact of high flow events and increasing the intensity of low flow periods. Long-lived macroinvertebrates were low on all both reaches. Long-lived macroinvertebrates decrease with flow changes as they are not able to stay in one place as conditions change. Altered hydrology is a stressor to both ditches.     </li> </ul>

#### Summary of stream health in Judicial Ditch 10 (Wood Lake Creek) Subwatershed

SID work was completed on the downstream natural reach (from Wood Lake to the MN River) of Judicial Ditch 10 (Wood Lake Creek) during C1. DO, eutrophication, nitrates, suspended solids, and lack of habitat were the identified stressors for both reaches during C1 SID.

Three of the four phosphorus values were elevated on JD 10 (Wood Lake Creek) and the tributary JD 10. Thick algae was present (Figure 56and Figure 57) and DO values were also very high (24.10 mg/L) which is an indication of eutrophication. Choking filamentous algae and vegetation were observed at site 10MN056. *Hyalella* were the most common macroinvertebrate collected at both sites on JD 10 (Wood Lake Creek). They feed on organic material/detritus, so high numbers can be a sign of eutrophication.

The habitat conditions in JD 10 worsened over 10 points from 2010 to 2022 at site 10MN056. Heavy siltation decreased the score from C1 to C2 (Figure 58). Legless macroinvertebrates were high at 10MN128 on CD 31. Legless individuals are a signal of high levels of sedimentation. The channelization of each of the reaches is also contributing to the poor habitat.

Altered hydrology is a stressor to JD 10 and the two tributaries. Generalists were above average at all of the fish visits on JD 10. Generalist fish species, which are adaptable to different habitats through generalized food preferences, are correlated with channelization. Neither of the sites on JD 10 were able to be sampled in C2 in 2022 due to water levels being too low. The numbers of nest guarder species are also Figure 56. Thick algae on JD 10 (Wood Lake Creek).



Figure 57. Algae at 10MN128.



Figure 58. Silt and algae at site 10MN126.



positively correlated with increased low flows. The nest guarders made up more than 94% of the fish community at site 10MN129.

# Wood Lake Creek-MN River Subwatershed

#### **Biological Community Summary**

The Wood Lake Creek-MN River Subwatershed (Figure 59) has one reach impaired for aquatic life due to the degraded biological community located in the Yellow Medicine Watershed. The reach is Boiling Spring Creek (-555). Stressors are identified in Figure 60.

Boiling Spring Creek (-555) is a 3.58-mile-long stream reach that is impaired for aquatic life use due to the low scoring fish assemblage at its biological monitoring station 20MN007.

Figure 59: Map of Wood Lake Creek-MN River Subwatershed with impairments.



Figure 60: Biological stressor determinations for Boiling Spring Creek (-555). Red boxes indicate poor conditions and therefore, a stressor to aquatic life. Grey boxes indicate that the parameter is inconclusive as a stressor.



#### Summary of stream health in Boiling Spring Creek

Habitat is a stressor to Boiling Spring Creek. Site 10MN008 is a natural stretch of the creek and 20MN007 was located just downstream on a channelized section of the creek. Habitat related metrics were lower on the channelized section. Heavy erosion was observed at both sites (Figure 61 and Figure 62), which lowered the channel stability score. Embeddedness of coarse substrates with fine sediments lowered the habitat scores at both sites.

Figure 61. Erosion at site 20MN007.



Altered hydrology is a stressor to the creek. Generalists were elevated at the channelized site,

20MN007. Generalist fish species, which are adaptable to different habitats through generalized food preferences, are correlated with channelization.

Phosphorus values were high, with 45% of values over the standard, along with one elevated chl-*a* value. Elevated DO values (a high value of 13.21 mg/L) are also indications of eutrophication.

Figure 62. Bank erosion at site 10MN008.



## **Part 3: Conclusion**

Table 1: Stressor determinations in the Yellow Medicine River Watershed.

		Strossors	Dissolved	Eutrophication	Nitroto	Suspended	Uphitat	Altered
Stream Name		Aquatic Life Impairment	Oxygen	Eutrophication	Nitrate	Solius	парнас	пуштотову
Story Run Creek-Minnesota River Subwatershed		Aquatic Life impairment						
Unnamed Creek	07020004-710	Fish, Macroinvertebrates		0	0		•	•
County Ditch 6A	07020004-714	Macroinvertebrates	0	0	0		٠	•
County Ditch 90	07020004-792	Macroinvertebrates	0	0	0		•	•
Stony Run Creek Subwatershed								
Stony Run Creek	07020004-580	Fish, Macroinvertebrates	•	0	0	0	•	•
Stony Run Creek	07020004-772	Fish, Macroinvertebrates	•	•	0	0	•	•
Unnamed Ditch	07020004-709	Fish, Macroinvertebrates	•	0	о	0	•	•
County Ditch 9 Subwatershed								
Hazel Creek	07020004-774	Fish, Macroinvertebrates	0	•	о	0	•	•
Upper Yellow Medicine River Subwatershed								
Unnamed creek	07020004-545	Macroinvertebrates	0	0	о	0	•	•
Unnamed creek	07020004-796	Macroinvertebrates	0	0	0	0	•	
Yellow Medicine River	07020004-802	Macroinvertebrates	•	0	0	0	•	•
Yellow Medicine River	07020004-803	Macroinvertebrates	•		0	0	•	•
Lower Yellow Medicine River Subwatershed								
Judicial Ditch 7	07020004-636	Fish, Macroinvertebrates	0	0	0	0	٠	•
North Branch Yellow Medicine River Subwatershed								
North Branch Yellow Medicine River	07020004-542	Macroinvertebrates						•
South Branch Yellow Medicine River Subwatershed								
Judicial Ditch 29	07020004-550	Fish, Macroinvertebrates	0	0	0	0	•	•
Unnamed Creek	07020004-599	Fish, Macroinvertebrates	0	0	0	0	•	
South Branch Yellow Medicine River (County Ditch 35)	07020004-762	Macroinvertebrates	•	0	0		•	•

		Stressors	Dissolved Oxygen	Eutrophication	Nitrate	Suspended Solids	Habitat	Altered Hydrology	
Stream Name	AUID		Aquatic Life Impairment						
Unnamed Creek	07020004-788		Fish, Macroinvertebrates	0	о	0	0	•	•
Spring Creek Subwatershed									
Unnamed ditch		07020004-539	Fish, Macroinvertebrates	•	0	0	0	•	•
County Ditch 48		07020004-697	Fish, Macroinvertebrates	٠	0	о	0	•	•
Spring Creek		07020004-776	Fish, Macroinvertebrates	٠	0	о	0	•	•
Spring Creek		07020004-777	Fish, Macroinvertebrates	•	0	о	0	•	•
Judicial Ditch 17 Subwatershed									
Judicial Ditch 17		07020004-622	Macroinvertebrates	0	0	0	0	•	•
County Ditch 4		07020004-663	Macroinvertebrates	0	0	о	0	•	•
Unnamed Ditch		07020004-669	Fish, Macroinvertebrates	•	0	о	0	•	•
Unnamed Creek		07020004-703	Fish, Macroinvertebrates	0	0	0	0	•	•
Judicial Ditch 10 (Wood Lake Creek) Subwatershed									
Judicial Ditch 10		07020004-518	Fish, Macroinvertebrates	•	0	0	0	•	•
Judicial Ditch 10 (Wood La	ke Creek)	07020004-546	Fish, Macroinvertebrates	0	0	о	0	•	•
County Ditch 31		07020004-737	Macroinvertebrates	0	0	о	0	•	•
Wood Lake Creek-MN River Subwatershed									
Boiling Spring Creek		07020004-555	Fish	0	0	•	0	•	•

• = stressor; o = inconclusive stressor; --- = not an identified stressor

## For more information

The Yellow Medicine River WRAPS Updates, including necessary TMDLs, follows the completion of the SID process. For more information, go to <u>Minnesota River - Yellow Medicine River/Hawk Creek</u> <u>Minnesota Pollution Control Agency (state.mn.us)</u> or search for "Minnesota River – Yellow Medicine" on the MPCA website.

Details and specific monitoring information related to the SID analysis of this report is available from the contact below.

## **Contact person**

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